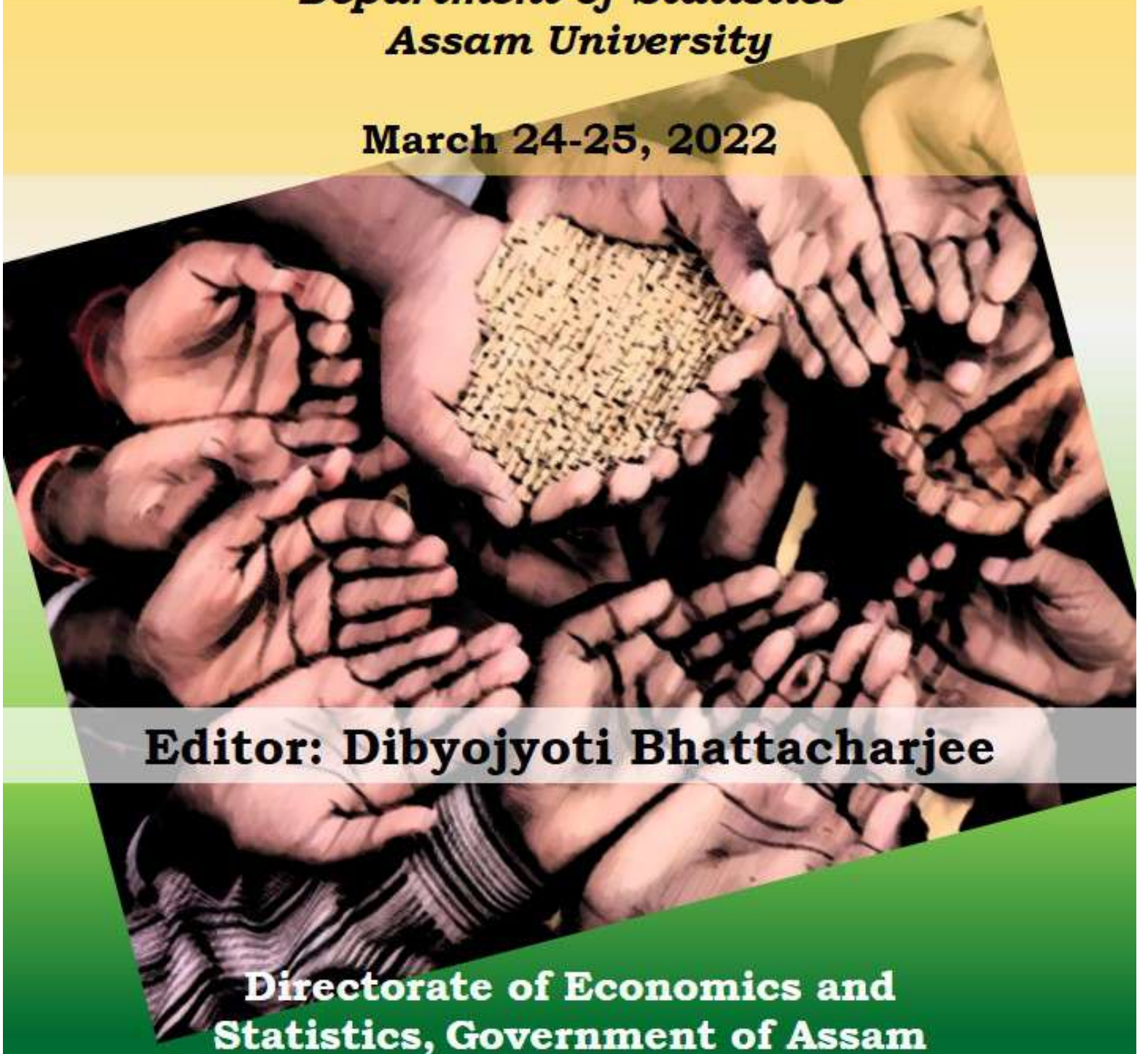
National Seminar Proceedings

Measures of Socio-economic Deprivation: Data Requirements and its relation with Policy Formulation for Better Governance

Organized by
Department of Statistics
Assam University

March 24-25, 2022



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Directorate of Economics and Statistics, Government of Assam

ISBN: 978-93-5701-737-4

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Government of Assam under the Support for Statistical Strengthening Scheme

The edited volume is outcome of the papers presented in the National Seminar on Measures of Socio-economic Deprivation *(Data Requirements and its relation with Policy Formulation for Better Governance)* organized by the Department of Statistics, Assam University, Silchar. The sponsor of the seminar and this seminar proceedings is the Directorate of Economics and Statistics, Government of Assam under the Support for Statistical Strengthening Scheme. Dibyojyoti Bhattacharjee is the editor of the seminar proceedings.

Year of publication is 2022.

ISBN: 978-93-5701-737-4

Typesetting and cover design by the editor.

Proceedings
of the National Seminar on
Measures of Socio-economic Deprivation

(Data Requirements and its relation with Policy Formulation for Better Governance)

24th and 25th of March, 2022

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Foreword

The piece of text between the two covers of the book are the written form of the deliberations made during the **National Seminar on the Measures of Socio-economic Deprivation**: **Data Requirements and its relation with Policy Formulation for Better Governance** organized on March 24 and 25, 2022 in the Department of Statistics, Assam University, Silchar. The Seminar was sponsored by the Directorate of Economics and Statistics (DES), Government of Assam under the Support for Statistical Strengthening (SSS) Scheme of the Central Government.

The Seminar was organized by the Department of Statistics, Assam University with the concept that- a country like India in which resources are scanty compared to the requirements, there is an acute need of a proportionate distribution of the available resources. While certain parts of the country are blessed with modern amenities expected for contemporary living; the story of the other is bleak and falls short of expectation. Distribution of the resource is unequal in the country. Certain regions are blessed with abundance of resources, while many other regions are bereft of it. Thus, the extent of deprivation depicts the development of a country and indicates the success of policies of the government in terms of human development. The success of democracy demands identification of the level of deprivation and the key indicators determining it. This shall clarify the status of regional inequality and indicate the extent of execution of government policies in different regions.

Researchers and Government Officials from different parts of Assam and beyond with experience of working in the field of deprivation and regional deprivation were invited to express their point of view. In the two-days excluding the inaugural session and the valedictory session there were as many as six technical sessions in which thirteen papers were presented. Each presenter was given at least 30 minutes for presentation followed by discussion on his/her work. More than 40 participants excluding the paper presenters attended the deliberations and took part in the interaction. The participants included research scholars, students, faculty members and government officials.

The Key Note Address was made by Sandip Mitra, Associate Professor, Indian Statistical Institute on the concept of socio-economic Deprivation and its measurement. The discussion also had inputs on sources of data on socio-economic deprivation at the local and global level. The next presentation was by Joyati Bhattacharya, Professor, Assam University on the topic “Rethinking the Debate on Caste based Reservation in the 21st century”. Following the lunch break the presentation was by Hemanta Saikia & Manash Pratim Kashyap on Quantifying Basic Health Care Facilities in different districts of Assam. The next presentation was by a government official Ms. Maumita Das

on the functions of the Agriculture Division of the Directorate of Economics and Statistics, Assam. Rabinjyoti Khataniar and Nilanjana Chakraborty made the last two presentations of the first day on the topic of deprivation related to Common Property Resources and Basic household amenities respectively.

In the second and last day of the Seminar the opening presentation was made by Golab Chandra Nandi and Manish Roy on Human Deprivation in South Assam. This was followed by presentation by Debtosh Chakraborty on quantifying the level of deprivation of women in different districts of the North Eastern States of India. Next, Government Official Mr. Suman Choudhury's discussion centred on the socio-economic deprivation of farmers of Assam. This was followed by a continuation lecture of Prof Sandip Mitra on data issues related to deprivational studies. The other lectures were on Information Deprivation by Himadri Barman, Housing shortage in India by Tanusree Deb Roy and Tourism performance of different states of India by Bidyut Jyoti Bhattacharjee.

Each of the presentation was subjected to threadbare discussion and relevent issues were raised. This compilation tries to include the major points of each of the presentation and the discussion that followed. In the valedictory session the participants and the speakers once again had a dialogue on the different issues of human deprivation in the context of India in general and Assam in particular. The participants also expressed their satisfaction on the way the Seminar was conducted. The speakers expressed their pleasure on the fact that the Seminar provided them sufficient time for discussion and analysis. The observer of the Seminar, Mr. Parimal Chakraborty, also expressed his happiness on the way in which the Seminar was arranged.

With thanks to the sponsor of the Seminar- Directorate of Economics and Statistics and the Administration of Assam University for providing with an opportunity to conduct the Seminar, the Preface is been signed off. The expectation is that this piece of literature shall be of proper use to researchers and policy makers.

The opinion expressed in the articles are those of the concerned authors and not of the Editor of the volume.

Dibyojyoti Bhattacharjee

Coordinator of the Seminar

Date: 10th August, 2022

Schedule of Events of the Seminar

Session	Agenda	Time
Date: 24th March, 2022		
0	Registration	9:45 am to 10:15 am
1	Inaugural Session	10:30 am to 11:45 am
High Tea 11:45 pm to 12 noon		
2	Sandip Mitra Topic: Measuring Deprivation and Under-Development: Data issues for Evidence-Based Policy Making	12 noon to 1 pm
	Joyati Bhattacharya Topic: Rethinking the Debate on Caste based Reservation	1 pm to 1:45 pm
Lunch Break 1:45 pm to 2:30 pm		
3	Hemanta Saikia & Manash Pratim Kashyap Topic: Quantifying Basic Health Care Facilities in Assam: Where Do the Districts Stand?	2:30 pm to 3 pm
	Maumita Das Topic: Functions of Agriculture Division of the Directorate of Economics and Statistics, Assam	3 pm to 3:30 pm
Tea Break 3:30 pm to 3:45 pm		
4	Rabinjyoti Khataniar Topic: Protecting the Poor from Deprivation: The Case of Common Property Resources in Northeast	3:45 pm to 4:15 pm
	Nilanjana Chakraborty Topic: Reviewing the measures of Deprivation & it's Determinants taking case evidences from Basic Household Amenities & Public Health Facilities of Assam	4:15 pm to 4:45 pm
Date: 25th March, 2022		
5	Golab Chandra Nandi and Manish Roy Topic: A Study of Human Deprivation in South Assam with Special reference to Hailakandi District	10:00 am to 10:30 am
	Debtosh Chakraborty Topic: Application of Principal Component Analysis to assess the Women deprivation in different districts of North Eastern States of India	10:30 am to 11:00 am
	Suman Choudhury	11:00 am to 11:30 am

Session	Agenda	Time
	Topic: Measures of Socio-economic deprivation of farmers of Assam	
Tea Break 11:30 am to 11:45 am		
6	Sandip Mitra Topic: Measuring Deprivation and Under-Development: Data issues for Evidence-Based Policy Making	11:45 am to 12:15 pm
	Himadri Barman Topic: Information Deprivation – A Curse for the Have Nots	12:15 pm to 1 pm
7	Tanusree Deb Roy Topic: Comparative Analysis of Housing Shortage in India	1 pm to 1:30 pm
Lunch Break 1:30 pm to 2:15 pm		
7 cont…	Bidyut Jyoti Bhattacharjee Topic: Evaluating Tourism Performance of Different States of India: A Comparative Study Using Composite Weighted Index	2:15 pm to 2:45 pm
Tea Break 2:45 pm to 3:15 pm		
8	Valedictory Session	2:45 pm to 3:15

Report on the Inaugural Session of the Seminar

The Inaugural Session of the **National Seminar on the Measures of Socio-economic Deprivation** *(Data Requirements and its relation with Policy Formulation for Better Governance)* started exactly at 10 am on 24th March, 2022 in the Seminar Hall of the Department of Statistics, Assam University. The inaugural session was chaired by the Dean of the School of Physical Sciences of Assam University- Prof. C R Bhattacharjee.

The program started with anchor of the event, Dr. Jonali Gogoi, Assistant Professor of the Department of Statistics welcoming all the dignitaries to the dais. The Welcome address was delivered by Dr. Rama Sanker, Head of the Department of Statistics, Assam University expressed his pleasure owing to the fact that the Department is back to its normal extended academic activities in off-line mode following the pandemic. The coordinator of the Seminar Prof. Dibyojyoti Bhattacharjee explained the need of conducting studies on socio-economic deprivation and how such studies leads to better governance. He also thanked the sponsor of the Seminar- Directorate of Economics and Statistics, Government of Assam for extending financial support and expressed that without this support the Seminar would never been a reality.

Prof. Sandip Mitra, Keynote Speaker of the Seminar also delivered a relevant speech while he expressed that conducting a Seminar on such a relevant theme in a remote place of northeast India is really praise worthy. In his speech the Chairperson of the inaugural session of the Seminar Prof. C R Bhattacharjee recalled his association with this department since its inception. Further, he also expressed his fulfilment on the theme on which this Seminar is conducted. He wished that the outcome of this Seminar shall definitely contribute towards policy formulation, decision making and ultimately leading to better governance.

Inaugural session of the Seminar in progress

The vote of thanks of the session was delivered by Dr. Vivek Verma, Assistant Professor of the Department of Statistics, Assam University where support of the officials of the university including the Honourable Vice Chancellor,

Registrar and Dean of School and Head of the Department were acknowledged. The financial assistance provided by the sponsor of the Seminar Directorate of Economics and Statistics, Government of Assam was mentioned and acknowledged. All the speakers of the Seminar were also thanked for their valuable time and for accepting the invitation for presentation. The faculty members, staff of the department, students and research scholars who worked day and night for the success of the Seminar was also recalled. The participants of the workshop who showed interest in the Seminar and travelled from far off places were also acknowledged.

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Understanding Deprivation: Measurement Issues

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Introduction

Deprivation may be defined as the lack of social and economic benefits considered to be basic necessities of a society or community or in a broader sense of a region. Deprivation in economic sense and also from social stand point can be defined as- world's poor are more likely to be malnourished, have less access to services like education, electricity, sanitation and healthcare, more vulnerable to conflict and climate change. Understanding poverty is thus fundamental to understanding how societies can progress.

Reducing poverty and inequality are central to the UN's Sustainable Development Goals (SDGs) and the World Bank Group's twin goals for 2030: Ending extreme poverty and promoting shared prosperity in every country in a sustainable manner. National statistical systems, household surveys and poverty measurement methodologies are at the heart of tracking these global goals.

The social, economic and philosophical definition of poverty is placed as under:

- Poverty: Denial of choices and opportunities, a violation of human dignity.
- Poverty: Means lack of basic capacity to participate effectively in society- not having enough to feed and cloth a family, not having a school or clinic to go to, not having the land on which to grow one's food or a job to earn one's living, not having access to credit.
- Poverty: means insecurity, powerlessness and exclusion of individuals, households and communities. It means susceptibility to violence, and it often implies living on marginal or fragile environments, without access to basic amenities.

The broadest approach to well-being (and poverty): focuses on the capability of the individual to function in society. Poor people often lack key capabilities; they may have inadequate income or education, or be in poor health, or feel powerless, or lack political freedoms.

Measurement Issues

Defining an indicator: The first step in measuring deprivation through poverty is defining an indicator of welfare such as **income or consumption per capita.** Information on welfare is derived from survey data.

Sampling related: Some surveys use simple random sampling. Most use stratified random sampling. This requires the use of sampling weights. **Multistage cluster sampling** is also standard- cost-effective and unbiased,

but it lowers the precision of the results, which calls for some adjustments when analyzing the data.

Questionnaires widely used: The World Bank-inspired Living Standards Measurement Surveys (LSMS) on multi-topic.

Income is defined in principle as consumption + change in net worth, in developed countries, but it tends to be seriously understated in less-developed countries.

Why Consumption is preferred? Consumption is less understated and comes closer to measuring permanent income.

How about using **consumption per capita**? Seems to be the most commonly used measure of welfare. Some analysts use consumption per adult equivalent in order to capture differences by age, and economies of scale in consumption etc. The Organization for Economic Co-operation and Development (OECD) has devised a scale on this.

Measurement Problems

Questions arise as to why food alone is considered in measuring poverty! Is it the only basic need? Even households that cannot afford adequate quantities of food devote some expenditures to other items, such as clothing, and shelter. It is reasonable to include them as very basic needs of the household for computation of poverty.

This argument also applies to durable goods (e.g. cycle, furniture). The problem is that durable goods bought at a point in time, and then consumed over a period of several years. Consumption should only include the amount of a durable good that is eaten up during the year. A relatively popular measure is by considering the change in the value of the asset during the year, plus the cost of locking up one's money in the asset. In that case, we need to value the different housing services.

The value of quantifying the housing services are as follows:

- House or apartment owned: it provides housing services that should be considered as part of consumption. The most satisfactory way to measure the values of these services is to ask how much would have to paid if, instead of owning your home, had to rent it.
- House if rented: The standard procedure is to estimate, for those households that rent their dwellings, a function Rent = f(area, running water, year built, type of roof, location, number of bathrooms…)
- The estimates based on hedonic regression then are used to impute the value of rent for those households that own, rather than rent, their housing.
- The **hedonic regression** method is a regression technique used to determine the value of a good, service, or asset by fractionating the product into constituent parts or characteristics. It is done to determine the contributory value of each characteristic separately through regression analysis.

- The regression model should be able to place values and weights on each component or contributory factor to determine the value of the composite product. Hedonic methods can be linear, non-linear, variable interaction, or other valuation scenarios of different complexities

Choosing of Indicators

There are a number of ways in which the well-being can be measured.

- **The welfarist approach :** seeks to measure household utility, which in turn is usually assumed to be approximated by household consumption expenditure or household income; given enough income, the household is assumed to know best how to deploy these resources, whether on food, clothing, housing, or the like. When divided by the number of household members, this gives a per capita measure of consumption expenditure or income **(not mentioning the optimization exercise)**
- **A more paternalistic, or non welfarist approach:** focus on whether households have attained certain minimal levels of, say, nutrition or health, include indicators such as infant mortality rates in the region, life expectancy, the proportion of spending devoted to food, housing conditions, or child schooling; Such measures are useful in fleshing out a **multidimensional portrait** of poverty, but they rest on a somewhat different philosophical foundation from the welfarist approach.

Thus, while the welfarist approach focuses on per capita consumption expenditure or income, other (non welfarist) measures of individual welfare might and this can make interpretation difficult. For instance, if people have enough income to feed, clothe, and house themselves adequately, how concerned should we then be if they do not in fact do so?

Why Per-capita measure not satisfactory?

Standard practice:

- **Accounting for Household Composition Differences:** Households differ in size and composition, and a simple comparison of aggregate household consumption can be quite misleading about the well-being of individuals in a given household.
- **Way out**: Most researchers recognize this problem and use some form of normalization. The most straightforward method - convert from household consumption to individual consumption by dividing household expenditures by the number of people in the household- household expenditure per capita is used as measure of welfare assigned to each member of the household.
- **Why Per-capita measure not satisfactory**? Although this is by far the most common procedure, it is not very satisfactory for two reasons:
  (i) **different individuals have different needs**. A young child typically needs less food than an adult, and a manual laborer requires more food than an office worker.

(ii) there are economies of scale in consumption, at least for such items as housing. It costs less to house a couple than to house two individuals separately

Solution: The solution to this problem is to apply a system of weights. For a household of any given size and demographic composition (such as one male adult, one female adult, and two children), an equivalence scale typically measures the number of adult males to which that household is deemed to be equivalent. Each member of the household counts as some fraction of an adult male. Effectively, household size is the sum of these fractions and is not measured in numbers of persons but in numbers of adult equivalents. Economies of scale can be allowed for by transforming the number of adult equivalents into effective adult equivalents.

Out of Per-Capita Income and Per-Capita Expenditure which one is better?

Even if they were measured perfectly, neither income nor expenditure would be an ideal measure of household well-being:

- Measures do not put a value on the leisure time enjoyed by the household
- Neither measures the value of publicly provided goods (such as education, or public health services)
- Neither values intangibles such as peace and security.

What about one more measure?

- Calories consumed per person per day. If one accepts the (non-welfarist) notion that adequate nutrition is a prerequisite for a decent level of well-being, then we could just look at the quantity of calories consumed per person.
- Anyone consuming less than a reasonable minimum—often set at 2,100 Calories per person per day— would be considered poor.
- Measuring calorie intake per household members not easy to compute as it would depend on the age, gender, and working activities of the individual.

Measures of outcomes rather than inputs

Food is an input, but nutritional status (being underweight, stunting or wasting) is an output. So one could measure poverty by looking at malnutrition.

Requires establishing a baseline anthropometric standard against which to judge whether someone is malnourished. This is a controversial issue

Advantage with Anthropometric indicators: can reveal living conditions within the household (rather than assigning the overall household consumption measure across all members of the household without

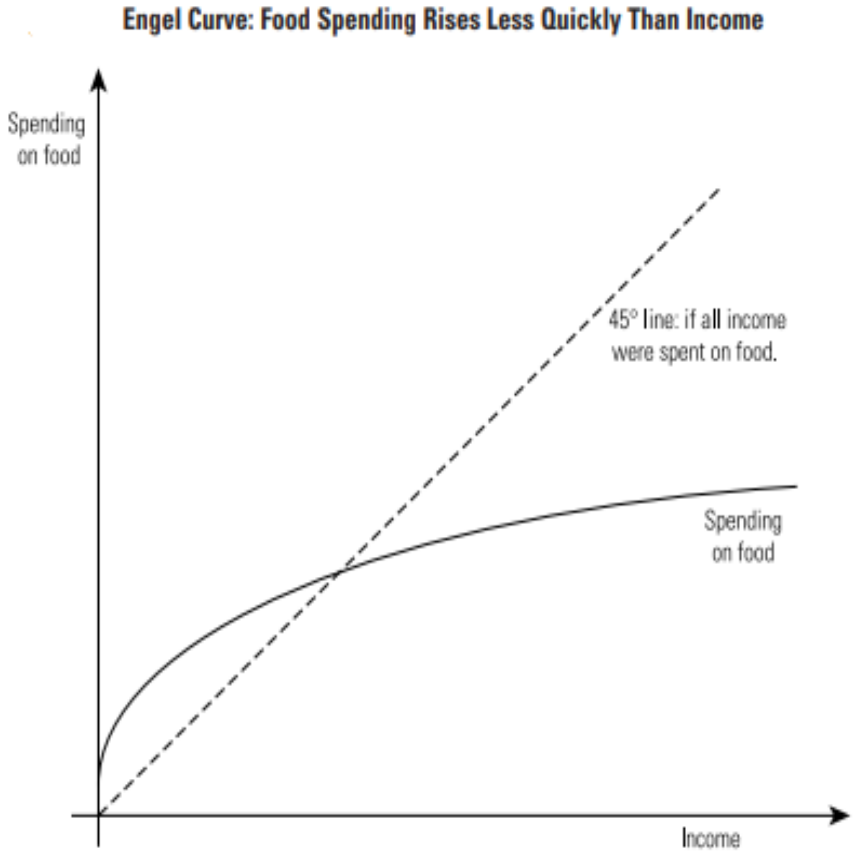
really knowing how consumption expenditure is divided among household members).

What is a measure of wellbeing then?

- Ernst Engel observed that as household income per capita rises, spending on food rises too, but less quickly.
- As a result, the proportion of expenditure devoted to food falls as per capita income rises. One could use this finding, which is quite robust, to come up with a measure of well-being and hence a measure of poverty.
- For instance, households that devote more than (say) 60 percent of their expenditures to food might be considered to be poor.
- The main problem with this measure is that the share of spending going to food also depends on the proportion of young to old family members (more children indicates a higher proportion of spending on food), and on the relative price of food (if food is relatively expensive, the proportion of spending going to food will tend to be higher).

Measurement issue: Perception measures vs consumption based measures

- According to Lanjouw and Stern (1998) the Measures based on perceptions formed on imperfect information: may be biased.
- Found that in their survey village, landless agricultural laborers were almost all deemed by their peers to be poor; yet based on income information, only about half fell below the poverty line used.
- When one is looking at a community (province, region) rather than individual households, it might make sense to judge the poverty of the community by life expectancy, or the infant mortality rate, although these are not always measured very accurately. School enrollments (a measure of investing in the future generation) represent another outcome that might indicate the relative well-being of the population.
- Certainly, none of these other measures of well-being are replacements for consumption per capita; nor does consumption per capita fully replace these measures.
- Rather, when taken together they allow us to get a more complete and multidimensional view of the well-being of a population
- How countries are ranked in terms of living standards clearly depends on which measure or indicator is considered. In sum, there is no ideal measure of well-being: all measures of poverty are imperfect. That is not an argument for avoiding measuring poverty, but rather for approaching all measures of poverty with a degree of caution, and for asking in some detail about how the measures are constructed.



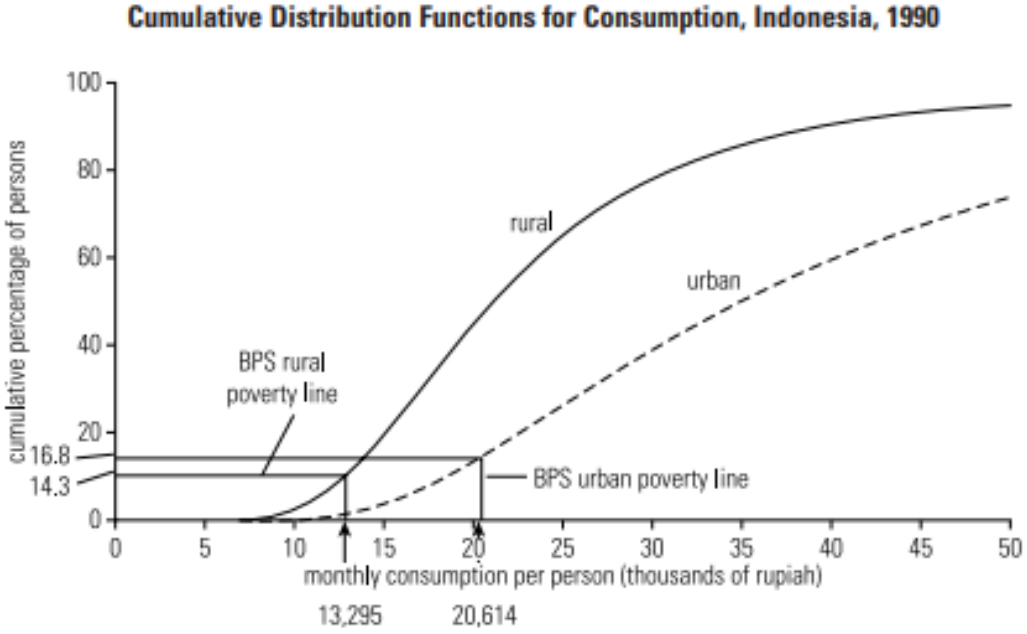
Urban-Rural Poverty

The Urban-Rural Problem. The problem begins when one recognizes that food energy, typically shown on the calorie income function, depends on other factors as well as income.

Other factors:

- tastes of the household (for example, urban tastes in food may differ from rural tastes)
- level of activity of household members
- relative prices of different foods, and of food to nonfood items
- the presence of publicly provided goods.
- Rural households can obtain food more cheaply, both because food is typically less expensive in rural areas and also because they are more willing to consume foodstuffs that are cheaper
- Urban consumers are more likely to buy higher quality foodstuffs, which raises the cost per calorie. It follows that the *calorie income function for rural households will typically be higher than that for urban households.*
- The implication is that for a given level of food energy intake, the poverty line in the rural area will be lower than in the urban area
- To the extent that this reflects differences in the cost of living, it is not a problem to have two poverty lines of this kind.

- The key finding of Ravallion and Bidani (1994), based on 1990 data from the household survey in Indonesia: urban poverty line was much higher than the rural



Subjective Poverty Lines

- If we measure poverty by asking people to define a poverty line, and using this to measure the extent of poverty. For instance, in a survey one might ask What income level do you personally consider to be absolutely minimal?
- The answers will vary from person to person (and by size of household), but they could be plotted, and a line fitted through them, to get a subjective poverty line
- It may also be possible to get adequate results by asking "do you consider your current consumption to be adequate to make ends meet?"

Self-rated Poverty Lines

Gaurav Datt of the World Bank has analyzed the Filipino data in some detail. Here are some of his more interesting findings (Datt 2002):

- Self-rated poverty lines are high.
- The self-rated poverty line has risen rapidly over time, by about 60–70 percent between 1985 and 1997.
- One consequence is that there is no trend in self-rated poverty over time.
- Another implication is that even when there is an economic slowdown, as occurred in 1997–98, the self-rated poverty rate hardly changes: it rose from 59 percent in 1996–97 to 61 percent in 1998.
- Self-rated poverty line given by poor households is only slightly lower than that for non-poor households, and in fact, the difference is not

statistically significant. One might have expected poor households to have a less generous measure of the poverty line.

- There is a clear urban/rural difference in perceptions of the poverty line, with urban households setting a (money) poverty line at about twice the level of rural households

Reasons of Differently-rated Poverty Lines

(i) There is more inequality in the urban areas raising expectation.
(ii) households in urban areas may have more exposure to the media, and may have been affected more thoroughly by consumerism
(iii) A third explanation is that urban households may be more attuned to political processes, and their estimates of the poverty line may include an element of strategic behavior—trying to influence policy makers.
(iv) Self-rated measures of poverty are rarely collected. Self-rated measures may complement, but cannot fully supplant, the more traditional "objective" measures of poverty. The question of the reliability of self-rated measures of satisfaction continues to be debated.

Linking to Satisfaction Measures

- Angus Deaton (2008) finds a measure of "life satisfaction," as collected in 123 countries in 2006 by the Gallup organization, is highly correlated with real per capita income.
- More specifically, life satisfaction is measured on a scale of 0 (dissatisfied) through 10 (satisfied), in response to a question that asks, "*All things considered, how satisfied are you with your life as a whole these days?"*
- Not synonymous with "happiness," which is a more short-term phenomenon.
- Using a measure of GDP per capita in 2000 international dollars, Deaton (2008) estimated the using a regression framework keeping satisfaction, GDP growth rate and per capita
- The strong link between real income and life satisfaction is clear;
- More surprising: After controlling for the level of per capita GDP, faster GDP growth is associated with lower life satisfaction, perhaps because of the psychological and other adjustment costs associated with rapid economic growth.
- Deaton concludes: *Reports of life satisfaction, at least on average, may provide a useful summary of the different components of people's capabilities" (2008, 12), but he considers that more objective measures of poverty are still needed, because people may simply have adapted to misery and hardship.*

Let us talk of a dilemma: *if a poor slave says he is happy, should we take that assertion at face value? But if not, then a subjective measure of life satisfaction is an incomplete measure of well-being.*

Simplest Measure: Head Count Index

- **Headcount Index:** By far, the most widely used measure is the headcount index, which simply measures the proportion of the population that is counted as poor, often denoted by P_0 , N is the total population (or sample). If 60 people are poor in a survey that samples 300 people, then P_0 = 60/300 = 0.2 = 20 percent.

$$P_0 = \frac{1}{N}\sum_{i=1}^{N} I(y_i < z)$$

- **The greatest virtues of the headcount index**: simple to construct and easy to understand. These are important qualities.

Weakness

(i) Headcount index does not take the intensity of poverty into account.
(ii) Does not capture differential poverty across countries.
(iii) As a welfare function, the headcount index is unsatisfactory as it violates the transfer principle, an idea first formulated by Dalton (1920) that states that transfers from a richer to a poorer person should improve the measure of welfare. With the headcount index, if a somewhat poor household were to give to a very poor household, the index would be unchanged, even though it is reasonable to suppose that poverty overall has lessened.
(iv) The headcount index does not indicate how poor the poor are, and hence does not change if people below the poverty line become poorer.
(v) The poverty estimates should be calculated for individuals, not households. But survey data are almost always related to households, so to measure poverty at the individual level we must make a critical assumption that all members of a given household enjoy the same level of well-being. This assumption may not hold in many situations. For example, some elderly members of a household, or girls, may be much poorer than other members of the same household. In reality, consumption is not always evenly shared across household member.

Poverty Gap Index

- A moderately popular measure of poverty is the poverty gap index, which adds up the extent to which individuals on average fall below the poverty line, and expresses it as a percentage of the poverty line.
- More specifically, define the poverty gap (G_i) as the poverty line (z) less actual income (y_i) for poor individuals; the gap is considered to be zero for everyone else. Using the index function, we have,

$$G_i = (z - y_i) \times I(y_i < z)$$

Then the poverty gap index (P_i) is given by,

$$P_1 = \frac{1}{N}\sum_{i=1}^{N} \frac{G_i}{z}$$

Accommodating Inequality in Poverty Measures

Squared Poverty Gap (Poverty Severity) Index: To construct a measure of poverty that takes into account **inequality among the poor:** This is simply a weighted sum of poverty gaps (as a proportion of the poverty line), where the weights are the proportionate poverty gaps themselves; a poverty gap of, say, 10 percent of the poverty line is given a weight of 10 percent while one of 50 percent is given a weight of 50 percent; this is in contrast with the poverty gap index, where the gaps are weighted equally.

$$P_2 = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{G_i}{z}\right)^2$$

Hence, by squaring the poverty gap index, the measure implicitly puts more weight on observations that fall well below the poverty line. The measure lacks intuitive appeal, and because it is not easy to interpret it is not used very widely. It may be thought of as one of a family of measures proposed by Foster, Greer, and Thorbecke (1984), which may be written, quite generally, as

$$P_\alpha = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{G_i}{z}\right)^\alpha, \alpha \geq 0$$

where a is a measure of the sensitivity of the index to poverty and the poverty line is z, the value of expenditure per capita for the i^{th} person's household is x_i, and the poverty gap for individual i is $G_i = z - x_i$ (with $G_i = 0$ when $x_i > z$). When parameter $a = 0$, P_0 is the headcount index. When $a = 1$, the index is the poverty gap index P_1, and when a is set equal to 2, P_2 is the poverty severity index. For all $a > 0$, the measure is strictly decreasing in the living standard of the poor (the higher one's standard of living, the less poor one is deemed to be). Furthermore, for $a > 1$ the index also has the property that the increase in measured poverty because of a fall in one's standard of living will be deemed greater the poorer one is. The measure is then said to be "strictly convex" in incomes (and "weakly convex" for $a = 1$).

Index Combining Effects

Sen proposed an index that seeks to combine the effects of the number of poor, the depth of their poverty, and the distribution of poverty within the group. The index is given by:

$$P_S = P_o\left(1-(1-G^P)\frac{\mu^p}{z}\right)$$

where P_0 is the headcount index, μ^P is the mean income (or expenditure) of the poor, and G^P is the Gini coefficient of inequality among the poor. The Gini coefficient ranges from 0 (perfect equality) to 1 (perfect inequality). The index can also be written as the average of the headcount and poverty gap measures, weighted by the Gini coefficient of the poor.

Other Poverty Measures

There are other additive poverty measures that are distribution-sensitive. Following Atkinson (1987), one can characterize a general class of additive measures, encompassing the Watts index, the FGT class of measures, and some other measures (such as the second measure proposed by Clark, Hemming, and Ulph , as taking the following form:

$$P = \frac{1}{N}\sum_{i=1}^{N} p(z, y_i),$$

where $p(z, y_i)$ is the individual poverty measure, taking the value zero for the non-poor ($y_i > z$) and some positive number for the poor, the value of which is a function of both the poverty line and the individual living standard, non-decreasing in the former and non-increasing in the latter.

Understandings and mis-understandings of multidimensional poverty measurement: Alkire and Foster

Multidimensional measures provide an alternative lens through which poverty may be viewed and understood. A practical approach to identifying the poor and measuring aggregate poverty.

Quite a departure from traditional uni-dimensional and multidimensional poverty measurement— particularly with respect to the identification step. Elucidated the strengths, limitations, and misunderstandings of multidimensional poverty measurement.

Checking the Robustness of Poverty Index

There are four main reasons why measures of poverty may not be robust.

- Sampling error occurs because measures of poverty are based on sample data, which gives the true poverty rate only with some degree of uncertainty. It is good practice to report standard deviations and confidence intervals for poverty measures; this can be done by bootstrapping. Because household surveys tend to be relatively small, it is not possible to disaggregate the results to units smaller than relatively broad regions.
- Measurement error occurs in all survey data: e.g. households underreport income and expenditure, which tends to overstate the degree of poverty. The effect can be large: in some cases a 5 percent understatement of consumption can translate into a 10 percent overstatement of the headcount poverty rate.
- Poverty rates vary depending on the equivalence scale used, although the variation is typically fairly modest. Equivalence scales are not widely used because of the difficulty of agreeing on an appropriate set of weights.
- The choice of a poverty line and associated poverty rate (for example, headcount index, poverty gap index) is arbitrary.

- By comparing the cumulative distribution function of expenditure (or income) per capita- sometimes called the poverty incidence curve—between two situations, one may judge whether the choice of poverty line affects the conclusion about the change in poverty. If there is first order stochastic dominance, the choice of poverty line is not crucial; otherwise it is often possible to use higher-order tests
- Checking for Robustness Haughton and Khandker (for example, second-order stochastic dominance) to help reach a clear conclusion about whether poverty differs between two time periods (or regions or countries). No study of poverty is complete without some discussion of the robustness of the findings.

Inequality

Inequality is a broader concept than poverty in that it is defined over the entire population, not just for the portion of the population below a certain poverty line. Most inequality measures do not depend on the mean of the distribution. This property of mean independence is considered to be a desirable feature of an inequality measure.

Inequality measures are often calculated for distributions other than expenditure—for instance, for income, land, assets, tax payments, and many other continuous and cardinal variables. The simplest way to measure inequality: by dividing the population into fifths (quintiles) from poorest to richest, and reporting the levels or proportions of income (or expenditure) that accrue to each level. Quintile information is easy to understand, although sometimes a summary measure is needed rather than a whole table of figures.

Measures of Inequality

Gini Coefficient of Inequality: The most widely used single measure of inequality is the Gini coefficient. It is based on the **Lorenz curve**, a cumulative frequency curve that compares the distribution of a specific variable (for example, income) with the uniform distribution that represents equality.

To construct the Gini coefficient, graph the cumulative percentage of households (from poor to rich) on the horizontal axis and the cumulative percentage of expenditure (or income) on the vertical axis.

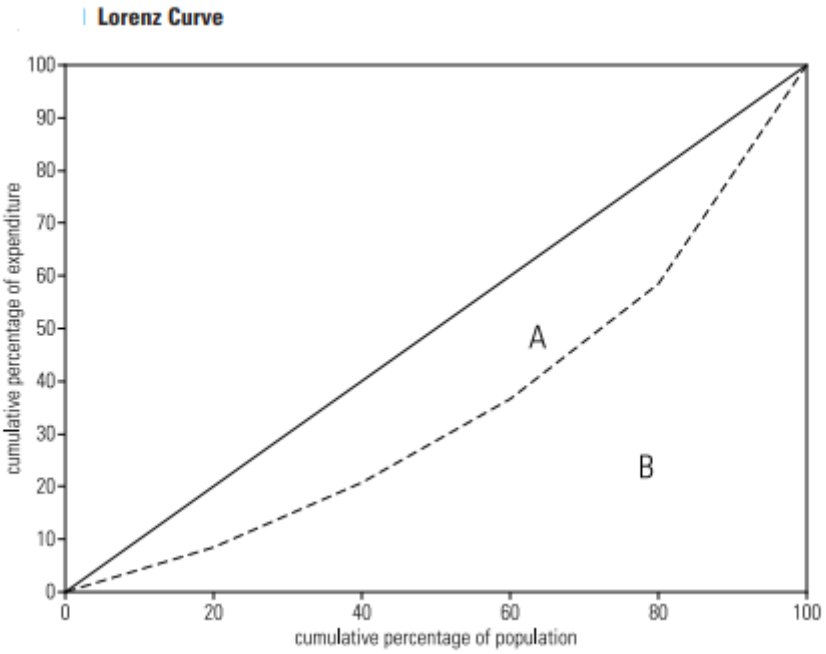
Lorenz curve: The diagonal line represents perfect equality. The Gini coefficient is defined as A/(A + B), where A and B are the areas shown in the figure. If A = 0, the Gini coefficient becomes 0, which means perfect equality, whereas if B = 0, the Gini coefficient becomes 1, which means complete inequality.

Formally, let x_i be a point on the x-axis and y_i be a point on the y-axis. Then

$$\text{Gini} = 1 - \sum_{i=1}^{N} (x_i - x_{i-1})(y_i + y_{i-1})$$

When there are N equal intervals on the x-axis the equation simplifies to

$$\text{Gini} = 1 - \frac{1}{N} \sum_{i=1}^{N} (y_i + y_{i-1})$$



Entropy measures: Theil index

Generalized Entropy Measures: There are a number of measures of inequality that satisfy many criteria. Among the most widely used are the Theil indexes and the mean log deviation measure. Both belong to the family of generalized entropy (GE) inequality measures. The general formula is given by:

$$GE(\alpha) = \frac{1}{\alpha(\alpha-1)}\left[\frac{1}{N}\sum_{i=1}^{N}\left(\frac{y_i}{\bar{y}}\right)^{\alpha} - 1\right]$$

where $\ddot{y}$ is the mean income per person (or expenditure per capita). The values of GE measures vary between zero and infinity, with zero representing an equal distribution and higher values representing higher levels of inequality. The parameter α in the GE class represents the weight given to distances between incomes at different parts of the income distribution, and can take any real value. For lower values of α, GE is more sensitive to changes in the lower tail of the distribution, and for higher values GE is more sensitive to changes that affect the upper tail. The most common values of α used are 0, 1, and 2. When GE(1) is Theil's T index.

Atkinson's Inequality Measures: Atkinson (1970) has proposed another class of inequality measures that are used from time to time. This class also has a weighting parameter ε (which measures aversion to inequality). The Atkinson class is defined as

$$A_{\varepsilon} = 1 - \left[\frac{1}{N}\sum_{i=1}^{N}\left(\frac{y_i}{\bar{y}}\right)^{1-\varepsilon}\right]^{1/(1-\varepsilon)}, \quad \varepsilon \neq 1$$

$$= 1 - \left[\frac{\prod_{i=1}^{N} \left(y_i^{1/N} \right)}{\bar{y}} \right] \quad , \varepsilon = 1$$

Conclusion

Decomposition of Income Inequality: For policy purposes, it is useful to be able to decompose these sources of inequality: if most inequality is due to disparities across regions, for instance, then the *focus of policy may need to be on regional economic development, with special attention to helping the poorer regions.*

- More generally, household income is determined by household and personal characteristics, such as education, gender, and occupation, as well as geographic factors including urban and regional location.
- Between-group component and some occurs because there is inequality within each group (e.g. among people with a given level of education or in a given occupation).
- The generalized entropy (GE) class of indicators, including the Theil indexes, can be decomposed across these partitions in an additive way, but the Gini index cannot

Income Distribution Dynamics: There is a longstanding, inconclusive, debate about the links between income distribution and economic growth. Kuznets (1955) based on his analysis of the historical experience of the United Kingdom and the United States, believed that in the course of economic development, inequality first rises and then falls. Although there are other cases where this pattern has been observed, it is by no means inevitable. There are many components of inequality, and they may interact very differently depending on the country: Bourguignon, Ferreira, and Lustig (2005) emphasize this diversity of outcomes, and argue that changes in income distribution are largely due to three "fundamental forces": Changes in the distribution of assets and the personal characteristics of the population (for example, educational levels, gender, ethnicity, capital accumulation)—the endowment effects. Changes in the returns to these assets and characteristics (for example, the wage rate, or profit rate)—the price effects, Changes in how people deploy their assets, especially in the labor market (for example, whether they work, and if they do, in what kind of job)—the occupational choice effects, demographic effects (e.g. households have fewer children, the earnings of working members will stretch further, and measured income per capita will rise).

Bourguignon, Ferreira, and Lustig (2005): set out and apply an approach that is designed to allow quantification of the effects on the whole income distribution of the various changes in "fundamental forces" that occur between two time points. Over time, the way that households choose their jobs, the returns from different types of employment, and the assets

(especially education) that households bring to the labor market, all change, and does the distribution of income.
Thus, the idea is to set up basic parametric models of occupational choice and earnings, to measure these at different times, and then to separate out the effects of changing returns from the effects of changing endowments.

Poverty comparison across time: If two or more rounds of household surveys are available, one may be able to measure the evolution of poverty over time. Ideally, such a measurement would use data from highly comparable questionnaires that use a similar sampling frame and research protocol and the same definitions of income or consumption.
One of the most difficult adjustments that has to be made when comparing monetary measures over time is for inflation. Deaton (2001) shows that the drop in the official poverty rate in India between 1993–94 and 1999–2000 was understated because the statistics office overstated inflation, and so raised the poverty line too quickly over time.
If constructed a poverty line in the base year using the cost of basic needs approach, one just needs to adjust this poverty line over time by applying the changes over time in the costs of each component of the poverty line (food, and nonfood items, typically). We can then compute the poverty rate in the second period. In practice, we might want to do this for each main region of the country, to take regional price variations into account.
Alternatively, could deflate income or expenditure from the second period and compare it with the original poverty line. In practice, the lack of good price data, especially broken down by region over time, is a serious problem.
So, even if the comparisons are less than ideal, they are made nonetheless. In such cases, the analyst needs to be sure to Correct for major differences in the sampling frame and sampling method for the different surveys or the different rounds of a panel survey.
Thus, use regional and temporal price indexes to ensure a similar definition of the poverty line over time and across regions (or to measure "real" income or expenditure over time). Adjust the definition of consumption or income aggregates over time to ensure that a similar definition is used.

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Rethinking the Debate on Caste based Reservation in the 21st Century

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Reservation Policy of the Constitution of India is undeniably a unique attempt of the Constitution makers to realize the ideals of equality and justice. Indian Constitution makers abolished the provision of communal representation in free India as it did not have the same implication after the division of India into two dominions on religious lines and the insurrection of a secular and progressive constitution. Besides, the idea of 'communal representation' was a ploy of the British to divide India on communal lines. However, Constitution makers carefully incorporated enough of constitutional guarantees in the form of fundamental rights to ensure equality and protect minority rights and culture in the country.

While the Constitution has abolished representation on communal lines, it has included safeguards for the advancement of 'Backward Classes' so that the principle of 'justice, social, economic and political' of the preamble of constitution can be realized. A major section of such backward classes are specified in the Constitution as Scheduled Castes and Scheduled Tribes who have suffered suppression and alienation perennially. Henceforth, measures adopted for the advancement of 'Backward' categories were exempted from the domain of 'protection' and 'equality' guaranteed under various fundamental rights of the constitution of India. Special privileges granted to these Castes and Tribes are considered sacrosanct and other citizens are not entitled to question the validity of such provision on the basis of its discriminatory nature.

Since then to the present time 'reservation debate' continues to be a very sensitive issue in Indian society and politics, if not most. Every Indian presumably shares a viewpoint on 'reservation' but does not often dwell upon the subject. Sensitivity attached to the term and safeguards granted through various legal and constitutional provisions restricts open debate and discussion on the impact of reservation. Besides, in a society of acute scarcity and deprivation, reservation served as an easy tool for accessing resources and sharing power. The ensuing competition for, and escalation in, the demand for reservation has intensified caste division that has serious political ramifications. In the process, there is little attempt to reflect upon what reservations were meant to achieve and, indeed, to review the policy which has been in force for last seventy five years.

Reservation in India is as old as our constitution. The rationale for reservation was to consecrate the core principle of democratic equality. Reservations in

public services and educational institutions were created with a view to giving a share to the members of the society who had been denied opportunity in the past. There is no definition of Scheduled Castes and Scheduled Tribes as such in our Constitution. But the President is empowered to draw up a list in consultation with the Governor of a state, subject to revision by the Parliament. Since then, the President has made orders from to time, specifying the Scheduled Castes and Scheduled Tribes in the different states in India, which have been amended by the Parliament. At present there are 1,178 castes under SC category in India.[1]

As mentioned reservation in India has always been a contentious and contested issue. Immediately after the insurrection of the constitution, the provision of reservation under Article 16 was challenged through a writ petition filed in the Madras High Court (*State of Madras versus Champakam Dorairajan, April, 1951)*. The order of the Madras Government in fixing the quota for each community in the educational institution was challenged in the Court of law. The Court held the Order as ultra vires under Article 29(2) and Article 16. There was also considerable protest particularly in southern states for which the constitution was amended (93rd Amendment Act 2005) and the Clause 15(4) was added which reads: 'Nothing in this article or in Clause (2) of Article 29 shall prevent the state from making any special provision for the advancement of any socially and educationally backward classes of citizens and for the Scheduled Caste and Scheduled Tribes. But such an amendment and constitutional safeguard did not obliterate the clatter against reservation. In the famous case of *M.R. Balaji versus Mysore state*, 1962, the Supreme Court struck down the Mysore Backward Classes List. In another landmark case of *K.S. Jayasree versus the State of Kerala,1976* the Supreme Court observed that economic backwardness plays a role in social and educational achievement of a caste. Besides these there are landmark cases like the Rangachari Case (*Rangachari versus General Manager*, 1962), Devadasan case (*Devadasan vs Union of India*, *1964*) which was ruled out in the *Indira Sawhney Case, 1992*, the PGIMS Chandigarh Case (reservation in medical colleges) and *Ajit Singh Janjua Case*, 1996 (seniority in promotion case), *Satyaveer Singh Dagur versus PG Institute of Medical Education, 2021* and so on which have raised issues about the legality of the reservation policy from time to time. It is well known that the implementation of the recommendations of the Mandal Commission was challenged and opposed not only by angry students belonging to the Hindu upper castes, but also by the Supreme Court bar association. A writ petition was filed in the name of Indira Sawhney, one of the practising advocates of the Supreme Court. In spite of angry agitation against Mandal recommendations, reservations in favour of the other backward classes to the extent of 27 per cent were upheld by the Supreme Court and the benchmark of 50 percent threshold was decisively laid down. But this did not pacify the debate. There are many more occasions when caste reservation in India was challenged within the ambit of law and the detractors of the policy continue

to believe that at least the 'creamy layer' among SCs and STs be taken off the privilege guaranteed under the policy.

More than seven decades have lapsed yet the dream of an egalitarian society seems elusive in India. This long span of time seemed to have failed to bridge the divide; instead fissures between castes deepened. The worst of the anguish about reservation was seen during the Mandal Commission in 1990. It is also amazing that in the 21st Century not only does caste continue to be the sole criterion in public policy towards positive discrimination, but categories likes SCs and OBCs continue to be treated as essentially homogenous. But evidences suggest that the hiatus within a backward caste, the kinds and degrees of deprivation vary substantially. The policy no doubt succeeded to bring a section of backward caste people to the mainstream of life, but on the whole it did not work well to obliterate the caste system in India. 'One can say with reasonable confidence, based on the record of any such lop-sided developmental process, that reservations have created more inequality within every so-called beneficiary caste than it did between the latter and other castes'.[2] There are also evidences to suggest that reservation is instrumental behind large scale brain drain in India. 'With all political parties supporting caste based reservation, students from upper castes feel they have nowhere to turn to.[3] In one study it is estimated that 'roughly 7, 77,000 students leave India to pursue further studies every year, with the figure predicted to rise to 1.8 million by 2024…Indian students feel left out and pushed out by the reservation system of India. Hence, they depart to pursue their education elsewhere, either on their own or through scholarships. In 2021, 62,000 student visas were awarded to Indian students in the United States alone, while the United Kingdom admitted 26, 685 Indian students in the same year'.[4] In various social media platform and blogs, there is deep displeasure visible about undermining merit by the policy of reservation. To substantiate the point, it may be mentioned that 'in Uttarakhand, as per the counselling results of NEET 2019, the last seat availed by an unreserved category student in Uttarakhand was at about 529 marks as compared to the same seat being availed by a reserved category student at about 338 marks. Such colossal difference in figures has taken a toll on the unreserved meritorious students. Opportunities for students must be based on their potential and financial frameworks as opposed to caste-based advantages'.[5] In a News reported in the *Indian Express*, some interesting data are provided which warrant concerns for citizens who consider that education is the primary key to nation building. 'Out of 2,461 students who dropped out from Indian Institutes of Technology (IITs) in the last two years, 371 students were from the Scheduled Caste (SC), 199 from the Scheduled Tribe (ST) and 601 from the Other Backward Classes (OBCs), informed the Human Resource Development Minister, Ramesh Pokriyal Nishank, in a written reply to the Parliament. In case of Indian Institutes of

Management (IIMs), out of 99 students who dropped out, 14 were from SC, 21 from ST and 27 from OBC category, as per the official HRD data. This implies that nearly 48 per cent of students dropping out of the IITs and over 62.6 per cent from IIMs are from the reserved category. The percentage of dropouts for SC/ ST and OBC candidates is equal or more than that of unreserved category, while their number of admissions is below unreserved category candidates, raising concerns. While this can hint at discrimination against these candidates, there are also questions against a caste-based reservation system that allows reserved category candidates with lower marks to take admission in an institute'.[6] In terms of finessing and contextualizing reservation in the 21st century, reservation policy in India needs to be reexamined with greater objectivity. It may perhaps be considered that reservations should be continued in the public sector to make sure that a critical number of SCs and STs have truly benefitted in a generation or two. But beyond that the reservation/affirmative action policies may not help to compensate for historical exclusion.

Thus, it may be argued that there is a need to rationalize the reservation policy in India on the basis of concrete evidences of holistic benefit it is yielding to the sections of the society that have suffered marginalization traditionally. Hard data sometimes do not complement the rationale of the policy. 'It is unambiguous that even in a backward and traditional society such as U.P during the early decades of the 20th century, ritual rank of a Caste was not a good indicator of its literacy and economic status…..In several non-twice born castes, for example, Jat, Kurmi and Kalwar, the size of the upper caste elite was considerable'[7] Besides an important take away of the reservation debate is that there is huge gap of socio-economic status within the beneficiary castes. The benefits of the reservation policy are not percolating down to the people who are in actual need of compensation. 'The so-called mobilising caste, being vehemently charged with the upper-caste spirit, is compelled to create a hostile environment between itself and the rest of the castes. And that is how the anti social aspect of caste is again revitalised, strengthened and retained intact, both in the mobilising castes and the rest of the castes, thus making no change in the old system of caste. Such mobility then does more harm to the castes than good'.[8] This lack of percolation of quota benefits to the poorest of the poor and the role change of the initial beneficiaries are creating a creamy layer within a traditionally deprived caste. The elite group within a caste is eating out the benefit while perpetuating the alienation of the rest at the lower rung of the same group. Besides, there is a conceptual constraint to the understanding of the reservation policy in India. We tend to treat the issue of reservation, positive discrimination or affirmative action more as a matter of principle rather than policy. As a result, the debate around reservation often turns into a sentimental issue instead of a matter of objective understanding. To substantiate the fact, distinction may be made between the AA policies in the U.S and reservation in India. In the U.S, AA policies are basically intended to assure equality of opportunity to all the U.S

citizens and to end discrimination against members of groups that had suffered discrimination historically. Over time, the term has come to denote policies that provide a certain degree of preference in the process of selection to various positions to members of under-represented groups. In brief, AA encompasses a form of discrimination in favour of under-represented groups as opposed to an attempt to abolish all forms of discrimination from the society. Reservation policies in India, on the contrary, consist of compensatory or protective benefit through fixing quotas in institutions and jobs. It has been made a tool to settle past scores. Politicians across party divides rarely oppose reservation, be it continuation or extension. A bulk of the society considers it to be a regressive policy which is making the economy inefficient in the long. T.E. Weisskopf in his book 'Affirmative Action in the United States and India: A Comparative Perspective' observes that the policy does not support the most disadvantaged. 'Weisskopf is less supportive of the quota policy unless it is constrained by size, the period for which it is to be applied, and merit bars. Instead he advocates a preferential boost system of positive discrimination. He also asks us to look at the sensitivity of the selection process, advises that potential beneficiaries should not be identifiable in order to reduce resentment, and favours broader policies to enhance competitiveness rather than quotas.'[9]

Dr. B R Ambedkar himself while delivering his lecture in the constituent assembly in 1947, expressed that reservation is not just about equality but also about fraternity. Thus, an objective assessment of the twin goals of reservation is imperative in India. Deliberation on its success and the specific proposals flowing from it may help to achieve the goal of the reservation in a substantive manner. Ultimately, India is a secular democracy and is committed to the ideology of equality and justice to all. Hence, there is need to revisit the reservation policy to undo the burden of oppression committed in remote past against certain caste groups. After seventy five years of India's independence, a reassessment of the reservation policy with empirical evidences is an absolute necessity of the time. Given the exceptionally high proportion of the former untouchables who are asset-less and less educated, there is thus a need to evolve a comprehensive policy of compensation and one-time settlement for the former untouchables in the manner in which Malaysia and South Africa have done to pay for the losses accruing to victims of social discrimination in these countries. This is a long overdue social debt that the higher castes owe to the erstwhile untouchables.

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Quantifying Basic Health Care Facilities in Assam: Where Do the Districts Stand?

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Health services are one of the most decisive dimensions to measure the development of a region. In an era of reforms in health sector, health systems deserve the highest priority in any endeavour to improve the public health facilities. The Government of Assam has made one-year rural posting mandatory for those doctors who wants to go for post-graduate studies through the government medical colleges from 2009. This study will provide a quantification of the district level scenario on health conditions before and after the implementation of such a welcome scheme on public interest. The study is an empirical approach to measure the health facilities available in the different districts of Assam through some indicators of health services supported by current literature. The prime objectives of the study are to quantify the health facilities available in different districts of Assam through some health-related indicators and then classify the districts of Assam. To classify the districts of Assam, a composite index called as MPI (Mazziotta-Pareto Index) is used. The different health indicators considered for health facility development are normalized to eliminate the unit of measurement and its variability.

The information about relevant data for the study is collected from "Statistical Hand Book, Assam, 2009 & 2020" a report published by Directorate of Economics and Statistics, Government of Assam, Guwahati. The report provides a wide range of up-to-date factual data on diverse aspects of socio-economic trend of Assam. Efforts have been made to present the latest available data covering up to 2008-2009 and 2019-2020 but for the Chirang, Baksa and Udalguri districts, the information for the indicators *viz.* number of hospital beds, number of doctors available, sanitation, average achievement of family welfare program and average achievement of immunization program are not available. As a result, the researchers try to estimate the missing data

using appropriate data imputation method for the districts Chirang, Baksa and Udalguri. Moreover, the former Kamrup district was recently divided into two separate districts as Kamrup Rural and Kamrup Metro. But through-out the study the two districts are considered together as Kamrup (M+R).

Missing data are present in almost all the case studies of composite indicators (Nardo *et al.*, 2005). One of the most suitable methods is that the missing values are substituted by estimated values obtained from a multiple regression equation. In order that the dependent variable of the regression is the indicator hosting the missing value and the regress variables are the indicators those are showing a strong relationship with the dependent variable. Accordingly, the multiple regression is used to estimate the values of different indicators that are missing, as the case may be, *viz.* number of hospital beds, number of doctors available, sanitation, average achievement of family welfare program (percent) and average achievement of immunization program (percent) for the districts Chirang, Baksa and Udalguri.

Let y_{ij} (where $i = 1, 2, \ldots, n$ and $j = 1, 2, \ldots, m$) be a set of m health enhancement indicators for n districts. Now suppose that out of m indicators only $m-1$ indicators are fully observed and an indicator k ($< m$) only observed for r districts but missing for the remaining $n-r$ districts. The multiple regression technique computes the regression of y_k on ($y_{i1}, y_{i2},\ldots, y_{im-1}$) using r complete observations and estimate the missing values as prediction (Nardo *et al.*, 2005) from the following equation.

$$\hat{y}_{ik} = \hat{\beta}_0 + \sum_{j=1}^{m-1} \hat{\beta}_j y_{ij} \quad , \quad i = 1, 2,\ldots, n-r \qquad \ldots (1)$$

A composite indicator is the mathematical combination of individual indicators that represent different dimensions of a concept whose description is the objective of the analysis (Saisana and Tarantola, 2002). Here Mazziotta-Pareto index is used to quantify the health facilities available in the districts because for each district, the indicators variability in relation to its mean value is measured by the coefficient of variation, allows to obtain a robust measure and less influenced by outliers.

Let $\{x_{ij}\}$ be the matrix of n rows and m columns where rows represent the districts and column represents the health enhancement indicators that are considered for the study. Let us suppose that $\bar{x}_j$ and S_j denote the mean and standard deviation of the j^{th} health indicator where

$$\bar{x}_j = \frac{\sum_{i=1}^{n} x_{ij}}{n} \qquad \text{and} \qquad S_j = \sqrt{\frac{1}{n}\sum_{i=1}^{n}\left(x_{ij} - \bar{x}_j\right)^2}$$

Now, the normalization matrix $\{z_{ij}\}$ is defined as follows

$$z_{ij} = 100 \pm \frac{\left(x_{ij} - \bar{x}_j\right)}{S_j} \times 10 \quad \ldots (2)$$

where the sign "$\pm$" depends on the relation of the j^{th} indicators with the phenomenon to be measured (i.e. "+" if the individual indicator represents a dimension considered positive for *e.g.* 'number of health centers' and "-" if it represents the dimension negative for *e.g.* 'death rate'). Also, the distribution of different indicators, measured in different way, can be compared by the transformation in standardized deviations (Aureli Cutillo, 1996). Thus, it is possible to convert the individual indicators to a common scale with mean 100 and standard deviation 10 and so they have the same mean and variability (see Appendix-A).

Again, let cv_i be the coefficient of variation for the i^{th} district and it can be calculated as

$$cv_i = \frac{S_i}{\bar{z}_i} \quad \ldots (3)$$

where $\bar{z}_i = \dfrac{\sum_{j-1}^{m} z_{ij}}{m}$ and $S_i = \sqrt{\dfrac{1}{n}\sum_{j=1}^{m}\left(z_{ij} - \bar{z}_i\right)^2}$

then the composite index MPI is given by

$$\text{MPI}_i = \bar{z}_i(1 - cv_i^2) = \bar{z}_i - (S_i \times cv_i) \quad \ldots (4)$$

Thus, the value of MPI is indicating the status of development in a district for all the indicators of health taken together. Higher the value of MPI more developed is the respective district in the available health facility and vice-versa.

Thereafter, the distributional pattern of the composite index MPI is identified to ease the classification of the districts based on the health services. The goodness of fit of the MPI values to two parameter gamma distribution is tested (*cf.* Figure 1) using the one-sample Kolmogorov-Smirnov test. The parameters of the fitted gamma distribution are estimated using the method of maximum likelihood estimation (MLE).

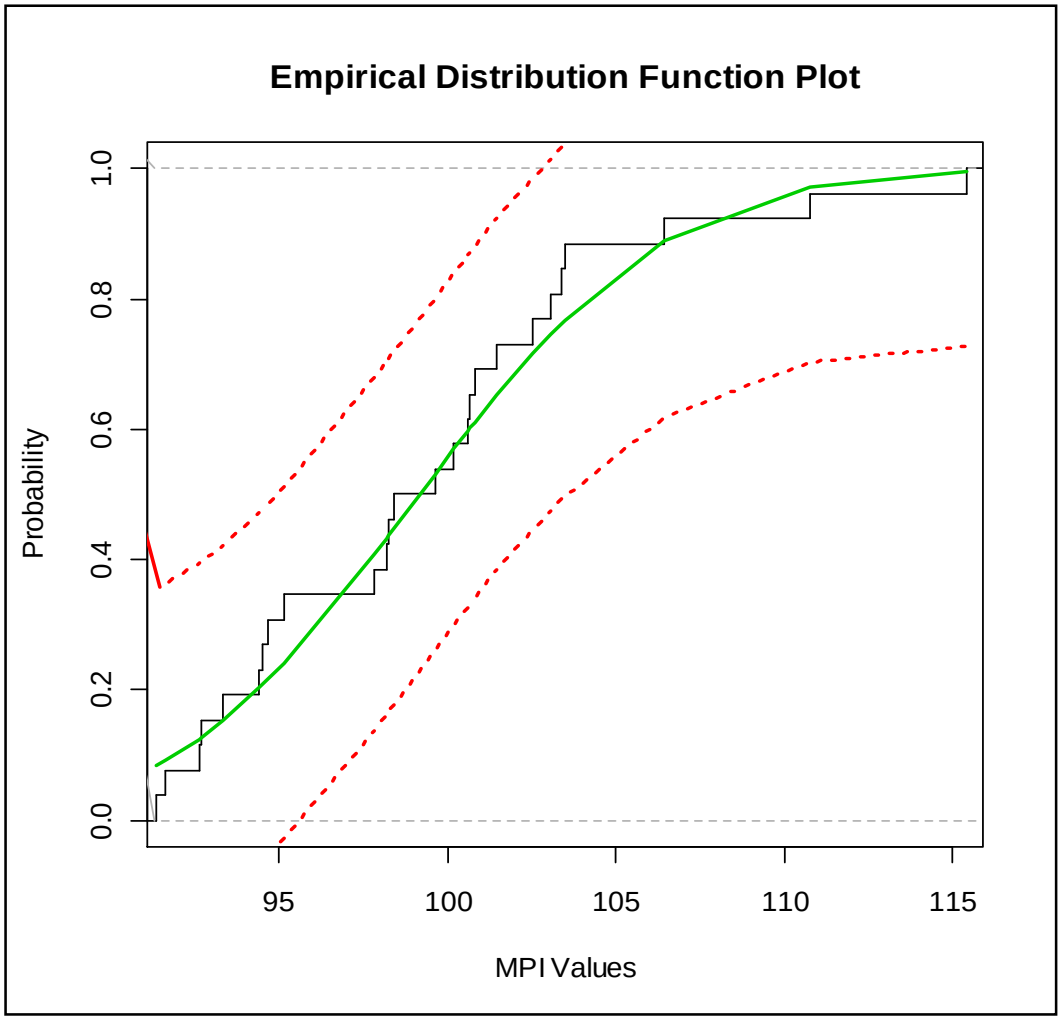
Finally, the low development districts of Assam are identified and the responsible indicators of such low level of development are discussed. Based on the data of 2009, It has been observed that nine districts are fall into the low development category in terms of health care facilities *viz.* Bongaigaon, Dhemaji, Morigaon, Tinsukia, NC Hills, Hailakandi, Chirang, Baksa and Udalguri. However, based on the data from 2020, out of nine low developed districts three districts *viz.* Bongaigaon, Dhemaji and Tinsukia now has improved and fall into the moderate development category. Moreover, the study also reflects that the low development of health facilities in some of the

districts crop up mainly because of the unequal distribution of health services.

Table 1: District-wise Classification of Development for 2009 and 2020

Development Category	Districts of Assam (2009)	Districts of Assam (2020)
Low Development	Bongaigaon, Dhemaji, Morigaon, Chirang, Tinsukia, NC Hills, Baksa, Hailakandi,	Morigaon, Chirang, NC Hills, Baksa, Hailakandi, Udalguri and Goalpara
Moderate Development	Kokrajhar, Goalpara, Barpeta, Nalbari, Darrang, Lakhimpur, Golaghat, Sibsagar,	Kokrajhar, Barpeta, Nalbari, Darrang, Lakhimpur, Golaghat, Sibsagar, Karbi-Anglong,
High Development	Dhubri, Kamrup (M+R), Sonitpur, Nagaon, Jorhat, Cachar	Dhubri, Kamrup (M+R), Sonitpur, Nagaon, Jorhat, Cachar, Dibrugarh

Figure 1: Goodness of fit of MPI values to gamma distribution



Recently though the state is making swift reforms in the health sector during last couple of years but the lack of MBBS doctors below the PHC level is a major concern for the state. Therefore, the government of Assam should take the initiative to promote equal distribution of health services in all the districts to the extent possible through National Rural Health Mission (NRHM). Along with the proposed NRHM scheme, which seems to be a welcome idea, it is also the responsibility of the public to cooperate with the health workers, mainly doctors, and participate in the health care and immunization programs to achieve better health outcomes. The success of such a model can set an example to improve the health scenario in the other states of the country.

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Functions of the Agriculture Division of the Directorate of Economics and Statistics, Assam

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Brief History and Functions of the Directorate of Economics and Statistics

The Directorate of Economics and Statistics (DES) was established in the year 1948 for collecting and compiling statistical data with a view to prepare various development and welfare programmes. It was initially under the control of the Finance Department but later on was brought under the administrative control of the Planning and Development Department, which is presently renamed as Transformation & Development Department, Government of Assam. Each office at district/ sub division level under Directorate of Economics & Statistics is called Deputy Director's/Sub divisional Statistical officer's office whose staple function is to assist the head quarter in data collection and conducting census/surveys.

Some of the important publications brought out by this institution includes- Statistical Handbook of Assam, Assam at a Glance, Economic Survey of Assam, State Income Statistics, Industrial Statistics, Agriculture Statistics, Price Statistics, District Handbook, District at a Glance etc.

Apart from the publications listed above the other noteworthy surveys conducted by this institution are:

(i) Socio-Economic Survey
(ii) Census of Employees of Govt. of Assam and other Establishments
(iii) Economic Census
(iv) Ad-Hoc Survey (e.g., Movement of Workforce from one activity to another activity in the rural areas of Assam, 2008-2009 to 2012-2013)

Agricultural Statistics Division and its activities

Agricultural Statistics Division is one of the most important divisions of Directorate of Economics and Statistics, Assam. Its main function consists of collection, compilation and analysis of data under the schemes like improvement of Crop Statistics (ICS), Crop Estimation Survey (CES), Land Utilisation Statistics (LUS), Crop Forecast, Timely Reporting Schemes (TRS), Sample Check on Area Enumeration, Sample Survey on Arecanut, Coconut, Fruits and Vegetables (ACFV) throughout the agriculture year. The duration of *Agriculture Year starts from 1st July and ends on 30th June.* Apart from this, another notable function carried out by the Agriculture division is the conduct of Agricultural Census.

Land Utilization Statistics: Agricultural Statistics Division prepares district and state level land utilization statistics i.e. area, crop and irrigation abstracts on the basis of the information collected by the primary workers in the villages in each crop season and are recorded in a register called 'CHITHA' by the officials of Land Revenue Administration, Agriculture Department & Irrigation Department. The geographical area of the district/state is classified into 9 major divisions namely (i) Forest (ii) Non Agricultural Uses (iii) Barren and uncultivable land (iv) Permanent pastures and other grazing land (v) Land under miscellaneous trees, groves etc. (not included in net area sown (vi) Cultivable waste land (vii) Fallow land other than current fallow (viii) Current fallow and (ix) Net area sown.

Crop Estimation Survey: Another noteworthy function of Agricultural Statistics Division is to carry out Crop Estimation Survey (CES) under the technical guidance of NSO. The objective of CES is to estimate district level and state level average yield (kg/hect) and production of nine principal food and non-food crops viz. autumn paddy, winter paddy, summer paddy, black gram, rape & mustard, potato, sugarcane, jute, wheat and black gram. However, in case of Barak Valley three crops viz. jute, wheat and black gram are left out from estimation. This is due to the fact that these crops are produced very less in this part of the world.

Crop Forecast: Forecasting about area and production of crops is another notable activity performed by Agricultural Statistics Division. Govt. of Assam has constituted Sub-divisional Committee on Agricultural Statistics (SDCAS) under the jurisdiction of Agriculture Department for preparation of forecast area under 38 crops and review of collection, compilation and maintenance of Agricultural Statistics in the Sub division level. For this purpose, Govt. of India has introduced a crop calendar showing specific dates and crops for holding forecast meetings at sub division level. These meetings are held for finalising and releasing District and State level estimates of area under each crop for onward transmission to the Govt. of India as per forecast calendar. On behalf of office of the DDES/SDSO, Deputy Director and Inspector associated with Agriculture Division of Economics & Statistics present in these SDCAS meetings.

Conducting Agricultural Census: It also conducts Agricultural Census in a phase manner to get basic data on operational holding viz. number, size, tenancy, land utilistaion, irrigation particulars and cropping pattern etc. This Census is a central sector scheme conducted quinquennially across different states of the country. The 10th Agriculture Census with reference year 2015-16 is under progress in the state. The Census is followed by Input Survey which provides key information about the structure of agriculture sector of the state.

Timely Reporting Scheme (TRS) : Last but not the least, Timely Reporting Scheme (TRS) was undertaken by the Union Ministry of Agriculture and Co-operation in the year 1973-74 with a view to prepare reliable estimates of area under different crops and their production which are required much in

advance. Under this programme, primary field work is carried out by the field worker of the Revenue department while Director of Economics and Statistics has drawn up the technical plan and programme and has organised the necessary trainings and analysed the results.

Concluding Remarks

To conclude, various surveys and publications done under the purview of Agriculture Division is of utmost importance to the research fraternity to deal with various deprivation related issues like institutional credit, provision of subsidised seed, fertiliser etc. But it is important to be noted that Agriculture division at district level is itself not responsible for taking up any deprivation related research issue. This is the job of the researchers and research organisations. Often researchers complain about the non-availability of data at our office. But it should be kept in mind that DES is an institution for data collecting and compilation under certain development policies and plans set by the state. It is not every researcher's automatic and readymade source of data bank.

Sometimes researchers seek data on something which is really very vague e.g. often their query is whether data on agriculture is available. But being researchers, they must clearly state on what types of agricultural variables information is sought. That is to say, they must have a clear conceptual framework of the research design. The lacking of this often results in misunderstanding between the officials of the DDES and the researchers. Lack of permanent Field Assistants act as hindrance for making our reports more informative. For successfully conducting more important surveys at grass root level like socio-economic deprivation, deprivation of farmers and the alike we need the recruitment of lots of Field Assistants on a permanent basis.

Thus, if we can broaden our scope of work by defeating the constraint of human resource and the research community make proper utilisation of our published data then deprivation related issues will receive right empirical treatment and which in turn may help the state in undertaking right sort of policies for alleviating deprivation.

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Protecting the Poor from Deprivation: The Case of Common Property Resources in Northeast

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1. Background of the Study

The common property resources (cpr) can be defined as those resources in which a group of people has joint rights over their uses (Jodha, N.S., 1986). Examples include community forest, pasture, waste land, watershed drainage, grazing land, village pond, rivers, etc. these cprs are very important in the socio-economic life of the poor people as it provides fuel and fodder, vegetables, fruits, fish, meat, medicinal herbs and so on.

Households' dependence on common forest for diverse kinds of services is an age-old phenomenon (Hesekia Garekae, Olekae T.Thakadu and Joyce Lepetu, 2017) and it is more prominent in the tribal belt of the Eastern Himalayan Region (Nongbri, 1997). Empirical evidence shows that forest products play a significant and crucial role in rural livelihood, particularly for the poor (Beyene *et al.*, 2008). People used to collect a wide variety of goods apart from receiving ecological services from the common forest (Haimendorf, 1985; Elwin, 1959) and firewood is considered the most important one out of all forest collections (Jodha N. , 1986b).

In the northeastern context, forest dependency is mostly due subsistence livelihood requirement, food habits of the people and extreme poverty of fringe villagers (Ramakrishnan, 1987)[1]. However, commercial extraction of such products has also been emerged to meet other livelihood requirement (Wonder, 1996; Iyenger, 1989; Jawad, 2004). Almost every tribal household uses to collect and consume some cpr products like firewood, bamboo, cane, etc. Firewood consumption in the tribal households is also influenced by the food habit of the tribals and the non-availability of alternate fuels at affordable prices (Khataniar R.& S. Benazir, 2018). The emergence of the market has pave-way the path for commercial extraction of forest product (Wonder, 1996; Iyenger, 1989; Jawad, 2004). At the same time, researchers also observed that the failure of the existing common property resources management system has resulted in the emergence of a 'neo-rich' class in society who has been exploiting common forest by extracting the resources for commercial purpose (Khataniar, 2009). Because of all the issues, cpr consumption has now gained global importance as it has been an important source of livelihood and a vital source of deforestation around the world (Sharpe, 1976; Amacher G.S., W.F.Hyde, and K.R. Kanel, 1999). It has also been emerged as a thrust area of research in the region and has been studied widely. Researchers have tried to address the issues of forest dependency, forest degradation, and deforestation, but failed to capture and quantify cpr dependency in a comprehensive and quantifiable way. Further, Studies also failed to identify

[1] Dependency on the forest for fuelwood causes severe deforestation in Northeast India (Ramakrishnan, 1987)

the group of peoples who will be mostly deprived as a result of institutional changes in cpr management.

2. Research Questions and Objectives

Some of the basic research questions to be addresses in this study are

I. Is it still praiseworthy to speak about cprs in the 21st century?
II. Is there enough data to understand and comprehend importance of cprs?
III. What is the extent of poor's dependence on cpr?
IV. What wrong with cpr management?
V. Who are mostly deprived in process of institutional transformation of cprs in the northeastern context?
VI. What could be the best alternative cpr mechanism?

The present study is a modest attempt to answer all these research questions. The specific objectives of the study are as under:

i. Highlight the importance of cpr in the household economy.
ii. Develop a comprehensive index to measure households' dependence on common forests.
iii. Understand the role of cpr in removing poverty and inequality.

3. Research Methodology

This piece of writing is based on some secondary sources of evidences available in institutional and individual levels as well as based on some primary evidences gathered by the researcher. Data related to cprs were gathered from Global Poverty Watch, Indian State of Forest Report, NSSO, and Ministry of forest and Environment as well as from individual research on cprs. Primary data were collected from the forest fringe villages belong to three randomly selected states of Northeast viz. Assam, Arunachal Pradesh and Nagaland.

The range standardisation method is used to standardise data related to the selected indicators and the Entropy weight determination method is employed to fix the weight of each indicator.

4. Principal Findings of the Research

4. 1 Peoples' Dependency on Common Property Resources (cprs)

A good number of research work found dealing with peoples' dependency on cprs. However, the researchers adopted different methods to highlight and quantify people's dependency on cprs. Here we showcase a few research on cprs which try to explain the extent of dependency of the peoples on cprs.

Principal Findings of the Research

Fact-1

Common property resources are more than a source for fuel and fodder. Its contribution to the poor man's economy is very crucial and diverse. According to one of current estimates cprs contribute some US $5 billion a year to the

incomes of poor rural households in India, which is accounted for 12 percent of the household income of poor rural households (Abbiw, 1990).

Fact-2

In an extensive survey (82 villages and 7 states) N.S. Jodha reported that cprs constitute between 15% and 23% of poor people's income, and contribute substantially to improving village equity. Poor households are losing access to cprs, and the extent of decline between the mid-1950s and 1980s was between 26% and 52%

Fact-3

Iyengar and Shukla (1999), survey of 15 villages in Gujarat claim that cprs consumptions are accounted for 0.1 to 11% of consumption expenditure of farm households and between one and 22% of nonfarm households.

Fact-4

The only institution who collected data on cpr is NSSO. In 1999 NSSO study on the role of land, water and forest commons in the life and economy of rural Indians revealed that.

- Percentage of common property land resources in total geographical area: 15%
- Common property land resources per household (ha): 0.31
- Common property land resources per capita (ha): 0.06
- Reduction in CPR land during last five years (per 1,000 ha): 19 ha

All these observations highlighted the crucial importance of cpr in socioeconomic life of the poor peoples and signifies the fact that importance of cpr for the poor is more than the anti-poverty schemes. However, due to factors like commercial extraction of cpr products, de facto management regime, population explosion, etc give rise to over extraction cprs and ultimately results in depletion of cprs.

4.2 Method for Estimation of Forest Dependence Index (FDI)

Present study also aimed at quantifying peoples' dependence on cpr by means of developing a comprehensive and multidimensional index called Forest Dependence Index (FDI) and try to differentiate poor and non-poor dependence on cprs. Finally, the study explores the case of deprivation of poor as a result of cpr depletion.

Until the recent time, forest dependence had not been well understood or wrongly understood and therefore different concepts or indicators were used by the researchers to quantify forest dependency. In the existing literature, forest dependency has been addressed different ways. Some people consider the extent of services derived from forest to quantify forest dependency (Jodha N. S., 1986; Bokil, S. Miland, 1996) whereas some others have used forest income may be in absolute or relative terms to quantify the same. Recently some authors have pointed out that Human dependence upon forests is a multifaceted phenomenon because forests provide a diverse stream of benefits to humans (Beckley, 1998) and therefore a

multidimensional index may be more appropriate to capture forest dependence.

The first-dimensional index is the importance of cpr product collection which capture the importance of cpr products collected in the total household requirement (Own consumption plus sale). The indicators used to capture the index value are the quantity of cpr product collected from the forest and the relative significance of forest product collection which is measured as a ratio of forest products collection in a year over the total firewood consumption from various sources including those purchased via the market.

The second-dimensional index is the effort dedicated to cpr product collection from the forest. The affluent households may collect and maintain a huge stock of cpr product like firewood without sparing much time and labour. This is possible either through market purchase or through deploying hired labour for firewood collection from the forest. But the poor households who collect cpr product from the forest spent substantial hours after collection. As such time spent on the collection of cpr product in terms of man-day (one man-day is equal to eight hours of collection time) is considered another indicator to measure forest dependence. Thus, FDI is developed based on two dimensions comprising of three indicators.

4.3 Entropy Weight Calculation

The researcher is not aware of the weight of different criteria/indicators selected for the development of the index. Existing literature also fails to provide any information in this regard. Therefore, the Entropy weight determination method is employed to fix the weight of each indicator. The result is presented in table I.

Table-I: Estimated Entropy Weight of the Indicators

Target variable	Dimensions	Indicators	Index	Influence	Weight
Forest Firewood Dependency	Importance of forest firewood	1. Firewood collected from CF	Quantity collection (qntl)/year	+	0.3218
		2. The relative importance of firewood.	Forest firewood collection/Total firewood consumption	+	0.2016
	Effort	3. Time spent on collection of firewood in terms of man-day	8 hours of collection time = 1 man-day.	+	0.4766

Source: Primary Data, 2018.

4.4 Quantification of forest firewood dependence

Once the weight of each index is determined through weighted comprehensive evaluation, this study builds its model of forest dependence evaluation as under:

$$D_i = \sum_{i=1}^{n} X_{ij}^{/} W_j \qquad \ldots(1)$$

Here, D_i = Comprehensive forest dependence value of the ith index (households); $X_{ij}^{/}$ = Standardized value of jth evaluation index; and W_j= weight of the jth index.

The descriptive statistics of FDI is presented in table-II.

Table-II: Descriptive statistics of the FFDI

Overall forest firewood dependence			
Parameters	Minimum	Maximum	Mean
FFDI	0	0.9632	0.5187
Dimensions wise forest dependence			
Forest product collection	0	0.3200	0.2702
The relative importance of forest product	0	0.2000	0.7535
Effort	0	0.4800	0.1632

Source: Author's self-calculated based on field survey data, 2018.

The study assesses multidimensional forest dependence index as high as 0.5187. It shows how important is the common forest for the poor. It can be noted that cpr's contribution to the rural livelihood improvement is more than that of any anti-poverty programme.

5. Conclusion

The study recommended that necessary interventions are highly demanded to protect the poor from further deprivation from their age-old access to cprs. At the same time, it is also necessary to reduce forest dependence considering the problems of forest depletion and health impact[2]. If appropriate measures are not taken soon the common forest resources will become degraded. Hence, policy should be designed to empower the local management institutions. Local-level decentralized management of common forest can be emphasized ensuring active participation of the local stakeholders. Policy initiatives must attempt at improving livelihood assets, education level of the members of the household of the tribal households as well as ensure subsidized and equitable LPG distribution policy. At the same, it is also necessary to create awareness among the people about the environmental cost and health hazards of firewood consumption to motivate people towards modern fuels like LPG.

[2] Extensive forest dependence may lead to forest degradation on one hand and may have adverse health impacts on the other hand. Globally, 3.8 million premature deaths happen due to smoke from fires and stoves**Invalid source specified.**.

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Reviewing the Measures of Deprivation & it's Determinants taking case evidences from Basic Household Amenities & Public Health Facilities of Assam

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Introduction

The phenomenon of deprivation and disparity is highly diversified. It has multifaceted dimensions of varied types of social, economic, well-being and quality of life. The aggregation of social crisis like poverty, unemployment, poor living conditions, low level of education lead towards the negative connotations in multiple dimensions of social, economic, environmental, functional disparities which intensifies further to take the form of deprivation. In developing economies, the social and material deprivation is the prevalent ones. Smętkowski et al. (2015) defines deprivation as the lack of access to opportunities and resources which are seen as common in a particular society. Deprivation measures across the countries varies due to differences in perceptual level of the term itself. There is lack of uniformity regarding the inclusion of indicators in measuring deprivation. In developing country like India or South American countries, the level of deprivation is incomparable because of the complex social and economic structure, which makes it difficult to unify the entire picture of deprivation in a single frame.

On the other hand, the basic household amenities like drinking water facilities, electricity and sanitation as well as the public health facilities especially the health infrastructure are the backbone of developing economies. In absence of these basic facilities, deprivation is certainly evident be it as social or material. This need for access to these basic facilities have been recognised both nationally and internationally as these are the line of difference between various types and form of deprivation prevalent in the society. To be specific, although India made impressive progress in the economic development still the full coverage of entire population in terms of basic facilities remains a challenging task. Similar picture is witnessed in case of public health facilities too that are available to the citizens, despite of well-planned medical strategies that are administered under appropriate authorities. Thus, this paper is an attempt towards providing a glace of measurement techniques available for quantifying deprivation as well as mentioning the case reference of one of the measurement techniques of calculating deprivation index keeping in view the basic household amenities and public health facilities of Assam.

Objectives of the paper

The purpose of the paper is two folds.

- First it attempts to highlight the literary support available for the various aspects of measuring deprivation index along with the determinants.
- Second, to present one of the case evidence of calculation of deprivation index in the context of Basic Household Amenities & Public Health Facilities of Assam.

Methodology

For the fulfilment of objective 1, i.e. reviewing the various measures of deprivation, the Human Development Report 2015 is taken as fundamental one, wherein few of measures were highlighted. The second objective relates to the development of deprivation index based on the basic household amenities like drinking water, sanitation, and public health facility (health infrastructure), at the district level of the state Assam.

Major Findings

I. Deprivation Indices Overview

The available set of Deprivation Indices in the literature are mentioned in the table below:

Index Name	Country	Level of Analysis
Index of Multiple Deprivation	UK	National
General Deprivation Index	Canada	Local/Regional
NZDep Index of Deprivation	New Zealand	National
District Deprivation Index	Poland	District/Local
Area Deprivation Index	The USA	Local
European Deprivation Index	Portugal	National

Source: Author

Among the mentioned indicators in the table, Index of Multiple Deprivation is the most famous, developed by the University of Oxford in 1990. The index is unique and notable because of its complex methodology including around 40 variables. It is evident that, all the indicators are operating in a scale ranging from local level up to national level.

II. Indicators of Deprivation Index

Almost all the indices mentioned above are having common sets of parameters or indicators based on various thematic areas. The most common ones are related to human needs and access to resources, like living condition, education, access to goods and services, income level, labour market and so on. But, the variables related to health and other public health facilities are

uncommon, which are essential in case of developing economies like India in specific. Thus, it is evident that there is no universally accepted indicators to measure deprivation as like Human Development Index (HDI).

III. Calculation of deprivation index in the context of Basic Household Amenities & Public Health Facilities of Assam

The study developed two composite indices- one for the basic household facilities and other for the health facilities. So for preparing the weighted composite index of basic health facility, Iyengar and Sudarshan (1982) method was followed assumed that the weights vary inversely as the variation in the respective variable, on the other hand for expressing the health facility data into a single composite index the Data Envelopment Analysis (DEA) for weighting the indicators.

Conclusion

Measures of multiple deprivation is the need of the hour. As there is less uniformity regarding the inclusion of indicators in constructing the deprivation index, attention to be drawn to view deprivation from a wider perspective or at a larger context like ASEAN countries, European Union and so on.

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A Study of Human Deprivation of South Assam with special reference to Hailakandi District

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Introduction

Human capability constitutes the ends in itself and signifies its' importance in both individual and social evaluation. It is very imperative that a determined effort to expand human capabilities through improved education, health and nutrition will serve to transform the prospects for economic expansion particularly in backward regions. The objective of development should be to create an enabling environment for people to enjoy long, healthy and creative lives. So, development should not be viewed from an economic angle only, rather it should be viewed from a humanitarian angle. It is the human development approach that really throws light on the exact level of development of human beings and helps in policy formulation to achieve the development goals particular in a backward region.

Keeping all these points in view the present study tries to explore the development perspectives of Hailakandi district one of the remote region of Assam.

Objectives of the Study

i) To identify the development gap between South Assam and the rest of the districts of Assam.

ii) To quantify the relative position of South Assam districts according to Human Development Index (HDI) and Multidimensional Poverty Index (MPI) Ranking across the districts of Assam.

Data Source and Methods

The analysis of the study has been carried out on the basis of secondary data compiled from Assam Human Development Report, 2014. Simple graphical and tabular presentation tools have been used to analysis the results.

Results and Discussion

Human Development Attainment in South Assam vis-a vis the Rest of Assam: HDI ranks countries and societies according to the average level of capability enjoyed by their people. HDI has three components denoting three basic capabilities related to health, education and living standard. The realised levels of achievement in the three components are measured by a set of indicators. Obviously, if a person is entitled to primary education, health care service, nutritious food, proper sanitation facility, free access to

safe drinking water, etc., he can enjoy a better quality of life. However, well-being must assess amongst other things, the freedom and right to achieve along with actual achievement. One way of seeing development is in terms of the expansion of the real freedoms that the people enjoy to pursue the objectives they have reason to value, and in this sense the expansion of human capabilities can be, broadly, seen as the central feature of the process of development.

The 'basic' capabilities refer to the ability to perform certain basic functions, that is, to be educated, to live a long and healthy life and to enjoy a minimally decent standard of life. The realised level of these basic functions define an achievement level and, hence, well-being. The level of well-being given by the levels of achievement in these three functions is reflective of the capability. The capability, therefore, can be assessed by an index based on the realised levels of achievements in these three basic functioning. Here HDI performs the same function.

Human Development Indicators and Indices in South Assam Districts and other Districts of Assam:

Life expectancy at Birth as an indicator of Health:

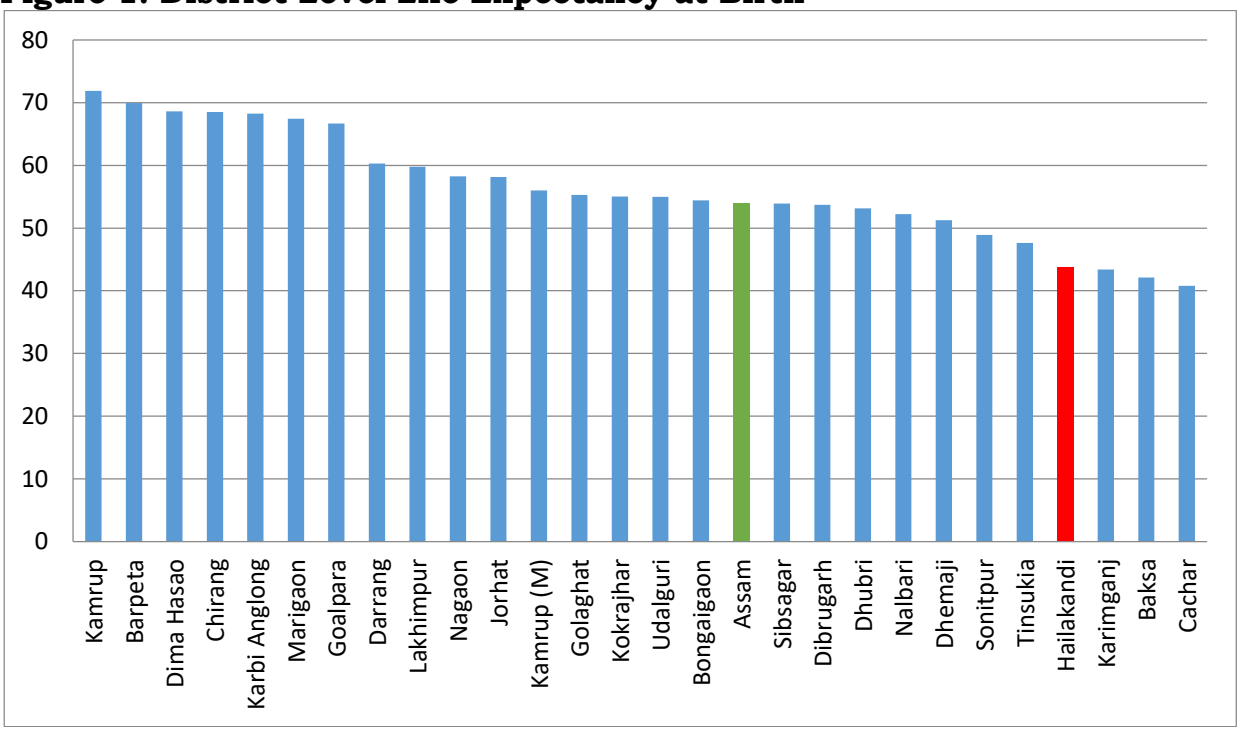
Life expectancy at birth denotes the number of years that a child can expect to live at the time of birth, given the age-specific mortality rates in the population. This indicator refers to long-term improvement in health. The latest available SRS data (2006-10) estimate life expectancy at birth in Assam at 62 years (male) 61 years (female). Based on Assam Human Development Report 2014 data, the life expectancy at birth in the state is found to be 54 years. District level estimates reveal that life expectancy varies widely across districts. The highest life expectancy is estimated in Kamrup (71.88) while the lowest is found in Cachar (40.76). Relatively higher life expectancies are found to be in the districts of Barpeta, Chirang, Dima Hasao, Karbi Anglong, Goalpara and Marigaon. Similarly, relatively lower life expectancies are found in districts of Baksa, Karimganj, Hailakandi, Tinsukia and Sonitpur (Figure 1). As shown in figure Hailakandi district attains least achievement (24th position) along with other districts of Barak Valley as far as this health indicator is concerned. So in health front Hailakandi district has been lagging behind absolutely and relatively.

Educational Attainment

Regarding educational attainment performance of Hailakandi district has been poor. Mean Years of Schooling (MYS) and expected years of schooling (EYS) are the two indicators used to measure educational achievement. MYS indicates the average number of completed years of education of a country's population aged 25 years and older. The MYS for Assam is estimated at 6.17. Given the normative goal of 15 years which ensures secondary level of schooling, the present educational achievement in the state is only about 40 per cent of the goal (Assam Human Development Report 2014). As shown in figure 2. Hailakandi district secures 18th position in respect of MYS among the district of Assam. Hailakandi District achieves even less than other two districts of Barak Valley, namely, Cachar and Karimganj. EYS is a measure of the number of years of schooling a child at the start of his or her education is

expected to receive, if current rates of enrolment are maintained throughout the child's life.

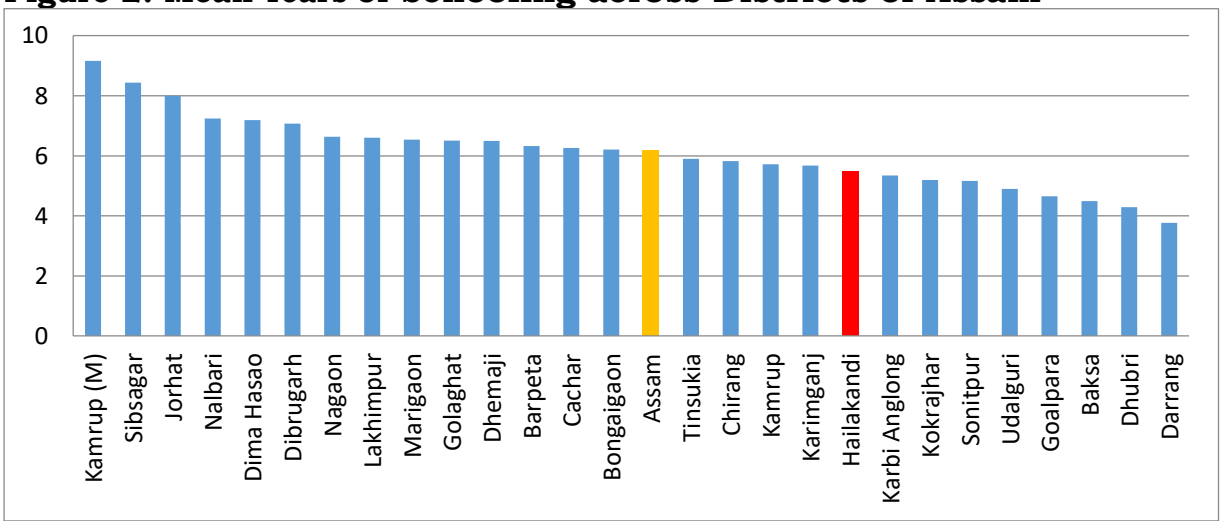
Figure 1: District Level Life Expectancy at Birth



Source: Assam Human Development Report 2014

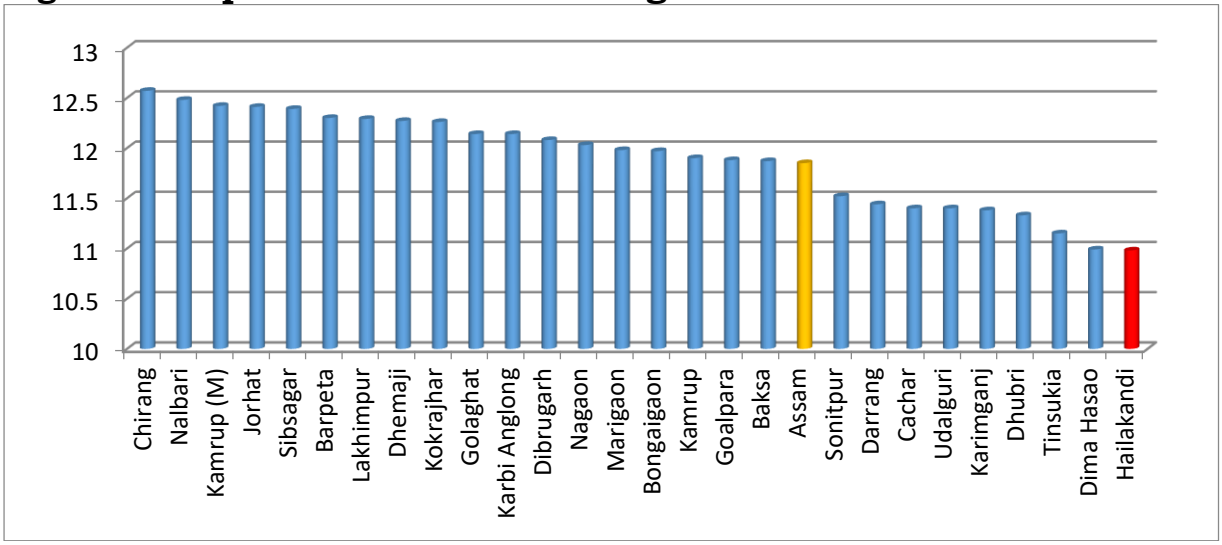
Higher value of EYS is believed to denote higher accumulated knowledge. According to Assam Human Development Report EYS in the state varies in the range 10.98 to 12.57. The lowest EYS is found in Hailakandi (10.98) and the highest is found in Chirang (12.57). So, as far as educational attainment is concerned Hailakandi is found to be the most deprived district in Assam.

Figure 2: Mean Years of Schooling across Districts of Assam



Source: Assam Human Development Report 2014

Figure 3: Expected Years of Schooling across Districts of Assam



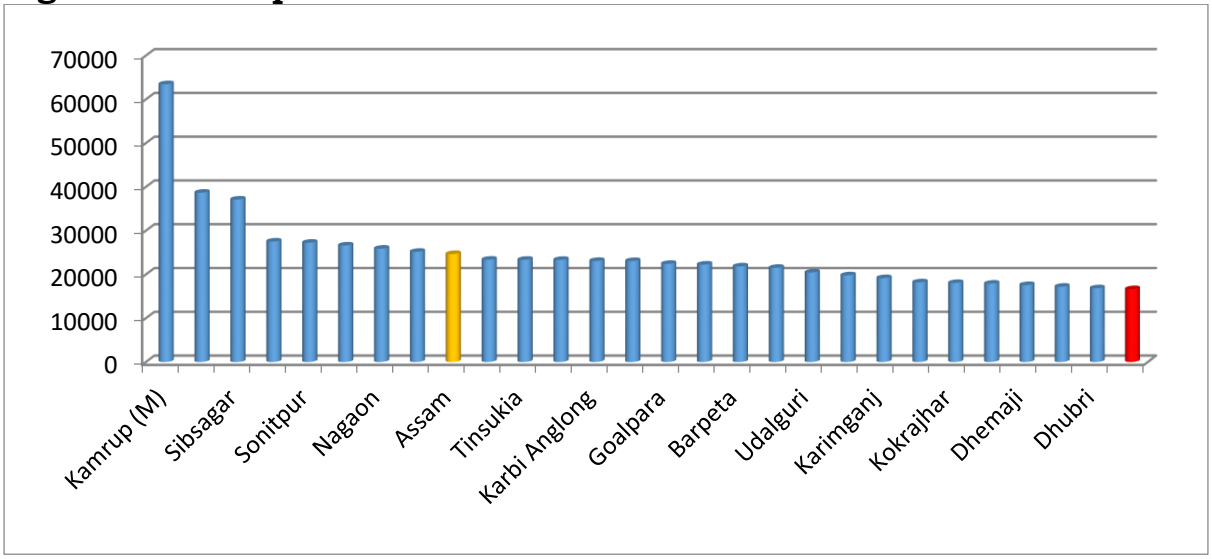
Source: Assam Human Development Report 2014

Income per Capita

Gross Domestic Product (GDP) per capita is widely accepted as an indicator to represent the income dimension of human development. Estimated Per Capita Annual Income (PCAI) is being used to represent District Domestic Product per capita. District wise, the highest PCAI was found in Kamrup (Metro) (INR 63,444) followed by Jorhat (INR 38,664). The lowest PCAI was obtained in Hailakandi (INR 16,632) followed by Dhubri (INR 16,336) (Figure 4).

Income per capita has been considered as the most prominent indicator of development as it acts both in ends and means to development. But unfortunately this parameter of development attains the least. So in income front also Hailakandi has to attain a lot.

Figure 4: Per Capita Annual Income District wise



Source: Assam Human Development Report 2014

Human Development Index (HDI), Multi-dimensional Poverty Index (MPI) and South Assam Districts

HDI looks at the development potential of a Nation and the attained level of well—being of its constituent population at a point of time, whereas, MPI looks at attributes reflecting deprivation in ability, including the command over material means of well—being of people from the deprived sections of the population to live a productive and meaningful life. In each of these measures, efforts are made to address a specific facet of the development process, using a common approach but focusing on more representative set of variables in a consistent relationship to each other.

The HDI is a composite index derived on the basis of dimensional achievements in health, education and income. The index presents the status of human development in the districts. The values of HDI represent how much progress the people have made in overall human development given the pattern of dimensional achievements in the district and the normative goal of capability expansion. The values of the index range between 0 and 1 – where 0 implies no progress made and 1 signifies complete achievement with regard to the normative goals set for the purpose of assessment.

Table 1 show that Hailakandi district secures less than even 0.4 when health and income indices are being estimated.

As shown in figure the present paper estimates the value of HDI for the state as a whole at 0.557. This tells us that given the desired normative goal, the present level of progress in overall human development in the state is just a little beyond the halfway mark. The highest attainment is observed in Kamrup (M) and the lowest in Hailakandi. In 15 of 27 districts, the average level of achievement in human development is found to be more than the state average. Figure shows that only four districts attains HDI value less than 0.5 and Hailakandi has been found as the least achiever among all the districts of Assam so far as over all development is concerned.

Table 1: Dimensional and Human Development Indices of Districts

District	Health Index	Education Index	Living Standard Index	HDI
Baksa	0.340*	0.606	0.404	**0.437***
Barpeta	0.768	0.684	0.462	**0.624**
Bongaigaon	0.530	0.667	0.507	**0.564**
Cachar	0.319*	0.647	0.479	**0.463**
Chirang	0.746	0.677	0.457	**0.614**
Darrang	0.620	0.566	0.399*	**0.519**
Dhemaji	0.481	0.688	0.393*	**0.507**
Dhubri	0.510	0.579	0.380*	**0.482***
Dibrugarh	0.518	0.700	0.483	**0.560**
Dima Hasao	0.748	0.662	0.525	**0.638**
Goalpara	0.718	0.612	0.470	**0.591**

District	Health Index	Education Index	Living Standard Index	HDI
Golaghat	0.543	0.684	0.431	**0.543**
Hailakandi	0.366*	0.605	0.376*	**0.437***
Jorhat	0.587	0.744	0.643	**0.655**
Kamrup	0.798	0.648	0.483	**0.630**
Kamrup (M)	0.554	0.783	0.800	**0.703**
Karbi Anglong	0.743	0.645	0.480	**0.612**
Karimganj	0.360*	0.627	0.420	**0.456***
Kokrajhar	0.539	0.645	0.402	**0.519**
Lakhimpur	0.612	0.693	0.468	**0.583**
Marigaon	0.730	0.678	0.386*	**0.576**
Nagaon	0.588	0.684	0.516	**0.592**
Nalbari	0.496	0.721	0.535	**0.576**
Sibsagar	0.521	0.758	0.630	**0.629**
Sonitpur	0.444	0.615	0.532	**0.526**
Tinsukia	0.425	0.625	0.483	**0.505**
Udalguri	0.538	0.602	0.441	**0.523**
Assam	**0.523**	**0.661**	**0.501**	**0.557**

Source: Assam Human Development Report 2014

Multi-dimensionally Poverty Index (MPI) and South Assam Districts:
The MPI identifies deprivations across the same three dimensions as the HDI and shows the number of people who are multi-dimensionally poor (suffering deprivations in 33% or more of the weighted indicators). It complements traditional income-based poverty measures by capturing the severe deprivations that each person faces at the same time with respect to education, health and living standards. Indicators used in estimating MPI are mentioned below. If someone is deprived in a third or more of ten (weighted) indicators, the global index identifies them as 'MPI poor'

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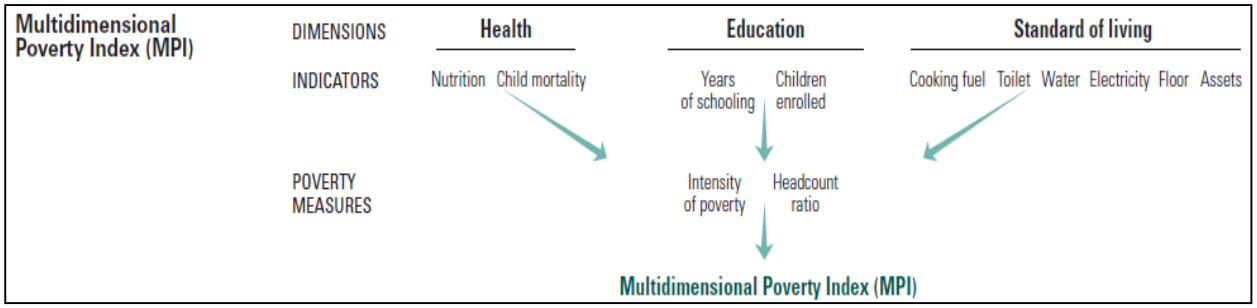

Table 2: Position of South Assam Districts according to HDI and MPI Ranking

District	Rank HDI	Rank MPI
Cachar	24	6
Hailakandi	27	4
Karimganj	25	3

Source: Assam Human Development Report 2014

Table 2 shows that level of achievement in terms of human development in Hailakandi district is consistently low than that of state average. Table shows the clear picture of uneven development in the state. In Human development front Barak valley is found to attain lop sided development. Cachar and Karimganj take 24th and 25th position respectively in human development out of 27 states in the State. More importantly, Hailakandi District secures the last position in HDI ranking revealing the fact of highest deprivation.

Poverty is viewed not only in terms of lack of adequate income, but as a state of deprivation in socio-economical and political aspects. In this respect too Barak Valley and specially Hailakandi register highest deprivation. In MPI ranking Karimganj, Hailakandi and Cachar secures 3rd, 4th and 6th position respectively. So it reveals that poverty and associated deprivations in this Valley are results of combined effect of social, economic and cultural factors. Deprivation in basic amenities governing human capabilities and functioning often reflect the inefficiency of the institutions of governance that are undertaken by the State in the name of public interest and well—being. With a huge shortfall in human development in Hailakandi District, there is an urgent need to redesign the public policies that directly affect the capabilities of the people to boost up human development and reduce human deprivation in the region.

Summary and Conclusion

The forgoing discussion suggests that, on the whole, human development in South Assam and specially in Hailakandi district remains low in relation to the other districts of the State. This district has been lagging behind not only in economic front but also in social front. Improvement of income, education and health emerges as the most critical policy concern. Different avenues of gainful employment especially rural employment assume the central place in the human development strategy in the district. It is imperative that any attempt at enhancing capability of the people in the region calls for investment not only in economic sectors of the economy, but also equally important is that investment should be made in the various social sectors too. Policies and programmes are to be formulated in such a way that economic expansion should strengthen the expansion of human capability which will greatly determine the level of development in the region.

The study suggests that along with expenditure on social services and rural development, good governance and proper planning and utilization of funds will be crucial factors in determining the level of human development in the district.

In a nutshell, the all-round efforts, which are of urgent need to improve the living condition in the district, can be outlined as –

(i) Wholehearted effort should be made to implement poverty alleviation schemes in the rural sectors.
(ii) Initiative should be taken to implement effectively some special employment generating programmes in the rural areas.
(iii) Steps should be taken to spread education, especially higher education, professional education and female education.

(iv) Health care facilities should be made available to the weaker section of the people.
(v) Panchayati Raj System should be organized properly to create social awareness in order to rouse 'will to live better' among the people.
(vi) Development of agriculture sector and establishment of agro-based cottage and small-scale industries would help to generate income and employment and to reduce the impact of poverty.

At last, it is concluded that the study supports the premise that socio-economic accessibility is one of the obvious requirements for sustained human development in these backward district. It may be stated that whatever be the policies adopted for improving living condition of people in the region, emphasis should be given to achieve development from below which ensures people's participation and capability expansion there in.

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Application of Principal Component Analysis to Assess the Women Deprivation in different Districts of North Eastern States of India

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Introduction

The North-Eastern Region (NER) of India consists of eight states, viz. Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. The North-Eastern Region is a complex, culturally diverse and geographically resourceful region. The population of this region is divided into different cultures, religions, languages and traditions. As per census 2011 the population density of this region is 148/ KM^2.

It has been considered that the North Eastern Region is a backward region in terms of per capita income, medical facilities, education facilities, pure drinking water facilities etc. Geographically, men and women share the same space, but everywhere in the world, women are in lower status than men. But there is a perception that the status of women is higher in the North Eastern Region of the country in comparison with the status of women in all India average (Das, 2013).

Literature Review

Manage and Scariano (2013) states that Principal component Analysis is a widely used technique, which is used in applied multivariate data analysis. This paper laid emphasis in the calculation of first principal component as a linear combination of different factors.

Das (2013) laid emphasis in the comparative study of the status of the women of North-East India to the women of other parts of India, considering different parts, viz. Female literacy rate, Female work participation rate, Female dropout rate, Anaemia among the women, Women's participation in decision making etc.

Lai (1999), used the weighted principal component method on the human development indicators to measure and analyze the progress of human development in the world. The main principal component was employed to quantify the temporal changes of the human development of several selected countries by the proposed Z-test. The trends of the human development in the period of market transition in two large countries, China and Russia, were discussed in terms of the impact of public health as well as economic development. The association of the main principal component obtained from this study and the human development index reported by the United Nations Development Programme was estimated by the Spearman's rank correlation coefficient.

Lai (2002) used the weighted principal component analysis to measure and analyse the progress of human development in Chinese provinces since 1990. In this paper the author laid emphasis in ranking the different provinces of China, using both HDI and principal component analysis

methods and made comparison between two methods using Spearman Rank Correlation.

Mazumdar (2013) states that the present study proposes an alternative measure of estimating HDI which bridges the gap between the methods of computing HDI proposed by the UNDP in 1990 and 1994. This study also incorporates unadjusted per capita real gross domestic product (PCRGDP) instead of adjusted PCRGDP used by the UNDP. The data from the Human Development Report (HDR) 2000 for 174 countries are used to test the robustness of the suggested index and the results are compared to those of the HDI. Also average values for full sample as well as top 20 percent and bottom 20 percent are offered to show the superiority of our method to that of the UNDP's HDI.

Bhattacharjee and Wang (2011) developed the weighted index of deprivation, for the basic facilities. In this study a technique is used to measure the appropriate weight of different facilities, in spite of equal weightage to all. Also the facility deprivation indices are measured using appropriate weights of different factors.

Objectives

1. To develop the principal components for different districts of North-Eastern states of India, calculating the loading specifically for different factors of women deprivation.
2. To quantify the level of women deprivation in different districts of North-Eastern states of India in terms of the factors women illiteracy rate, Women married before age 18 years, Women suffering from anemia and Women having BMI below normal.

Methodology

Let x_{ijk} be the percentage of i^{th} social and health deprivation parameters of the women of the j^{th} district of k^{th} state of North Easter Region.
Here, *i= 1 (*women illiteracy rate), *2 (*women married before age 18 years), *3 (*women suffering from anemia) and *4 (*women having BMI below normal)

Principal Component Analysis (PCA) is a non-parametric variable reduction technique. This technique is used to collapse a set of correlated variables into fewer uncorrelated variables as a linear combination of original variables. PCA aims to reduce the observed variables down into a smaller number of Principal Components.

Lai (2002) states that, in this technique, first it is required to prepare a correlation matrix for the given factors. Manage and Scariano (2013) assumes that, if $\lambda_1, \lambda_2,.., \lambda_n$ be the Eigen values of the correlation matrix and $Y_1, Y_2,...Y_n$ be the Eigen vectors corresponding to the Eigen values $\lambda_1, \lambda_2,...\lambda_n$ then the values of Eigen vector corresponding to the highest Eigen value will give the loading (W_1, W_2, W_3 and W_4) of the Principal Components, corresponding to the respective states. Multiplying the loadings with the standardised form of the corresponding factors (Parameters) and summing them, the first principal component can be obtained. If $P^{(1)}_{ijk}$ be the first principal component of the j^{th} state, then –

$$P^{(1)}_{ijk} = Z_{1jk}W_1 + Z_{2jk}W_2 + Z_{3jk}W_{3jk} + ... + Z_{njk}W_n \quad ... (1)$$

Where $Z_{ijk} = \frac{x_{ijk} - \bar{x}_{i.k}}{\sigma_{i.k}}$ … (2)

Distribution of the Principal Components of Women Development Indices

It is assumed that the Human Development Indices follows Normal Distribution (Iyengar and Surendran, 1982). Using K-S test, it is assumed that the Principal Components of different districts of North-Eastern states of India follows the normal distribution.

Now for the probability Distribution of the composite index, it is required to find two real numbers $-a$ *and* a , such that $(-\infty, -a), (-a, a)$ & (a, ∞) has the same probability weights of .3333, ie,

` $P(-\infty < P_{i1} < -a) = .3333$ … (3)

$P(-\infty < P_{i1} < a) = .6666$ … (4)

So, from (3) and (4)

$P(a < P_{i1} < \infty) = .3333$ … (5)

These intervals are used here to characterized the various stages of the development as follows-

i) Low developed if $-\infty < P_{i1} < -a$

ii) Medium Developed, if $-a < P_{i1} < a$

iii) High developed, if $a < P_{i1} < \infty$

Calculation

From the available data, the correlation matrix for the eight states of North East India is –

$$R = \begin{bmatrix} 1 & 0.432 & 0.221 & 0.057 \\ 0.432 & 1 & 0.647 & 0.537 \\ 0.221 & 0.647 & 1 & 0.687 \\ 0.057 & 0.537 & 0.687 & 1 \end{bmatrix}$$

Since R is a symmetric matrix of order 4×4, so the correlation matrix R has three eigen values, namely λ = 0.562, 0.338, 1.003 and 3.374 (64%). Here the height eigen value is 3.374 and its corresponding eigen vector is $Y = \begin{bmatrix} 0.562 \\ 1.087 \\ 1.103 \\ 1 \end{bmatrix}$

So, here the loading of the principal components, corresponding to the factors are-

Table 1: Loading associated with the different factors of women development index

Women development factors	Women illiteracy rate	Women married before age 18 years	Women suffering from anemia	Women having BMI below normal
Loading	0.562	1.087	1.103	1

Since the values of Principal Components lies between (-∞, ∞), so using K-S test in SPSS, it is assumed that the principal components of different states follows normal distribution, having the pdf-

$$f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{-\left(\frac{x-\mu}{\sigma}\right)^2}, -\infty < x < \infty, -\infty < \mu < \infty \text{ and } \sigma^2 > 0$$

Now using the method of mle (Johnson and Kotz,1970) the estimated values are –

$$\hat{\mu} = \bar{x} \quad \text{and} \quad (\hat{\sigma})^2 = S^2 = \frac{1}{n-1}\sum_1^n (x_i - \bar{x})^2$$

∴ From the principal components obtained, the estimated values of μ and σ^2 are -

$$\hat{\mu} = -9.6504\times10^{-16} \text{ and } (\hat{\sigma})^2 = 8.8164$$

$$\therefore \quad f(x) = \frac{1}{\sqrt{8.8164}\sqrt{2\pi}} e^{-\left(\frac{x+9.6504\times10^{-16}}{\sqrt{8.8164}}\right)^2}, -\infty < x < \infty$$

Using Normal Distribution Calculator: On line statistical table in (3) –

$$P(-\infty < PA < -a) = .3333$$

$$\Rightarrow \int_{-\infty}^{-a} \frac{1}{\sqrt{8.8164}\sqrt{2\pi}} e^{-\left(\frac{x+9.6504\times10^{-16}}{\sqrt{8.8164}}\right)^2} dx = .3333$$

$$\Rightarrow -a = -1.305$$

Similarly, from equation (4)

$$P(-\infty < PA < a) = .6666$$

$$\Rightarrow \int_{-\infty}^{a} \frac{1}{\sqrt{8.8164}\sqrt{2\pi}} e^{-\left(\frac{x+9.6504\times10^{-16}}{\sqrt{8.8164}}\right)^2} dx = .6666$$

$$\Rightarrow a = 1.305$$

The values of $-a$ and a are obtained to classify the Principal Components into the following stages of women development.

Table 2: Stages of Development classified by Principal Components

Stages of Development	**Values of Principal Components**
Low deprived	Less than −1.305
Medium deprived	−1.305 *to* 1.305
High deprived	More than 1.305

Table 3: Women of the districts of different states of NER who suffer from maximum and minimum problems

Name of the State	No. of districts	Women of the District facing	
		Maximum Problem	Minimum Problem
Arunachal Pradesh	20	Namsai (2.456629)	Siang (-3.8302)
Mizoram	8	Lawngtlai (-0.9687)	Serchhip (-5.2412)

Tripura	8	Unakoti (5.3959)	West Tripura (2.7026)
Nagaland	11	Zunheboto (-0.2443)	Kohima (-5.0665)
Meghelaya	11	South-west Khasi hills (1.2458)	West Khasi Hills (-1.878)
Assam	33	Dhubri (6.5418)	Dima Hasao (-0.3957)
Manipur	9	Bishnupur (-2.00762)	Imphal West (-3.61136)
Sikkim	4	North District (-2.668)	South District (-3.4205)

From the Table 3, it is found that the women of Dhubri district, Assam is maximum deprived and Serchhip district of Mizoram is least deprived.

Conclusion and Future Direction of Research

The present study laid emphasis on the quantification of women deprivation and in this connection composite index is used, when principal component analysis is used to determine the loading. Here principal components of each district of each state of North-East Region are estimated using the loadings of principal component analysis and the problems of women are quantified using normal distribution. In this study, problems of women are studied only for the districts of the states of North-Eastern Region. But this study can be extended for the state wise study of the whole India.

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Socio-economic deprivation of farmers of Assam

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Introduction

As a government official I had the opportunity to be a visitor to each and every corner of agricultural lands in Barak Valley. So, I got exposed to the difficulties faced by the farmers of this region. Our Directorate of Economics and Statistics, Government of Assam was set up in 1948, after independence of the country. Whatever survey and census we conduct is done under the supervision of the Central Statistical Office (CSO). This is done so that there is uniformity in the process in the various states of the country in the surveys that are conducted by the different states. Our office conducts the general census (which was earlier called as the population Census). Because of the pandemic situation it was not possible to complete the census in 2021 but the work is going on in full swing following the improvement of the pandemic situation. Besides general census we conduct Annual Survey of Industries (ASI), Crop Estimation Surveys for different crops. In Assam 9 crops are considered as major crops which include autumn paddy, summer paddy, winter paddy, potato, mustard, sugar cane, wheat and maze. However, in Barak Valley region only 6 crops are grown and they are considered under crop estimation survey.

Agricultural Surveys

During the survey we follow the guidelines of the CSO for selecting of villages. Our stratum is considered as circle each and every district is divided into circles for administrative purpose. The circle officer provides us with a list of villages within the circle. The list of villages under each circle is prepared and 20 % of the villages are considered as the annual survey, so that in five years all the villages are surveyed. Suppose, there are 100 villages in a circle then 20 % of the villages shall be considered in this agricultural year another 20 % villages in the next agricultural year and so on. In this way within a period of five years all villages shall be surveyed. Agricultural year starts from 1st July of a particular year to 30th June of the next year. We carry out our agricultural surveys during this agricultural year. Each agricultural year is further subdivided into four seasons viz. Early Kharip, Late Kharip, Rabi and summer seasons. During each of the seasons we conduct crop estimation surveys, vegetable surveys, TRS (Timely reporting System) etc.

Information Deprivation of the Farmers of Barak Valley

My point of discussion is based on the deprivation of the farmers of the Barak valley region and is based on the experiences that I gathered during the agricultural surveys. The farmers of Bark valley regions are deprived on two things. One is lack of irrigation facility and the other is the crop insurance scheme.

Irrigation Facility: Due to lack of irrigation facilities available to the farmers in this region they remain deprived of the supply of water as and when required for farming, rather they have to depend on the rain water. Accordingly, we performed a survey on the available irrigation facilities available to the farmers of Barak valley and we submitted the report to the Government of Assam. Based on the recommendations of our report some steps are taken. One such step was the 'Deep-tube Well Pump Project' that is initiated by the irrigation department of the State Government. This is a great improvement towards better farming for the people of this region and it has increased their productivity. The farmers of our region are not as rich as the farmers of Punjab and Haryana and could not effort to have any irrigation facility. The farmers of our region are so poor- they have very small plot of land and that they cannot even use power tiller for preparing the soil for cultivation, but has to depend on the age old techniques.

Crop Insurance: The other factor where our farmers are deprived is the crop insurance scheme. This scheme was introduced in Assam long back in 1980s. But due to the lack of interest of the Government of India in this scheme there were no serious attempts to raise the awareness of the farmers towards this scheme. So the farmers are not aware of the facilities they shall get from these schemes. But with the launching of the Pradhan Mantri Fashal Bima Yajona (PMFBY) in 2016 followed by awareness program in this regard by the state government and the central government about the crop insurance scheme facility. A farmer having one hector (7.5 bigha) of land, small piece of land if you consider the plowed area, can get his crop insured by paying Re. 1. But in most cases the farmers are not aware about the scheme. It is only after launching of the PMFBY that some awareness campaigns were taken up. Earlier there was no awareness program as experienced by me during my 23 years of service. The farmers of Assam, thus are not aware of this scheme while their counterparts from other states like Haryana, Punjab, Uttar Pradesh has taken the benefit of crop insurance. In case the farmers are aware of this insurance scheme they could have benefited them from the same. This would have given them to plough the land even in rainy season.

The crop can be sub-divided into many ways. In different areas the cropping methods are completely dissimilar. So these crops are planted by the farmers. In our locality majority are plain areas so in rainy season there is not much plowing of the land because of the fear of flood. If the crop area is insured then the farmer would show interest in plowing the land as he knows that

even if rain comes down heavily then too he shall get the benefit. The minimum cost of the crop the farmer shall get back from the government of Assam. If the crop for 7.5 bigha is lost then under this insurance scheme government shall be paying the farmer about Rs. 10,000, and they shall not be the looser.

So, I actually wanted to highlight these two factors i.e. irrigation facility and crop insurance scheme. The basic purpose of the presentation is to make the researchers aware of the schemes. We are government officials and we are not in a position to criticize the implementation of the policies of the government. But, as a researcher you people are independent and carry out research in these two factors and can present your research report to the government of Assam highlighting the status of these schemes. So that the farmers of the region can take the benefit of these schemes.

Conclusion

Socio economic deprivation is a multi-dimensional concept as it refers to the relative dis-advantages of individual or a social group of people in terms of access and control over economic material, social resources and opportunities. We also conduct socio-economic survey every year under the guidelines provided to us by the National Sample Survey Office (NSSO). In the last year it cannot be conducted because of the pandemic. The survey is conducted all over India, in all the states covering all the villages. The urban sector are divided into two parts the municipal area and the corporation area. The urban sectors and the villages are divided into two parts. One part is surveyed by the state government officials and the other part are conducted by NSSO itself, so that they do not overlap. We conduct the survey by selecting the sampling units using random sampling method using the same schedule that are used by the NSSO and developed by the Ministry of Statistics and Program Implementation (MOSPI). In every year in such socio-economic surveys different topics are been taken to conduct the survey by the Government of India like- poverty, health, hazard, unemployment etc. The different departments of Government of India has some queries on some factors. Health department bout the heath infrastructure, Labor department may have some queries about labor etc. So based on the different queries of the different departments of India the government may ask the concerned offices to conduct different surveys. So based on our surveys the government takes the decision. So our surveys gives us the base based on which the different developmental steps are taken up by the government. The government needs some fundamental data so as to understand the current scenario and accordingly frames the policies. The outcome of the surveys conducted by our office and the relevant data are available in our website and are regularly updated. The researchers may visit our website or visit our office for data relevant to their research on socio-economic and agricultural issues. As per state government employee we conduct the survey or Census as per the requirement of the Government of India or the Government of Assam. So all types of socio economic data are not available with us. So researchers before setting your objective may check the availability of data with us and

based on the availability of data you may restructure the objective of the study. We try to help researcher from any university or institute with the data available to us. However, it is not the requirement of the university or the research scholar's data requirement that is addressed by us but we work as per the requirement of the government. It is not possible to collect and maintain data for all types with our limited staff. But we are always ready to help you with the available data as per our ability.

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Information Deprivation – A Curse for the Have Nots

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Introduction

According to Merriam-Webster online dictionary (2022), Information Age is 'the modern age regarded as a time in which information has become a commodity that is quickly and widely disseminated and easily available especially through the use of computer technology'. The first known use of the word 'Information Age' has been listed as 1960 in the dictionary. In the information age, information is considered as power because right information at the right time enhances our capacity in a given context (Jha, 2006). It is seen that the rise of Information Technology and the explosive growth of the Internet have led to an expansion of information overload for people of all social ranks (Roetzel, 2019). Of course, information overload is for those who have access to information. It is an irony that on one hand we are burdened with too much information, such that managing information itself has become difficult and on the other hand, we are facing information deprivation. It is akin to the availability of so much water in the seas and the oceans without having much to drink and quench our thirst. One of the first known uses of the word 'Information Deprivation' is by Schiller (1996). He used the term but didn't define it as such. Literature also has the term, 'Information Underload' (Kline, n.d.).

Deprivation is the state of being kept from possessing, enjoying, or using something and when this something is information, we shall call it *information deprivation*. This information deprivation can keep people or groups of people ignorant in many ways and render them powerless or helpless. Information deprivation may be by design or consequential. It will be by design if it is systematically done to monopolize power, or carried out to more easily take advantage of others. And it will be consequential if information may not be sourced or retrieved because of a variety of reasons.

Hoarding of information, creating bottlenecks in the flow of information or spreading misinformation may be looked at as information deprivation by design and it is seen and practiced widely. Consequential information deprivation is due to a host of factors. It may occur because of naivety, inexperience, and even arrogance. Foremost is illiteracy which makes access to information impossible. Lack of information at the right place or right time which are important attributes of information is also a major factor. For a large and diverse country like India with scores of languages, the unavailability of information in a particular language can also lead to information deprivation. In this age of information technology where information is digitized to a large extent, the difficulty in accessing and using technology in itself is also a major reason of information deprivation. The reasons for information deprivation are thus too many.

Information Deprivation among the Poor

While information deprivation can put anyone to many disadvantages and challenges; it is the poor people who are affected the most. With a poverty rate of around 28% in 2019 (Mahapatra, 2021), the gravity of the problem may be easily comprehended. It would not be an exaggeration to say that information deprivation is a curse for the have nots, whether it is by design or it is consequential. Information deprivation deprives the have nots of many government schemes and they are unable to take advantage of the same. Many middlemen take advantage of this situation. In the guise of helping them, they would siphon of a major share of the benefits. Information deprivation may be a reason for denial of justice or lead to many legal harassments for the have nots as powerful people take advantage of the situation. In the long run, information deprivation can keep the have nots in the same state of marginalization and not allow them to come out of poverty. Information deprivation creates inequalities and does not allow the social divide to diminish.

Tackling Information Deprivation

Information deprivation by design is more dangerous because it is difficult to counter and newer ways can always be found to deprive someone from getting the information. This class of information deprivation may be addressed through information transparency and strong legal measure. On the other hand, consequential information deprivation may be better managed through intervention and intent. Awareness programmes, digital literacy initiatives, making information available in multiple languages are all examples of intervention and intent to manage consequential information deprivation. Legal initiatives like the Right to Information (RTI) Act, mandatory disclosures under various Acts like the Company Act may be looked at as ways of managing information deprivation by design. Emerging digital and information technologies may also be deployed to halt the spread of information deprivation and counter the threats posed by it.

Conclusion

Though the term information deprivation finds usage in the medical and behavioural science disciplines; research or discussions on information deprivation as mentioned here is limited or non-existent as a Google search will reveal. Looking at the magnitude and severity of the issue of information deprivation in uplifting the poor, there is an urgent need to take it up and initiate steps for its mitigation. This is especially important in the backdrop of the Sustainable Development Goals (SDGs) which talks about No Poverty (SDG 1) and Reduced Inequalities (SDG 10) among others. The SDGs are to be realized by 2030 and tackling information deprivation may be a key to reach at least a few of the SDGs. It is high time that research and discussions are initiated on information deprivation so that the poor are less afflicted by it.

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Comparative Analysis of Housing Shortage in India

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Introduction

Housing is regarded as an 'engine of economic growth' and can give a big push to the economy through its strong 'backward' and 'forward' linkages with about 250 ancillary industries according to Statistical Compedium, 2013. Recognizing the importance of housing in the country as a basic human need, it has been one of the priorities of the Government of India right from the First Five Year plan till date. The core of all the housing initiatives is to concentrate efforts on improvement of the housing conditions of industrial workers/economically weaker sections and of low-income groups, through housing schemes, involving an element of subsidy ranging between 20 percent to 50 percent. All the housing programs have resulted in the positive growth in the total housing stock, which has increased from 13.30 million units in 1961 to 78.48 million units in 2011. According to the Report of the Technical Group (TG-12) on Estimation of Urban Housing Shortage, the total urban housing shortage in the country in 2012 recorded a decline from (24.71) Million at the beginning of 11th Five year Plan as estimated by 11th Plan Technical Group to 18.78 million in the beginning of the 12th Plan as estimated by TG-12. The urban housing shortage during the 12th Five Plan period (2012-2017) may even come lower if the rate of growth in housing stock continues to be higher than the growth in number of Households in the 12th Five Year Plan, as observed in the last decade.

Government has always been sensitive to the needs of the urban poor and it has addressed the magnitude of housing shortages by launching several programs, mainly aimed at catering to the needs of poorer segments of the society. Some of the recent programs for housing the poor include: Two Million Housing Program, *Valmiki Amedkar Awas Yojana* (VAMBAY), Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Interest Subsidy for Housing the Urban Poor (ISHUP), Affordable Housing in Partnership (AHIP) Scheme, and interest subvention scheme. One of the important developments in the urban housing sector is the launching of the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) – with components of Basic Services to the Urban Poor (BSUP) and Integrated Housing & Slum Development Programme (IHSDP) - in 2005 discussed in Statistical Compedium 2013.

Objectives

i) To study the housing shortage and Level of Deprivation
ii) To analyze the regional variations in the level of socio-economic deprivation in the study area.
iii) To find out the relationship between housing shortage (dependent variable) and selected socio-economic variables of deprivation (independent variables) among the states and union territories of India

Study Area

Here we have considered India as a study area for the present research work and boundary as state/UT has been considered as the smallest unit of study. From Statistical Compendium 2013, we can find that according to the 2011 census, the total number of houses in India was 330.84 million. This includes 306.16 million occupied and 24.67 million vacant houses. The number of houses in rural area was 220.70 million with 207.12 million occupied houses and 13.58 million vacant houses; in urban areas the number was 110.14 million total houses, which includes 99.05 million occupied and 11.09 million vacant houses. The total number of households was 246.69 million in India as per 2011 Census and the All-India average household size was 4.9 persons. The number of rural households was 167.83 million (68 per cent), while the urban households were 78.86 million (32 per cent). The average household size was 4.9 and 4.8 persons respectively for rural and urban areas.

India is situated north of the equator between 8°4' north (the mainland) to 37°6' north latitude and 68°7' east to 97°25' east longitude. It is the seventh-largest country in the world, with a total area of 3,287,263 square kilometres (1,269,219 sq. mi). India measures 3,214 km (1,997 mi) from north to south and 2,933 km (1,822 mi) from east to west. It has a land frontier of 15,200 km (9,445 mi) and a coastline of 7,516.6 km (4,671 mi).

According to the Report of the Technical Group (TG-12) in 2011 Indian Census, the total population of India was 1210.2 million of which 833.1 million was rural and remaining 377.1 million was classified as urban. The general density of population was 382 persons per square kilometer. The general sex ratio, that is the number of females per thousand males, was 940 while in rural areas it was 947 and in urban areas 926. The literacy rate was 74.04 per cent. The percentage of literacy in rural and urban population was 68.91 per cent and 84.98 percent respectively. In the country, 39.1 per cent population was employed. The employment rate among males was 51.7 per cent and among females it was only 25.6 per cent. The data released by the Census of India on Houses, Households, Amenities and Assets for 2011 indicate that total number of households in India is 248.8 million and urban areas is 78,865,937.000 unit, which records an increase from the previous number of 55,832,570.000 unit for 2001.

The major problem with rural housing is a households living in temporary houses and congested conditions, there was also a shortage because of obsolescent houses. In addition, rural households were highly deprived when it came to basic amenities (Kumar, 2014).

According to Handbook of Urban Statistics 2019, 29.4 percent of India's urban population lived in slums 96 percent urban population in India was estimated to have access to improved water sources in 2010 and 59 percent urban population had access to improved sanitation in 2010. The global figure for urban population with improved water sources was 96.1 percent in 2010 and those with improved sanitation was 79.4 percent in 2010.

Data Source and Methodology

The present research work is entirely based on secondary sources of data collected from Census of India 2011 (Office of Registrar General; Census Commissioner, India). In the analysis, a set of ten indicators of socio-

economic deprivation have been taken into account to determine the level of deprivation in the twenty eight states and seven union territories of India. These indicators fall into categories like population characteristics, literacy, unemployment and housing conditions. In the first step, the raw data for each variables, which determines the variations in level of deprivation have been computed into standard score. It is generally known as *Z* value or *Z*-score. The score quantify the departure of individual observations, expressed in a comparable form**.** This means it becomes a linear transformation of the original data (Smith, 1973). It may be expressed as:

$$Z_{ij} = \frac{X_{ij} - \overline{X_{ij}}}{\sigma_{ij}}$$

Where, Z_{ij} = Standardized value of the variable i in state/UT j,

X_{ij} = Actual value of variable i in state/UT j,

$\overline{X_{ij}}$ = Mean value of variable i in state/UT j and

σ_i = Standard deviation of variable i in state/UTs.

In the second step, the Z- scores of all variables have been added state and union territory wise and the average has been taken out for these variables which may be called as composite score (CS) for each state/UT and it may be algebraically expressed as:

$$CS = \frac{\sum Z_{ij}}{N}$$

Where, CS stands for composite score,
N refers to the number of indicators (variables), and
$\sum Z_{ij}$ Indicates *z*-score of all variables i in state/UT j.

The positive values relating to the Z-score of a State/UT defines the high level of housing shortage and high level of socio economic deprivation and negative values shows low level of concentration in these aspects (Khan et al., 2011).

Regional Analysis of Housing Shortage in India

Table 1 visualizes the state and union territories wise *z*-score values of housing shortage and levels of socio-economic deprivation in India. The whole range of variations of these two variables may be arranged into three categories such as, high (above 0.555 score), medium (-0.555 to 0.555 score) and low (below -0.555 score) as given in Tables 2 & 3.

The states with Z-score values above 0.555 are categorized under the high level of housing shortage wherein eight states are counted. The states included in this category are Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal. The Z-score values of medium category ranges from -0.555 to 0.555 score, and Table 2 exhibits that there are nine states which experience the medium level of housing shortage, they are Assam, Chhattisgarh, Gujarat, Haryana, Jharkhand, Odisha, Punjab, Karnataka and Kerala. The states scoring the Z-score values of less than -0.555, are grouped under low level of housing shortage. Table 2 shows that there are 11 states, namely, Arunachal Pradesh, Goa, Jammu and Kashmir, Nagaland, Manipur, Meghalaya,

Mizoram, Sikkim, Tripura, Uttrakhand and Himachal Pradesh which come under low level of housing shortage.

As far as rate of housing shortage in the union territories of India is concerned, there are seven Union Territories that experienced the medium level (0.555 to -0.555score) of housing shortage, they are Puducherry (-0.129 score) Lakshadweep (-0.468 score), Daman & Diu (-0.468 score), Andaman & Nicobar Islands (-0.525 score), Dadra & Nagar Haveli (-0.242 score), Chandigarh (-0.412 score). NCT Delhi (2.245 score) has the highest level of housing shortage in the country (Table 1).

Table 1: States/Union Territories Wise Housing Shortage and Level of Deprivation in India, 2011

State	Z-Score of Housing Shortage	Composite Z-Score of Socio-Economic Deprivation	Housing Shortage and Level of Deprivation
Andhra Pradesh	0.868	0.364	H_1D_2
Arunachal Pradesh	-0.862	-0.412	H_3D_2
Assam	-0.513	-0.143	H_2D_2
Bihar	0.799	0.514	H_1D_2
Chhattisgarh	-0.416	-0.057	H_2D_2
Goa	-0.820	-0.629	H_3D_3
Gujarat	0.478	0.220	H_2D_2
Haryana	-0.318	-0.216	H_2D_2
Himachal Pradesh	-0.848	-0.608	H_3D_3
Jammu and Kashmir	-0.723	-0.580	H_3D_3
Jharkhand	-0.025	0.026	H_2D_2
Karnataka	0.519	0.253	H_2D_2
Kerala	-0.151	-0.074	H_2D_2
Madhya Pradesh	0.631	0.375	H_1D_2
Maharashtra	1.803	1.321	H_1D_1
Manipur	-0.793	-0.194	H_3D_2
Meghalaya	-0.862	-0.307	H_3D_2
Mizoram	-0.876	-0.277	H_3D_2
Nagaland	-0.611	-0.274	H_3D_2
Odisha	-0.332	-0.162	H_2D_2
Punjab	-0.360	-0.282	H_2D_2
Rajashthan	0.701	-0.016	H_1D_2
Sikkim	-0.890	-0.718	H_3D_3
Tamil Nadu	0.813	0.549	H_1D_2
Tripura	-0.862	-0.113	H_3D_2
Uttar Pradesh	3.381	1.163	H_1D_1
Uttrakhand	-0.681	-0.472	H_3D_2
West Bengal	0.952	0.749	H_1D_1

State	Z-Score of Housing Shortage	Composite Z-Score of Socio-Economic Deprivation	Housing Shortage and Level of Deprivation
Andaman and Nicobar Island (UT)	-0.525	-0.418	H_2D_2
Lakshadweep(UT)	-0.468	0.012	H_2D_2
Puducherry(UT)	-0.129	-0.283	H_2D_2
NCT Delhi(UT)	2.245	0.936	H_1D_1
Chanigarh(UT)	-0.412	-0.079	H_2D_2
Dadra & Nagar Haveli(UT)	-0.242	0.032	H_2D_2
Daman & Diu(UT)	-0.468	-0.200	H_2D_2
Andhra Pradesh	0.868	0.364	H_1D_2

Data Source: *Office of the Registrar General & Census Commissioner, India Ministry of Home affairs, Government of India (censusindia.gov.in) in 2011*

Here, $\mathbf{H_1}$ = High Level of Housing Shortage, $\mathbf{H_2}$ = Medium Level of Housing Shortage and $\mathbf{H_3}$ =Low Level of Housing Shortage. $\mathbf{D_1}$ = High Level of Socio-Economic Deprivation**,** $\mathbf{D_2}$ = Medium Level of Socio-Economic Deprivation and $\mathbf{D_3}$ = Low Level of Socio-Economic Deprivation.

Table 2: Housing shortage in India, 2011

Category	Z-Score	No. of States	Name of the States
High	Above 0.555	08	Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal
Medium	-0.555 to 0.555	09	Assam, Chhattisgarh, Gujarat, Haryana, Jharkhand, Odisha, Punjab, Karnataka and Kerala
Low	Below -0.555	11	Arunachal Pradesh, Goa, Jammu and Kashmir, Nagaland, Manipur, Meghalaya, Mizoram, Sikkim, Tripura, Uttrakhand and Himachal Pradesh
Total		**28**	**-**

Table 3: Socio Economic Deprivation in India 2011

Category	Mean Z-Score	No. of States	Name of States
High	Above 0.555	3	Uttar Pradesh, Maharashtra and West Bengal
Medium	-0.555 to 0.555	21	Andhra Pradesh , Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Jharkhand, Karnataka, Kerala, Madhya

			Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Tamil Nadu, Tripura and Uttrakhand
Low	Below - 0.555	4	Goa, Himachal Pradesh, Jammu and Kashmir, Sikkim
Total		**28**	**-**

The states with mean Z-score values above 0.555 are categorized under the high level of socio-economic deprivation wherein only 3 states are counted. The states included in this category are Uttar Pradesh, Maharashtra and West Bengal. The mean Z-Score values of medium category ranges from -0.555 to 0.555 score, and Table 3 exhibits that there are twenty one states of medium level of socio-economic deprivation which are Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chhattisgarh, Gujarat, Jharkhand, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Tamil Nadu, Tripura and Uttrakhand. In the Regression analysis, we can define the variation of independent variables in a dependent variable. In this research work the regression analysis has been done in SPSS 23, the results are given below

Table 4: Descriptive Statistics

	Mean	**Std. Deviation**
Housing Shortage	1.07	3.15
Total Pop	69101592.34	203506745.60
SC house hold	645715.77	1902721.71
ST house hold	181498.09	536540.09
House Hold	4585372.60	13500974.05
Slum Population	3742548.80	11146282.14
Literacy Rate	86.95	4.70
Population Growth	19.15	11.12
Population Density	1103.43	2387.23213
Unemployment	5.88	5.77
Below Poverty Line	12.45	7.61

Table 5: Model Summary

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error of the Estimate**
1	1.000[a]	.999	.999	.10153

Note: (a) Predictors: (Constant), Below Poverty Line, House Hold, Pop Density, Unemployment, Pop Growth, Literacy Rate, ST house hold, Slum Pop, Total Pop, SC house hold
b. Dependent Variable: Housing Shortage

Table 4 and Table 5, gives the descriptive statistics of the given data set and from the R Square value we can say that there is 99% variation of independent variables in the selected dependent variable or in Housing shortage.

Conclusion

The overall analysis of the study reveals that there is high level of housing shortage in the states of Andhra Pradesh, Bihar, Madhya Pradesh, Maharashtra, Rajasthan, Tamil Nadu, Uttar Pradesh, and West Bengal . While, there is gradual decrease in housing shortage in the states Arunachal Pradesh, Goa, Jammu and Kashmir, Nagaland, Manipur, Meghalaya, Mizoram, Sikkim, Tripura, Uttrakhand and Himachal Pradesh. On the other hand, the level of socio-economic deprivation is high in the states Uttar Pradesh, Maharashtra and West Bengal and decreases in the states Goa, Himachal Pradesh, Jammu and Kashmir, Sikkim.

The variations in the level of housing shortage may have been due to variations in the level of slums, poverty, etc. because these variables of socio-economic deprivation has a significant relationship with the housing shortage. To alter the housing shortage situation into adequate availability of housing in India, the due emphasis has to be given to solve the problems like houselessness, slums, illiteracy and poverty by the endorsement of educational facilities, industrialization & employment opportunities, health and medical facilities, infrastructural facilities (means of transportation and communication, power and banking), etc. It is also a need of the hour that policies and programmes have to be formulated and implemented that the benefits of development programmes launched by Government of India for poverty alleviation, employment generation and housing provision may be percolated up to the lowest stratum of the society.

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Quantifying Tourism Performance of Select States of India: A Comparative Study Using Composite Weighted Index

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1. Introduction

Tourism has grown to be a significant economic industry around the world, encompassing a diverse range of businesses, industries, and stakeholders. It is one of the world's largest and fastest-growing industries. Apart from its unique quality of being an essential employment generator, tourism is one of the most important revenue-generating sectors for all countries. It generates jobs, which boosts economic growth, and it can raise the standard of living for those who live in tourist-oriented areas. (Briedenhann & Wickens, 2003).

Tourism is an important economic and social characteristic of today's world. Because of its direct effect on national societies' social, cultural, educational, and economic sectors, as well as their international connections, tourism was recognised as a key activity in the life of countries in the Manila Declaration on World Tourism in 1980. Many public planners have already handled tourism's function as a new source of revenue by increasing taxable amounts, currency absorption, and social infrastructure improvements that can contribute to societal progress. (Rodenburg, 1980).

Tourism is recognised by all major countries of the world and accepted the fact that tourism not only helps to improve the economy of the region by earning foreign exchange but also helps to less affect on environment. Other than tourism, almost all the establishment of business has negative impact on environment. The country like India also accepted that tourism plays a significant role in developing the economy as the country has lot of potentiality and advantages. Presently the central government of India has given lot of importance and framing the policies and strategies to improve the services of tourism industry throughout the nation. In India, tourism is now recognised as one of the biggest service industry of the country. (Formica, 2000).

India is a country with natural resources, historical sites, a diverse climate, hilly stations, a rich heritage, sea beaches, deserts, and deep forests, among other things. Aside from that, India boasts a pleasant environment, a growing tourism infrastructure, and a long history of hospitality. In a genuine sense, India embodies the features of 'Incredible India,' since it is a tourism paradise for all sorts of visitors. (Rajan, Chaterjee, Chakraborty, 2015)

At the moment, all of India's states are working on and implementing a variety of strategies to mobilise domestic and international visitors for the state's socioeconomic growth. In its yearly budget, the Indian government also supports all states by giving financial assistance through different tourist initiatives and tourism education. As a result, assessing the competitiveness of the state's tourist infrastructure may play a significant role in prioritising measures and allocating resources to assist the whole tourism industry in the

"Incredible India" response Ranjan, Chatterjee & Chakraborty (2015). As the importance of tourism quality as a way of acquiring a competitive advantage grows, it is vital to examine the tourist performance of all the states of India.. Thus, in this paper, an attempt has been made to evaluate and rank the Indian states using an Composite Weighted Index based on different parameters related to tourism.

2. Literature Survey

There is practically little literature on evaluating the success of tourism destinations. Newton (2004) established a potential study technique that provides a quantitative, theoretically informed empirical analysis that can be used to influence tourist management and policy choices. Richie and Crouch (2000) establish a set of metrics that give an integrated framework for various competitiveness challenges. Buhalis (2000) and Hassan (2000) draw attention to the link between competitiveness and economic growth, as well as the provision of a more gratifying experience than other similar places. De Keyser and Vanhove (1994) propose a theoretical model that highlights the macroeconomic elements that influence the tourist sector, as well as supply, transportation, demand, and tourism regulation. Hanafia (2019) indicates that tourist performance is influenced by core resources, complimentary conditions, globalisation, and tourism pricing. The findings revealed disparities in competitiveness levels and actual performance among countries. Insufficient funds, lack of infrastructure, transportation, lack of alternative modes of transportation, marketing, boundary issues, terror effect, and permit period were identified as the major constraints of north-east tourism development and uneven performance among states, according to Riza and Asokan (2013). Uma Devi (2013) examined the tourist industry's expansion and its influence on India's union territories' overall development. Ardakani (2014) adopted TOPSIS, simple additive weighting and taxonomy to rank around 40 different factors influencing on tourism industry in city of Yazd, Iran. Zhou et al. (2015) employed a hybrid AHP method to evaluate West Virginia's resource-based tourism competitiveness in relation to its neighboring states. Bhattacharya (2005) argues that development of tourism sector depends on better management of local government. According to him in North East, the private sector is not coming forward for the development of tourism in this region. Ray (2005) observes that there is a question for not development of tourism in North East India despite of huge natural resources. He suggests that there is a vital need for an integrated approach to develop tourism which will ultimately help to accelerate the economic development of the North East Part of India**.** Yadav & Devnath (2014) studied about the importance of visa facilitation with focus on e-visa and viewed that in order to reap the benefits of tourism travel facilitation should be taken as priority. Visa facilitation is the need of hour and e-visa is a promising tool that could increase the potential of tourism. E-visa can be more easily obtained and does not require the physical presence of the applicant as well as the presence of widespread network of embassies and consulates.

3. Statement of Problem/ Research Gap

From the literature survey, it is observed that only a few attempts have been made by the past researchers on performance evaluation of tourism destinations using different models. However, no attempt has still been made to quantify the tourism potentials of all the Indian states with respect to their cultural, historical and religious importance. Hence, it is the high time to employ some statistical tools, in the form of a composite weighted Index approach, to appraise the performance of the Indian states in tourism to achieve the qualities of 'Incredible India' in the truest sense of the term.

4. Objectives of the Study

The broad objective of the study is to evaluate the performance of the tourism sector of the different states of India. The specific objectives are set as under:

- To develop a Composite Weighted Index to measure the state tourism performance
- Assess comprehensively the overall performance of Tourism in the different states of tourism by developing a Tourism Destination Performance Evaluation (TDPE) Index
- To examine the interrelationship between presence of domestic tourist and select variables included in the study
- To examine the interrelationship between presence of foreign tourist and select variables included in the study

5. Research Questions and Hypotheses

Following research hypotheses and questions are to be answered through the study:

- What could be the rating of different states tourism sector in a comprehensive multidimensional rating scale?
- How the variable jointly influenced the growth of visitors of domestic as well as foreign?
- There are no significant relationship between growth of domestic tourist and the select variables included in the study.
- There are no significant relationship between growth of foreign tourist and the select variables included in the study.

6. Research Methodology

India is the seventh largest country by area, the second most populous country in the world. Tourism is the second largest foreign exchange earner in India. Nature has gifted a variety of resources for tourism in its diverse and wide spread socio-economic regions. Although India is a rich country in culture, historical monuments, hill stations, pilgrimages etc., only a little research work has been carried out to explore its huge potentiality in the field of tourism. Only 28 states are considered in this paper for their performance evaluation in tourism. Union territories and other states are not considered here because of non-availability of pertinent data. In order to fulfil the objective of this paper, several evaluation criteria are first shortlisted based on the natural and environmental characteristics of the Indian states. The major attributes which contribute to the performance evaluation of tourism destinations are price, economic openness, technological developments,

structure, human development in tourism, social development, environment and human resources, situational conditions, management of the destination, attractions and natural resources, climate, ecology, culture, architectural heritage, museums, festivals, local traditions, hotels, transport and entertainment Gooroochurn and Sugiyarto (2004), Kozak and Rimmington (1999), Melián-González and García-Falcón (2003). Based on the available information in various Indian tourism related websites, the evaluation of 28 Indian states is performed with respect to 12 criteria, as enlisted in Table 1. The data relating to tourist visit collected from the Indian Tourism Statistics 2019, respective websites are consulted to collect the information relating to number of airports, sanctuaries, hotels for the year 2019 as the figure remain same for last five years. The highest pollution index in a given day of the year 2019, recorded for the capital city of every state (considered in the study) from the web site of Air Quality Index. Again average Cost of Living Index (CLI) of capital city of the every state (considered in the study) from 2016 to 2019 collected from Council for community and Economic Research, Census Report 2011 has been taking to collect the information of pollution density of study states for the period 2016-2019 and the source of National Crime Records Buerau is been considered to collect the crime rate of states. Moreover 12 variables are categorized under three important factors of Tourist Visit, Tourist Attractiveness and Economy and Environment.

Table 1: Select Variables with their Measurement

	Parameters	Measurement of Parameters
1.	No. of Foreign Tourists	Average foreign tourist arrivals during 2016 to 2019
2.	No. of Domestic Tourists	Average domestic tourist arrivals during 2016 to 2019
3.	No. of Airports	No of Airports during 2019 / Area of the state
4.	No. of Sanctuaries and Zoos	No of Sanctuaries and Zoos during 2019
5.	No. of Hotels	No. of hotels during 2019
6.	Pollution Index	PM^2(Average) (Air Quality Index)
7.	No. of Historical Monuments	No of historical monuments during 2019
8.	Cost of Living Index	CLI of Capital city of the states
9.	Railway Track and Road Distance	Measured by KM covered by railway and Road/ Total Area of the State
10.	No. of Railway Stations	No. of railway stations during 2019 / Total Area of the State
11.	Population Density Per Sq. Km.	Population density of the state
12.	Crime Rate	Crime Occurrence/ Total Population

Source: *Literature Support*

7. Methodology to Compute the Composite Weighted Index to Rank the States

- **State Ranking Methodology**

To develop the methodology to rank the various states of India we consult the methodology developed by Ram and Shekar (2006) and Bhattacharjee (2012). Altogether 12 indicators are included in our study to rank the states. At the very outset we normalized the indicators. Some indicators have a positive dimension for example, higher the tourist rate or higher the number of historical monuments indicates better is the performance. Such indicators are normalized using the formula-

$$I_{jk} = \frac{x_{jk} - \min_j(x_{jk})}{\max_j(x_{jk}) - \min_j(x_{jk})} \quad \ldots(1)$$

Where x_{jk} represents the value of the k^{th} indicator in the j^{th} state, max($x_{.k}$) and min($x_{.k}$) represents the maximum and minimum value of the k^{th} indicator across all the states and DI_{jk} is the normalized value of the k^{th} indicator in the j^{th} state.

However, in some cases the indicator may be of negative dimension like rate of crime or pollution index. Here, lower the value of the indicator better is the performance of the state. In such cases the normalized value of the indicator is given by,

$$I_{jk} = \frac{\max_j(x_{jk}) - x_{jk}}{\max_j(x_{jk}) - \min_j(x_{jk})} \quad \ldots(2)$$

This type of normalization converts all the normalized indicators to positive dimensions, i.e. higher the value of the normalized index of a state corresponding to a particular indicator, better is the performance of the state in that indicator. Also all the values of the normalized index lies between 0 and 1, with the best state having an index value 1 and the worst state have an index value 0. In other words

$$0 \le I_{jk} \le 1 \quad \text{for all values of } j \text{ and } k$$

$$\text{Also, } \max_j I_{jk} = 1 \text{ and } \min_j I_{jk} = 0 \text{ for all } k$$

Where, $k = 1, 2, 3, \ldots, n$ are the indicators related to tourism for example, availability of Hotels ($k = 1$), Availability of historical monuments ($k = 2$), Number of Airports ($k = 3$) and so on.

Now, for combining this normalized indicators, we used the method of weightage defined by the Iyengar and Sudarshan (1982) and then the normalized indicators are aggregated using a positive model. Precisely, the weights corresponding to the k^{th} indicator is

$$W_k = \frac{C}{\sqrt{Var(I_{jk})}} \quad \ldots(3)$$

where C is a normalizing constant that follows

$$C = \left[\sum_{k=1}^{n} \frac{1}{\sqrt{Var(I_{jk})}} \right]^{-1} \quad \ldots(4)$$

The choice of the weights in this manner would ensure that large variation in any one of the indicators would not unduly dominate the contribution of the rest of the indicators and distort the inter district comparisons (Iyengar and Sudarshan, 1982).

The ultimate index for Tourism Development (TDI) corresponding to the j^{th} state is given by,

$$TDI_j = W_1 \times I_{j1} + W_2 \times I_{j2} + W_3 \times I_{j3} + ... + W_k \times I_{jk} \text{ , with } \sum_{k=1}^{3} W_k = 1 \quad ...(5)$$

The value of the TDI can indicate the status of development/deprivation in the tourism sector for the states under consideration. A TDI score of a state near 0 is an indicator of a poor state in terms of the tourism facility/infrastructure and a value of TDI near 1 is an indication of a high level of tourism facility/infrastructure. Such an index shall supports the comparison amongst the states in terms of tourism related facility/infrastructure.

8. Analysis and Discussion

The objective of this research paper is to find the gap and to improve the branding strategy of already successful centralized campaign, "Incredible India" so as to maximize the possibilities of foreign tourist arrivals in India. The purpose of this research paper is to identify the gaps in "Incredible India" centralized campaign vis-à-vis state wise campaign to promote tourism in India. The Table 2 comprises of three main factors indices and overall rank of the state based on overall indices. The variables of domestic and foreign tourist presence are included in making the tourist presence indices, whereas the variables like no. of airports, no. of zoos, no. of historical monuments, railway track and road distance, no. of railway stations are considered in formulating the indices of tourist attractiveness. Similarly, economic and environment factor indices calculated based on the variables of pollution index, cost of living index and crime rate. The indices value near 1 gives a signal for "good performance" and the indices value near 0 implies "poor performance". On the basis of tourist presence, the state like Tamilnadu (1st Rank), Uttar Pradesh (2nd Rank) and Maharashtra (3rd Rank) occupies first three position and the state of Manipur (26th Rank), Nagaland (27th Rank) and Mizoram (28th Rank) occupies last three position. It implies more tourist are showing the keen interest to visit Tamil Nadu, Uttar Pradesh and Maharashtra. The visitors chooses other states after these three states and least importance to the state of Manipur, Mizoram and Nagaland might be because of far away from the capital city of India, poor transportation and insurgency problem and lack of promotional camping.

Regarding the tourist facility factor, the state of Uttar Pradesh (1st Rank), Maharashtra (2nd Rank) and Kerala (3rd Rank) secured first three position because of availability facilities like airports, hotel, historical monuments, and railway station on the other hand Mizoram (26th Rank), Sikkim (27th Rank) and Nagaland (28th Rank) because of having less number of facilities. Although the state Sikkim is renowned for tourist spot but the rank shows the state need to adopt strategic decision to enhance the number of facilities like improving the transportation, number of hotels and manmade tourist spots. The tourist always consider the factors like economy of the visit,

air pollution and especially crime before selection of tourist state. The state like Arunachal Pradesh (1st Rank), Himachal Pradesh (2nd Rank) and Nagaland (3rd Rank) secured first three position basically because of less air pollution, less cost of living, although crime becomes significant variable, whereas, the state of Haryana (26th Rank), Maharashtra (27th Rank) and Uttar Pradesh (28th Rank) are placed on downstream. By considering the 12 variables, the state of Tamil Nadu (1st Rank), Uttar Pradesh (2nd Rank) and Maharashtra (3rd Rank) placed first three position but the state of Bihar (26th Rank), Tripura (27th Rank) and Haryana (28th Rank) placed last three position.

Table 2: Rank Based on Performance of Tourism Parameters

Name of State	Tourist Index	Facility Index	Environment Index	Overall Index and Rank
Andhra Pradesh	(7)	(10)	(10)	(6)
	0.24419	0.27765	0.71799	0.42018
Arunachal Pradesh	(25)	(25)	(1)	(14)
	0.00107	0.04296	0.95931	0.34688
Assam	(21)	(12)	(16)	(18)
	0.00917	0.25631	0.65311	0.32753
Bihar	(10)	(16)	(25)	(26)
	0.14294	0.17257	0.44261	0.25758
Chattishgarh	(20)	(20)	(7)	(13)
	0.02674	0.12956	0.84263	0.34754
Goa	(14)	(18)	(11)	(16)
	0.07489	0.16045	0.71722	0.32926
Gujatat	(13)	(9)	(22)	(17)
	0.09974	0.30443	0.53157	0.32852
Haryana	(18)	(14)	(26)	(28)
	0.04365	0.19816	0.36496	0.21474
Himachal Pradesh	(15)	(15)	(2)	(7)
	0.07216	0.19679	0.91936	0.41228
Jharkand	(16)	(21)	(12)	(21)
	0.06884	0.12613	0.71013	0.31175
Karnataka	(6)	(5)	(17)	(5)
	0.24893	0.3972	0.6362	0.44025
Kerala	(12)	(3)	(24)	(10)
	0.12151	0.43059	0.51465	0.37798
Madhya Pradesh	(4)	(8)	(20)	(8)
	0.27197	0.32757	0.57257	0.39712
Maharashtra	(3)	(2)	(27)	(3)
	0.63723	0.53517	0.32521	0.48992
Manipur	(26)	(23)	(9)	(25)
	0.00035	0.05144	0.81294	0.29971
Meghalaya	(24)	(24)	(6)	(22)
	0.00195	0.0433	0.84934	0.30944
Mizoram	(28)	(26)	(4)	(20)

Name of State	Tourist Index	Facility Index	Environment Index	Overall Index and Rank
	0.43005	0.02851	0.88382	0.31498
Nagaland	(27)	(28)	(3)	(19)
	0.00023	0.0087	0.90868	0.31580
Odisha	(19)	(11)	(15)	(15)
	0.02745	0.27571	0.66971	0.34567
Punjab	(11)	(13)	(14)	(12)
	0.12487	0.21608	0.67302	0.34908
Rajasthan	(8)	(4)	(13)	(4)
	0.21229	0.41707	0.67603	0.45208
Sikkim	(22)	(27)	(5)	(23)
	0.00741	0.01192	0.88016	0.30916
Tamil Nadu	(1)	(7)	(21)	(1)
	1.0000	0.33447	0.54101	0.58096
Telangana	(9)	(19)	(18)	(24)
	0.16578	0.13935	0.59562	0.30315
Tripura	(23)	(22)	(19)	(27)
	0.00398	0.07784	0.59417	0.23583
Uttar Pradesh	(2)	(1)	(28)	(2)
	0.6399	0.59889	0.29771	0.50618
Uttrakhand	(17)	(17)	(8)	(11)
	0.05921	0.17222	0.8172	0.36411
West Bengal	(5)	(6)	(23)	(9)
	0.26563	0.34074	0.52346	0.38374

Source: *Self calculation using CWI, the figure within parenthesis indicates Rank Value*

Table 3 exhibits the performance of select states of India in respect of tourism. In this study, the value of indices are divided into three layer like 0-0.5 indicates poor performing states, 0.5-0.75 indicates moderate performer state and 0.75-1.00 indicates good performing state. Regarding the tourist inflow, the state of Uttar Pradesh becomes moderate performer state and Tamil Nadu is good performer state and other states are poor performer states which implies highest number of tourist prefer to visit the state of Tamil Nadu. In respect of tourist facilities, the state of Maharashtra and Uttar Pradesh are moderate performer but including Tamil Nadu other states are poor performer implying that it is necessary for the states to improve the facilities to attract the tourist presence. The state like Haryana, Maharashtra and Uttar Pradesh are in back foot position in respect to economy and environment; particularly these three states need to reduce the cost of living as well as pollution resulting into more attendance of tourist. The calculated overall indices shows although the state of Tamil Nadu secured rank 1 but fail to achieve the good performer state indices layer. Except the state of Tamil Nadu and Uttar Pradesh, other states tourism performance are not good. The state government of all the state need to improve work on facilities and economy and environment to become "Incredible India". The tourism performance of

the states help to improve the rank of India in the scenario of world rank, presently the rank of India is 25th as per The World Tourism Organisation.

Table 3: State Categorised Based on Indices

	Poor Performer State (0- 0.5)	**Moderate Performer State (0.5-0.75)**	**Good Performer State (0.75-1.00)**
Tourist Inflow	Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chattishgarh, Goa, Gujrat, Haryana, Himachal Pradesh, Jharkand, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Maharashtra, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Telangana, Tripura, Uttarakand, West Bengal	Uttar Pradesh	Tamil Nadu
Tourist Facilities	Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chattishgarh, Goa,Gujrat, Haryana, Himachal Pradesh, Jharkand, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Telangana, Tripura, Uttarakand, West Bengal, Tamil Nadu	Maharashtra, Uttar Pradesh	Nil
Economy and Environment	Haryana, Maharashtra, Uttar Pradesh	Goa, Jharkand, Rajasthan, Punjab, Odisha, Karnataka, Telangana, Tripura, Madhya Pradesh, Tamil Nadu, West Bengal, Assam, Bihar, Kerala	Arunachal Pradesh, Himachal Pradesh, Nagaland, Mizoram, Sikkim, Meghalaya, Chattishgarh, Uttarakand, Manipur

Overall	Andhra Pradesh, Arunachal Pradesh, Assam, Bihar, Chattishgarh, Goa,Gujrat, Haryana, Himachal Pradesh, Jharkand, Karnataka, Kerala, Madhya Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Odisha, Punjab, Rajasthan, Sikkim, Telangana, Tripura, Uttarakand, West Bengal,	Tamil Nadu, Uttar Pradesh	Nil

Source: *Self compiled*

Conclusion

The Index is used to develop outranking relationships while also providing a complete list of the 28 states considered in India. The identification of the best performing Indian state in tourism would encourage state and federal governments to deploy even better promotional and strategic decisions in order to attract more tourists to that state. The state's ranking will aid in identifying the criteria for which some Indian states score poorly in tourism. As a result, poor-performing/under-performing states may request specific aid and support from their respective governments in order to improve and survive.

After rigorous survey of existing literature, the present study used 12 parameters to measure the performance of tourism of the state. The parameters like no. of domestic and foreign tourists are included under the visitors presence categories, the parameters like no. of airports, no. of sanctuaries and zoos, no. of hotels, no. of historical monuments, railway track and road distance, no. of railway stations considered in the tourist facilities categories and pollution index, cost of living index, population density per km^2 have been taking under the category of environment and economy. By using composite weighted index the study observed that from the point of view of visitors presence Maharashtra ranked number 1 whereas the state of Nagaland stood at last position i.e. 28^{th} rank. If we consider the tourist facilities criteria, the state of Uttar Pradesh, Maharashtra and Kerala secured first three position and the state of Mizoram (26th Rank), Sikkim (27th Rank) and Nagaland (28th Rank) secured last three position. As per the criteria of environment and economy the state of first three position secured by Arunachal Pradesh (1st Rank), Nagaland (2nd Rank) and Himachal Pradesh (3rd Rank) respectively, on the other hand the state of Haryana (26th Rank), Maharashtra (27th Rank) and Uttar Pradesh (28th Rank) secured last three position from bottom of the table. Therefore, the study conclude with the statement that the infrastructure of some of the state are far better than other states, so government and policy maker need to give proper attention to the poor performer state like North eastern States, Bihar etc., and formulate strategy considering the parameter especially which become statistically significant in our study.

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Report on the Valedictory Session of the Seminar

The Valedictory Session of the **National Seminar on the Measures of Socio-economic Deprivation** *(Data Requirements and its relation with Policy Formulation for Better Governance)* started exactly at 2:45 pm of 25th March, 2022 in the Seminar Hall of the Department of Statistics, Assam University. The session was chaired by the Head of the Host Department- Dr. Rama Shanker.

The program started with anchor of the event Dr. Vivek Verma, Assistant Professor of the Department of Statistics welcoming all the dignitaries to the dais. The initial address was delivered by Dr. Rama Sanker, Head of the Department of Statistics, Assam University who expressed his pleasure owing to the fact that the Department has successfully completed the seminar. He advised the research scholars to pick up topics from the deliberation of the speakers of the seminar and continue their research on deprivation. He also asked the presenters of the seminar to visit the department in future too and help the department in its academic journey.

Prof. Sandip Mitra, also delivered a relevant speech expressing satisfaction on the way in which the seminar was conducted and expressed that his return to Kolkata shall be accompanied by many sweet memories of the seminar. Next, the observer of the seminar Mr. Parimal Chakraborty from the Directorate of Economics and Statistics, Government of Assam spoke about the highlights of the seminar and expressed that the seminar was a perfectly conducted event.

Next from the dais Dr. Gopa Sinha, senior most participant of the seminar expressed the view that the seminar was like a breeze of fresh air for all of us following the era of pandemic. Next the participants of the seminar and some of the speakers expressed their positive view on relevant issues and on the management of the different events and logistic of the seminar.

In the closing comments the coordinator of the Seminar Prof. Dibyojyoti Bhattacharjee expressed his heartfelt thanks to the Sponsor of the Seminar the Directorate of Economics and Statistics, Government of Assam for providing necessary financial support. He give a summary of the presentations made in the seminar and expressed his satisfaction about the large number of dimensions of deprivation that were discussed in the seminar, for which he thanked the speakers. He expressed his pleasure over the matter that in spite of several infrastructural limitations there was no negative comment regarding the organization of the seminar by any of the stake holder of the seminar. He thanked the faculty members, staff, research scholars, students and all service providers for their active involvement in the seminar.

The certificates were then distributed to all the participants of the seminar by the dignitaries. At the end the Vote of Thanks of the Valedictory session and

the Seminar was delivered by Dr. Jonali Gogoi, Assistant Professor of the host department.

Valedictory session of the seminar in progress

In her deliberation Dr. Gogoi acknowledged the financial support from the Directorate of Economics and Statistics, permission from the Vice Chancellor, administrative support from University office, academic support from the presenters, patient listening and interaction by the participants, organizational involvement by the faculty members, non-teaching staff, research scholars and students of the department.

The session ended with Group Photos of the participants and speakers of the seminar.

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SPECIAL ARTICLE[3]

Quantifying Deprivation in Household Amenities in the Northeast Indian States

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1. Introduction

Despite its immense resource potential, the NER is confined by the geographic isolation that has led to deprivation of economic development, which, in turn, minimized the resource access to support a primitive style of living (Cappellari and Jenkins, 2006). Thus, assessing the deprivation is not only crucial for the regional concern, but also important for establishment of equity toward balanced development across the nation.

Accordingly, this research is designed to investigate the availability of some basic facilities in the different districts of the NER. Indicators of the deprivation are obtained using the percentage of household under each district covered by the availability of safe drinking water, sanitary facilities and electricity supply. These indices are calibrated by a weighted deprivation index to incorporate considerations among those aspects. The distribution pattern is disentangled to link the index variability with disparity of the deprivation in this region.

2. Literature Review

Often the words 'poverty' and 'deprivation' are used interchangeably, but in the recent years, the European literature has designated the word 'deprivation' to explain the concept of relative poverty. For instance, Peter Townsend (2009), an authority in poverty and related studies had stated- "Deprivation may be defined as a state of observable and demonstrable disadvantage, relative to the local community or the wider society or nation to which an individual, family or groups belong." (p. 214)

Once the concept of relative poverty was accepted, there had been many attempts to define both deprivation and its measure (Osmani; 2007). The National Assembly for Wales in partnership with the Welsh Local Government Association developed the first deprivation index called the Welsh Index of

[3] This article is written by the editor of the book. It was not presented in the conference.

Multiple Deprivation (WIMD) that was published in August 2000 and replaced the then existing Welsh Index of Socio-Economic conditions. The index combined six domains of deprivation namely Income, Employment, Health and Disability, Education, Skills and Training, Housing and Geographical Access to Services. The next edition of the WIMD was released in 2005 which had seven domains instead of six in the earlier index. The added domain was that of physical environment. The index is a measure of multiple deprivation at small area super output area level. Multidimensional indices of deprivation based on absolute thresholds have been developed in several other studies. Eurostat (2002) and Layte *et al.* (2001) provide a composite index based on 24 items for European countries. Jensen *et al.* (2002) propose a different approach to the construction of a synthetic measure of deprivation for New Zealand. Extending the approach of Fergusson *et al.* (2001), Jensen *et al.* (2002) build a full-spectrum index of living standards (the Economic Living Standard Scale) by selecting items according to the respondents view about their importance, and their capacity to discriminate between high and low living standards. Some other literature concerned about similar issues and their measurement involves Cowell (1995) and Fedorov (2002).

To a great extent, the construction of empirical indices is inseparable from statistical modeling. Cappellari and Jenkins (2006) employed a two parameter item response models to measure deprivation for household level data. Martínez and Ruiz-Huerta (2006) used direct standard of living indicators to construct deprivation indices for Spanish Data. To measure the unequal distribution of wealth at different geographical regions, an index of deprivation was created by the Office of the Deputy Prime Minister of England in 2004.

India is a land of diversities in terms of several demographic respects. Thus, deprivation in the distribution of national wealth is something that seems very obvious to happen. Several authors have taken up the issue of deprivation and have presented the different dimensions of the issue in their works. Sen contributed significantly towards the issue of deprivation with considerable emphasis on the Indian context and stressed the point that deprivation is the main hindrance towards economic development through a series of works, some of which are Sen (1980, 1981, 1983, 1985, 1987, 1990, 1992, 1997, 1999a, 1999b). Bhatty (1998) discusses deprivation in primary education especially amongst children who prefer to join the labour force because of poverty, though there are several government initiatives in this regard. Chakravarty and Mukharjee (1999) articulated different measures of relative and absolute deprivation using functions of social satisfaction. Srinivasan and Mohanty (2004) based on National Family Health Survey (NFHS) data measured the deprivation is basic amenities in India classifying the population by caste and religion. Gaiha and others (2007) expressed the different issues of deprivation in rural areas compared to urban India.

While the wealth characteristics seemed more pertinent to developed regions, the NER of India has been struggling with establishment of basic household

necessities. The development process of a region must be designated to meet the basic necessities of the people- clean drinking water for sustaining life, modernized sanitation and clean environment for healthy life and electricity connection for productive and comfortable life. In the words of Sen (1999a)- "Development requires the removal of major sources of unfreedom: poverty as well as tyranny, poor economic opportunities as well as systematic social deprivation, neglect of public facilities as well as intolerance or over activity of repressive states." Of the different parameters related to social deprivation, Sen's main stress was on deprivation to public facilities namely, schooling, safe water, sanitation, basic health facilities etc. (Sen, 1999b). Dimensions of deprivation can be due to lack of access to basic health services, primary education, drinking water, sanitation, electricity etc. (Kumar *et al.*, 2008). Of the different types of basic facilities described above, a few of them are household specific and others are made available only at the community level. Therefore, empirical investigations are needed in developing primitive indicators involving household specific basic facilities to understand the disparity of their allocation in NER. Yoskowitz and Umphres (2006) theorized a linkage between utility and sanitation, where the utility part typically covers the availability of running water and electricity drawn from the natural environment. Snyder and Keary (2007) concurred inseparability of those two aspects in any asset management. Those household necessities are indispensable for a sustainable development in the 21st century (Daigger, 2009). Guided by the current literature, the availability of safe drinking water, sanitary facilities and electricity supply has been chosen to facilitate examination of the regional disparity across the NER districts.

The term 'deprivation' seems to be more comprehensive in comparison to the deprivation in basic facilities at household level that the current study is out to measure. Thus, the term 'facility deprivation' is introduced to specify the particular dimension of deprivation that is under consideration. Accordingly, the composite index is termed 'Facility Deprivation Index' (FDI).

3. Objective of the Study

The paper is planned to attain the following objectives:

(i) To quantify the level of facility deprivation in the different districts of NER in terms of three basic facilities namely, supply of safe drinking water, electricity and sanitary facility.

(ii) Develop a weighted index of deprivation (to be called as the facility deprivation index) for all the three basic facilities taken together and to categorize the districts as per their level of deprivation.

(iii) To identify some of the possible reasons for the highly deprived districts of NER.

4. Data and Methodology

4.1 Data Source

The source of data is the Indian Census website's dashboard which along with several other district level information, also provides data on the percentage of household in each district of the entire country covered under the supply of safe drinking water, sanitary facility and supply of electricity. The study is delimited to those districts that have the information documented in the said website.

4.2 The Facility Deprivation Index (FDI)

Notation of the facility deprivation index construction depends on clarification of variables and subscript below. Let x_{ijk} represent the percentage of household enjoying the k^{th} facility in the j^{th} district of the i^{th} state, where i = 1, 2, …, 8 for those afore-mentioned eight states in NER, j = 1, 2, …, n_i for the number of districts in the i^{th} state is represented by n_i, and k = 1, 2, 3 for the three basic necessities: safe drinking water (k = 1), sanitary facility (k = 2) and electricity supply (k = 3).

Let max($x_{.k}$) denotes the percentage of households in a given district which has the best coverage of the k^{th} facility (k = 1, 2, 3) in entire nation and min($x_{.k}$) represent the percentage of household in the district, that has the worst coverage of the k^{th} facility (k = 1, 2, 3) in the entire nation.

The deprivation indicator (DI) for the k^{th} facility in the j^{th} district of the i^{th} state is given by,

$$DI_{ijk} = \frac{\max(x_{.k}) - x_{ijk}}{\max(x_{.k}) - \min(x_{.k})} \qquad \ldots(1)$$

The value of DI_{ijk} varies from zero to one, where the value of 1 implies that the given district is most deprived in comparison to the best district in the country in the k^{th} facility. The reverse is true for a value of 0.

To construct the facility deprivation index for the district comparison, one must recognize the fact that all the indicators are not equally important. Thus, a simple average of the three indicator values should be avoided in the index construction. On the contrary, Morris and Liser (1977) advocated the use of weighted average when developing the Physical Quality of Life Index (PQLI). Another important contributor to this issue is Iyengar and Sudarshan (1982) who assumed that the weights vary inversely as the variation in the respective variable. Das and Nath (2007) also developed a weighted composite index for human deprivation in different river islands of Assam. Based on the current literature, the weighted index of deprivation (facility deprivation index) for the j^{th} district of the i^{th} state is given by,

$$FDI_{ij} = W_1 \times DI_{ij1} + W_2 \times DI_{ij2} + W_3 \times DI_{ij3}, \text{ with } \sum_{k=1}^{3} W_k = 1 \qquad \ldots(2)$$

where W_k represents the weight associated with the k^{th} basic facility *(k = 1, 2, 3)*.

Iyengar and Sudarshan (1982) further linked the weight to variance of deprivation across the regions. More precisely, they postulated that

$$W_k = \frac{C}{\sqrt{Var(DI_{ijk})}} \qquad \ldots(3)$$

where C is a normalizing constant that follows

$$C = \left[\sum_{k=1}^{3} \frac{1}{\sqrt{Var(DI_{ijk})}} \right]^{-1} \qquad \ldots(4)$$

The choice of the weights in this manner would ensure that large variation in any one of the indicators would not unduly dominate the contribution of the rest of the indicators and distort the inter district comparisons (Iyengar and Sudarshan, 1982).

The value of the facility deprivation index can indicate the status of deprivation in a district for all the three facilities taken together. Again, based on Iyengar and Sudarshan's(1982) calibration, a score near 0 is an indicator of availability of basic facilities i.e. very low level of deprivation and a value of 1 is an indication of poor availability of basic facilities i.e. a high level of deprivation.

Such an index supports comparison amongst the districts of a state, and the result can be aggregated across the districts for inter-state comparison. The variance of the weighted index scores of the different districts can be used as a measure of dispersion in basic facilities within that state.

4.3 Distribution of the Weighted Index of Deprivation

To support the probabilistic inference, distribution of the FDI should be examined to facilitate classification of the districts on the basis of the extent of deprivation (Navaneetham and Saxena; 1999). Iyengar and Sudarshan (1982) assumed that the development index followed the Beta distribution. Vidwan (1983) empirically showed a better classification under a normal distribution. Hence, the assumed distribution played a crucial role in obtaining the empirical outcomes (Navaneetham and Saxena; 1999).

For testing the hypothetical distribution of the weighted index of deprivation (FDI_{ij}), one may use the chi-square test of goodness of fit. As $FDI_{ij} \in [0, 1]$, the values of the indices are essentially continuous in nature. To model the empirical frequency, the range [0, 1] can be divided into non-overlapping class intervals, and the chi-square test of goodness of fit can be conducted after obtaining the frequency within each class interval. The observed frequency can be compared with the theoretical frequencies expected under the hypothetical distribution. Although the interval setting could be arbitrary and converting the scale from continuous to discrete might have reduced the precision, the approach outlined above has been commonly used in practice (Kotz and Johnson, 1983).

The Kolmogorov Smirnov (K-S) test statistic, could also be applied in this case as the indices are continuous in nature. Different authors have proved that the K-S statistic is more appropriate for continuous data compared to the chi-

square test of goodness of fit (Keeping, 1962; Pal, 1998). The test statistic is given by,

$$D_n = \max | S_n(x) - F(x) | \quad \ldots(5)$$

where $S_n(x)$ and $F(x)$ are empirical and theoretical distribution functions respectively. However, for performing the K-S statistic the theoretical distribution needs to be completely specified i.e. the valued of the parameters needs to be known. In this exercise the parameters are estimated form data. The critical value of D_n for α level of significance depends on the number of observations and may be denoted by $D_{\alpha,n}$. If the number of observations are over 35, as the case here, the critical value at 5 percent level of significance ($D_{0.05,n}$) is $1.36/\sqrt{n}$. Thus, D_n value greater than $1.36/\sqrt{n}$, will indicate that the fitted distribution is significantly different from the theoretical distribution.
Thus, both the tests viz. the K-S test and chi-square test can be used to verify the appropriate distribution to which the FDI values, fit. The interval $[F(x)-D_{\alpha,n}, F(x)+D_{\alpha,n}]$ provides the $100(1-\alpha)\%$ confidence band for $F(x)$ which can be used as a visual tool for goodness of fit.
After deciding about the probability distribution of FDI_{ij} it is important to find two real numbers $c, d \in [0, 1]$ to divide three linear intervals namely $[0, c]$, $[c, d]$ and $[d, 1]$ with the same probability weight of 33.33%, i.e.,

$$P[0 \le FDI_{ij} \le c] = 0.3333 \quad \ldots(6)$$

and, $$P[0 \le FDI_{ij} \le d] = 0.6666 \quad \ldots (7)$$

Thus, $P[c \le FDI_{ij} \le d] = 0.3333$ using (6) and (7)
These intervals has been used in this study to characterize the various stages of deprivation as follows:

(i) Low Deprivation if $0 \le FDI_{ij} \le c$
(ii) Moderate Deprivation if $c \le FDI_{ij} \le d$
(iii) High Deprivation if $d \le FDI_{ij} \le 1$

5. Calculation and Results

The weight can be computed using formulas (3) and (4). Based on the data available from the source mentioned above, formula (1) is used to calculate the deprivation indicator (See Table 1 for the weights corresponding to the different indicators).

Table 1. Weights associated with the indicators of the different basic facilities

Basic facility	Safe drinking water	Sanitary facilities	Electricity
Weights	0.3370	0.3595	0.3035

After obtaining the weights the facility deprivation index (FDI) for all the districts are obtained using (2). The facility deprivation index for the most deprived and the least deprived districts for each of the states in Table 2. It

also shows the averages and standard deviations of the FDI of the districts for each of the states.

It should be noted in Table 2 that among the states of NER, the maximum deprivation in the basic facilities is located in Assam followed by Meghalaya. The average value of the facility deprivation index in the districts of Mizoram is the least, which implies that the state has minimum deprivation in basic facilities. The deprivation index varies most in Manipur followed by Mizoram, which could imply more irregularity in the distribution of basic facilities in those two states. In the entire NER, the least deprived district is Aizwal of Mizoram and the most deprived district is Chandel of Manipur.

Table 2. The most and least deprived districts of the different states of North East India along with their average FDI values

State	Number of districts	District		Average FDI of the state	SD of FDI of the state
		Least deprived	Most deprived		
Arunachal Pradesh	16	Papum Pare 0.138	Kurung Kumey 0.9163	0.5044	0.2097
Assam	27	Kamrup metropolitan 0.2583	Chirang 0.9587	0.7028	0.1632
Manipur	9	Imphal West 0.1257	Chandel 0.9819	0.4679	0.2371
Meghalaya	7	East Khasi Hills 0.2176	West Garo Hills 0.6608	0.5438	0.1447
Mizoram	8	Aizawl 0.0018	Lawngtlai 0.6892	0.2684	0.2221
Nagaland	11	Mokokchung 0.3339	Mon 0.7243	0.5081	0.1298
Sikkim	4	East 0.1571	North 0.4501	0.3089	0.1095
Tripura	4	West Tripura 0.3237	Dhalai 0.5761	0.4452	0.0895
North East India	76	Papum Pare 0.1970	Kokrajhar 0.7935	0.4609	0.1358

Source: Calculated based on data collected from Census of India website

Since the values of FDI lies between 0 and 1, one may select the two parameter beta distribution of type I as a probable distribution. The beta distribution is generally a skewed distribution and its probability density function is given by,

$$f(x) = \frac{1}{\beta(a,b)} x^{a-1}(1-x)^{b-1}, \quad 0 < x < 1 \text{ and } a, b > 0 \qquad (8)$$

$$= 0, \text{ otherwise}$$

Here, $$\beta(a,b) = \int_0^1 x^{a-1}(1-x)^{b-1}dx \qquad (9)$$

Based on the values of FDI for all districts, the estimated values of a and b are obtained using the method of maximum likelihood (Johnson and Kotz, 1970). The estimated values are given by,

$$\hat{a} = m_1\left[\frac{m_1(1-m_1)}{m_2} - 1\right] \qquad \ldots(10)$$

and

$$\hat{b} = (1-m_1)\left[\frac{m_1(1-m_1)}{m_2} - 1\right] \qquad \ldots(11)$$

Here,

m_1 = mean of all FDIs and
m_2 = variance of all FDIs

Based on the empirical data for this investigation, the estimated model parameters are $\hat{a} = 2.081037$ and $\hat{b} = 1.825195$. The goodness of fit test has generated a result of $\chi^2(5\ df) = 11.0705$, $p = 0.7634$ for this model, which supports the use of $\beta_I(2.081037, 1.825195)$ to describe the values of FDI in this investigation. The K-S test is also used to check if the FDI values fit to the beta distribution specified by the parameters already estimated from the data. The value of the statistic,

$$D_n = \max |S_n(x) - F(x)| = 0.05509$$

which is insignificant at 5 percent level, confirms the findings of the chi-square test. The distance between the values of $S_n(x)$ and $F(x)$, for different values of x can be visualized in Figure 1.

Based on (6),

$P[0 \le FDI_{ij} \le c] = 0.3333$

$$\Rightarrow \int_0^c \frac{1}{\beta(2.081037, 1.825195)} x^{1.081037}(1-x)^{0.825195}dx = 0.3333$$

$\Rightarrow c = 0.42328$ (Using regularized incomplete beta function calculator)[4]

[4] http://functions.wolfram.com/webMathematica/FunctionEvaluation.jsp?name=BetaRegularized

Similarly, (7) leads to P[0 ≤ FDI_{ij} ≤ d] = 0.6666

$$\Rightarrow \int_0^d \frac{1}{\beta(2.081037, 1.825195)} x^{1.081037}(1-x)^{0.825195}\,dx = 0.6666$$

$\Rightarrow d$ = 0.651567 (Using regularized incomplete beta function calculator)

The values of c and d thus obtained are needed to classify the FDI values into the following three stages of deprivation.

Figure 1: The Cumulative Distribution function and the Empirical Distribution Function of the Facility Deprivation Index Values

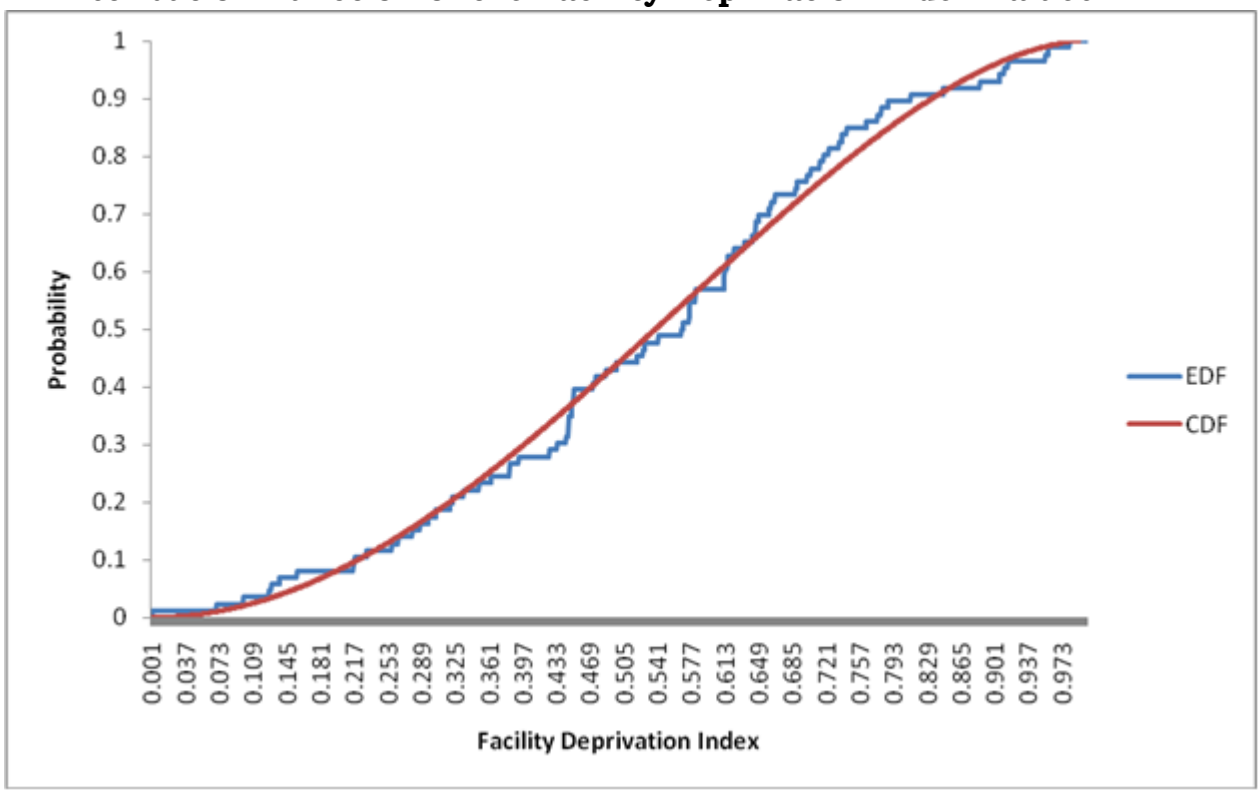

Table 3. Stages of Deprivation classified by the FDI

Stage of deprivation	**Values of FDI**
Low Deprivation	Less than 0.42328
Moderate Deprivation	Between 0.42328 but less than 0.651567
High Deprivation	0.651567 or higher

By a comparison between the values of the FDI and the classification criteria in Table 3, the different districts of the region can be categorized into the different levels of deprivation.

Table 4. Districts of the northeastern states classified by the level of deprivation

State	Type of Deprivation	Districts
Arunachal Pradesh	Low Deprivation	Lower Subansiri, Papum Pare, Tawang, Tirap, Upper Siang, West Kameng
	Moderate Deprivation	Changlang, Dibang Valley, East Siang, Lower Dibang Valley, West
	High Deprivation	Anjaw, East Kameng, Kurung Kumey, Lohit, Upper Subansiri
Assam	Low Deprivation	Kamrup Metropolitan
	Moderate Deprivation	Cachar, Dibrugarh, Dima Hasao, Golaghat, Hailakandi, Jorhat, Karimganj, Sivasagar, Tinsukia
	High Deprivation	Baksa, Barpeta, Bongaigaon, Chirang, Darrang, Dhemaji, Dhubri, Goalpara, Kamrup, Karbi Anglong, Kokrajhar, Lakhimpur, Morigaon, Nagaon, Nalbari, Sonitpur, Udalguri
Manipur	Low Deprivation	Bishnupur, Imphal East, Imphal West
	Moderate Deprivation	Churachandpur, Senapati, Tamenglon, Thoubal, Ukhrul
	High Deprivation	Chandel
Meghlaya	Low Deprivation	East Khasi Hills
	Moderate Deprivation	East Garo Hills, Jaintia Hills, Ribhoi, South Garo Hills, West Khasi Hills
	High Deprivation	West Garo Hills
Mizoram	Low Deprivation	Aizwal, Champai, Kolasib, Lunglei, Serchhip
	Moderate Deprivation	Mamit, Saiha
	High Deprivation	Lawngtlai
Nagaland	Low Deprivation	Dimapur, Mokokchung, Phek, Zunheboto
	Moderate Deprivation	Kiphire, Kohima, Longleng, Peren, Tuensang, Wokha
	High Deprivation	Mon
Sikkim	Low Deprivation	East, South, West

	Moderate Deprivation	North
	High Deprivation	
Tripura	Low Deprivation	West
	Moderate	North, South, Dhalai
	High Deprivation	

It is interesting to note though Assam is the most well located state of the entire NER yet the majority of the districts of Assam get classified into the "High Deprivation" category. Out of 27 districts of Assam 17 of them are in that category. Followed by Assam is Arunachal Pradesh with five out of 17 districts as highly deprived in the household facilities under consideration. Meghalaya, Mizoram and Nagaland have only one highly deprived district; Tripura and Sikkim have none. For all the states under consideration, as expected, the district in which the capital city of the state belongs, remain classified as the less deprived district with Nagaland being the only exception. In the last decade nine new districts took birth in NER, three each in Assam, Arunachal Pradesh and Nagaland. All new districts of Assam are in the highly deprived category. This is paradoxical as new districts are created for better governance and proper allocation of resources which is not fulfilled. Two out of the three newly formed districts of Arunachal Pradesh is in highly deprived category. However, all the three new districts of Nagaland are in the moderately deprived category.

7. Conclusion and Future Directions of Research

In a vast country like India, the resource distribution could vary across geographical regions. To justify accountability of the government policy, quantitative indicators are needed to identify deprivation of household necessities that hinders a balanced national development. The deprivation in basic facilities, creates a sense of neglect in the mind of the citizens of the deprived areas towards the government. This may sometimes prove to be very hazardous in a democratic setup like India. To quantify the neglect in the basic human rights, the indicator constructed from this research is grounded on fundamental amenities that are essential to the living quality like *safe drinking water*, *sanitary facility* and *electricity supply*. In NER, some of the districts are predominantly rural while a few of them are enjoying an urban or mostly urban set up. The urban districts are less deprived for obvious reasons. With higher deviation in basic facilities, the pre-dominantly urban districts will pull the population towards itself, which at a later stage may enhance the deprivation indices of the urban districts as well.

A descriptive research on the probable reasons of high deprivation in the districts may be performed by researchers. Different political, geographical or even social reasons may surface as covariates for such high deprivation.

Future researchers can also extend the facility deprivation index for regionwise analysis of all the other states of the country. The classification of

the FDI can be done to five groups instead of three and the most deprived districts can be identified. An in-depth analysis of the geographical, social and political conditions of those highly deprived districts may provide further insight into the reasons of such a pathetic level of deprivation. Another area of research can be to compute the extent of urbanization in the districts and then to search for the existence of any relation with the deprivation index. Some other basic facilities that are household specific may also be included in the study and the weighted deprivation index be calculated afresh.

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Some Photographs of the Seminar

Banner of the Seminar

Dr. Jonali Gogoi, Assistant Professor of the Department of Statistics, Assam University anchoring the Inaugural Session of the Workshop on the morning of 24th March, 2022

Head of the Department of Statistics, Assam University Dr. Rama Shanker delivering the Welcome address in the inaugural session of the seminar on the morning of 24th March, 2022

Prof. Sandip Mitra of Indian Statistical Institute, Kolkata delivering the Key note address of the seminar on the morning of 24th March, 2022

Prof. Joyati Bhattacharya invited speaker of the Seminar receiving appriciation certificate from the Seminar Coordinator

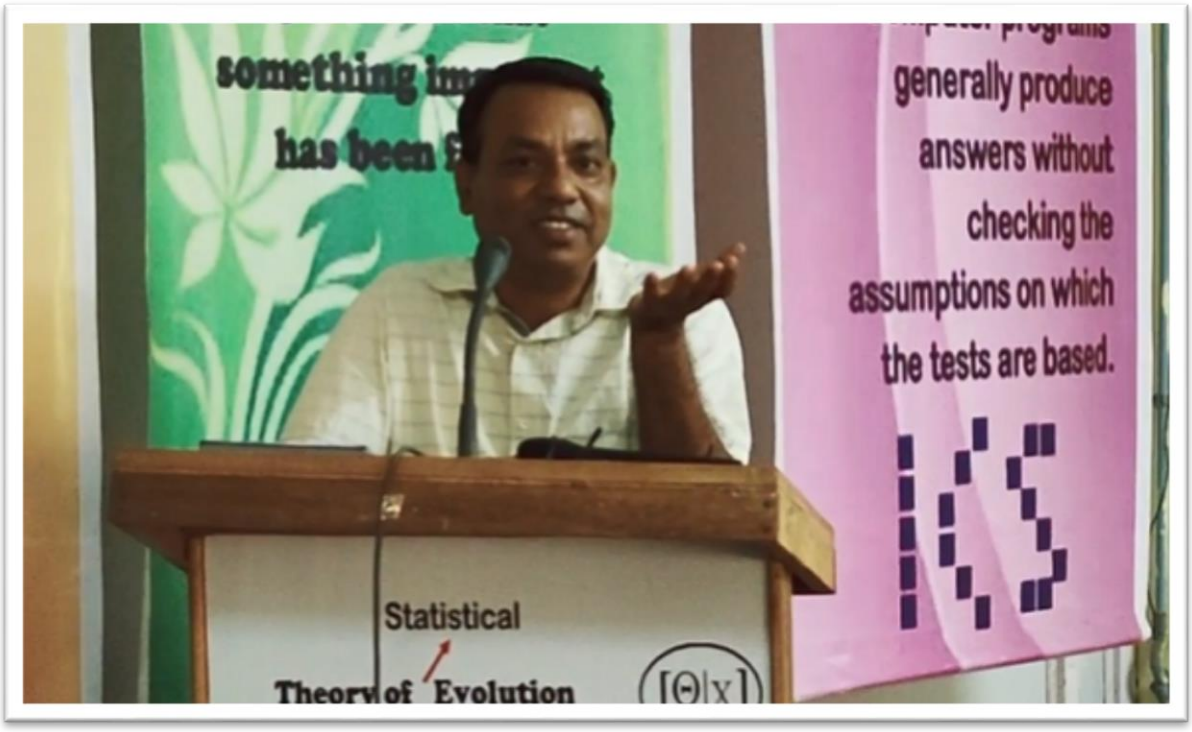
Participants and Speakers of the Seminar taking lunch during the Lunch Break of 24th March, 2022

Honourable Vice Chancellor of Assam University, Prof. Rajive Mohan Pant planting sapling to mark the occasion of the Seminar at the Department of Statistics, Assam University in the evening of 24th March, 2022 in presence of the Dean of Physical Sciences of Assam University, Prof. C R Bhattacharjee

Dr. Bidyut Jyoti Bhattacharjee, Speaker of the Seminar felicitated by Dr. Vivek Verma of the host Department on 25th March, 2022

Dr. Tanusree Deb Roy, speaker of the Seminar presenting her paper on Housing Shortage in India on the afternoon of 25th March, 2022

Comments made by the participants about the Seminar in the Valedictory Session in the evening of 25th March, 2022



Observer of the seminar Mr. Parimal Chakraborty from the Directorate of Economics and Statistics commenting on the successful arrangement of the Seminar in the Valedictory Session in the evening of 25th March, 2022

Closing remarks of the Seminar made by the Coordinator of the event Prof. D. Bhattacharjee on the evening of 25th March, 2022

Senior most participant of the Seminar Dr. Gopa Sinha of G C College, handing over Certificate of participation to another participant on the evening of 25th March, 2022

Group Photo of the Participants and Invited Speakers on the evening of 25th March, 2022 after the Valedictory Session of the Seminar

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National Seminar on Measures of Socio-economic Deprivation

This text contains the deliberations made during the National Seminar on the Measures of Socio-economic Deprivation (Data Requirements and its relation with Policy Formulation for Better Governance) organized between 24th to 25th of March, 2022 in the Department of Statistics, Assam University, Silchar. The Seminar was sponsored by the Directorate of Economics and Statistics (DES), Government of Assam under the Support for Statistical Strengthening (SSS) Scheme of the Central Government.

Researchers and Government Officials from different parts of Assam and beyond with experience of working in the field of deprivation and regional deprivation were invited to express their point of view which are compiled in this volume.

This is a publication by the Editor Dibyojyoti Bhattacharjee of the Department of Statistics, Assam University, Silchar.

ISBN 978-93-5701-737-4

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