



**ENGINEERS
WITHOUT
BORDERS**
Bristol



A Needs Assessment Report for FRANK Water, 2016

Engineers Without Borders Bristol

EWB – FRANK Water Needs Assessment Mapping 2016

This report is written by Engineers Without Borders Bristol for FRANK Water, a Bristol-based NGO working on WASH projects in six states across India. The report focuses on an assignment proposed by FRANK:

‘FRANK Water would like to investigate which areas are in most need of additional WASH interventions.’

Nine maps were created using GIS software (QGIS and ArcGIS) of the six states in which FRANK Water works, providing a ranking of need for FRANK’s work based on several criteria.

The states that were compared are:

- Andhra Pradesh
- Chhattisgarh
- Madhya Pradesh
- Odisha
- Telangana
- Uttar Pradesh

As FRANK’s work is predominantly in rural areas, these have been the focus of the study. However, many of the points apply to both rural and urban communities.

Wide Angle

Economic, population, water access and **health** data have been reviewed. The maps produced show the links between important indicators from these fields and clean water access projects.

Sources

Data has been sourced from a wide range of places – NGOs, Census data, thinktanks, government statistics banks and reports, the India water tool, university data, reports and papers. Often data has a single original source, but has been verified or changed in light of others sources. Where possible, the main data source has been given with the map.



Telangana

As Telangana is a new state (formed in 2014), many datasets do not consider it. The data used is a mix of old and new – old data considers Telangana as a part of Andhra Pradesh.

Ranking & Assimilating Indicators

By comparing the states through many indicators, we can rank them in terms of, for example: ‘current clean water access’ or ‘needs of the rural population’.

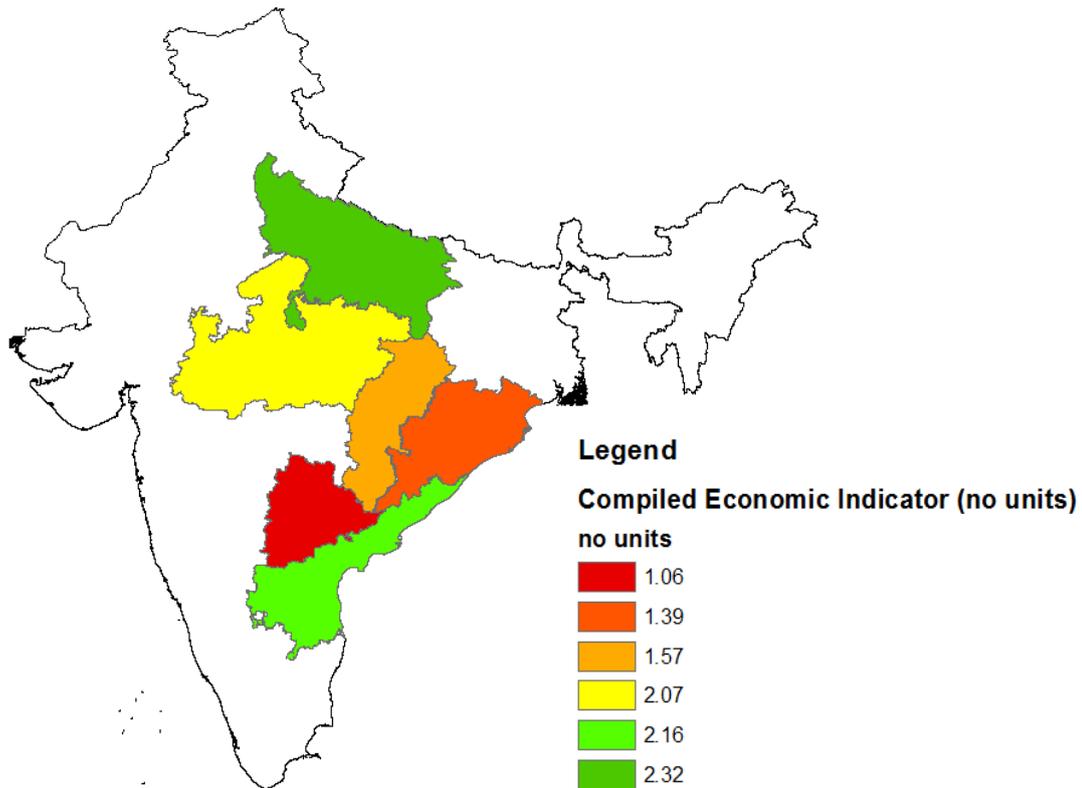
A generalised ranking of the states, considering all of the indicators discussed, is provided, though it is important to note that this ranking is not weighted towards FRANK’s interests. Where FRANK holds particular goals in for example, alleviating health problems related to clean water access, the health maps are a more important consideration than the population maps.

In order to provide an overall ranking from this range of perspectives, we have provided our own ‘relevance’ and ‘source’ scores. Relevance is framed in terms of the map’s relevance to the question of ‘need for WASH activities’. The source score is based on several criteria: reliability of the source, year of data collection, and number of sources available for verification. All data deemed unreliable has been omitted.

MAPS

Overall Economic Indicator.....	4
Population density and growth from 2001-2011	5
Proportion of population scheduled tribe & scheduled caste.....	6
Percentage of population who are of working age (15-65).....	7
Quality of Current Water Sources	8
Rainfall’s impact on Water resources	9
Groundwater Resources.....	10
Comparing Diarrhoea Prevalence, Access to Healthcare and Access to Treated Water Supply	11
Irrigation of Crop Rank & Average Rural per capita Income.....	12
Life Expectancy and Water Access	13
Annexed Economic Maps	14
Final Ranking.....	15
Reference Data	16

OVERALL ECONOMIC INDICATOR



The indicator includes:

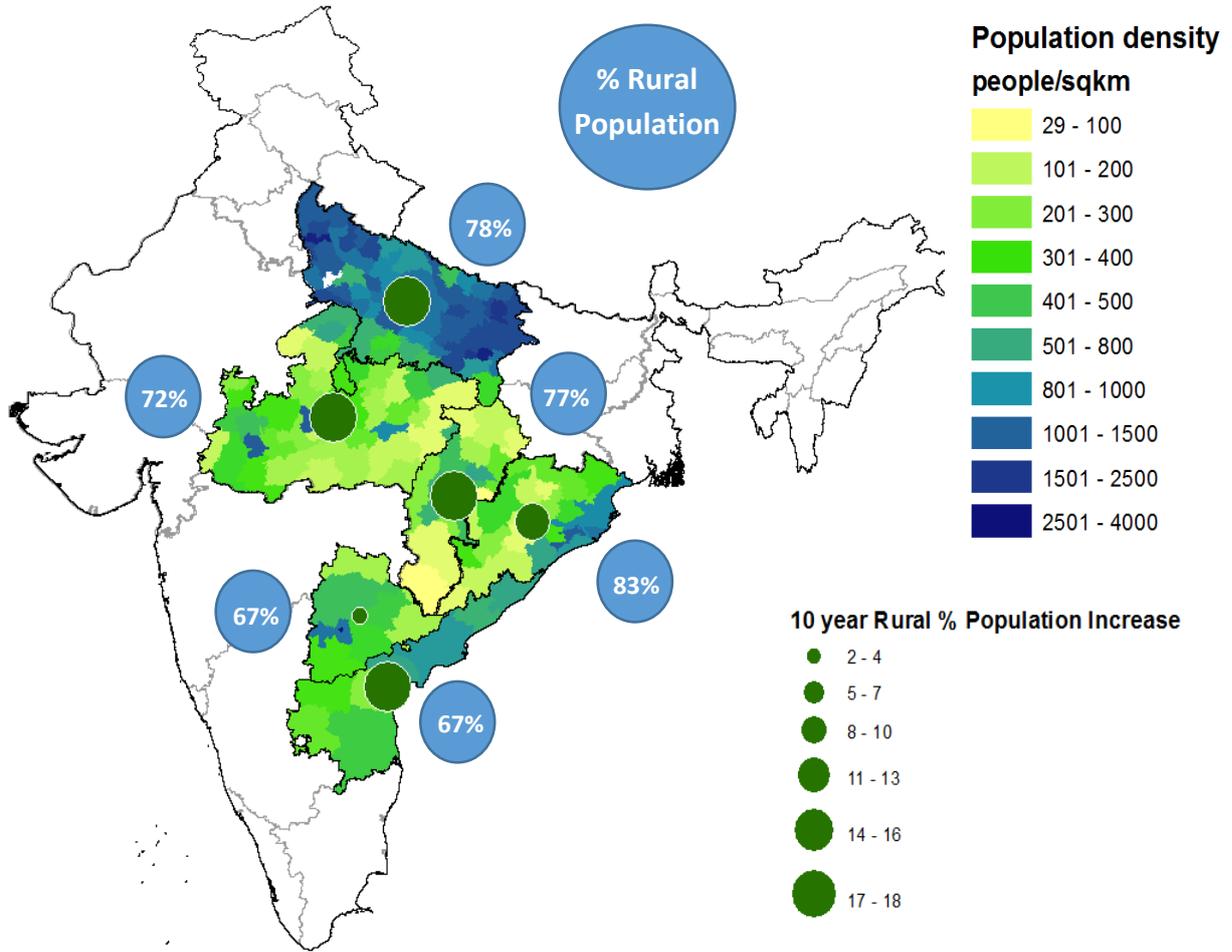
- Gini coefficient – a measure of inequality
- Per capita income – whole state
- Per capita income – rural only
- Gross Domestic Product (GDP)
- Literacy Rate – an indicator of growth and potential
- Nominal Growth – % growth of economy
- Unemployment rate – rural and urban
- FDI inflow – foreign investment
- Percentage below poverty line

Combining these nine indicators provides a general economic measure relating to the worst off in society.

We can see that the economies of Telangana and Odisha are performing badly, while Andhra Pradesh and Uttar Pradesh are both performing well.

Relevance 0.8	Economic Indicator for FRANK's target beneficiaries.
Source 0.8	Compiled from many sources, some figure confirmed by multiple surveys.

POPULATION DENSITY AND GROWTH FROM 2001-2011



Rural populations are often poorer than urban populations and do not benefit from the infrastructure or many of the government-funded schemes of urban areas, and will benefit from FRANK's work. In densely populated areas, FRANK's work will benefit many more people.

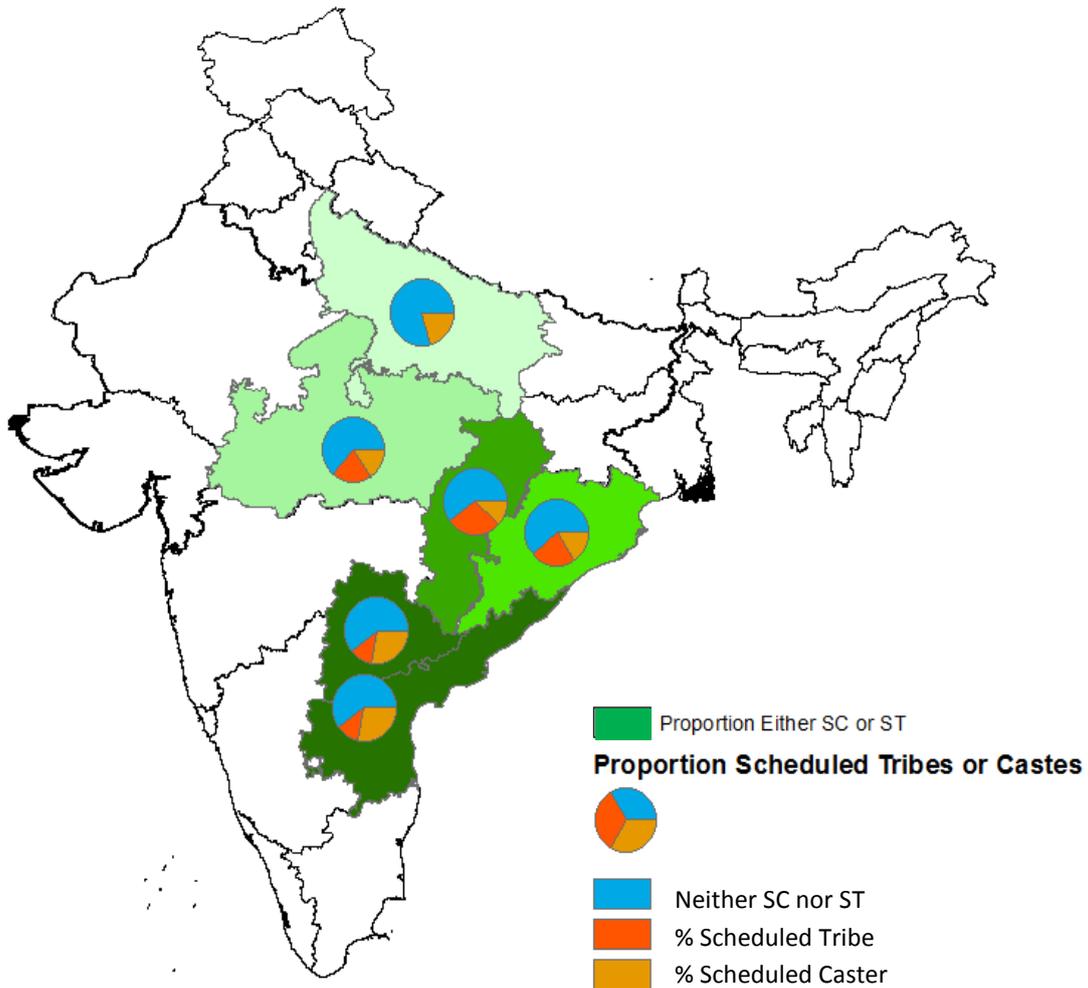
There are many densely populated rural areas in Uttar Pradesh and Odisha, 78% and 83% of the population live rurally, and this number is growing above or at national average.

Telangana's rural population is growing very slowly (many people migrate to Hyderabad), and the rural areas are sparsely populated.

Madhya Pradesh and Chhattisgarh are sparsely populated, but the rural population is growing quickly.

Relevance 0.7	Number of beneficiaries of projects & future trends
Source 0.9	Census data 2001 to 2011 – [1]

PROPORTION OF POPULATION SCHEDULED TRIBE & SCHEDULED CASTE

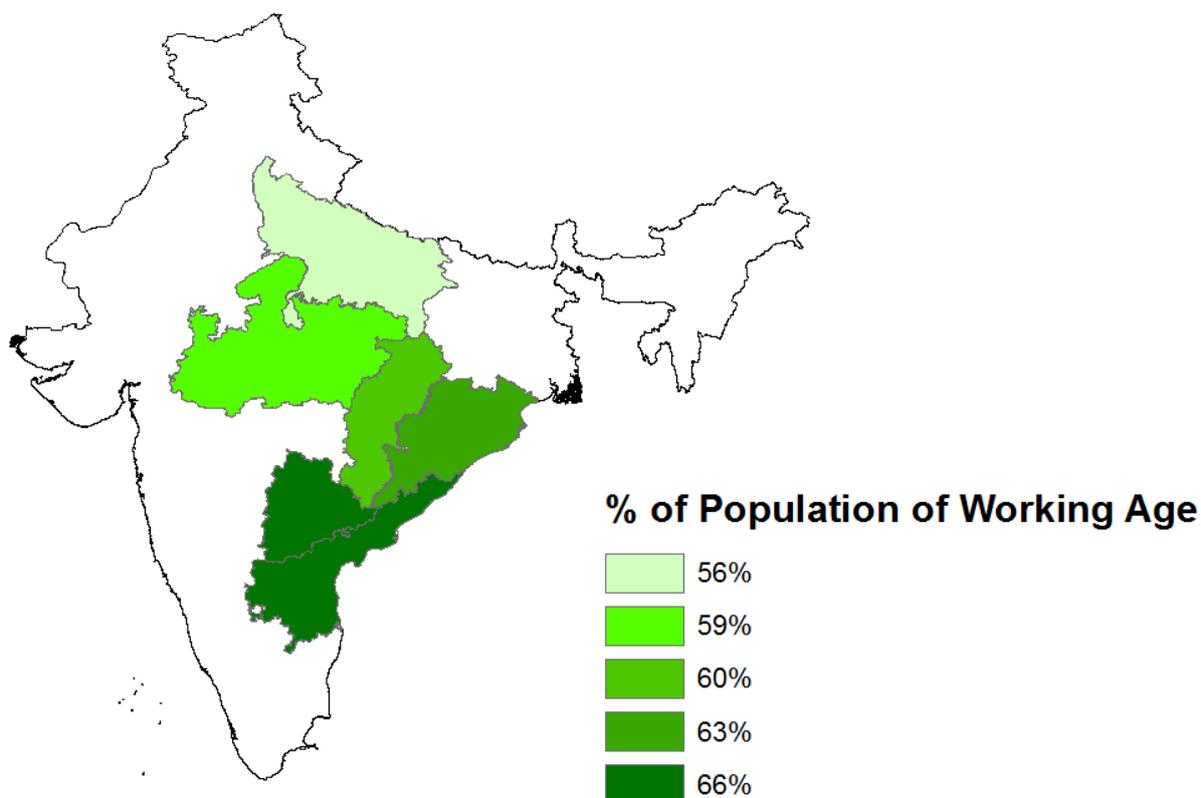


Scheduled Tribes and Scheduled Castes are often the poorest in society, and will often benefit the least from WASH infrastructure schemes.

This map shows the proportion of society that are in these groups – the highest proportion is in Andhra Pradesh/Telangana, where 40% of people are considered SC or ST. In Uttar Pradesh, there are fewer, all of whom are SC.

<p>Relevance</p> <p>0.5</p>	<p>Marginalised communities who will benefit from NGO WASH schemes.</p>
<p>Source</p> <p>0.9</p>	<p>Census data 2001 to 2011 [2]</p>

PERCENTAGE OF POPULATION WHO ARE OF WORKING AGE (15-65)



A basic breakdown of age groups provides the proportion of the population who are of working age (15 to 65).

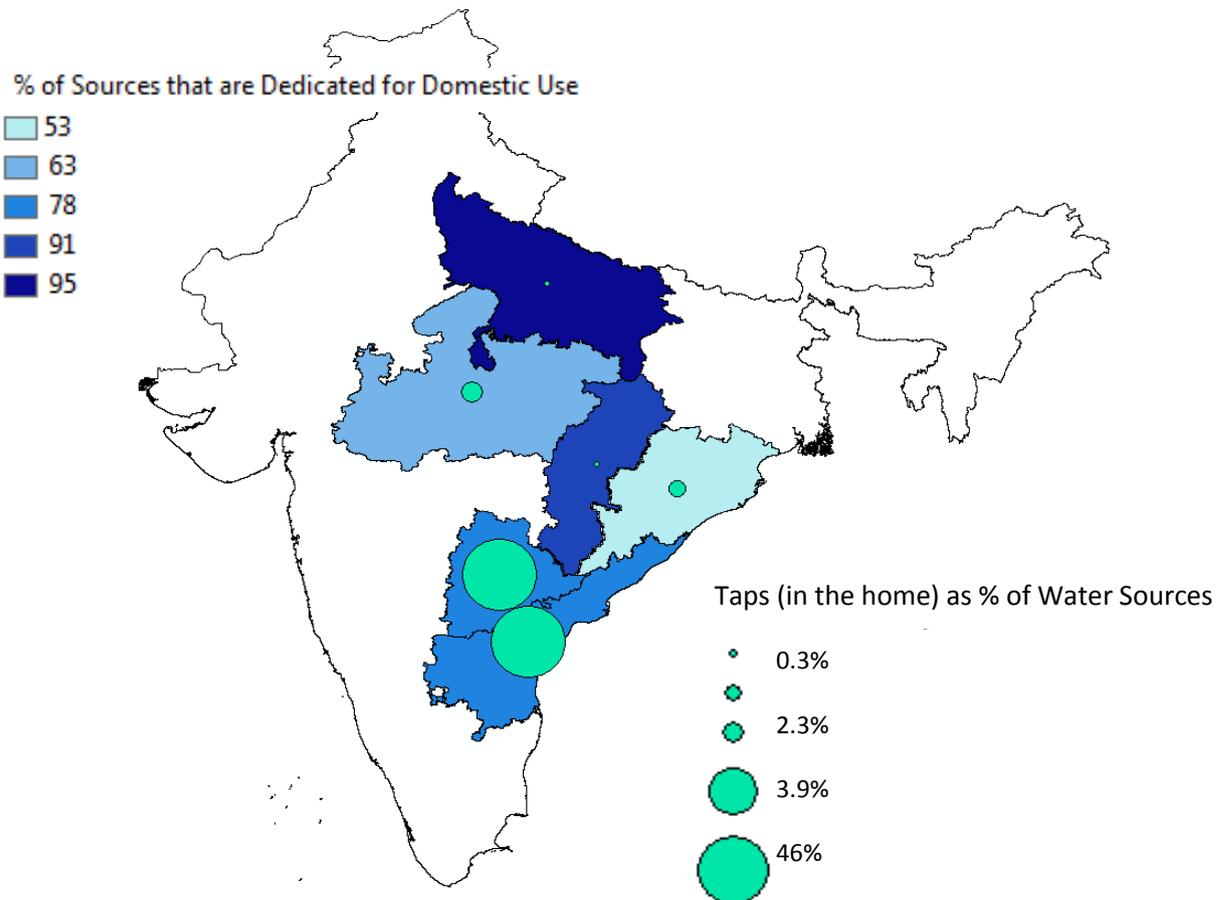
This gives an indication of the proportion of earners to dependents, extent of vulnerability to economic upset, and potential for future growth.

Andhra Pradesh, Telangana and Odisha have the highest proportions of working age, suggesting reduced poverty here.

In Uttar Pradesh and Madhya Pradesh, the low proportion of working age adults is due to a high proportion of children.

<p>Relevance</p> <p>0.5</p>	<p>Potential for short-term growth, poverty indicator</p>
<p>Source</p> <p>0.9</p>	<p>Census Data 2001 to 2011. The source is comprehensive, but 5 years old. Next census is 2021, [1]</p>

QUALITY OF CURRENT WATER SOURCES



A survey of the primary drinking water sources (taken throughout the year) splits source types into eight categories: tap (in home), tube-well/hand-pump, open well, dedicated tank/pond, other tank/pond, river/canal/lake, spring, other.

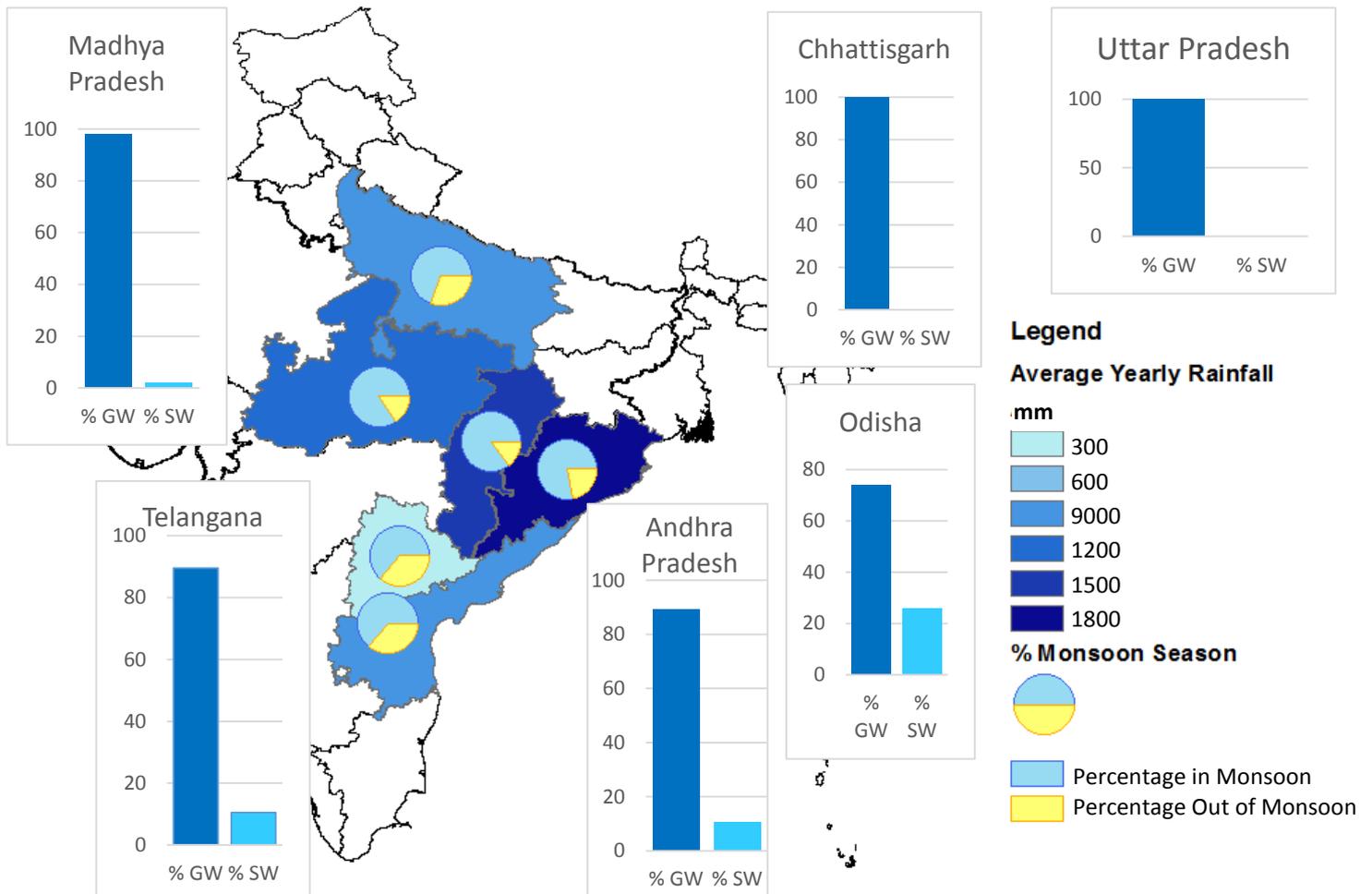
From these: tap, tube well, and dedicated tank are assumed dedicated sources. Taps are singled out as the ideal source.

Percentage of dedicated domestic sources and tap water access show the current state of water access in the six states.

Andhra Pradesh/Telangana have very good access to improved sources, while the other four states have almost no tap water, and Odisha has only 53% dedicated sources.

Relevance 1	The state of affairs for current water access – basic and improved
Source 0.8	Government statistics ministry, 2002 ~150 villages and 1000 households surveyed per state. [3], [4].

RAINFALL'S IMPACT ON WATER RESOURCES



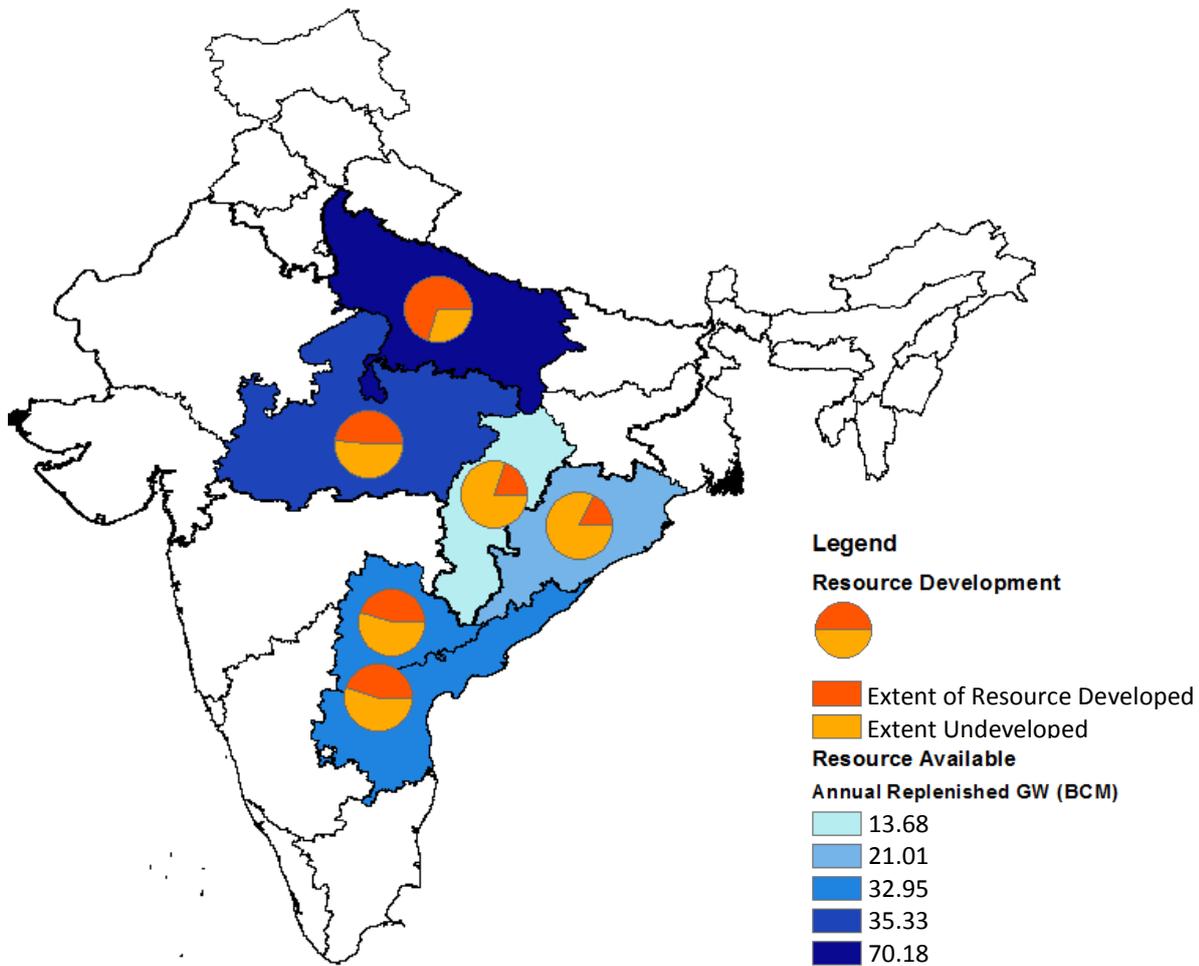
Average Yearly rainfall shows that Odisha and Chhattisgarh have great rainwater resources, as does Madhya Pradesh. Telangana, Uttar Pradesh and Andhra Pradesh all have less annual rainfall.

However, Andhra Pradesh, Odisha, Uttar Pradesh and Telangana have high out-of-season rainfall. Three of these four states also have high degrees of rainwater harvesting.

This suggests that capacity for rainwater harvesting depends predominantly on out-of-season rainfall, and can be improved particularly in **Uttar Pradesh**.

Relevance 0.8	Shows which states have the capacity for improved rainwater harvesting
Source 1	Current Results thinktank [9]

GROUNDWATER RESOURCES



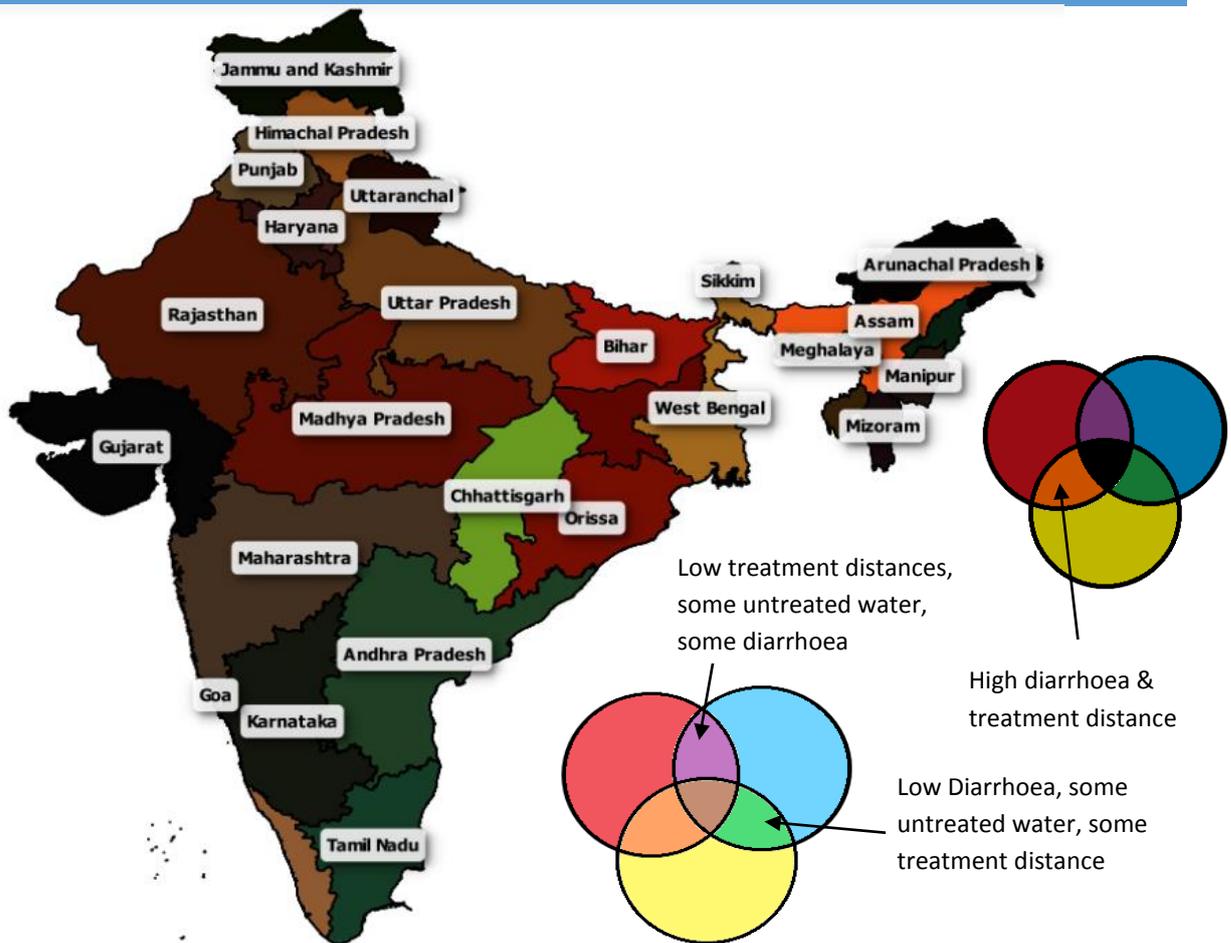
The annual replenished groundwater (measured in billion cubic metres or BCM) is equivalent to the quantity of groundwater in a region that can be extracted without depleting the groundwater storage.

This analysis tells us that resources for extraction are greatest in **Uttar Pradesh** and **Madhya Pradesh**.

However, the extent of development of the resource is vital in deciding further development – **Uttar Pradesh** is almost fully developed, where the resources of **Andhra Pradesh** and **Telangana** are undeveloped.

Relevance 0.5	Where resources are plentiful, spending by FRANK may be more economical.
Source 0.9	Reliable, Central Groundwater Board [5]

COMPARING DIARRHOEA PREVALENCE, ACCESS TO HEALTHCARE AND ACCESS TO TREATED WATER SUPPLY



Using the 2011 Census and the 2006 Demographic Health Survey, relative measures for:

- % of 3-5 year olds who had diarrhoea two weeks preceding the survey (**red**).
- % of households whose main source of drinking water is tap water from an untreated source (**blue**).
- Percentage of women who reported they have big problems in the distance to health facilities (**yellow**).

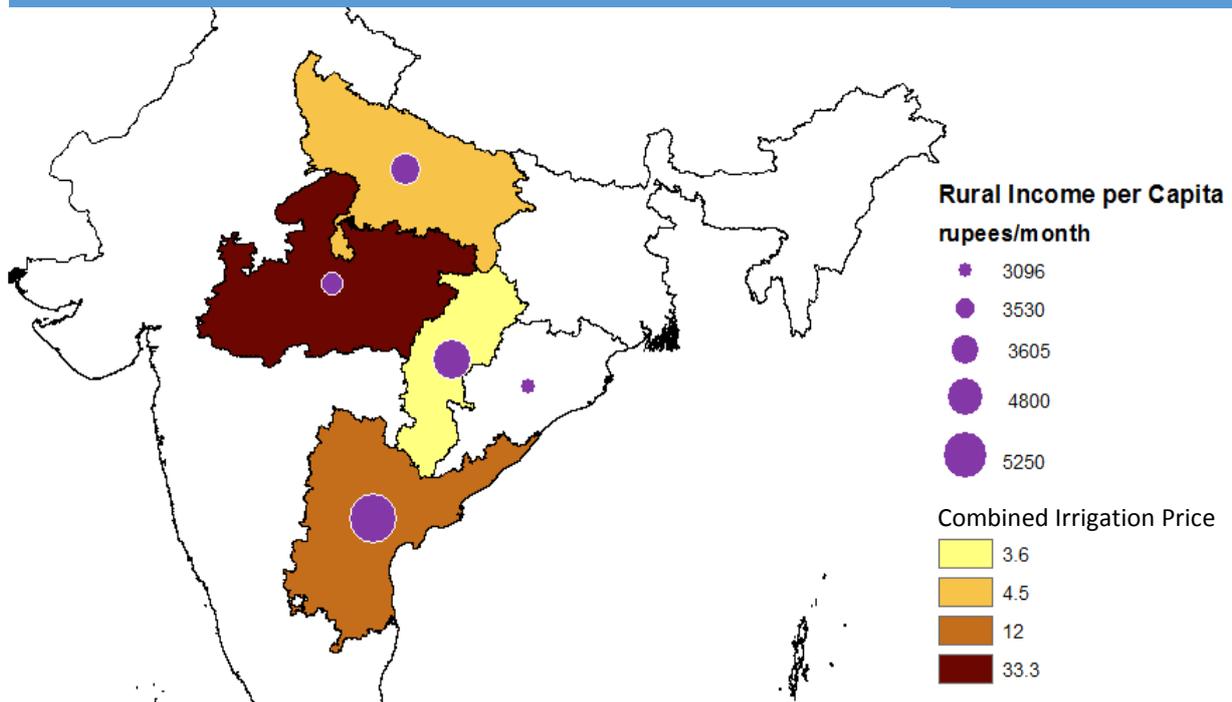
When aiming to reduce diarrhoea, the contributing factors should be considered: We can see that diarrhoea in the southern states is not a vital issue, despite water being untreated and access to healthcare is poor.

In northern states, diarrhoea rates are higher, despite well-treated water and short distances to healthcare. This suggests other factors (e.g. sanitation) are important.

If further areas are to be looked at, the borders have poor water & health facilities and high diarrhoea rates.

Relevance 0.8	Shows contributing factors to diarrhoea rates vary between states.
Source 0.7	Reliable but slightly outdated – DHS and Census surveys – [6], [1].

IRRIGATION OF CROP RANK & AVERAGE RURAL PER CAPITA INCOME



This map shows the price of water with respect to local income per capita, through the lens of crop irrigation. It is based on: the price of crops (rupees per hectare); the amount of crop grown; and the percentage of each crop irrigated. Five crops are covered: wheat, rice, pulses, oilseed and sugarcane.

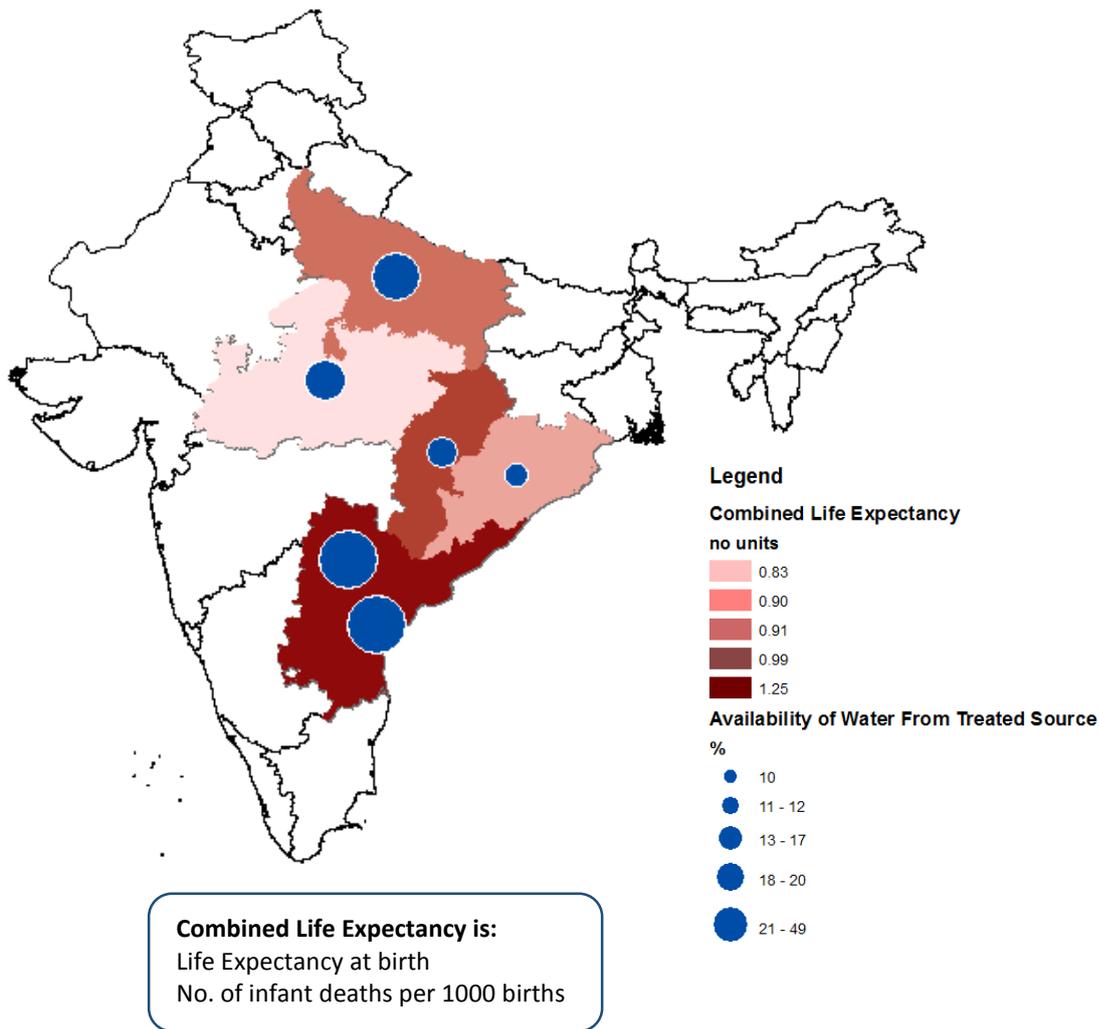
In areas where irrigation is expensive, water access is generally more expensive, so need for FRANK's activities is greater.

Madhya Pradesh has the highest water price, and per-capita income is very low, so water may be a large proportion of household expenditure.

There are three important reservations to this analysis:

- 1) The data ranges between 2006 and 2011, and is therefore dated; however, it is from a reputable government source - Ministry of Agriculture. Other sources were needed in parts.
- 2) Neither Odisha nor Telangana is covered, so these states cannot be compared.
- 3) The complex indicator may be less reliable, as all crops are weighted equally throughout, disregarding some possible differences.

Relevance 0.7	Price of water greatly impacts accessibility for the worst off in society
Source 0.7	Reliable but outdated, Directorate of Economics & Statistics, Ministry of Agriculture, 2006 [7] [8]

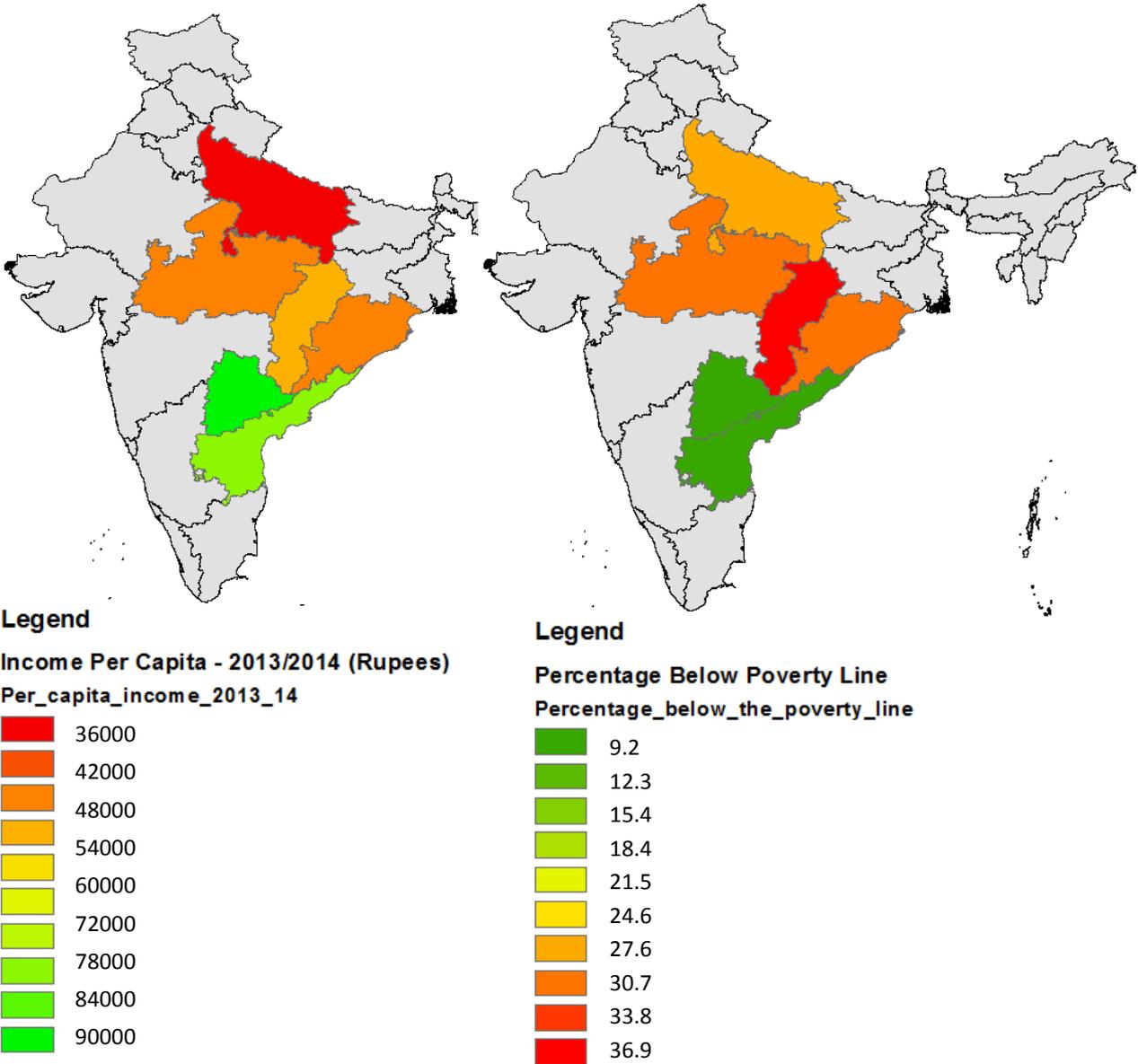


Many drivers were assessed for their impact on combined life expectancy: access to money for treatment, nutrition, vaccinations, cigarette use. Availability of treated water was found to have the greatest correlation, so health data is a very strong proxy for water access.

Ranking the six states, Telangana and Andhra Pradesh have low infant mortality and high life expectancy, while Odisha and Madhya Pradesh have high infant mortality and low life expectancy. Treated water access corresponds.

Relevance 0.9	Public health is very strongly linked to water supply
Source 0.9	Several sources including MOSPI Ministry of Statistics - 2011

The economic indicator map is based on many indicators, but two others provide a more detailed picture:



These maps show that Telangana and Andhra Pradesh are the best places to live to the poorest in society as a whole. This provides a perspective against the heavily rural-biased overall economic indicator on page 3.

FINAL RANKING

This report has assessed need in terms of water access, health, economic prosperity, and population. These indicators provide a multi-faceted picture of the needs of the six states.

The ranking within each section are given below, with combined 'source' and 'relevance' weighting:

Indicator	Source and Relevance Weighting	Rank					
		AP	CH	MP	OD	TG	UP
Percentage of Population of Working Age	1.4	1	3	4	2	1	5
Population Density and Growth	1.6	2	3	4	5	1	6
Proportion of Population SC & ST	1.3	5	4	2	3	5	1
Quality of Current Sources	1.6	1	3	4	5	1	2
Overall Economic Indicator	1.4	2	4	3	5	6	1
Life Expectancy	1.4	1	2	5	4	1	3
Diarrhoea Prevalence	1.4	1	1	4	3	1	2
Rainfall-fed Resources	1.6	4	2	1	5	3	6
Irrigation-based Pricing	1.4	4	1	5	3	4	2
Groundwater Resources	1.4	5	1	4	2	5	3
Overall (weighted)		37.3	34.8	52	54.5	39.7	46.1

By aggregating the states for a final ranking, we lose many of the nuances of these maps, but gain an overall sense of 'need for FRANK's work'. In particular, the range of differences are lost – a 1% difference in diarrhoea prevalence is of the same value as a 90% difference in replenished groundwater.

This work finds that **Odisha** and **Madhya Pradesh** are of the most need of FRANK's work, followed by Uttar Pradesh, while Andhra Pradesh, Chhattisgarh and Telangana are of lesser need.

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REFERENCE DATA

- [1] - India National Census 2011 - <http://censusindia.gov.in/>
- [2] - India National Census 2011
<http://www.censusindia.gov.in/2011census/SCST-Series/ST14.html>
- [3] - Ministry of Statistics - mail.mospi.gov.in/index.php/catalog/29/download/291
- [4] – Ministry of Statistics - mospi.nic.in/rept%20_%20pubn/487_final.pdf
- [5] – Central Groundwater Board, 2011
www.cgwb.gov.in/documents/Dynamic-GW-Resources-2011.pdf
- [6] – Demographic Health Survey - <http://spatialdata.dhsprogram.com/home/>
- [7] – Directive of Economics and Statistics, Ministry of Agriculture -
<http://eands.dacnet.nic.in/>
- [8] - http://www.cwc.gov.in/main/downloads/JS_Pricing%20of%20Water%20in%20Public%20System-%20Final-RN_.29.10.pdf
- [9] - <http://www.currentresults.com/Weather/India/average-yearly-precipitation.php>