



# SOCIAL PROGRESS INDEX: STATES OF INDIA **2005 -2016**

## METHODOLOGY REPORT

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## INSTITUTE FOR COMPETITIVENESS

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## SOCIAL PROGRESS INDIA

Social Progress India (SPI) is a presentation of Institute for Competitiveness and Social Progress Imperative. SPI produces the Social Progress Index that is a holistic and robust measurement framework for national, social & environmental performance that can be used by leaders in government, business and civil society at the country level as a tool to benchmark success, improve policy, and catalyse action.

## SOCIAL PROGRESS IMPERATIVE

The Social Progress Imperative's mission is to improve the lives of people around the world, particularly the least well off, by advancing global social progress by: providing a robust, holistic and innovative measurement tool—the Social Progress Index; fostering research and knowledge-sharing on social progress; and equipping leaders and change-makers in business, government and civil society with new tools to guide policies and programs. From the EU to India to Brazil and beyond, the Social Progress Imperative has catalysed the formation of local action networks that bring together government, businesses, academia, and civil society organizations committed to using the Social Progress Index as a tool to transform societies and improve people's lives.

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## INTRODUCTION

The purpose of the Social Progress Index: States of India was to complement the economic assessment of India with the social assessment by adopting the Social Progress Index.

A multi-stage iterative process was followed to reach the most accurate framework of the Social Progress Index for the states of India.

The first stage involved an interaction with the Social Progress Imperative to gain understanding of Social Progress Index concept, principles and methodology.

The second stage involved identifying a possible set of indicators that meet the Social Progress Index criteria.

The third step involved engagement with key experts and stakeholders to solicit feedback and validation.

Among those who provided valuable feedback was the team of experts at NITI Aayog whose contribution was invaluable for the Index creation.

This report describes the methodology used to calculate the Social Progress Index for the Indian States for the period 2005–2016. The first section talks about the conceptual architecture of the Social Progress Index and the principles that guide the index creation process. The second section provides a step-by-step overview of the process of constructing the Social Progress Index for India's states: data collection, missing values, data transformation, assessment of the fit, and aggregation. Furthermore, the report outlines the challenges and solutions to calculating the longitudinal Social Progress Index and describes the method for conducting relative analysis of performance for the States of India.

## SOCIAL PROGRESS INDEX PRINCIPLES

The Social Progress Index focuses on what matters to societies and people by giving them the tools to better understand and seize opportunities and building blocks to enhance and sustain the quality of their lives, as well as create the conditions to reach their full potential. The Index offers a systematic, empirical foundation for governments, businesses, civil society and communities to prioritise social and environmental issues, and benchmark performance against other countries, regions, cities and communities to inform and drive public policies, investments, and business and community decisions.

It was developed in collaboration with a team of scholars led by Professor Michael E. Porter of Harvard Business School. National and city leaders across Latin America, and the European Commission's Directorate General for Regional and Urban Policy, are using the index for agenda setting, policymaking, prioritizing resource mobilization and measuring impact.

Guided by a group of academic and policy experts, the Social Progress Index follows a conceptual framework that defines social progress as well as its key elements. In this context, social progress is defined as the **“capacity of a society to meet the basic human needs of its citizens, establish the building blocks that allow citizens and communities to enhance and sustain the quality of their lives, and create the conditions for all individuals to reach their full potential.”**

According to Stern et. al (2017) the Social Progress Index is built around a framework that comprises three architectural elements: dimensions, components, and indicators.

- Dimensions represent the broad conceptual categories that define social progress:

- **Basic Human Needs dimension** considers citizens' ability to survive with adequate nourishment and basic medical care, clean water, sanitation, adequate shelter, and personal safety. These needs are still not met in many disparate countries and are often incomplete in more prosperous countries.

- **Foundations of Wellbeing** captures whether a society offers building blocks for citizens to improve their lives, such as gaining a basic education, obtaining information, and access communications, benefiting from a modern healthcare system and live in a healthy environment.

- **Opportunity** captures whether citizens have the freedom and opportunity to make their own choices. Personal rights, personal freedom and choice, tolerance and inclusion, and access to advanced education all contribute to the level of opportunity within a given society.

- Within each dimension are components: four distinct but related concepts that together make up each dimension (Figure 1).

- Each component is composed of indicators that measure as many valid aspects of the component as possible.

The most important step in designing the index is to select the appropriate indicator set which best captures the concept within every component under each dimension. To help guide this process, the following guiding questions (Figure 2) are used for selecting indicators for each of the twelve components.

Apart from the criterion that the data should be publicly available, principles of the index guide the choice of a relevant set of indicators. The set of **unique design principles** (Stern et. al, 2017) that allow an exclusive analysis of social progress and help the Index stand out from other indices are:

Figure 1 / Social Progress Index Component Level Framework

Basic Human Needs	Foundations of Wellbeing	Opportunity
Nutrition and Basic Medical Care	Access to Basic Knowledge	Personal Rights
Water and Sanitation	Access to Information and Communication	Personal Freedom and Choice
Shelter	Health and Wellness	Tolerance and Inclusion
Personal Safety	Environmental Quality	Access to Advanced Education

Source: Social Progress Imperative (2017)

### SOCIAL AND ENVIRONMENTAL INDICATORS ONLY

The Index represents the first comprehensive framework for measuring social progress that is independent of economic performance. As a complement to traditional measures of economic performance, such as income, the Social Progress Index provides a better understanding of the relationship between economic gain and social progress. In contrast, other indices such as the Human Development Index combine economic and social indicators. The objective of this initiative is to utilize a clear yet rigorous methodology that isolates the non-economic dimensions of social performance.

### OUTCOMES, NOT INPUTS

Two cogent techniques exist in the literature for index creation: input indices and output indices. Input indices look at a region’s policies that are believed to lead to an outcome; output indices on the other hand directly measure the outcomes of those policies. Both the methodologies differ significantly in their assumptions. Utilizing an input index assumes that

inputs transform into results, i.e. policies lead to better social outcomes. When there are multiple output measures or a lack of consensus on all the inputs that matter, or when data related to inputs are highly incomplete, an outcome-oriented index may be more appropriate (Fleurbaey & Blanchet, 2013). Along this line, the Social Progress Index has been designed to aggregate output indicators.

The rationale behind the index goes beyond capturing the efforts towards the availability of various goods and services. Instead, the Index measures the results that people experience directly. For instance, the Social Progress Index does not take into account the money spent on education or healthcare but measures educational attainment and the length and quality of people’s lives.

### RELEVANT TO ALL SOCIETIES

All indicators included in the Social Progress Index need to be selected taking into account their relevance for each unit of observation. This aspect directly contributes to the applicability and actionability of the index.

While the Social Progress Index: States of India adopts the same framework as the Global Social Progress Index, there is a slight difference in the name of the Tolerance and Inclusion component. The Social Progress Index: States of India only uses the term Inclusion as it is more contextualized to local circumstances. However, the conceptual basis of the component, i.e. the underlying question, whether “no one is excluded from the opportunity to be a contributing member of society?” remains the same.

## AN ACTIONABLE TOOL TO DRIVE CHANGE

The Social Progress Index is designed to help leaders, policymakers, civil society and businesses to make policy decisions and CSR investments based on the findings of the index. The results of the index are not just meant to infer a snapshot about how well

regions are performing on different aspects relevant to the quality of life such as education, healthcare, etc., but also to provide insights about how lives can be improved. The index can be used as an inflexion point to build strategy for inclusive growth and drive change.

Figure 2 / Social Progress Index Guiding Questions

### Basic Human Needs

#### Nutrition and Basic Medical Care

Do people have enough food to eat and are they receiving basic medical care?

#### Water and Sanitation

Can people drink water and keep themselves clean without getting sick?

#### Shelter

Do people have adequate housing with basic utilities?

#### Personal Safety

Are people able to feel safe?

### Foundations of Wellbeing

#### Access to Basic Knowledge

Do people have the educational foundations to improve their lives?

#### Access to Information and Communications

Can people freely access ideas and information from anywhere in the world?

#### Health and Wellness

Do people live long and healthy lives?

#### Environmental Quality

Is this society using its resources so they will be available to future generations?

### Opportunity

#### Personal Rights

Are people free of restrictions on their rights?

#### Personal Freedom and Choice

Are people free of restrictions on their personal decisions?

#### Tolerance and Inclusion

Is no one excluded from the opportunity to be a contributing member of society?

#### Access to Advanced Education

Do people have the opportunity to achieve high levels of education?

Source: Social Progress Imperative (2017)

### SOCIAL PROGRESS INDEX: STATES OF INDIA

The Social Progress: States of India follows the Social Progress Index rationale as well as its key principles and methodology. As such, it adopts the same dimension and component level framework<sup>1</sup> as the global Social Progress Index, although some of the indicators of the two indices differ due to the following reasons:

First, there are certain indicators that are valid globally but are not directly applicable at subnational level.

Second, it was important to take into consideration India’s unique challenges to include indicators that are specifically relevant and reflect the real issues across India’s states.

The scope of this project is limited to twenty-eight states of India and one union territory, Delhi.

The rationale behind keeping Delhi in the index is due to the dual status of the region. Delhi, being the capital of the country is termed as a city state besides being officially recognized as a union territory. Therefore, we believe that it is important to include the capital while analysing the sub-national social progress of India.

The one state that we leave out from the analysis is Telangana. It was awarded separate statehood in June 2014 when the state of Andhra Pradesh was divided into two i.e. Telangana & a residual Andhra Pradesh. Therefore, all the data that is available prior to 2014 relates to the entire region covering both the states.

### GEOGRAPHIC COVERAGE

The Index is calculated for the Indian states. India comprises twenty-nine states & seven union territories, which are further sub-divided into districts and cities.

### INDEX CALCULATION

Calculating the Social Progress Index involves a multistage process which is depicted in Figure 3 and outlined below.

Figure 3 / Index Calculation Steps



Source: Authors

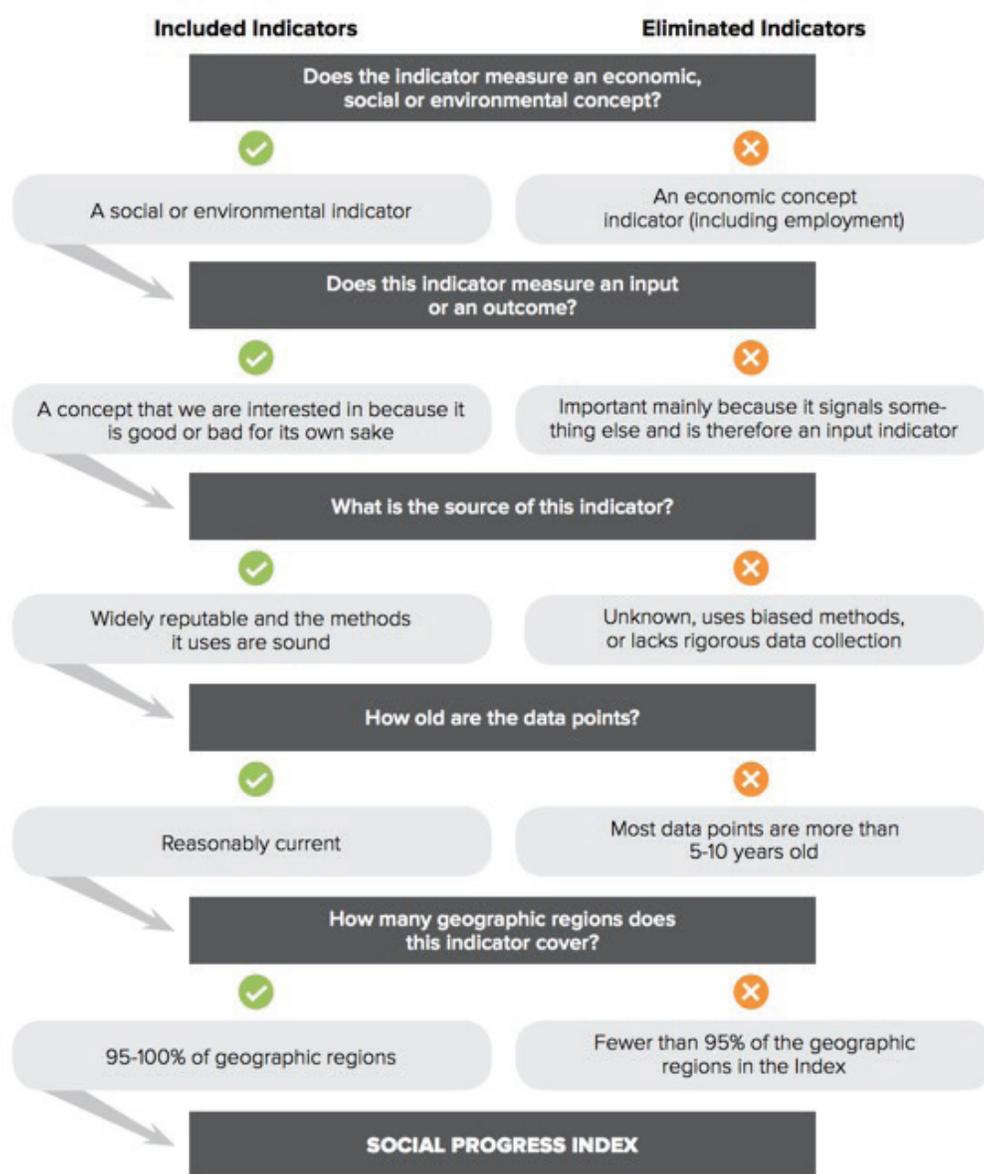
## INDICATOR SELECTION AND DATA COLLECTION

The Indicators for SPI India were selected following SPI general design principles: non-economic focus, outcome indicators, relevant to all units of observation and actionable. Furthermore, credibility of sources, expert feedback, and data availability were also considered. The process of indicator selection

followed the Social Progress Index methodology as outlined in Figure 4.

A list of indicators that were taken into consideration but are not included in the final index is presented in Appendix A. Detailed information on individual indicators included in the Index is presented in Appendix B.

Figure 4 / Indicator selection tree



Source: Stern et. al (2017)

All the data used in the Index was compiled from government sources, or from sources endorsed by NITI Aayog, therefore it is the most reliable data available. In a number of cases, however, the data for certain states was missing for particular indicators, and these had to be completed by imputation methods.

After this descriptive analysis was performed on the selected set of indicators. Descriptive analysis can inform decisions on which variables to include in the analysis, and highlight data management issues, such as coding of variables and missing values (Vyas & Kumaranayake, 2006).

The final framework is presented in Figure 5.

Figure 5 / Social Progress Framework



Source: Authors

## DEALING WITH MISSING VALUES

Overall, the following 4 approaches were considered for missing values imputation:

1. using historical data forward
2. using most recent data backward
3. using all-India average
4. using an average of selected states

Imputing values by regression analysis was tested, however the results were not believed to be more accurate than the above methods, therefore this method was not used in any missing values imputations.

There were several indicators where the data availability gap is greater than 5 years. However, it's not the case that the data would be older, but younger, i.e. the nearest available data point was further than 5 years into the future. This is the case for the following indicators for the year 2005:

- Drinking water covered habitations (2011)
- Gross secondary enrolment (2010)
- Gender parity (2012)
- Internet subscribers (2014)
- Renewable energy (2012)
- Insurance (2010-2011)

### Indicator/Component

### Missing Value Estimation

#### Basic Human Needs

Children under 5 years with anaemia

The state of Nagaland is missing 2005 value for Children under 5 years with anaemia. The reason being that “In Nagaland, local opposition prevented the NFHS-3 teams from collecting blood for any purpose. Hence, neither haemoglobin measurement nor HIV testing could be done...” (IIPS, 2009).

Nagaland's value in 2015 was among the lowest three (21.6), Mizoram and Manipur being the other two with 17.7 and 23.9 respectively. To impute Nagaland's missing value, we averaged Mizoram's and Manipur's 2005 values, 43.8 and 41.1 respectively, and the averaged value of 42.45 was used for Nagaland's 2005 value. We also cross checked this value with Nagaland's NFHS-2 report, where the value for anaemic children under 35 months was 43.7 in 1998-1999. Due to the change of definitions in the reporting periods, i.e., from 35 months to 59 months, we decided to take the average of the nearest performers.

Maternal Mortality Rate

Maternal Mortality Rate data is not available for either year for the following states: Arunachal Pradesh, Delhi, Goa, Himachal Pradesh, Jammu & Kashmir, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura. The all-India average was used to impute missing data.

Typhoid & Diarrhoea

For the following states, typhoid and diarrhoea data is not available for selected years: Arunachal Pradesh (2005, 2007), Assam (2005-2006), Bihar (2005-2010), Chhattisgarh (2005).

The nearest available data point was used either forward or backward, i.e., Arunachal Pradesh (2006), Assam (2007), Bihar (2011), Chhattisgarh (2006).

Drinking Water covered habitations

Data for Delhi is not available for the rural habitations with drinking water supply indicator.

As Delhi is among the best performers in other indicators under the component, it is safe to assume that Delhi will be among the top performing states in rural habitations as well. Therefore, the average of the top 5 performers in each year was used to impute the missing value.

**Foundations of Wellbeing**

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Dropout Rates

Data for drop out rates is not available for Delhi for 2005 and 2015.

The all-India average was used to impute missing data.

Net Enrolment Ratio

Net primary enrolment data is missing for the following states in the specified years: Arunachal Pradesh (2005-2014), Assam (2006-2014), Bihar (2007-2010), Jharkhand (2006-2010), Manipur (2005-2014), Meghalaya (2006-2010), Mizoram (2005-2013), Nagaland (2005-2012), Tripura (2005-2014), Uttar Pradesh (2006-2010).

The all-India average was used to impute missing values for some states. For the following states and years preceding data was carried forward: Chhattisgarh (2007, 2009-2010), Goa (2012), Karnataka (2007), Rajasthan (2008), Sikkim (2010, 2012), West Bengal (2009-2010). For Chhattisgarh's missing value in 2005, the nearest value (2006) was used.

Literacy

Literacy values are not available for the following states for 2006-2007.

In all cases preceding data was carried forward: Delhi, Goa, Meghalaya, Nagaland, Sikkim, Uttarakhand.

Phone and Internet

The values for phone subscribers and internet subscribers are missing for Arunachal Pradesh, Chhattisgarh, Goa, Jharkhand, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura and Uttarakhand. The all-India and North-Eastern Block data is used to calculate the missing values. For the North-Eastern states, i.e. Arunachal Pradesh, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura, North-East block data is multiplied by the state's population share to arrive at the value and for other states same methodology is applied using All-India data.

Life Expectancy at 60

Missing values for life expectancy at 60 for the following states and years, all India average was used: Arunachal Pradesh (2005, 2010), Chhattisgarh (2005), Delhi (2005), Goa (2005, 2010), Jharkhand (2005), Manipur (2005, 2010), Meghalaya (2005, 2010), Mizoram (2005, 2010), Nagaland (2005, 2010), Sikkim (2005, 2010), Tripura (2005, 2010), Uttarakhand (2005).

Leprosy	Missing value for Chhattisgarh in 2010. The preceding year's value was used.
Respiratory Infections	Respiratory Infections, for the following states data is not available for selected years Arunachal Pradesh (2005, 2007), Assam (2005-2006), Bihar (2005-2010), Chhattisgarh (2005), the nearest available data point was used, i.e. Arunachal Pradesh (2006), Assam (2007), Bihar (2011), Chhattisgarh (2006).

### Opportunity

Corruption	For corruption, data is only available only for 20 states. The all-India average was used for other states.
Judiciary	Missing value for Manipur for Access to judiciary in 2008. The preceding year's value was used.  Scheduled tribe gross enrolment, missing values for all years for the following states: Delhi, Goa, Haryana, Punjab. The all-India average was used.
Women in Panchayati Raj Institutions	Missing values in Women in Panchayati institutions were supplemented by all India average for 2013 for the following states: Sikkim, Odisha, Nagaland, Mizoram, Meghalaya, Jammu & Kashmir, Delhi, and in 2008 for the following states: Delhi, Jammu & Kashmir, Jharkhand, Meghalaya, Mizoram, Nagaland.

## DATA TRANSFORMATION

All the indicators in the final set are modified so that a greater value means a higher score for the state. For instance, diarrheal cases will have an adverse impact on the index. Therefore, transformations are applied to make its impact positive. A list of the inverted indicators is presented in Appendix D.

In addition, there are specific cases where data values for certain indicators are over a rational boundary. For

example, Gross Enrolment Rates are measured as 'Percentage of a total number of pupils enrolled at an educational level irrespective of age to the population of the official age group of that educational level', this implies that enrolment rates can amount to a value of more than 100 percent, which is not rational. In some other cases, data values exceed all other values among states so as to excessively skew distribution. These indicators are capped at a rational boundary, a list is presented in Table 1.

Table 1 / Capped Indicators

Indicator	Min	Max	Capping
Housing shortages	0.01	0.11	0.7
Violent crimes	11.20	97.40	60
Gross secondary enrolment	40.54	136.44	100
Phone	30.43	300.33	100
News	0.00	11.19	4

<b>Water withdrawals</b>	0.04	172.00	100
<b>Women in Panchyati Raj institutions</b>	0.30	0.59	0.5
<b>Insurance</b>	1.22	522.91	300
<b>Scheduled tribe enrolment, higher education</b>	42.08	135.37	100
<b>Female graduates</b>	17.62	55.31	50

Source: Authors

## BUCKETED INDICATORS

Some other indicators were grouped in buckets to reduce the effects of extreme outliers. A list of the bucketed indicators is presented in Table 2.

Table 2 / **Bucketed Indicators**

<b>Indicator</b>	<b>Min</b>	<b>Max</b>	<b>Bucketing</b>
<b>Rural sanitation</b>	2.90	97.50	Quintiles
<b>Renewable energy</b>	0.00	0.95	Deciles

Source: Authors

## STANDARDIZATION

As all the indicators are measured in different units, it is important to standardize them so that they become comparable. Otherwise, a variable that has less variation relatively but is measured on a larger scale compared to other variables may appear to have much greater variation than it actually does. Standardization helps solving the problem by making indicators unitless as it rescales them with a mean of zero and standard deviation of one.

## EVALUATING THE FIT

The indicator selection process entails including the indicators that describe the concept of the component in the best possible way and are conceptually linked to each other. The rigor of the Social Progress Index methodology is strengthened by assessing multiple

aspects of fit between those. First, exploratory factor analysis is used to test the underlying factors among the set of selected indicators in each component. In this process, the indicators that are statistically incompatible are removed.

Furthermore, the Social Progress Index methodology involves evaluating the fit between the individual indicators by calculating Cronbach’s alpha for each component. Alpha was developed by Lee Cronbach in 1951 to provide a measure of the internal consistency of a test or scale; it is expressed as a number between 0 and 1 (Tavakol & Dennick 2011). Internal consistency describes the extent to which all the items in a test measure the same concept or construct and hence it is connected to the inter-relatedness of the items within the test. Internal consistency can be employed for research or examination purposes to ensure validity. An applied practitioner’s rule of thumb is that

the alpha value should be above 0.7 for any logical grouping of variables (Cortina, 1993). The alpha values are presented in Table 3.

Table 3 / Alpha Values

DIMENSION	COMPONENT	ALPHA
<b>Basic Human Needs</b>	Nutrition and Basic Medical Care	0.87
	Water and Sanitation	0.68
	Shelter	0.63
	Personal safety	0.7
<b>Foundations of Wellbeing</b>	Access to Basic Knowledge	0.68
	Access to Info and Communications	0.8
	Health and Wellness	0.63
	Environmental Quality	0.49
	Personal Rights	0.42
<b>Opportunity</b>	Personal Freedom and Choice	0.68
	Inclusion	0.63
	Access to Advanced Education	0.84

Source: Authors

Cronbach’s alpha values are significantly lower for Environmental Quality and Personal Rights. We acknowledge this shortcoming, but it is important to include the current indicators as they reflect the underlying idea of the component in the best possible manner.

(with one exception to be discussed later). It is based on three elements i.e. indicators, components, dimensions.

The Social Progress Index uses the Principal Component Analysis (PCA) for calculating the weights of indicators within a component.<sup>2</sup> The component values are calculated by summing the weighted scores using the following formula:

$$\text{Components} = \sum (w_i * \text{indicator})$$

A complete list of weights is presented in Appendix E.

## AGGREGATION

The Social Progress Index India follows the global Social Progress Index aggregation methodology

<sup>2</sup> Principal Component Analysis is a multivariate technique which was developed in early 20th century for the purpose of aggregating information. In economics, the method has been applied to the studies of cointegration and spatial convergence (Harris 1997, Drakos 2002), development (Caudill, Zanella & Mixon 2000), panel data (Bai 1993, Reichlin 2002), forecasting (Stock & Watson 2002), simultaneous equations (Choi 2002) and economics of education (Webster 2001). Factor analysis uses variances to produce communalities between variables and the goal is to remove the common variance. (Yong & Pearce 2013).

The last step of determining the component score involves transforming the values to a 0 to 100 scale. This is done by calculating scores using best- and worst-case scenario in addition to the regional dataset. The best and worst-case scenario is defined at the indicator level according to the theoretically possible upper and lower bounds. In some cases where it is not possible theoretically to set bounds the actual best, and worst-case values from the dataset are considered. See Appendix F for the worst and best-case scenario.

This method enhances comparability as well as comprehensiveness across the dataset.

The calculation is done using the following formula:

$$\frac{X_j - \text{Worst Case}}{\text{Best Case} - \text{Worst Case}}$$

**Best Case-Worst Case**

Where,  $X_j$  represents the raw component values.

### Dimension Scores

Each dimension score is taken to be a simple average of its four components. The rationale being the absence of any theoretical or empirical proof to weight any of the components higher than others.

$$\text{Dimension}_d = \frac{1}{4} \sum \text{Component}_c$$

### Index Scores

The three dimensions are believed to reflect equally important aspects of the quality of life. Therefore, while calculating the index no priority is given to any dimension. Equal weights are assigned to each of them to highlight their role in social progress.

$$\text{SPI} = \frac{1}{3} \sum \text{Dimension}_d$$

The one exception, where the Social Progress Index for India's states deviates from the standard Social Progress Index methodology is the Health and Wellness component. Due to calculation challenges, and each of the indicators being significant from policy perspective, the Health and Wellness component is divided into two subcomponents:

Health and Wellness 1: Male and female obesity, suicides, respiratory infections

Health and Wellness 2: Life expectancy at 60, leprosy, HIV

Weights within subcomponents are set following PCA methodology. Both subcomponents are then equally weighted to calculate the Health and Wellness component score.

After calculating each component, the goodness of fit is evaluated using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy<sup>3</sup>. The KMO index ranges from 0 to 1, as a rule of thumb, KMO scores should be above 0.5 (Williams, Onsmann, & Brown 2010). The results of this analysis are shown in Table 4. The KMO values are well above the set standards for each of the component reflecting consistency among the indicators.

KMO values in all cases meet the standard requirements.

A detailed list of weights is presented in Appendix D. There are a number of indicators with smaller than ideal weights. We have carefully considered removing these indicators from the framework, but as these indicators are important from policy perspective, we have taken the decision that they should remain in the framework.

<sup>3</sup> The statistic is a measure of the proportion of variance among variables that might be common variance.

Table 4 / KMO Values

DIMENSION	COMPONENT	MEAN KMO
<b>Basic Human Needs</b>	Nutrition and Basic Medical Care	0.78
	Water and Sanitation	0.71
	Shelter	0.57
	Personal safety	0.57
<b>Foundations of Wellbeing</b>	Access to Basic Knowledge	0.72
	Access to Info and Communications	0.7
	Health and Wellness	0.6
	Environmental Quality	0.54
<b>Opportunity</b>	Personal Rights	0.53
	Personal Freedom and Choice	0.64
	Inclusion	0.54
	Access to Advanced Education	0.75

Source: Authors

## LONGITUDINAL SOCIAL PROGRESS INDEX: STATES OF INDIA

Limited data availability across the 11-year period did not allow for proper calculation of a longitudinal Social Progress Index. This method has been tested and in most cases, the statistical properties did not meet the necessary quality standards; KMO as well as Cronbach's alpha and weights were not adequate. For this reason, we have decided to calculate the Social Progress Index for 2005 and 2016 year values only, and apply the weights derived across the 11-year period (2005-2016). This is presented as simulation of Social Progress, rather than a full Social Progress Index.

## RELATIVE PERFORMANCE OF STATES

The absolute scores do not distinguish states on the basis of economic development. In some cases, it is more illuminating to compare a state's performance with its economic peers. For instance, a state may score low on certain aspects of the social progress, but its performance could exceed the scores for states with similar per capita income levels. Conversely, a high-income state may have a high absolute score on a component, but still fall short of what is typical for comparably wealthy states.

For this reason, the Social Progress Index developed a methodology to assess state's strengths and weaknesses on a relative rather than absolute basis.

Scorecards are used to depict the relative results. The state-level scorecards portray a state's detailed absolute and relative analysis. The scorecards are colour-coded to highlight relative strengths and weaknesses. Red indicates performance below the peer group median; yellow indicates performance consistent with the peer group; and green highlights areas of relative strength.

To determine the relative strength and weakness of a state, the first step is to identify a peer group. We define state's economic peers as 10 states closest in GDP per capita (Appendix G). We then calculate median social progress scores for the peer group (overall, and by dimension, component, and indicator). A state's performance is then compared to its peer group's median social progress scores to identify its relative strengths and weaknesses. A strength is performance significantly greater than the median score, while a weakness is performance significantly lower than the median score. Neutral performance is neither strong nor weak, but within the same range

as economic peers. Significance is determined by a score that is greater than or less than the average absolute deviation from the median of the comparator group.

## CONCLUSION

The Social Progress Index provides a benchmark by which states can compare themselves to others, and can identify priorities that need addressing in order to advance social progress. Additionally, scoring on a 0–100 scale gives states a realistic benchmark rather than an abstract measure. This scale allows to track absolute, not just relative performance of states over time on each component, dimension, and the overall model.

Despite numerous methodological challenges, the authors believe, the presented Social Progress Index: States of India is a robust and credible assessment of social progress.

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APPENDIX A: INDICATORS NOT INCLUDED IN THE FINAL FRAMEWORK

Dimension	Component	Indicators
<b>Basic Human Needs</b>	Nutrition & Basic Medical Care	Children under 5 years who are stunted (height-for-age)
		Children under 5 years who are wasted (weight-for-height)
		Children age 12-23 months fully immunized (BCG, measles, and 3 doses each of polio and DPT) (%)
		Female Mortality Rate
	Personal Safety	Rate of IPC Crimes
	Water & Sanitation	Drinking water facility within premises
		Rural access to safe drinking water
		Quality affected habitation
		Availability of Tap water (A subset of drinking water within premises)
		Access to Improved latrine facilities
<b>Foundations of Wellbeing</b>	Access to Basic Knowledge	Pupil Teacher Ratio
		Children in Std V who can do division
		Children in Std V who can read a level II text
		Gender Parity Index
	Access to Information & Communication	Number of registered Publications
		Access to Telephone
	Health & Wellness	Out of Pocket Expenditure
		Percentage of targets achieved for eye operations
		Disability
		Environmental Quality
<b>Opportunity</b>	Personal Rights	Child Labour
		Early Marriages
		Sex Ratio
		Voter's Turnout
	Personal Freedom & Choice	Access to Insurance
		Access to Banking
		Contraception Usage
Drop-out Rates		

		Women Labour Force Participation Rate (Urban)
		Women Labour Force Participation Rate (Rural)
		Human Trafficking
	Inclusion	Gender Pay gap
		Women Labour Force Participation Rate (Urban)
		Women Labour Force Participation Rate (Rural)
		Contraception usage
		Women elected in gram panchayat
		Crimes against women
		Male to Female Participation Ratio
		Caste based Crimes
		Cases of Riots
		Enmity Between Groups
		Access to Judiciary
		Access to Banking
	Access to Advanced Education	Number of Colleges
		Percentage of Graduates
		Number of Nationally Ranked Universities

APPENDIX B: INDICATOR DEFINITIONS AND SOURCES

Component	Indicator name	Definition	Source
<b>Basic Human Needs</b>			
Nutrition & Basic Medical Care	Children under 5 years with anaemia	Children age 6-59 months who are anaemic	NFHS - National Family Health Survey
	Children under 5 years who are underweight	An underweight child has a weight-for-age z-score that is at least 2 SD below the median for the WHO Child Growth Standards.	NFHS - National Family Health Survey
	Infant mortality rate	Infant mortality rate (IMR) is the number of deaths of children less than one year of age per 1000 live births.	EPWRF Database
	Maternal mortality rate	Maternal Mortality Rate is defined as the number of maternal deaths to women in the ages 15-49 per lakh of women in that age group.	Census (SRS Bulletin)
<b>Personal Safety</b>			
	Crimes against women	Rape crimes	NCRB – National Crime Records Bureau (Crimes in India)
	Murder crimes	Incidence of murder crimes per one lakh of population	NCRB – National Crime Records Bureau (Crimes in India)
	Road deaths	Deaths due to road accidents – Percentage share to total deaths	NCRB – National Crime Records Bureau (Accidental Deaths & Suicides)
	Violent crimes	Incidence of Violent Crimes per one lakh of population	NCRB – National Crime Records Bureau (Crimes in India)
<b>Shelter</b>			
	Electricity	Percentage of households with electricity as source of lighting	Census
	Pucca houses	Percentage of census houses in good conditions	Census
	Housing shortages	The number of katcha houses (Census) and state wise BPL households' figures with equal weightings to distribute total housing shortages across states.	Ministry of Housing & Urban Poverty Alleviation

	Power deficit	Actual power supply position in terms of Peak Demand vis-à-vis Peak Met	Central Electricity Authority of India
Water & Sanitation			
	Improved water source	Percentage of households having piped water into dwelling/yard/plot, public tap/standpipe, tube well or borehole, protected dug well, protected spring, rainwater, community RO plant.	National Family Health Survey
	Typhoid	Cases of enteric fever per 1000 of population	Central Bureau of Health Intelligence
	Diarrhoea	Cases of acute diarrheal diseases per 1000 of population	Central Bureau of Health Intelligence
	Rural sanitation coverage	Percentage of households that flush to piped sewer system, flush to septic tank, flush to pit latrine, ventilated improved pit (VIP)/biogas latrine, pit latrine with slab, twin pit/composting toilet, which are not shared with any other household.	National Family Health Survey
	Drinking water covered habitations	Habitations in which the average supply of drinking water is equal to or more than 40 lpcd  Percentage of fully covered habitations = (Number of fully covered habitations/Total number of habitations) *100	National Rural Drinking Water Programme
<b>Foundations of Wellbeing</b>			
Access to Basic Knowledge			
	Net enrolment ratio	Enrolment in primary education (grade 1-5) of the official primary school age group (6-10+ years) expressed as a percentage of the corresponding population	DISE

	Gross enrolment ratio	Percentage of total number of pupils enrolled at an educational level irrespective of age to the population of the official age group of that educational level	DISE
	Literacy	It is defined as the ratio of literate persons to all persons aged 7+.	EPWRF Database (NSSO Based)
	Gender parity	The ratio of girl's enrolment to boys enrolment	DISE
	Dropout rates	Presents average of grade-specific drop-out rates in Primary Grades	DISE
Access to Information & Communication			
	TV	Percentage of Households having television	Census
	News	Number of newspaper circulations (Accounted for population)	Ministry of Information & Broadcasting
	Internet	Number of internet subscribers per 100 of population	TRAI – Telecom Regulatory Authority of India
	Phone	Total Subscribers (Wireless + Wireline) per 100 of population	TRAI – Telecom Regulatory Authority of India
Health & Wellness			
	Obesity male	Percentage of males who have BMI $\geq 25.0$ kg/m <sup>2</sup>	National Family Health Survey
	Obesity female	Percentage of female whose BMI $\geq 25.0$ kg/m <sup>2</sup>	National Family Health Survey
	Suicides	The persons who committed suicides due to AIDS, cancer, paralysis, insanity and other prolonged illness per lakh of population.	
(Persons who have committed suicide due to illness/Population) *100000	NCRB – National Crime Records Bureau (Crimes in India)		
	Respiratory infections	Total number of cases registered under Acute Respiratory Infection (per 1000 of population)	Central Bureau of Health Intelligence

	HIV	Prevalence of HIV	Central Bureau of Health Intelligence
	Leprosy	Prevalence of Leprosy	Central Bureau of Health Intelligence
	Life expectancy at 60	The average number of years a person is expected to live after this age given the mortality levels.	Life Tables by SRS, Census
Environmental Quality			
	Renewable energy	Renewable energy/Total energy	CEA
	Forest cover	Change in Forest Cover during two years	Ministry of Statistics and Programme Implementation
	Water withdrawals	Stage of Ground Water development = (Existing gross draft for all uses/Net annual ground water availability) *100	Central Ground Water Board
	Land degradation	Total area under desertification (%) as defined by Space Application Centre, Indian Space Research Organisation	Indian Space Research Organisation
<b>Opportunity</b>			
Personal Rights			
	Property rights	Property Rights- NCRB Percentage of property stolen or recovered 2014 (Percentage Recovery) Percentage recovery = {Total value recovered (in lakhs)/Total value stolen (in lakhs)}*100	NCRB – National Crime Records Bureau (Crimes in India)

	Human trafficking	Rate of total cognizable crimes Rate of Cognizable Crimes = (Total Cases reported under Human Trafficking/Total Popu- lation) x 10000 i.e., Incidence of crimes relating to human trafficking per one lakh of population '#' Human Traffick- ing consists of crime heads namely Section 370/370A of IPC, Importation of Girls from Foreign Country(Section 366-B IPC), Immoral Traffic (P) Act, 1956, Procurement of Minor Girls (Section 366-A IPC), Buying of Minor Girls for Prostitution (Section 373 IPC) and Selling of Minors for Prostitution (Section 372 IPC)	NCRB – National Crime Records Bureau (Crimes in India)
	Judiciary	Trials completed within 3 years as a % of total trials	NCRB – National Crime Records Bureau (Crimes in India)
Personal Freedom & Choice			
	Family planning	Total unmet need - Unmet need for family planning refers to fecund women who are not using contraception but who wish to postpone the next birth (spacing) or stop childbearing altogether (limiting).	National Family Health Survey
	Early marriages	Early Marriage (Women age 20-24 years married before age 18 years (%))	National Family Health Survey
	Child labour	Percentage of working children	Census
	Corruption	Percentage of households that have experienced corruption in public services	CMS
<b>Inclusion</b>			
	Financial inclusion - bank branches	Number of functioning offices of commercial banks	Reserve Bank of India
	Financial inclusion - women	Percentage of women having a bank or savings account that they use themselves	National Family Health Survey

	Women in Panchayati Raj institutions	Percentage of elected women representatives in Panchayati Raj Institutions (PRIs)	Government Database
	Child sex ratio	Number of females per thousand males between the age group 0-6 years	Census
	Insurance	Number of lives covered (per 1000 of population)	IRDA - Insurance Handbook
	Scheduled tribe enrolment	Percentage of Scheduled tribe enrolment	EPWRF Database
Access to Advanced Education			
	Gross enrolment ratio - higher education	GER calculated for the age group 18-23 years	EPWRF Database
Source: All India Survey of Higher Education			
	Female graduates	The percentage of females amongst total graduates	Census
	Technical institutes	Number of Industrial Training Institutes per 1000 of population	Government Database
	Colleges (UGC)	Number of colleges recognized by UGC per 1000 of population Number of Colleges includes Affiliated Colleges /University Colleges/Constituent Colleges/ PG Centres/recognised Centres / Off Campuses, etc	University Grants Commission

## APPENDIX C: INVERTED INDICATORS

### **Inverted Indicators**

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Infant mortality rate

Children under 5 years who are underweight

Maternal mortality rate

Children under 5 years with anaemia

Typhoid

Diarrhoea

Housing Shortages

Road deaths

Murder crimes

Crimes against women

Violent crimes

Gender parity

Dropout rates

Obesity male

Obesity female

Suicides

Respiratory infections

HIV

Leprosy

Water withdrawals

Land degradation

Human trafficking

Family planning

Child labour

Corruption

Early marriage

## APPENDIX D: WEIGHTS

Indicator Name	Weight
<b>Nutrition and Basic Medical Care</b>	
Infant mortality rate	0.30736195
Children under 5 years who are underweight	0.31429599
Maternal mortality rate	0.24982123
Children under 5 years with anaemia	0.2956775
<b>Water and Sanitation</b>	
Typhoid	0.35727137
Diarrhoea	0.34825416
Improved water source	0.25662471
Drinking water covered habitations	0.31892127
Rural sanitation	0.1318005
<b>Shelter</b>	
Power deficit	0.3290513
Electricity	0.43348036
Pucca houses	0.43034328
Housing shortages	0.07748039
<b>Personal safety</b>	
Road deaths	0.23584349
Murder crimes	0.34728216
Crimes against women	0.34172935
Violent crimes	0.41423175
<b>Access to Basic Knowledge</b>	
Net primary enrolment	0.22615099
Gross secondary enrolment	0.32998461
Literacy	0.35657778
Gender parity	0.32204804
Dropout rates	0.2419432
<b>Access to Info and Communications</b>	
TV	0.35085772
Internet	0.34500471
Phone	0.32534481
News	0.19848693
<b>Health and Wellness</b>	
Obesity male	0.35566961
Obesity female	0.35549332
Suicides	0.28573994
Respiratory infections	0.25226866

HIV	0.37163156
Life expectancy at 60	0.49554929
Leprosy	0.48145891
<b>Environmental Quality</b>	
Renewable energy	0.46335199
Forest cover	0.22703017
Water withdrawals	0.4069759
Land degradation	0.43107099
<b>Personal Rights</b>	
Property rights	0.56455921
Human trafficking	0.30089877
Judiciary	0.54399954
<b>Personal Freedom and Choice</b>	
Family planning	0.21491042
Child labour	0.41479364
Corruption	0.37599619
Early marriage	0.34074262
<b>Inclusion</b>	
Child sex ratio	0.09894092
Financial inclusion - bank branches	0.34817261
Financial Inclusion - women	0.38983461
Women in Panchyati Raj institutions	0.20396498
Insurance	0.25480241
Scheduled tribe enrolment	0.22245313
<b>Access to Advanced Education</b>	
Gross enrolment ratio - higher education	0.30416336
Female graduates	0.30136357
Technical institutes	0.29129642
Colleges (UGC)	0.3217473

## APPENDIX E: BEST CASE AND WORST CASE SCENARIOS

Indicator Name	Best case	Worst case
<b>Nutrition and Basic Medical Care</b>		
Infant mortality rate	0	76
Children under 5 years who are underweight	0	60
Maternal mortality rate	0	53.8
Children under 5 years with anaemia	0	78
<b>Water and Sanitation</b>		
Typhoid	0	0.016
Diarrhoea	0	0.102
Improved water source	100	41.6
Drinking water covered habitations	100	15.78
Rural sanitation	100	2.9
<b>Shelter</b>		
Power deficit	0	-40.2
Electricity	100	10.3
Pucca houses	100	25.5
Housing shortages	0	0.106
<b>Personal safety</b>		
Road deaths	0	84
Murder crimes	0	10.1
Crimes against women	0	23.7
Violent crimes	0	97.4
<b>Access to Basic Knowledge</b>		
Net primary enrolment	100	38.08
Gross secondary enrolment	100	40.54
Literacy	100	53
Gender parity	0	0.37
Dropout rates	0	24.3
<b>Access to Information and Communications</b>		
TV	100	9.1
Internet	100	13.333
Phone	100	30.425
News	33.376	0.001
<b>Health and Wellness</b>		
Obesity male	4.3	34.8
Obesity female	4.6	34.9

Suicides	0	20.708
Respiratory infections	0	278.825
HIV	0	1.970
Life expectancy at 60	21.117	15.645
Leprosy	0	3.600
<b>Environmental Quality</b>		
Renewable energy	1	0
Forest cover	29.319	-2.288
Water withdrawals	0	172.000
Land degradation	0	68.980
<b>Personal Rights</b>		
Property rights	100	0
Human trafficking	0	4.6
Judiciary	100	14.286
<b>Personal Freedom and Choice</b>		
Family planning	0	35.8
Child labour	0	12.335
Corruption	0	77
Early marriage	0	65.2
<b>Inclusion</b>		
Child sex ratio	1000	798
Financial inclusion - bank branches	0.462	0.03
Financial inclusion - women	100	7.4
Women in Panchyati Raj institutions	0.586	0.302
Insurance	522.914	1.224
Scheduled tribe enrolment	100	42.08
<b>Access to Advanced Education</b>		
Gross enrolment ratio - higher education	58.29	5.86
Female graduates	55.306	17.624
Technical institutes	0.053	0
Colleges (UGC)	0.064	0.006

## APPENDIX F: PEER GROUPS

**Andhra Pradesh:** Mizoram, Karnataka, Meghalaya, Tripura, West Bengal, Arunachal Pradesh, Punjab, Nagaland, Rajasthan, Jammu & Kashmir

**Arunachal Pradesh:** West Bengal, Meghalaya, Rajasthan, Jammu & Kashmir, Mizoram, Andhra Pradesh, Jharkhand, Chhattisgarh, Madhya Pradesh, Karnataka

**Assam:** Manipur, Odisha, Madhya Pradesh, Uttar Pradesh, Chhattisgarh, Jharkhand, Bihar, Jammu & Kashmir, Rajasthan, Arunachal Pradesh

**Bihar:** Uttar Pradesh, Assam, Manipur, Odisha, Madhya Pradesh, Chhattisgarh, Jharkhand, Jammu & Kashmir, Rajasthan, Arunachal Pradesh

**Chhattisgarh:** Jharkhand, Madhya Pradesh, Jammu & Kashmir, Odisha, Rajasthan, Manipur, Assam, Arunachal Pradesh, West Bengal, Meghalaya

**Delhi:** Goa, Sikkim, Maharashtra, Haryana, Gujarat, Tamil Nadu, Uttarakhand, Kerala, Himachal Pradesh, Nagaland

**Goa:** Delhi, Sikkim, Maharashtra, Haryana, Gujarat, Tamil Nadu, Uttarakhand, Kerala, Himachal Pradesh, Nagaland

**Gujarat:** Tamil Nadu, Uttarakhand, Haryana, Kerala, Maharashtra, Himachal Pradesh, Nagaland, Punjab, Tripura, Karnataka

**Haryana:** Maharashtra, Gujarat, Tamil Nadu, Uttarakhand, Kerala, Himachal Pradesh, Sikkim, Nagaland, Punjab, Tripura

**Himachal Pradesh:** Kerala, Nagaland, Uttarakhand, Punjab, Tripura, Tamil Nadu, Karnataka, Gujarat, Andhra Pradesh, Haryana

**Jammu & Kashmir:** Rajasthan, Jharkhand, Chhattisgarh, Arunachal Pradesh, Madhya Pradesh, West Bengal, Meghalaya, Odisha, Manipur, Assam

**Jharkhand:** Chhattisgarh, Madhya Pradesh, Jammu & Kashmir, Rajasthan, Odisha, Manipur, Assam, Arunachal Pradesh, West Bengal, Meghalaya

**Karnataka:** Tripura, Punjab, Andhra Pradesh, Nagaland, Mizoram, Himachal Pradesh, Meghalaya, West Bengal, Arunachal Pradesh, Kerala

**Kerala:** Uttarakhand, Tamil Nadu, Gujarat, Himachal Pradesh, Haryana, Nagaland, Punjab, Maharashtra, Tripura, Karnataka

**Madhya Pradesh:** Chhattisgarh, Odisha, Jharkhand, Manipur, Assam, Jammu & Kashmir, Rajasthan, Uttar Pradesh, Arunachal Pradesh, West Bengal

**Maharashtra:** Haryana, Gujarat, Tamil Nadu, Uttarakhand, Kerala, Sikkim, Himachal Pradesh, Nagaland, Punjab, Tripura

**Manipur:** Assam, Odisha, Madhya Pradesh, Chhattisgarh, Uttar Pradesh, Jharkhand, Jammu & Kashmir, Rajasthan, Bihar, Arunachal Pradesh

**Meghalaya:** West Bengal, Arunachal Pradesh, Mizoram, Andhra Pradesh, Rajasthan, Jammu & Kashmir, Jharkhand, Chhattisgarh, Karnataka, Tripura

**Mizoram:** Andhra Pradesh, Meghalaya, West Bengal, Karnataka, Arunachal Pradesh, Tripura, Punjab, Nagaland, Rajasthan, Jammu & Kashmir

**Nagaland:** Punjab, Tripura, Karnataka, Himachal Pradesh, Andhra Pradesh, Mizoram, Kerala, Uttarakhand, Tamil Nadu, Meghalaya

**Odisha:** Manipur, Assam, Madhya Pradesh, Chhattisgarh, Jharkhand, Uttar Pradesh, Jammu & Kashmir, Rajasthan, Bihar, Arunachal Pradesh

**Punjab:** Nagaland, Tripura, Karnataka, Himachal Pradesh, Andhra Pradesh, Mizoram, Kerala, Uttarakhand, Meghalaya, Tamil Nadu

**Rajasthan:** Jammu & Kashmir, Jharkhand, Chhattisgarh, Arunachal Pradesh, West Bengal, Madhya Pradesh, Meghalaya, Odisha, Manipur, Assam

**Sikkim:** Maharashtra, Haryana, Gujarat, Tamil Nadu, Uttarakhand, Kerala, Himachal Pradesh, Nagaland, Punjab, Delhi

**Tamil Nadu:** Gujarat, Uttarakhand, Kerala, Haryana, Maharashtra, Himachal Pradesh, Nagaland, Punjab, Tripura, Karnataka

**Tripura:** Karnataka, Punjab, Nagaland, Andhra Pradesh, Mizoram, Himachal Pradesh, Meghalaya, West Bengal, Arunachal Pradesh, Kerala

**Uttar Pradesh:** Bihar, Assam, Manipur, Odisha, Madhya Pradesh, Chhattisgarh, Jharkhand, Jammu & Kashmir, Rajasthan, Arunachal

Pradesh

**Uttarakhand:** Kerala, Tamil Nadu, Gujarat, Himachal Pradesh, Haryana, Nagaland, Punjab, Maharashtra, Tripura, Karnataka

**West Bengal:** Arunachal Pradesh, Meghalaya, Rajasthan, Mizoram, Jammu & Kashmir, Andhra Pradesh, Jharkhand, Chhattisgarh, Madhya Pradesh, Karnataka



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