



P-ISSN: 2706-7483  
E-ISSN: 2706-7491  
IJGGE 2020; 2(1): 54-56  
Received: 23-02-2020  
Accepted: 25-04-2020

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## Needs to upgrade water footprints in eastern India

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### Abstract

Eastern region is the most populated region of the country and in spite of high water availability in the region, its per capita water availability is almost half of the national per capita water availability of 1588 m<sup>3</sup>. Among the states, per capita water availability is highest in Odisha and least in Bihar. With reference to the water availability per unit land, West Bengal and Bihar have higher proportion as compared to Odisha and Jharkhand. Eastern region has 19% of total utilizable surface water resources of the country and 20.3% of net annual groundwater availability of the country. As such contribution of groundwater to the total water availability in the region is limited to 36% with major water supplies through the rivers draining the Eastern region surface. Among the states, Odisha is richest in Study of Assessment of Water Foot Prints of India's Long Term Energy Scenarios 31 available surface water resources with more than 34% share in the region. West Bengal, Bihar and Jharkhand follow the sequence of availability quantum. However, net annual groundwater availability is very high in West Bengal and Bihar constituting 70% of the region's potential (Figure 2.19).

**Keywords:** eastern, water, groundwater, resources, region, foot-print, per capita

### Introduction

Freshwater scarcity is increasingly perceived as a global systemic risk. In its last seven annual risk reports, since 2012, the World Economic Forum lists water crises as one of the top five risks to the global economy in terms of potential impact <sup>[1]</sup>. A recent study shows that two thirds of the global population live under conditions of severe water scarcity for at least one month of the year <sup>[2]</sup>. Nearly half of those people live in China and India. Half a billion people in the world face severe water scarcity all year round.

### World Wide Water Foot Print- A Bird's Eye

Overconsumption of water is widespread. Rivers such as the Yellow River in China and the Colorado River in the United States do not even meet the ocean anymore. Along their way, the water from these rivers is withdrawn to supply farmers, industries and households. The Aral Sea in Central Asia and Lake Urmia in Iran have nearly disappeared as a result of upstream water use. Groundwater reserves are being depleted at worrying rates as well, on all continents. The United States, for example, is overexploiting its High Plains and Central Valley Aquifers, India and Pakistan their Upper Ganges and Lower Indus Aquifers, and China its Northern China Aquifer. Abstraction rates of 10 to 50 times natural recharge rates are quite common <sup>[3]</sup>.

Some of us, live in rainy areas where water scarcity seems like a remote problem, but we can still relate to it. A surprising 40 per cent of the water footprint for European consumers lies outside the continent, often in places facing severe water problems. Much of our food and many other goods are imported from countries with water-stressed catchments. Food production, in particular, uses a lot of water. To produce one 200-gram steak, an average of 3,000 liters of water is consumed. A 200-gram chocolate bar requires 3,400 liters of water. Feed for livestock and food for our direct consumption are intensively traded, often coming from water-scarce places. For example, it has been estimated that about 50 per cent of the water footprint of consumers in the United Kingdom lies in river basins where water consumption exceeds sustainable levels, all outside the country <sup>[4]</sup>.

### Water Foot Print: In Eastern India- A Bird's Eye

Eastern region of the country comprises of Bihar, Jharkhand, West Bengal and Odisha. The region comprising of these states spreads over an area of 4,24,810 km<sup>2</sup>, equivalent to 13% of the country's surface area. The region is bounded by Himalayan Mountains in the north

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and Bay of Bengal towards south east adjoining West Bengal and Orissa. The region lies in the humid-subtropical zone, and experiences hot summers from March to June. Jharkhand and Orissa are mineral rich states of the country while Bihar and West Bengal have fertile alluvial soil of the Gangetic plains.

### Hydrological characteristics

Eastern region of the country is drained by rivers like Ganga, Mahanadi, Brahmaputra, Subarnarekha, Brahmani-Baitarni, and Godavari. Also, there are small streams which drain the coastal regions of Eastern region. These small streams flowing towards Bay of Bengal are located in Odisha south of Mahanadi River. Largest area of the region lies in the Ganga basin forming almost 55% of the eastern region and contributing to 58% of the utilizable surface water potential of the region. Subarnarekha and Brahmani-Baitarni are smaller rivers but lie almost within the eastern region and drain almost 20% of the region contributing about 18% of the region's surface water potential. Mahanadi originating in the central region, drains through eastern region before meeting Bay of Bengal and has almost 50% of its catchment area in this region contributing to 18% of its surface water potential.

### Rainfall Distribution

Area weighted annual average rainfall in the Eastern region is about 1470 mm, which is higher than the national annual average of 1187 mm. Within the region, except the southern Bihar and parts of Jharkhand, rainfall is plenty. Sub Himalayan West Bengal in the north-eastern part of the region receives 2700 mm rainfall, annually. Significant rainfall in the Jharkhand leads to the origin of Subarnarekha and Brahmani-Baitarni rivers, with their average water resources potential of 41 BCM, however, considering the topography and other geographical factors, only 60% of this water can be utilized.

### Water Availability in Eastern Region

Eastern region has 19% of total utilizable surface water resources of the country and 20.3% of net annual groundwater availability of the country. As such contribution of groundwater to the total water availability in the region is limited to 36% with major water supplies through the rivers draining the Eastern region surface. Among the states, Odisha is richest in Study of Assessment of Water Foot Prints of India's Long Term Energy Scenarios 31 available surface water resources with more than 34% share in the region. West Bengal, Bihar and Jharkhand follow the sequence of availability quantum. However, net annual groundwater availability is very high in West Bengal and Bihar constituting 70% of the region's potential. Eastern region is the most populated region of the country and in spite of high water availability in the region, its per capita water availability is almost half of the national per capita water availability of 1588 m<sup>3</sup>. Among the states, per capita water availability is highest in Odisha and least in Bihar. With reference to the water availability per unit land, West Bengal and Bihar have higher proportion as compared to Odisha and Jharkhand.

### Water Demand in Eastern Region<sup>[5]</sup>

#### Agricultural Water Demand

Almost 42% of the state's area equivalent to 1,76,759 km<sup>2</sup>

is under crop cultivation. Cultivated area in eastern region is almost uniformly distributed among Bihar, West Bengal and Odisha with Jharkhand sharing only 8%. Paddy is the most dominant crop in the region being grown in almost 75% of agricultural land. Area under paddy cultivation in Odisha and West Bengal is almost 72% of the total in the eastern region. Almost 80% of area under wheat cultivation lies in Bihar. Pulses also make an important crop under cultivation being grown in almost all the states.

Ratio of the net area irrigated to net crop area is maximum for Bihar and West Bengal, with least being in Jharkhand. Only 8% of the area under cultivation in Jharkhand is being irrigated. As such, net area irrigated in the Eastern region is 8.8 million hectares which is 50% of the total crop area and is above the national average of 45%. Paddy is the major crop under irrigation with 76% of its cropped area being irrigated, with as much as 68% of paddy area in Bihar being irrigated. Net irrigation water requirement in eastern region is 56% of its total crop water requirement and is 15% of the national water requirement for 14% of national area under irrigation for agricultural production.

Within the region, agricultural water requirement is highest for Bihar and West Bengal consuming almost 80% of total irrigation water. Water requirement for kharif season is higher for Odisha and West Bengal but in Bihar, water requirement is higher during rabi season due to wheat cultivation in the state.

#### Domestic Water Demand

Total human population of the Eastern region is 270.33 million with only 21% people living in urban areas, and livestock population is close to 98.5 million. Total water demand for human and livestock consumption in the region is 5.88 BCM which is close to 10% of the total water demand in the region. Bihar has highest population in the region, but due to higher level of urbanization, human water demand is highest in West Bengal. Urban water demand is less than rural water demand in Bihar and Odisha but in West Bengal, it is 61% of the domestic water demand for the state. For the region, rural water demand is 53% of the total domestic water demand.

#### Industrial Water Demand

Eastern region is among the least industrialized regions of the country. But iron and steel industry is very prominent in states of Odisha, Jharkhand and West Bengal. Iron and steel industry constitutes for 86% of total industrial water consumption in the region. Among the states, Jharkhand is the biggest consumer of industrial water followed by Odisha and West Bengal. Bihar has some cement industry and its industrial water requirement is negligible.

#### Water for Energy Production in Eastern Region

Eastern region produces almost 10% of total electricity in the country. However, 86% of electricity in the region is produced through non-renewable resources like coal and gas, contributing about 16% of total coal based electricity production in the country. Eastern region has 12% of country's oil refining capacity and produces almost 8.5% of country's biofuel based energy.

Total water requirement for the production of energy in the Eastern region is almost 50% of its industrial water requirement. 94% of water for energy in the region is consumed for production of electricity and remaining for the

refining of petroleum. With reference to water consumption for electricity production, major states of the region can be ranked as West Bengal> Orissa> Jharkhand> Bihar, however, the top two states are responsible for consumption of almost 60% of total water.

### **Water Stress in Eastern Region**

On an annual basis, total water demand for the region is almost 30% of its total water availability. 34.3% of total water availability is contributed by replenish able ground water and remaining by the surface water resources. As proportion of water demand against water available is between 20-40%, the region can be categorized as 'medium to high' water stress region.

### **Conclusion**

Let me summarize. Our water footprint needs to be significantly lowered in many river basins in the region. We can achieve this by agreeing on water footprint caps per river basin and water footprint reduction targets per product, as well as by changing our consumption patterns, including wasting less food and eating less meat. Fair sharing of the region's limited freshwater resources will be key in reducing the threat posed by water scarcity on biodiversity and human welfare. International collaboration in implementing these measures will be crucial.

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