Status Report on Current water resources, water governance, institutional arrangements, water-related policies, cross-boundary issues, agreements of Karnataka State

as part of the

State Specific Action Plan (SSAP) on Climate Change for Water Sector

Under the

National Water Mission

Supported by

Advanced Centre for Integrated Water Resources Management, Karnataka

Authors: Suresh Raghavan, Jangal Jayaram, Arvind Lakshmisha, Priyanka Agarwal, Manasi Nikam and Bhargavi Nagendra

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<td>ACIWRM</td>
<td>Advanced Centre for Integrated Water Resource Management</td>
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<tr>
<td>AMRUT</td>
<td>Atal Mission for Rejuvenation and Urban Transformation</td>
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<tr>
<td>BDA</td>
<td>Bangalore Development Authority</td>
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<tr>
<td>BWSSB</td>
<td>Bangalore Water Supply and Sewerage Board</td>
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<tr>
<td>BCM</td>
<td>Billion Cubic Meters</td>
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<tr>
<td>BRCs</td>
<td>Block Resource Centres</td>
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<td>BBMP</td>
<td>Bruhat Bengaluru Mahanagara Palike</td>
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<tr>
<td>CMB</td>
<td>Cauvery Management Board</td>
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<tr>
<td>CRA</td>
<td>Cauvery River Authority</td>
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<tr>
<td>CSC</td>
<td>Cauvery Supervisory Committee</td>
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<tr>
<td>CWDT</td>
<td>Cauvery Water Disputes Tribunal</td>
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<td>CWRC</td>
<td>Cauvery Water Regulation Committee</td>
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<td>CPCB</td>
<td>Central Pollution Control Board</td>
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<td>CADA</td>
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<td>Ca.</td>
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<td>°C</td>
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<td>°F</td>
<td>Degree Fahrenheit</td>
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<tr>
<td>DPR</td>
<td>Detailed Project Report</td>
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<tr>
<td>DE&amp;S</td>
<td>Directorate of Economics and Statistics</td>
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<td>DLRMC</td>
<td>District Level Review and Monitoring Committee</td>
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<td>DWSM</td>
<td>District Water and Sanitation Mission</td>
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<tr>
<td>FRL</td>
<td>Full Reservoir Level</td>
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<td>GWDT</td>
<td>Godavari Water Disputes Tribunal</td>
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<td>GSDP</td>
<td>Gross State Domestic Product</td>
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<tr>
<td>Hect/ha</td>
<td>Hectares</td>
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<td>HLC</td>
<td>High Level Canal</td>
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<td>HLC-RE</td>
<td>High Level Committee for Renewable Energy</td>
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<td>IWRM</td>
<td>Integrated Water Resource Management</td>
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<tr>
<td>IPCC</td>
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<tr>
<td>KPCL</td>
<td>Karnataka Power Corporation Limited</td>
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<td>KREDL</td>
<td>Karnataka Renewable Energy Development Limited</td>
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<td>KSPCB</td>
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<td>km</td>
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<td>Government of India</td>
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<td>GP/VWSC</td>
<td>Gram Panchayat/Village Water and Sanitation Committee</td>
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<td>Government of India</td>
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Low Level Canal (LLC)
Mahadayi Water Disputes Tribunal (MWDT)
Maximum Water Level (MWL)
Mean Sea Level (MSL)
Megawatt (MW)
milligrams per liter (mg/L)
Millimeter (mm)
Minister for Water Resources (MOWR)
National Action Plan on Climate Change (NAPCC)
National Mission for Sustainable Agriculture (NMSA)
National Mission on Micro Irrigation (NMMI)
National Water Mission (NWM)
National Water Policy (NWP)
Pre-Feasibility Report (PFR)
Project Management and Development Consultant (PMDC)
Project Management Unit (PMU)
Renewable Energy (RE)
Revenue Division Centers (RDC)
Run of the River (ROR)
Rural Development and Panchayat Raj (RDPR)
Scheduled Caste (SC)
Scheduled Tribe (ST)
Service Level Improvement Plan (SLIP)
Small Hydro Power (SHP)
State Domestic Product (SDP)
State Level High Powered Steering Committee (SHPSC)
State Level Nodal Agency (SLNA)
State Level Scheme Sanctioning Committee (SLSSC)
State Level Technical Committee (SLTC)
State Level Water and Sanitation Mission (SWSM)
State Technical Agency (STA)
Thousand million cubic (TMC)
United Nations Framework Convention on Climate Change (UNFCCC)
Urban Development Department (UDD)
Urban Local Bodies (ULBs)
Visvesvaraya Jal Nigam Limited (VJNL)
Water and Sanitation Support Organisation (WSSO)
Water Resources Department (WRD)
Water Users Association (WUA)
Water Users Project Level Federation (WUPLF)
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Executive Summary

India today is facing the challenge of sustaining its rapid economic growth while dealing with global threat to climate change. India is actively engaging in multilateral negotiations with the United Nations Framework Convention on Climate Change (UNFCCC) to collectively and cooperatively deal with threat due to climate change. In 2008, a national strategy - National Action Plan on Climate Change (NAPCC) was released targeting 8 mission areas with a multi-pronged, long-term, integrated approach to address climate change. The National Water Mission (NWM) launched by the Ministry of Water Resources, Government of India forms one of the core missions with main objectives of conserving water, minimising wastage and ensuring more equitable distribution both across and within States through integrated water resources development and management. The following five important goals to achieve the main objective have been identified in the Comprehensive Mission Document of “National Water Mission”:

I) Comprehensive water data base in public domain and assessment of the impact of climate change on water resource
II) Promote citizen and state actions for water conservation, augmentation and preservation
III) Focus attention to vulnerable areas including over-exploited areas
IV) Increase water use efficiency by 20% and
V) Promote basin level integrated water resources management

Many of the identified strategies/actions to achieve the goals of the NWM are required to be taken by the State Governments/Union Territories. In this context, developing State Specific Action Plans for Water Sector aligned with the State Action Plan on Climate Change and formulated by the States under NAPCC is highly desirable. This is because the water resources situation, its development, management and availability vary considerably from State to State. The first step towards this road map, i.e., “Preparation of Status report on present situation of water resources development and management, water governance, Institutional arrangements, water related policies, cross-boundary issues and agreements etc of Karnataka State has been presented in this report. This document also defines the problems/issues related to all aspects of water resources specific to Karnataka State.

The status report has been prepared by Public Affairs Centre, a not-for profit think tank, by collating and compiling data with respect to water resources in the State. The Status Report draws on relevant latest information from the State Ministries/Departments/Agencies and Central Ministries/Departments/ Agencies. The report has been enhanced by presenting the data in the form of maps, tables and graphs for easy understanding and inference.
The first chapter of the status report includes a detailed profiling of Karnataka State in terms of its location; geology; general climate profile; rainfall; demographic profile including urban/rural population; agriculture profile; soil profile; land-use pattern; land holding; and irrigation profile from different sources.

The chapter on Water profile in Karnataka is a compilation of data on river networks, details of river/sub-basins, water availability across the state for different sectors and in terms of surface water and ground water. The information collected from State Ministries/Departments/Agencies also encompasses data on water quality-measured in terms of concentration of fluoride, concentration of chloride, concentration of nitrate, pH levels and electrical conductivity; statistics on current water demand (2015) across sectors and projected water demand for 2020. The impact of climate change on water availability and resources in Karnataka is extensively covered by review of literature.

A comprehensive overview of institutions and organisations for water governance including policies, acts, institutions and gaps are covered in the third chapter. The policies mentioned in the section serve as benchmarks and roadmaps for decision making in this sector. The Karnataka State Water Policy (KWP) 2002 and National Water Policy (NWP) 2012 were studied in detail with focus on their thematic areas. The cross cutting thematic areas under the Karnataka State Water Policy 2002 includes participatory management, preservation of water, research and monitoring and inter and intra-sectoral co-ordination. The themes focused in the National Water Policy 2012 are equitable use and allocation of water, conservation of water, climate change, dispute resolution and inter-state co-ordination and data collection and research. A comparative analysis of KWP 2002 and NWP 2012 gives insight to the commonalities and differences between the two policies. An overview of Renewable Energy policies including Karnataka Renewable Energy Policy (2009-14) and Draft Karnataka Renewable Energy Policy (2014-20) and Industrial Policy 2014-19 also conveys to the readers the intentions of the government and the factors that will influence decisions with regard to micro and mini hydro power and industrial supply of water through these policies. Chapter three captures the important Acts and institutions in the water sector of Karnataka covering aspects of irrigation, ground water, rainwater harvesting, lake conservation and development, water governance in urban areas and rural areas, hydropower and issues of water governance and provides concluding thoughts about water governance in the state.

The last chapter examines the inter-state issues river basin-wise and is segmented as per the issues, agreements, awards given and the key decisions of relevant Tribunals.

This status report has tried to capture all the essential aspects to provide the readers an unbiased picture of the current scenario of water resources in Karnataka. Volume-II of this report will contribute a detailed analysis of the data district-wise.
Introduction

The National Action Plan on Climate Change (NAPCC) was launched by the Hon’ble Prime Minister of India in June 2008. It effectively pulls together a number of existing national plans on water, renewable energy, energy efficiency agriculture, and others – bundled with additional ones – into a set of eight Missions. Emphasising the overriding priority of maintaining high economic growth rates to raise living standards, the plan “identifies measures that promote development objectives while also yielding co-benefits for addressing climate change effectively.”

Through eight sectoral Missions, the NAPCC focuses on key sectors impacted by or impacting climate change, including agriculture, water, forestry, energy and urban planning. The National Water Mission (NWM) is one of the 8 Missions. The NWM under the NAPCC aims for conservation of water minimising wastage and ensuring equitable distribution across and within states through integrated water resources development and management. With this objective, the Mission has identified the following five outcomes:

1. Comprehensive water database in public domain and assessment of the impact of climate change on water resources
2. Promotion of citizen and state actions for water conservation, augmentation and preservation
3. Focused attention to vulnerable areas including over-exploited areas
4. Increase water use efficiency by 20% and
5. Promote basin level integrated water resources management

The water resources situation, its development, management and availability vary considerably from State to State. Many of the identified strategies/actions to achieve the goals of the National Water Mission are required to be adapted by the State Governments/Union Territories. In this context, State Specific Action Plans for Water Sector are developed and are aligned with the State Action Plan on Climate Change (SSAPCC) formulated by the States under NAPCC that provide a holistic roadmap to achieve the desired goals. The State Specific Action Plan for water sector would essentially consist of three outcome/reports. In view of this, The Advanced Centre for Integrated Water Resources Management (ACIWRM), Water Resource Department, Government of Karnataka invited Expression of Interests (EoIs) followed by a Call for Proposals from reputed firms/organisations to assign the preparation of Outcome 1. The objective of this assignment was, “Preparation of status report on present water resource development and management, water governance, institutional arrangements, water related policies, cross-boundary issues and agreements etc., of Karnataka State as a part of State Specific Action Plan on Climate Change for Water Sector under the National Water Mission’.
Public Affairs Centre (PAC) was selected and tasked with undertaking this assignment after winning a competitive bid. PAC entered into an agreement with ACIWRM to create this status report. PAC is a leading not-for-profit independent think tank based in Bangalore, dedicated to mobilizing a demand for good governance in India. PAC has designed a number of leading-edge tools in this regard and has also been at the fore of ground breaking advancements in electoral legislation in India. Our services have been sought internationally for projects by the World Bank, UK’s Department for International Development, Asian Development Bank and a host of other donors.

This status report includes a detailed study for understanding and presenting the current situation of the following in the state of Karnataka. Furthermore, this status report also includes the problems and issues related to all aspects of water resources specific to Karnataka.

1. Water resources development and management
2. Policy environment – National and State policies, programmes, institutional and governance frameworks, Water governance, Institutional arrangements
3. Trans-boundary disputes between Karnataka and neighbouring states

This status report is compiled by collecting secondary data primarily from the various state department websites and their annual reports. This status report draws the most recent relevant information from the Central and State Ministries/Departments/Agencies. The team members from the project also visited several government departments with regard to data collection which were not available on the respective websites of these departments. The District Irrigation Plans (DIPs) were also referred for various other data points related to administration, agriculture and agro-climatic information.

An assessment and comparative analysis of the Karnataka State Water Policy 2002, National Water Policy 2012 and the draft Karnataka State Water Policy 2016 is also done. A detailed analysis of the rules and institutions under each of the water related sectors was also undertaken. This Status report contains the latest district-wise statistics on administration, demography, agriculture, irrigation, meteorological parameters, number and type of industries, ground water and surface water in the State. It also includes assessment of gaps in potential created and utilisation of water resources in domestic, irrigation, public places, industries, etc. as reported in the DIPs of each district. An analysis of secondary data was undertaken at the district level. Post this analysis, some of the data points related to water resources like water demand and availability was aggregated at the river basin levels. The various data collected for creating this status report was converted into Tables/Figures and maps for easy understanding and inference. A draft report was shared with ACIWRM and the report was finalised after incorporating suggestions given by the ACIWRM team.
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<td>000s</td>
<td>30967</td>
<td>623122</td>
<td>4.97</td>
</tr>
<tr>
<td>3</td>
<td>Females</td>
<td>000s</td>
<td>30128</td>
<td>587448</td>
<td>5.13</td>
</tr>
<tr>
<td>4</td>
<td>Rural Population</td>
<td>000s</td>
<td>37469</td>
<td>833463</td>
<td>4.50</td>
</tr>
<tr>
<td>5</td>
<td>% of Rural Population</td>
<td></td>
<td>61.3</td>
<td>68.8</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>Urban Population</td>
<td>000s</td>
<td>23626</td>
<td>377106</td>
<td>6.27</td>
</tr>
<tr>
<td>7</td>
<td>% of Urban Population</td>
<td></td>
<td>38.7</td>
<td>31.2</td>
<td>-</td>
</tr>
<tr>
<td>8</td>
<td>Population density</td>
<td>per sq. km.</td>
<td>319</td>
<td>368</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>Rural Population density</td>
<td>per sq. km.</td>
<td>201</td>
<td>269</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>Urban Population density</td>
<td>per sq. km.</td>
<td>2003</td>
<td>3689</td>
<td>-</td>
</tr>
<tr>
<td>11</td>
<td>Sex Ratio</td>
<td>Females per 1000 Males</td>
<td>973</td>
<td>943</td>
<td>-</td>
</tr>
<tr>
<td>12</td>
<td>2001-2011 Decadal Growth of Population</td>
<td>Percent</td>
<td>15.6</td>
<td>17.7</td>
<td>-</td>
</tr>
<tr>
<td>13</td>
<td>Literacy Rate</td>
<td>Percent</td>
<td>75.4</td>
<td>73</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>Population of SC</td>
<td>000s</td>
<td>10474</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Population of /ST</td>
<td>000s</td>
<td>4248</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Total Workers</td>
<td>000s</td>
<td>27872.5</td>
<td>481743</td>
<td>5.79</td>
</tr>
<tr>
<td>17</td>
<td>Total Population involved in Agriculture</td>
<td>000s</td>
<td>13736.6</td>
<td>263022.5</td>
<td>5.22</td>
</tr>
<tr>
<td>18</td>
<td>Number of Households</td>
<td>000s</td>
<td>13357.03</td>
<td>249454.25</td>
<td>5.35</td>
</tr>
<tr>
<td></td>
<td>Land-use Classification - Karnataka (2014-15) &amp; India (2013-14)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Geographical Area</td>
<td>in million Hectares</td>
<td>19.05</td>
<td>28.73*</td>
<td>5.80</td>
</tr>
<tr>
<td>20</td>
<td>Forest</td>
<td>in million Hectares</td>
<td>3.07</td>
<td>71.83</td>
<td>4.28</td>
</tr>
<tr>
<td>21</td>
<td>Not available for cultivation</td>
<td>in million Hectares</td>
<td>2.25</td>
<td>43.86</td>
<td>5.13</td>
</tr>
<tr>
<td>22</td>
<td>Cultivable waste</td>
<td>in million Hectares</td>
<td>0.41</td>
<td>12.39</td>
<td>3.30</td>
</tr>
<tr>
<td>23</td>
<td>Uncultivated land</td>
<td>in million Hectares</td>
<td>1.18</td>
<td>13.45</td>
<td>8.78</td>
</tr>
<tr>
<td>24</td>
<td>Fallow land</td>
<td>in million Hectares</td>
<td>2.09</td>
<td>25.80</td>
<td>8.12</td>
</tr>
</tbody>
</table>

SSAPCC
<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Item</th>
<th>Unit</th>
<th>Karnataka</th>
<th>India</th>
<th>Karnataka's share</th>
</tr>
</thead>
<tbody>
<tr>
<td>25</td>
<td>Net Area sown</td>
<td>in million Hectares</td>
<td>10.044</td>
<td>140.71</td>
<td>7.14</td>
</tr>
<tr>
<td>26</td>
<td>Number of River Basins</td>
<td></td>
<td>7</td>
<td>25</td>
<td>-</td>
</tr>
<tr>
<td>27</td>
<td>Average Annual Rainfall</td>
<td>in mm</td>
<td>1125</td>
<td>1160</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Total Surface Water Availability (2015)</td>
<td>BCM</td>
<td>65.127</td>
<td>690</td>
<td>9.44</td>
</tr>
<tr>
<td>30</td>
<td>Existing Groundwater draft for all uses (2013)</td>
<td>BCM</td>
<td>9.76</td>
<td>253</td>
<td>3.86</td>
</tr>
<tr>
<td>31</td>
<td>Stage of Ground water development (%) (2013)</td>
<td></td>
<td>66</td>
<td>62</td>
<td>-</td>
</tr>
</tbody>
</table>

*Reporting Area for Land Utilisation Statistics is 307.80 million hectares*
Karnataka State Profile
1. Karnataka State Profile

The State of Karnataka is located within 11.5 degree North and 18.5 degree North latitudes and 74 degree East and 78.5 degree east longitudes. It is situated on a tableland where the Western and Eastern Ghat ranges converge into the Nilgiri hills, in the Western part of the Deccan Peninsular region of India. The State is bounded by Maharashtra and Goa States in the North and North-West; by the Arabian Sea in the West; by Kerala and Tamil Nadu States in the South and by the States of Andhra Pradesh and Telangana in the East. Karnataka extends to about 750 km from North to South and about 400 km from East to West.

The state has a total land area of 1,91,791 sq.km, accounting for 5.83% of the total area of the country (32.88 lakh sq. km) and ranks eighth among major States in terms of size. As per 2011 Census, the State's population was 611 lakhs (approximately). There are 968 females per thousand population. Karnataka occupies ninth place with regard to population and the density of population as per 2011 Census was 319 persons per sq. km which was lower than the all-India density of 382. Karnataka State has been divided into four Revenue divisions, 49 sub-divisions, 30 districts, 177 taluks for administrative purposes. The State has 27,028 inhabited and 2,362 uninhabited villages, and 281 (241 Municipalities) towns and urban agglomerations. Bangalore is the sixth largest urban agglomeration out of 23 metropolis, urban agglomerations and cities in India.

The jurisdictions of the Revenue Divisions are as follows:

<table>
<thead>
<tr>
<th>Name of the Revenue Division</th>
<th>Location of RDCs</th>
<th>District under Jurisdiction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangalore</td>
<td>Bangalore</td>
<td>Bangalore Urban, Bangalore Rural, Chikballapura, Chitradurga, Davangere, Kolar, Ramanagar, Shivar, Tumakuru</td>
</tr>
<tr>
<td>Mysore</td>
<td>Mysore</td>
<td>Chamarajanagar, Chikmagalur, Dakshin Kannada, Hassan, Kodagu, Mandya, Mysore, Udupi</td>
</tr>
<tr>
<td>Belagavi</td>
<td>Belagavi</td>
<td>Bagalkot, Belagavi, Vijayapura, Dharwad, Gadag, Haven, Uttara Kannada</td>
</tr>
<tr>
<td>Kalaburgi</td>
<td>Kalaburgi</td>
<td>Bellary, Bidar, Kalaburgi, Koppal, Raichur, Yadgir</td>
</tr>
</tbody>
</table>

Table 2: Revenue Division of Karnataka
Figure 1: Revenue Map of Karnataka

1.1
Demographic Profile

Karnataka ranks ninth in terms of population in India. The population density of the state is 319 per sq. km. The decadal growth rate of Karnataka’s population is 15.7%. Karnataka’s population was recorded as 61.13 million as per 2011 Census of India. Out of this, 61.43% reside in rural areas. The sex ratio for the state is 973 which is higher than the all-India average of 940. The sex ratio for rural Karnataka is 979 while for urban Karnataka it is 963.

The child sex ratio for Karnataka stands at 948. This Figure is again higher than the national average of 914. The overall literacy rate for the state of Karnataka is 75.4%. The male literacy rate is 82.47%. The female literacy rate stands at 68.08%.

Figure 2: District Total Population map of Karnataka

Source: Census of India (2011)
**Figure 3: District-wise Urban Population of Karnataka**

District-Wise Urban Population- Karnataka

Legend
Urban Population (in lakhs)
District
- 0.00 - 2.00
- 2.00 - 4.00
- 4.00 - 6.00
- 6.00 - 8.00
- 8.00 - 10.00
- 10.00 - 13.00
- 13.00 - 88.00

Source: Census of India (2011)

**Figure 4: District-wise Rural Population of Karnataka**

District-wise Rural Population- Karnataka

Legend
Rural Population (in lakhs)
District
- 4.00 - 8.00
- 8.00 - 10.00
- 10.00 - 12.00
- 12.00 - 14.00
- 14.00 - 16.00
- 16.00 - 18.00
- 18.00 - 21.00
- 21.00 - 36.00

Source: Census of India (2011)
1.2 Climate Profile

The state is located on the western coast of India, and gets most of the precipitation from the southwest monsoon. The state experiences three types of climate: arid, semi-arid and humid tropical. The climate changes from place to place due to the region’s altitude, topography and distance from the sea. The State enjoys three distinct climates varying with the seasons. The winter season from January to February is followed by summer season from March to May. The period of June to September is the active South-West monsoon for the state. The period from October to December forms the post-monsoon season. The period from October to March, covering the post-Monsoon and winter seasons, is generally pleasant over the entire State except during a few spells of rain associated with north-east monsoon which affects the south-eastern parts of the State during October to December. The months April and May are hot, very dry and generally uncomfortable. The weather tends to be oppressive during June due to high humidity and temperature. July, August and September are somewhat comfortable due to reduced day temperature although the humidity continue to be very high.

1.3 Rainfall

The state receives the benefit of two monsoons: the South-West monsoon and the North-East monsoon. Karnataka receives mean annual rainfall of around 1,355 millimeters (mm). More than 80% of this rainfall is received due to the South-West monsoon. The state can be earmarked into three meteorological zones, namely, North interior Karnataka, South interior Karnataka and coastal Karnataka. The occurrence and distribution of rainfall in the state is not uniform. The region that receives the maximum rainfall is coastal Karnataka. It gets an average annual rainfall of 3,456 mm. South interior Karnataka receives only 1286 mm average rainfall while North interior Karnataka receives the least rainfall with 731 mm average annually. The southwest monsoon brings maximum rainfall to the state. The district of Udupi gets the highest average rainfall while districts such as Chitradurga, Koppal and Vijayapura receive the lowest rainfall. The annual rainfall in the state varies roughly from 50 to 350 cm. In the districts of Vijayapura, Raichur, Bellary and Southern half of Kalaburgi, the rainfall is the lowest varying from 50 to 60 mm, because the north interior region falls in the rain shadow area. The South-West monsoon is the principal rainy season during which the State receives 80% of its rainfall. Rainfall in the winter season (January to February) is less than one percent of the annual total and in the hot season (March to May) about 70% and in the post-monsoon season is about 12%.

<table>
<thead>
<tr>
<th>Months</th>
<th>Seasons</th>
<th>% of rainfall received</th>
</tr>
</thead>
<tbody>
<tr>
<td>June – September</td>
<td>South West monsoon</td>
<td>80%</td>
</tr>
<tr>
<td>October- December</td>
<td>Post monsoon (North East monsoon or Retreating South west monsoon)</td>
<td>12%</td>
</tr>
<tr>
<td>January- February</td>
<td>Winter</td>
<td>1%</td>
</tr>
<tr>
<td>March-May</td>
<td>Summer</td>
<td>7%</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>
Figure 5: Karnataka District-wise Average Annual Rainfall (in mm)

Karnataka : District Wise Average Annual Rainfall (in mm)

Legend
Average Rainfall (in mm)
District
- 0 - 600
- 600 - 750
- 750 - 1000
- 1000 - 2500
- 2500 - 5000

Source: Advanced Centre for Integrated Water Resources Management, Bengaluru, Karnataka.

Figure 6: Average annual rainfall in mm (1986 to 2015)
Table 4: District-wise Annual Average Rainfall data (1986 to 2015)

<table>
<thead>
<tr>
<th>Districts</th>
<th>Average Annual Rainfall (in mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bellary</td>
<td>531</td>
</tr>
<tr>
<td>Dharwad</td>
<td>574</td>
</tr>
<tr>
<td>Chitradurga</td>
<td>584</td>
</tr>
<tr>
<td>Yadgur</td>
<td>588</td>
</tr>
<tr>
<td>Bagalkote</td>
<td>594</td>
</tr>
<tr>
<td>Gadag</td>
<td>606</td>
</tr>
<tr>
<td>Koppar</td>
<td>623</td>
</tr>
<tr>
<td>Vijayapura</td>
<td>630</td>
</tr>
<tr>
<td>Davanagere</td>
<td>648</td>
</tr>
<tr>
<td>Raichur</td>
<td>664</td>
</tr>
<tr>
<td>Haveni</td>
<td>707</td>
</tr>
<tr>
<td>Tumkur</td>
<td>721</td>
</tr>
<tr>
<td>Chikkaballapur</td>
<td>726</td>
</tr>
<tr>
<td>Kalaburgi</td>
<td>728</td>
</tr>
<tr>
<td>Bangalore (Urban)</td>
<td>730</td>
</tr>
<tr>
<td>Mandya</td>
<td>767</td>
</tr>
<tr>
<td>Mysuru</td>
<td>780</td>
</tr>
<tr>
<td>Bangalore (Rural)</td>
<td>793</td>
</tr>
<tr>
<td>Chamrajnagar</td>
<td>795</td>
</tr>
<tr>
<td>Bidar</td>
<td>839</td>
</tr>
<tr>
<td>Belagavi</td>
<td>842</td>
</tr>
<tr>
<td>Kolar</td>
<td>844</td>
</tr>
<tr>
<td>Ramanagar</td>
<td>857</td>
</tr>
<tr>
<td>Hassan</td>
<td>899</td>
</tr>
<tr>
<td>Karnataka State Average</td>
<td>1125</td>
</tr>
<tr>
<td>Shivamogga</td>
<td>1570</td>
</tr>
<tr>
<td>Kodagu</td>
<td>1859</td>
</tr>
<tr>
<td>Chikkamagaluru</td>
<td>2240</td>
</tr>
<tr>
<td>Uttara Kannada</td>
<td>2539</td>
</tr>
<tr>
<td>Dakshina Kannada</td>
<td>3521</td>
</tr>
<tr>
<td>Udupi</td>
<td>4893</td>
</tr>
</tbody>
</table>

1.4 Agro Climatic Zone

Karnataka lies in 10 different agro-climatic zones, the details of which can be seen in Figure 7 and Table 5.
Figure 7: Karnataka Agro climatic Zone Map
Table 5: Agro climatic zones of Karnataka

<table>
<thead>
<tr>
<th>Zone No. &amp; Name</th>
<th>Geographic area (lakh hectares)</th>
<th>Geographic area (lakh hectares)</th>
<th>% of Geographic Area</th>
<th>District</th>
<th>Rainfall (mm)</th>
<th>Soil Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. North Eastern Transition Zone</td>
<td>871036</td>
<td>8.71</td>
<td>5</td>
<td>Bidar (5) &amp; Kalaburgi (2)</td>
<td>830-890</td>
<td>Major- clay, Minor- Laterite</td>
</tr>
<tr>
<td>2. North Eastern Dry Zone</td>
<td>1762604</td>
<td>17.63</td>
<td>9</td>
<td>Kalaburgi(5) Yadgir (3) &amp; Raichur (3)</td>
<td>633.2-806.6</td>
<td>Major- deep black clay, Minor- Medium black</td>
</tr>
<tr>
<td>3. Northern Dry Zone</td>
<td>4783642</td>
<td>47.84</td>
<td>25</td>
<td>Koppal (4), Gadag (4), Dharwad (1), Belagavi (5), Vijayapura (5), Bagalkot (6), Bellary (7), Davangere (1), Raichur (2)</td>
<td>464.5-785.7</td>
<td>Major- shallow to deep black clay</td>
</tr>
<tr>
<td>4. Central Dry Zone</td>
<td>1943830</td>
<td>19.44</td>
<td>10</td>
<td>Chitradurga (6), Davangere (3), Tumkur (6), Chikkamagalur (1), Hassan (1)</td>
<td>453.5-717.7</td>
<td>Major- red sandy loams Minor- shallow to deep black clay</td>
</tr>
<tr>
<td>5. Eastern Dry Zone</td>
<td>1808217</td>
<td>18.08</td>
<td>9</td>
<td>Bangalore Rural (4), Ramanagar (4), Bangalore Urban (3), Kolar (5), Chikkaballpur (6) Tumkur (2)</td>
<td>679.1-888.9</td>
<td>Major- red loamy Minor- lateritic</td>
</tr>
<tr>
<td>6. Southern Dry Zone</td>
<td>1739430</td>
<td>17.39</td>
<td>9</td>
<td>Mysuru (4), Chamarajnagar (4), Mandya (7), Tumkur (2), Hassan (2)</td>
<td>670.6-888.6</td>
<td>Major- Red sandy loam Minor- red loamy</td>
</tr>
<tr>
<td>7. Southern Transition Zone</td>
<td>1218029</td>
<td>12.18</td>
<td>6</td>
<td>Hassan (4), Chikkamagalur (1), Shivamogga (3), Mysore (3), Davanagere</td>
<td>611.7-1053.9</td>
<td>Major- Red sandy loam Minor- red loamy</td>
</tr>
</tbody>
</table>
There are different types of soils in Karnataka. Six broad groups of soil orders are identified, based on differences in soil formation processes, as reflected in the nature and sequence of soil horizons. Black soils are predominantly found in northern Karnataka whereas red and red loamy soils are prominent in southern Karnataka. Laterite soils are found in Malnad and coastal areas of the state (Table 6). A brief description of the properties of these soil groups, along with their distribution across districts of Karnataka, is presented in Table 6.
Table 6: Type of Soils in Karnataka

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Properties</th>
<th>District wise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black Soil</td>
<td>In texture, soil varies from loam to clays. Generally, they are neutral to alkaline in reaction, calcareous and well supplied with bases such as Calcium, Magnesium, and Potassium. Black soils are known to get self-ploughed due to their swelling and shrinking properties with changes in moisture content.</td>
<td>Districts are Belagavi, Vijayapura, Kalaburgi and Bidar, also parts of Raichur, Chitradurga and Bellary</td>
</tr>
<tr>
<td>Laterite Soil</td>
<td>Laterite soils result from advanced stages of weathering; highly leached, they are poor in bases and very acidic in reaction. The moisture retentivity of the soil is very poor; soil contains adequate quantities of organic matter.</td>
<td>Malnad and coastal areas of Uttara Kannada, Dakshin Kannada and parts of Dharwad, Chikmagalur,</td>
</tr>
<tr>
<td>Red and Red Loamy Soil</td>
<td>They are light textured, from sandy to gravelled or loamy, with poor aggregating ability. They are poor in bases and acidic to neutral in reaction.</td>
<td>Shivamogga, Chikmagalur, Hassan, Mysuru and Kodagu</td>
</tr>
<tr>
<td>Coastal Alluvials</td>
<td>The surface soil is generally grey, yellow or light brown; the intensity of the colour increases with depth. The soils are acidic in nature, low in cation exchange capacity and bases.</td>
<td>Dakshin Kannada, and Uttara Kannada</td>
</tr>
<tr>
<td>Dark Brown Clayey Soil</td>
<td>They are clayey, low in bases, rich in organic matter as the surface soil receives the decomposition product of the virgin forest</td>
<td>Dakshin Kannada, Uttara Kannada, Kodagu &amp; Mysore</td>
</tr>
<tr>
<td>Mixed Red and Black Soil</td>
<td>Black soil seen in the low land and valleys has properties resembling those of medium black soil. Soils are productive under good management practices</td>
<td>Raichur, Bellary and Chitradurga</td>
</tr>
</tbody>
</table>
Figure 8: Soil texture Map of Karnataka
1.6 Geology

The geology of Karnataka lies widespread across 5 major eras, namely the Archean, Proterozoic, Mesozoic and the Cenozoic, but is largely confined to the two oldest eras; the Archean and the Proterozic. The rest of the great periods from Cambrian to recent are hardly represented but for minor sediments of recent age exposed along the coastal margin to the West. A substantial part of North Karnataka is covered by the Deccan trap, representing phenomenal outburst of volcanic activity at the dawn of the Cenozoic era. The state has exposed oldest rocks in Gorur area, Hassan district, Karnataka, that date back to about 3300 million years. The Precambrian craton (ca.) of Karnataka is made up of western and eastern segments. The Precambrians of Karnataka have been divided into older Sargur supracrustals (about 3300 to 3000 million-year-old) and younger Dharwar supracrustals (about 3000 to 2600 million-year-old. The Dharwar supracrustals Supergroup has been further divided into older Bababudan Group (ca.3000 to 2700 million years) and younger Chitradurga Group (ca.2700 to 2500 million years). The schist belts of the Eastern craton, like Kolar, Hutti, Sandur etc., appear to be approximately equivalent to the Chitradurga Group. The Karnataka craton has been extensively intruded by granites and granitoids of the ca. age 2600 to 2500 million years. The eastern Karnataka abounds in these granites and granitoids. The northern part of Karnataka is made up of Kaladgi and Badami and Bhima Group of sediments, approximately of Proterozoic age. Further north the terrain is covered by extensive volcanic flows known as Deccan traps of Cretaceous - Tertiary age¹.

¹ National Institute of Disaster Management
Figure 9: Karnataka State Geological Map
1.7 Agriculture Profile

Agriculture is a major occupation for most people in rural Karnataka. About 61% of the people live in the villages and 71% of the total work force is engaged in agriculture. About 123,100 sq. km of land is cultivated in Karnataka. This is about 64% (Department of Agriculture, 2014-15) of the total geographical area of the state. Agriculture in Karnataka is heavily dependent on the southwest monsoon. Out of the total 64% geographical area under cultivation only 26.5% of the sown area (30,900 km²) is under irrigation. The major crops grown in the state are cereals, pulses, oilseeds and cash crops. Ragi, paddy, maize, jowar, and bajra are the major food crops grown in Karnataka.

Karnataka is the largest producer of coffee, raw silk and sandalwood based products like perfumes and 75% of Indian floriculture industry is located in Karnataka. Sandalwood comes from the dense forested areas of southern Karnataka. The lower slopes of the Western Ghats in Kodagu District, Chikmagalur District and Hassan District produce coffee. Mysuru District is the primary producer of raw silk in India and the world-famous Mysore silk saris which are manufactured at the Mysore silk factories. The main oil seed crops in the state are sunflower, safflower, ground nut and sesame. Important crop exports from the state include coffee, tea and mango. The state accounts for 59% of the country’s coffee production which are cultivated on the lower slopes of the Western Ghats. Karnataka produces 47% of the country’s ragi production and more than 55% of the raw silk produced in the country.

Water rich areas of Mandya District, Shivamogga District, Dakshina Kannada districts produce most of the sugarcane crop in Karnataka. Jute, jowar, bajra, and pulses (tur and gram) and oil seeds are largely grown in the drier areas of northern and north-central Karnataka. Cotton is grown in abundance in the districts of Kalaburgi and Davangere, and are seen as centres of cotton trade and industry.

Agriculture remains the primary activity and main source of livelihood for the rural population in the state. It is characterised by wide crop diversification and remains highly dependent on the vagaries of the southwest monsoon. During 2010-11, food grain production in the state increased at an enormous rate of more than 14% over the previous year and this increase was mainly led by an increase in yield as the area increase during the year was only 2.9%. Agriculture contributed 13.5% (at constant prices) to the state’s GSDP in 2011-12. There has been a decline in GSDP generated from the agricultural sector and consequently, the SDP per worker in the sector has been declining at a faster rate in the recent past when compared to the last decade. The share of primary sector has declined from 14.5 % in 2011-12 to 11.79% in 2015-16.
1.8 Land-use Pattern

Land is a finite resource and its demand for diverse purposes is increasing day by day. There are large areas of utilisable but wasteland resources. Moreover, the pressure of commercialisation is increasingly forcing out productive land resources for non-agricultural uses. Considering the importance of land-use, the Government of Karnataka brought out a document on land-use policy in 2003. The analysis of land-use data from 1966 to 2009 indicates structural changes in land-use pattern. Areas under permanent pasture decreased consistently and areas under non-agricultural uses increased sharply during the past four decades. Fallow land, which was around 11 lakh ha, increased to 13.50 lakh ha after the mid-nineties. Fallow land area fluctuates from year to year; in certain years (like 1998-99, 1990-2000, 2001-02, 2006-07 and 2008-09), the percentage reached above 10 per cent of the total (190.50 lakh ha) geographical area of the state. This was mainly because of deficient rainfall and the inability of the government to provide irrigation facilities during this time. The net sown area also started shrinking after the 1990s. The net sown area, which accounted for 55.77% of the total geographical area of the state in the triennium ending 1988, decreased to 54.28% during the triennium 2007-09. The interpretation of this data is difficult due to many factors like illegal encroachments and changing land-use due to population pressure and market forces (GoI, 2004).

As can be seen in Figure 10, the net sown area has further declined to 52.72%. The cropping intensity in the state for the year 2014-15 was reported as 121%.
It is interesting to note that the number of small and marginal holdings as well as their share in the total operated area is increasing over the years. The increase in small and marginal holdings and areas operated became more conspicuous after 2000-01. Small and marginal farmers (operating < 2 ha) account for 76% of the holdings and share roughly 37% of the operated area in Karnataka. The average size of operated area of all the land size classes is declining. This clearly indicates the increasing fragmentation of land holdings in the state.

1.9 Land Holding
**Table 9: Trends in land holding patterns in Karnataka**

<table>
<thead>
<tr>
<th>Year</th>
<th>Marginal Farmers (Below 1 ha.)</th>
<th>Small Farmers (1 to 2 ha.)</th>
<th>Semi-med. Farmers (2 to 4 ha.)</th>
<th>Medium farmers (4 to 10 ha.)</th>
<th>Large farmers (10 ha. and above.)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Area</td>
<td>No.</td>
<td>Area</td>
<td>No.</td>
<td>Area</td>
</tr>
<tr>
<td>2000-01</td>
<td>3351928</td>
<td>1482332</td>
<td>1909263</td>
<td>2741866</td>
<td>1259460</td>
<td>3428650</td>
</tr>
<tr>
<td>(%)</td>
<td>45.94</td>
<td>12.13</td>
<td>26.97</td>
<td>22.28</td>
<td>17.79</td>
<td>27.66</td>
</tr>
<tr>
<td>Average</td>
<td>Holding</td>
<td>Size</td>
<td>-</td>
<td>0.45</td>
<td>1.44</td>
<td>-</td>
</tr>
<tr>
<td>2005-06</td>
<td>2653882</td>
<td>1651491</td>
<td>2012198</td>
<td>2075807</td>
<td>1278210</td>
<td>3466133</td>
</tr>
<tr>
<td>(%)</td>
<td>48.23</td>
<td>13.33</td>
<td>26.56</td>
<td>23.22</td>
<td>16.88</td>
<td>28.00</td>
</tr>
<tr>
<td>Average</td>
<td>Holding</td>
<td>Size</td>
<td>-</td>
<td>0.45</td>
<td>1.43</td>
<td>-</td>
</tr>
<tr>
<td>2010-2011</td>
<td>2848134</td>
<td>1850946</td>
<td>2138208</td>
<td>3020002</td>
<td>1286829</td>
<td>3393036</td>
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<tr>
<td>(%)</td>
<td>49.14</td>
<td>15.22</td>
<td>27.30</td>
<td>24.83</td>
<td>16.17</td>
<td>27.90</td>
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<tr>
<td>Average</td>
<td>Holding</td>
<td>Size</td>
<td>-</td>
<td>0.48</td>
<td>1.41</td>
<td>-</td>
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</table>

1.10 Irrigation Profile
Irrigation plays an important role in improving production and productivity of agriculture. It facilitates adoption of improved technologies and increases cropping intensity thereby making optimum use of a finite resource i.e., land. There has been a gradual increase in the irrigated areas in the state. The gross irrigated area has increased steadily from 9.06 lakh ha during 1960-63 to 27.45 lakh ha during 1990-93 and touched 41.87 lakh ha for the triennium ending 2008-11. The net irrigated area is 34.90 lakh ha at the triennium ending 2008-11 when compared to 22.05 lakh ha during 1990-93.

Among the irrigation sources, canals and tanks were the major sources of irrigation till the 1980s. However, the share of tube/bore-wells in the total irrigated area started increasing phenomenally after early 1990s. In 2008-11, the net area irrigated by tube/bore wells accounted for 36.29% of the total net irrigated area in Karnataka as against 32.84% covered by canal irrigation. The following Figure shows that the share of tube/bore wells in the total irrigated area has increased up to 39.31%. Canals (33.96%) remain the second major source of irrigation followed by wells (10.07%).

Figure 11: Source-wise irrigation in Karnataka (%)
Figure 12: District-wise sources of irrigation (%), 2015
Table 10: Source-wise irrigated area in Karnataka (District-wise) 2014-2015

<table>
<thead>
<tr>
<th>District</th>
<th>Canals</th>
<th>Tanks</th>
<th>Wells</th>
<th>Tube/Bore wells</th>
<th>Lift Irrigation</th>
<th>Other Sources</th>
<th>Total Gross Irrigated Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bagalkote</td>
<td>54685</td>
<td>0</td>
<td>7675</td>
<td>110173</td>
<td>2544</td>
<td>123321</td>
<td>298398</td>
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<tr>
<td>Bangalore (Urban)</td>
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<td>0</td>
<td>0</td>
<td>12067</td>
<td>0</td>
<td>0</td>
<td>12067</td>
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<tr>
<td>Bangalore (Rural)</td>
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<td>0</td>
<td>0</td>
<td>25538</td>
<td>43</td>
<td>0</td>
<td>25581</td>
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<tr>
<td>Belagavi</td>
<td>86300</td>
<td>341</td>
<td>164749</td>
<td>174635</td>
<td>18990</td>
<td>144493</td>
<td>589508</td>
</tr>
<tr>
<td>Bellary</td>
<td>134600</td>
<td>2452</td>
<td>4356</td>
<td>94848</td>
<td>44005</td>
<td>10368</td>
<td>290629</td>
</tr>
<tr>
<td>Bidar</td>
<td>35</td>
<td>0</td>
<td>19287</td>
<td>24833</td>
<td>0</td>
<td>204</td>
<td>44359</td>
</tr>
<tr>
<td>Vijayapura</td>
<td>136414</td>
<td>1506</td>
<td>77624</td>
<td>119824</td>
<td>1989</td>
<td>17115</td>
<td>354472</td>
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<tr>
<td>Chamarajanagar</td>
<td>18660</td>
<td>3322</td>
<td>2340</td>
<td>38529</td>
<td>0</td>
<td>0</td>
<td>62851</td>
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<tr>
<td>Chikkaballapur</td>
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<td>0</td>
<td>54787</td>
<td>0</td>
<td>0</td>
<td>54787</td>
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<tr>
<td>Chikkamagalur</td>
<td>9710</td>
<td>7504</td>
<td>179</td>
<td>30614</td>
<td>88</td>
<td>14018</td>
<td>62113</td>
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<td>Chitradurga</td>
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<td>102896</td>
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<td>0</td>
<td>103686</td>
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<tr>
<td>Dakshina Kannada</td>
<td>0</td>
<td>0</td>
<td>42624</td>
<td>16741</td>
<td>129</td>
<td>22815</td>
<td>82309</td>
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<tr>
<td>Davanagere</td>
<td>125801</td>
<td>2342</td>
<td>1080</td>
<td>106716</td>
<td>12632</td>
<td>2431</td>
<td>251002</td>
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<tr>
<td>Dharwad</td>
<td>28261</td>
<td>0</td>
<td>0</td>
<td>27859</td>
<td>0</td>
<td>0</td>
<td>56120</td>
</tr>
<tr>
<td>Gadag</td>
<td>36490</td>
<td>260</td>
<td>349</td>
<td>49919</td>
<td>0</td>
<td>16424</td>
<td>103442</td>
</tr>
<tr>
<td>Kalaburgi</td>
<td>40279</td>
<td>878</td>
<td>18090</td>
<td>60227</td>
<td>10322</td>
<td>3007</td>
<td>132803</td>
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<tr>
<td>Hassan</td>
<td>47045</td>
<td>24384</td>
<td>709</td>
<td>40064</td>
<td>0</td>
<td>4362</td>
<td>116564</td>
</tr>
<tr>
<td>Haveri</td>
<td>5456</td>
<td>10506</td>
<td>22</td>
<td>81175</td>
<td>847</td>
<td>22822</td>
<td>120828</td>
</tr>
<tr>
<td>Kodagu</td>
<td>1226</td>
<td>50</td>
<td>0</td>
<td>195</td>
<td>85</td>
<td>81</td>
<td>1637</td>
</tr>
<tr>
<td>Kolar</td>
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<td>0</td>
<td>0</td>
<td>26144</td>
<td>0</td>
<td>0</td>
<td>26144</td>
</tr>
<tr>
<td>Koppal</td>
<td>65403</td>
<td>164</td>
<td>0</td>
<td>114972</td>
<td>343</td>
<td>0</td>
<td>180882</td>
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<tr>
<td>Mandya</td>
<td>105188</td>
<td>18563</td>
<td>9525</td>
<td>18832</td>
<td>429</td>
<td>1692</td>
<td>154229</td>
</tr>
<tr>
<td>Mysuru</td>
<td>99097</td>
<td>18545</td>
<td>18210</td>
<td>34471</td>
<td>215</td>
<td>0</td>
<td>170538</td>
</tr>
<tr>
<td>Raichur</td>
<td>215215</td>
<td>257</td>
<td>501</td>
<td>30881</td>
<td>12066</td>
<td>0</td>
<td>258920</td>
</tr>
<tr>
<td>Ramanagar</td>
<td>9312</td>
<td>2076</td>
<td>0</td>
<td>29451</td>
<td>463</td>
<td>0</td>
<td>41302</td>
</tr>
<tr>
<td>Shimoga</td>
<td>56591</td>
<td>56948</td>
<td>6828</td>
<td>43878</td>
<td>4837</td>
<td>5433</td>
<td>174515</td>
</tr>
<tr>
<td>Tumkurur</td>
<td>4199</td>
<td>9993</td>
<td>940</td>
<td>148776</td>
<td>0</td>
<td>0</td>
<td>163908</td>
</tr>
<tr>
<td>Udupi</td>
<td>0</td>
<td>453</td>
<td>26465</td>
<td>520</td>
<td>2226</td>
<td>3978</td>
<td>33642</td>
</tr>
<tr>
<td>Uttara Kannada</td>
<td>0</td>
<td>6132</td>
<td>10435</td>
<td>8840</td>
<td>669</td>
<td>14349</td>
<td>40425</td>
</tr>
<tr>
<td>Yadgir</td>
<td>140848</td>
<td>3525</td>
<td>9371</td>
<td>17071</td>
<td>3358</td>
<td>4347</td>
<td>178520</td>
</tr>
</tbody>
</table>

District Wise Total Gross Irrigated Area (in hectares)-
2014-15

Source: Annual Season & Crop Statistics Report
Figure 14: District-wise Gross irrigated by Tube/Bore wells in Karnataka

Gross Irrigated Area by Tube/Bore Wells-Karnataka-(2014-15)

Legend
Tube/Bore Wells (in hectares)
District
- 195 - 1000
- 1000 - 10000
- 10000 - 25000
- 25000 - 30000
- 30000 - 40000
- 40000 - 50000
- 50000 - 100000
- 100000 - 120000
- 120000 - 180000

Figure 15: District-wise gross irrigated area by Tanks in Karnataka

Gross Irrigated Area by Tanks- Karnataka-
(2014-15)

Legend
Tanks (in hectares)
District
- 0 - 0 Not irrigated by tanks
- 0 - 500
- 500 - 1500
- 1500 - 3500
- 3500 - 7500
- 7500 - 11000
- 11000 - 20000
- 20000 - 25000
- 25000 - 57000

Figure 16: District-wise gross irrigated area by Canals in Karnataka

Gross Irrigated Area by Canals- Karnataka-(2014-15)

Legend
Canals (in hectares)

- 0 - 0 No canal irrigation
- 0 - 50000
- 50000 - 100000
- 100000 - 150000
- 150000 - 200000
- 200000 - 250000

Figure 17: District-wise gross irrigated area by Lift-Irrigation in Karnataka

Gross Irrigated Area by Lift Irrigation-
Karnataka-(2014-15)

Legend
Lift irrigation (in hectares)
District
- 0 - 0  No lift irrigation
- 0 - 500
- 500 - 1000
- 1000 - 5000
- 5000 - 10000
- 10000 - 15000
- 15000 - 20000
- 20000 - 45000

Gross Irrigated Area by Other Sources of Irrigation (includes temporary irrigation)- Karnataka-(2014-15)

Legend
Other Sources of Irrigation (in hectares)

<table>
<thead>
<tr>
<th>District</th>
<th>Coverage</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 0 No other sources of irrigation</td>
<td></td>
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<tr>
<td>0 - 1700</td>
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<tr>
<td>1700 - 5000</td>
<td></td>
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<td>5000 - 17000</td>
<td></td>
</tr>
<tr>
<td>17000 - 100000</td>
<td></td>
</tr>
<tr>
<td>100000 - 150000</td>
<td></td>
</tr>
</tbody>
</table>

1.11 Hydro-power

Karnataka has been a pioneer in the power sector having established the first hydel generating station at Shivanasamudram in 1902. Karnataka had the longest transmission line in the world in 1902, from Shivanasamudram to KGF, covering a distance of 147 km. and it was the first state in the country to conceive and set up a professionally managed Corporation to plan, construct, operate and maintain power generation projects in the state. The total installed generating capacity of the state has been 14327.725 MW of which hydro contributed 6498. Karnataka state is endowed with hydro power potential estimated to be about 7000MW².

Currently, the state of Karnataka has over 110 major and minor hydroelectric power stations built over the seven river basins. These power stations are owned and operated by both the private and the public sector. The two main authorities that own and operate hydroelectric power stations under the public sector are:

a. Karnataka Power Corporation Limited – Deals with Hydel stations with capacity more than 25MW (Large Hydro) and a few Small Hydros.

b. Karnataka Renewable Energy Development Limited - Deals with Hydel stations with capacity 20MW to 25MW (Small Hydro)

2 KREDL Website [http://kredlinfo.in/projhydro.aspx](http://kredlinfo.in/projhydro.aspx) (accessed on 9/1/17)
Karnataka Power Corporation Limited (KPCL)

Karnataka Power Corporation Limited is owned by the Government of Karnataka, and is engaged in the service of generating electrical power in the state of Karnataka in India. The modes for generation of electric power are hydroelectric, thermal and diesel. The company was started in 1970 as the Karnataka government envisaged separate entities for generation and distribution of electric power.

Figure 20: Total Number of Hydropower projects under KPCL
Table 11: List of Completed Hydro and Thermal Power Projects under KPCL

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Power Stations</th>
<th>Units x MW</th>
<th>Installed Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Hydro electric projects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Cauvery River Projects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Sir Sheshadari Iyer Hydro Electric Station</td>
<td>4x6</td>
<td>42.00</td>
</tr>
<tr>
<td></td>
<td>(Shivanasamudram)</td>
<td>6x3</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Sharavathy River Project</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Linganamakki Dam Powerhouse</td>
<td>2x27.5</td>
<td>55.00</td>
</tr>
<tr>
<td>3.</td>
<td>Mahatma Gandhi Hydro Electric Station</td>
<td>4x21.6</td>
<td>139.20</td>
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<td></td>
<td>4x13.2</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>Sharavathy Generating Station</td>
<td>10x103.5</td>
<td>1035.00</td>
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<tr>
<td>5.</td>
<td>Gerusoppa Dam Powerhouse</td>
<td>4x60</td>
<td>240.00</td>
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<td></td>
<td><strong>Kali River Projects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td>Supa Dam Powerhouse</td>
<td>2x50</td>
<td>100.00</td>
</tr>
<tr>
<td>7.</td>
<td>Nagjari Powerhouse</td>
<td>5x50+1x135</td>
<td>885.00</td>
</tr>
<tr>
<td>8.</td>
<td>Kadra Dam Powerhouse : 3x50 = 150</td>
<td>3x50</td>
<td>150.00</td>
</tr>
<tr>
<td>9.</td>
<td>Kodasalli Dam Powerhouse : 3x40 = 120</td>
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<tr>
<td></td>
<td><strong>Varahi River Projects</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Varahi UGPH: 4x115 = 460</td>
<td>4x115</td>
<td>460.00</td>
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<td></td>
<td><strong>Krishna Basin Projects</strong></td>
<td></td>
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<tr>
<td>11.</td>
<td>Almatti Dam Powerhouse</td>
<td>1x15</td>
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<td>12.</td>
<td>Ghataprabha Dam Powerhouse</td>
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<td>13.</td>
<td>Bhadra Right Bank Canal Powerhouse</td>
<td>1x7.2</td>
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<td>14.</td>
<td>Bhadra Left Bank Canal Powerhouse</td>
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<td>1x2</td>
<td></td>
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<td>15.</td>
<td>Munirabad Powerhouse</td>
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<td></td>
<td>(Tungabhadra River Basin)</td>
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</table>
### MINI HYDRO PROJECTS

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Power Stations</th>
<th>Units x MW</th>
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<tr>
<td>16.</td>
<td>Shimsha Hydro Electric Station (Cauvery Basin)</td>
<td>2x8.6</td>
<td>17.20</td>
</tr>
<tr>
<td>17.</td>
<td>Mani Dam Powerhouse (West flowing rivers from Tadri to Kanyakumari)</td>
<td>2x4.5</td>
<td>9.00</td>
</tr>
<tr>
<td>18.</td>
<td>Mallapur Mini Hydel Scheme (Krishna Basin)</td>
<td>2x4.5</td>
<td>9.00</td>
</tr>
<tr>
<td>19.</td>
<td>Sirwar Mini Hydel Scheme (Krishna Basin)</td>
<td>1x1</td>
<td>1.00</td>
</tr>
<tr>
<td>20.</td>
<td>Kalmala Mini Hydel Scheme (Krishna Basin)</td>
<td>1x0.40</td>
<td>0.40</td>
</tr>
<tr>
<td>21.</td>
<td>Ganekal Mini Hydel Scheme (Krishna Basin)</td>
<td>1x0.35</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>36.95</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL HYDRO</strong></td>
<td><strong>3652.35</strong></td>
<td></td>
</tr>
</tbody>
</table>

### THERMAL STATIONS

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Power Stations</th>
<th>Units x MW</th>
<th>Installed Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Raichur Thermal Power Station 1 to 7 Unit</td>
<td>7x210</td>
<td>1470.00</td>
</tr>
<tr>
<td>2.</td>
<td>Raichur Thermal Power Station 8 Unit</td>
<td>1x250</td>
<td>250.00</td>
</tr>
<tr>
<td>3.</td>
<td>Bellary Thermal Power Station Unit I</td>
<td>1x500</td>
<td>500.00</td>
</tr>
<tr>
<td>4.</td>
<td>Bellary Thermal Power Station Unit II</td>
<td>1x500</td>
<td>500.00</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>2720.00</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: KPCL

Table 12: List of Ongoing Thermal and Hydro Power Projects under KPCL

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>Power Stations</th>
<th>Units x MW</th>
<th>Installed Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bellary Thermal Power Station Unit III</td>
<td>1x700</td>
<td>700.00</td>
</tr>
<tr>
<td>2</td>
<td>Yermaras Thermal Power Station</td>
<td>2x800</td>
<td>1600.00</td>
</tr>
<tr>
<td></td>
<td><strong>Hydro Stations</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Munirabad Hydro Power Station</td>
<td>1x10</td>
<td>10.00</td>
</tr>
<tr>
<td>2</td>
<td>R.M &amp; U of Nagjhari Powerhouse Unit 6</td>
<td>1x15</td>
<td>15.00</td>
</tr>
<tr>
<td></td>
<td><strong>TOTAL</strong></td>
<td><strong>2335.00</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: Karnataka Power Corporation Limited
Table 13: Proposed Hydro and Thermal Power Projects under KPCL

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Power Stations</th>
<th>Units x MW</th>
<th>Installed Capacity (MW)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shivanasamudram Seasonal Scheme</td>
<td>3x100+1x45</td>
<td>345.00</td>
</tr>
<tr>
<td>2</td>
<td>Gundia Hydel Project</td>
<td>2x200</td>
<td>400.00</td>
</tr>
<tr>
<td>3</td>
<td>Ghataprabha Hydel</td>
<td>2x10</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td><strong>THERMAL STATION</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Godhna Thermal Power Station Chhattisgarh</td>
<td>2x800</td>
<td>1600.00</td>
</tr>
<tr>
<td>2</td>
<td>Edlapur Thermal Power Station</td>
<td>1x800</td>
<td>800.00</td>
</tr>
</tbody>
</table>

Source: Karnataka Power Corporation Limited

1.11.1 Small Hydro Power

Karnataka is one of the high potential states and had exploited 25% of its potential of its SHP compared to Uttarakhand, Jammu & Kashmir, Arunachal Pradesh and Chhattisgarh. The Report of the Comptroller and Auditor General of India on Renewable Energy Sector in India shared its finding regarding low capacity in Karnataka: The Government of Karnataka restricted the establishment of mini hydro projects to 5 MWs and supported only Run of the River (ROR) projects in the Western Ghats and Forest Areas. The audit observed that 167 allotments made for establishing mini hydro projects in the state were held up due to non-clearance from the Forest Department. The Government of Karnataka informed that obtaining clearances in the ecologically sensitive region was a major hurdle for the implementation of the projects.

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3 Chapter 5: Report of the Comptroller and Auditor General of India on Renewable Energy Sector in India
Table 14: Total Number of Commissioned Small Hydel Power Projects under (KREDL) – District-wise

<table>
<thead>
<tr>
<th>Sl.No</th>
<th>District Name</th>
<th>Total Number of Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Belagavi</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Bellary</td>
<td>5</td>
</tr>
<tr>
<td>3</td>
<td>Vijayapura</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>Chamarajanagar</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>Chikkamagalur</td>
<td>1</td>
</tr>
<tr>
<td>6</td>
<td>Dakshina Kannada</td>
<td>10</td>
</tr>
<tr>
<td>7</td>
<td>Kalaburgi</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>Hassan</td>
<td>10</td>
</tr>
<tr>
<td>9</td>
<td>Kodagu</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>Koppal</td>
<td>1</td>
</tr>
<tr>
<td>11</td>
<td>Mandya</td>
<td>17</td>
</tr>
<tr>
<td>12</td>
<td>Mysuru</td>
<td>5</td>
</tr>
<tr>
<td>13</td>
<td>Raichur</td>
<td>4</td>
</tr>
<tr>
<td>14</td>
<td>Ramanagara</td>
<td>3</td>
</tr>
<tr>
<td>15</td>
<td>Shivamogga</td>
<td>9</td>
</tr>
<tr>
<td>16</td>
<td>Udupi</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>Yadgir</td>
<td>11</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td>90</td>
</tr>
</tbody>
</table>

Source: Karnataka Renewable Energy Development Ltd.
There are two policies published by the Karnataka Renewable Energy Development Limited, Karnataka Renewable Energy Policy 2009-14 and Karnataka Renewable Energy Policy 2014-20 that enhances the efficiency and promotes expansion of the small Hydel power plants. This is described in the Chapter 3.
State of Water Resources
2. Water Resource Profile

Water resources in Karnataka primarily constitute surface and groundwater. Rainfall is the basic source of water in the state. Surface water is available in Karnataka in the form of rivers, lakes, waterfalls, reservoirs, etc. Being the seventh largest state in India (area-wise), Karnataka possesses about six percent of the country’s total surface water resources of about 17 lakh million cubic meters (M.cum). Important water resources include surface water rivers, rainfall, lakes and tanks and groundwater.

The lakes and tanks meet a portion of the State’s water demand. There are 36,753 traditional tanks that have a potential command area of about 685,000 hectares. There are also about 20,000 irrigation tanks that have a potential to irrigate about 6.5 lakh ha. From 1951 onwards, the irrigation potential from tanks have declined owing to the development of surface water irrigation and also encroachment and siltation of existing tanks. Karnataka is blessed with seven river basins. The total catchment area of all the seven-river system is 19,05,000 sq.km. The rivers, along with their tributaries, account for much of Karnataka’s surface water resources. About 60% of the state’s surface water is provided by the west flowing rivers while the east flowing rivers account for the remaining portion. The annual average yield in the seven river basins of the state is estimated to be around 3,475 TMC (TMC (98401.04 M.cum).

Table 16: River basins of Karnataka and their yield break up

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>River Basin</th>
<th>Catchment area</th>
<th>Estimated average yield in M.cum</th>
<th>TMC</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Krishna</td>
<td>1,13,271</td>
<td>27,451</td>
<td>969.44</td>
<td>27.9</td>
</tr>
<tr>
<td>2</td>
<td>Cauvery</td>
<td>34,273</td>
<td>12,034</td>
<td>425</td>
<td>12.23</td>
</tr>
<tr>
<td>3</td>
<td>Godavari</td>
<td>4,406</td>
<td>1,415</td>
<td>49.97</td>
<td>1.44</td>
</tr>
<tr>
<td>4</td>
<td>West Flowing River</td>
<td>56177</td>
<td>56,600</td>
<td>1998.8</td>
<td>57.51</td>
</tr>
<tr>
<td>5</td>
<td>North Pennar</td>
<td>6,937</td>
<td>906</td>
<td>32</td>
<td>0.92</td>
</tr>
<tr>
<td>6</td>
<td>South Pennar</td>
<td>4,370</td>
<td></td>
<td>1.97</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Palar</td>
<td>2,813</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2,22,247</td>
<td>98406</td>
<td>3475.2</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Water Resource Department, Government of Karnataka

---

Figure 21: Map Indicating the River Basins of Karnataka
The surface and ground water availability in all the seven river basins is shown in Figure 22. The share of surface water in the Krishna Basin which forms 70% of the geographical area of the state is around 76% whereas in the Cauvery basin nearly 64% of the water available is in the form of surface water as compared to 36% of groundwater.

Figure 22: Map indicating the water availability (surface and ground) in the seven river basins

Karnataka’s net groundwater resources availability is estimated to be around 14.83 BCM (Ground water Directorate and Central Ground Water Board, 2016). Ground water resources have not been exploited evenly across the state. In areas where adequate surface water is available, exploitation of ground water resources has been the least. Exploitation of ground

6 Assuming that all surface water bodies are full to their capacity
water in the dry taluks of North and South interior Karnataka is higher as compared to coastal Malnad and irrigation command areas of the state. The dependency on ground water resources has increased drastically over the years in Karnataka. It has been noted that a significant increase in the use of tube and bore wells in the state. The gross irrigated area by tube/bore wells in 2001 was 6,80,734 lakh hectares and has increased to 14,02,136 lakh hectares in the year 2014-15.

Figure 23: District-wise water availability in Karnataka 2015 (Groundwater and Surface water)
Figure 24: District-wise Surface and Groundwater Availability in Karnataka

Figure 25: Percentage of Surface and Groundwater Availability in Karnataka

Table 17: Water availability and demand in Karnataka

<table>
<thead>
<tr>
<th>Description</th>
<th>BCM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface Water</td>
<td>65.127</td>
</tr>
<tr>
<td>Ground Water</td>
<td>13.142</td>
</tr>
<tr>
<td>Total Available Water</td>
<td>78.27</td>
</tr>
<tr>
<td>Total Water Demand (2015)</td>
<td>122.44*</td>
</tr>
<tr>
<td>Total Water Demand (2020)</td>
<td>159.75*</td>
</tr>
</tbody>
</table>

*Including demand for power generation
<table>
<thead>
<tr>
<th>District</th>
<th>Surface Water Availability (BCM)</th>
<th>Ground Water Availability (BCM)</th>
<th>Total Water Availability (BCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bagalkot</td>
<td>2.317</td>
<td>0.398</td>
<td>2.715</td>
</tr>
<tr>
<td>Bengaluru(U)</td>
<td>0.53</td>
<td>0.145</td>
<td>0.675</td>
</tr>
<tr>
<td>Bengaluru Rural</td>
<td>0.109</td>
<td>0.194</td>
<td>0.303</td>
</tr>
<tr>
<td>Belagavi</td>
<td>3.130</td>
<td>0.802</td>
<td>3.932</td>
</tr>
<tr>
<td>Ballari</td>
<td>0.857</td>
<td>0.532</td>
<td>1.389</td>
</tr>
<tr>
<td>Bidar</td>
<td>0.313</td>
<td>0.294</td>
<td>0.607</td>
</tr>
<tr>
<td>Vijayapura</td>
<td>2.579</td>
<td>0.546</td>
<td>3.125</td>
</tr>
<tr>
<td>Chamarajanagar</td>
<td>0.450</td>
<td>0.342</td>
<td>0.792</td>
</tr>
<tr>
<td>Chikaballapura</td>
<td>0.175</td>
<td>0.810</td>
<td>0.985</td>
</tr>
<tr>
<td>Chikkamagalur</td>
<td>1.142</td>
<td>0.65</td>
<td>1.792</td>
</tr>
<tr>
<td>Chitradurga</td>
<td>0.106</td>
<td>0.068</td>
<td>0.174</td>
</tr>
<tr>
<td>Dakshina Kannada</td>
<td>0.882</td>
<td>0.560</td>
<td>1.442</td>
</tr>
<tr>
<td>Davanagere</td>
<td>0.232</td>
<td>0.200</td>
<td>0.432</td>
</tr>
<tr>
<td>Dharwad</td>
<td>0.119</td>
<td>0.222</td>
<td>0.341</td>
</tr>
<tr>
<td>Gadag</td>
<td>0.237</td>
<td>0.229</td>
<td>0.466</td>
</tr>
<tr>
<td>Kalaburagi</td>
<td>1.926</td>
<td>0.632</td>
<td>2.558</td>
</tr>
<tr>
<td>Hassan</td>
<td>1.004</td>
<td>0.736</td>
<td>1.740</td>
</tr>
<tr>
<td>Haveri</td>
<td>0.340</td>
<td>0.530</td>
<td>0.870</td>
</tr>
<tr>
<td>Kodagu</td>
<td>0.332</td>
<td>0.077</td>
<td>0.409</td>
</tr>
<tr>
<td>Kolar</td>
<td>1.150</td>
<td>0.204</td>
<td>1.354</td>
</tr>
<tr>
<td>Koppal</td>
<td>0.454</td>
<td>0.537</td>
<td>0.991</td>
</tr>
<tr>
<td>Mandya</td>
<td>1.975</td>
<td>0.913</td>
<td>2.888</td>
</tr>
<tr>
<td>Mysuru</td>
<td>1.636</td>
<td>0.659</td>
<td>2.295</td>
</tr>
<tr>
<td>Raichur</td>
<td>3.527</td>
<td>0.832</td>
<td>4.359</td>
</tr>
<tr>
<td>Ramanagara</td>
<td>0.149</td>
<td>0.212</td>
<td>0.361</td>
</tr>
<tr>
<td>Shivamogga</td>
<td>5.743</td>
<td>0.253</td>
<td>5.996</td>
</tr>
<tr>
<td>Tumkur</td>
<td>1.298</td>
<td>0.840</td>
<td>2.138</td>
</tr>
<tr>
<td>Udapi</td>
<td>16.495</td>
<td>0.207</td>
<td>16.702</td>
</tr>
<tr>
<td>Uttara Kannada</td>
<td>12.792</td>
<td>0.184</td>
<td>12.976</td>
</tr>
<tr>
<td>Yadgir</td>
<td>3.130</td>
<td>0.336</td>
<td>3.466</td>
</tr>
<tr>
<td>Karnataka State</td>
<td>65.127</td>
<td>13.142</td>
<td>78.269</td>
</tr>
</tbody>
</table>

Source: District Irrigation Plans 2015
2.1 Water Quality

2.1.1 Surface water quality

River Water Quality Monitoring

The Karnataka State Pollution Control Board (KSPCB) is monitoring the water quality of rivers including tributaries, drains in 84 stations in the state under the National Water Quality Monitoring Programme. Inference on the River Water Quality monitoring:

The Central Pollution Control Board (CPCB) has specified Primary Water Quality Criteria depending on the designated best use and activities in the river. The classifications are:

a) **Class ‘A’**-Drinking water source without Conventional treatment but after disinfection

b) **Class ‘B’**-Outdoor bathing (Organised)

c) **Class ‘C’**-Drinking water source with Conventional treatment followed by disinfection

d) **Class ‘D’**-Propagation of wildlife Fisheries

e) **Class ‘E’**-Irrigation, Industrial Cooling, Controlled Waste Disposal
Monitoring results (Figure 26) reveal that the quality of river water is affected due to the discharge of torn sewage. By and large most of the river stretches fall under “C” category, meaning that the water is fit for domestic use after physio-chemical treatment and disinfection.

At the following three locations, the treated industrial effluents are permitted for discharge into the rivers. The water quality at these locations about 100 meters downstream of the treated effluent discharge point are as under:

1. **Mysore Paper Mill’s treated effluent into Bhadra River near Bhadravathi, Shivamogga district.**
   
   Bhadra River quality downstream of Bhadravathi conforms to ‘D’ class.

2. **Harihara Poly Fibres-Grasilene Division treated combined effluent into Tungabhadra River near Harihara, Haveri District.**
   
   Tungabhadra River water quality downstream of Harihara Poly Fibres conforms to ‘E’ class.

![Classifications of river quality of water as per GEMS and MINARS Programme during the year 2011-2016](image-url)
3. **West Coast [Paper Mills Ltd treated effluent into Kali River near Bangur Nagar near Dandeli, Uttara Kannada district.**

Kali River water quality, monitored quarterly indicates that at the downstream of the industry, it conforms to ‘C’ Class throughout the year except in December where it conforms to ‘D’ class.

**Lake Water Monitoring**

The CPCB under National Water Quality Monitoring Programme, agreed to take up water quality monitoring of 120 lakes from 2014-15 in the State on a monthly basis. The lake water quality as regards to Bengaluru confirms to Class “E” for 50 lakes and Class “D” for 25 lakes out of the 75 lakes being monitored.

Consequent to directions issued by CPCB to KSPCB under section 18 (1) (b) of the Water (Prevention and Control Pollution) Act, 1947, the Board on 28.10.2015 sought compliance on the directions issued by the CPCB from BBMP/BDA/BWSSB/LDA and DC, Bengaluru Urban district on the following:

1. BBMP and BWSSB shall set up Sewage Treatment Plants (STPs) of adequate capacity and provide underground sewerage to cover the entire sewage catchment area of the lakes and bridge the gap.
2. BBMP and BWSSB shall ensure the treated sewage is utilised mandatorily for industrial application, railway/buses cleaning, gardening/horticulture purpose, and flushing and irrigation purpose, so that treated sewerage does not enter lakes.
3. BBMP shall prepare the action plan with a timeline to achieve the above-directed actions and carry out regular monitoring of implementation.
4. Concerned authorities shall establish bunds along the periphery of the lake.
5. BDA/BBMP/LDA/BWSSB shall explore possibility to set up aerators or other appropriate devices to oxygenate the lake as a short-term measure. This may also include other innovative projects that can be followed to rejuvenate both the lakes, i.e., Varthur and Bellandur.
6. Deputy Commissioner (Bengaluru Urban) and BDA shall earmark boundary of every lake.

Further, The Board in its 201st meeting held on 1.12.2015 resolved to provide Rs.100 Crore financial assistance in a phased manner as and when construction is taken up by BWSSB for establishing sewage treatment plant in Bellandur catchment area.

Consequent to fish kill incidents in Ulsoor Lake on 06.03.2016 and 07.03.2016, the Chairman, and KSPCB along with the officers of the Board and officers of BWSSB, BBMP and Fishery Department visited the area on 07.03.2016 to ascertain the causes for fish mortality. Meeting of all stake holders was also called on 08.03.2016 and directions issued to
initiate action to find a permanent solution to ensure that fish-kill doesn’t re-occur in future.

2.1.2 Groundwater Quality

The quality of water is fast deteriorating in Karnataka, mainly in the rural areas. A report by the Rural Development and Panchayat Raj Department indicates that out of the 59,945 habitations in Karnataka, water quality in nearly 2365 habitations is affected. The main contaminants of water resources in these areas are Fluoride (1225 habitations), Nitrate (564 habitations), Iron (366 habitations), Salinity (124 habitations) and Arsenic (9 habitations). Tumkur district has highly contaminated water, with nearly 455 habitations infested with contaminated water sources. Water sources in Chamarajanagar and Kodagu have no zero habitations that are contaminated.

The following five maps depict the ground water quality measured in terms of:

1. Concentration of fluoride (measured in mg/L)
2. Concentration of chloride (measured in mg/L)
3. Concentration of nitrate (measured in mg/L)
4. pH levels
5. Electrical conductivity (measured in µS/cm at 25°C)
Karnataka: District Wise Ground Water Quality
(Concentration of Fluoride in mg/L)

Legend
Flouride (in mg/L)
District
- 0.00 - 0.00 Data not available
- 0.00 - 1.00 Desirable limits
- 1.00 - 1.50 Permissible limits
- >1.5 Beyond permissible limits

Source: Ground Water Year Book of Karnataka State (2015-16)
Figure 28: District-wise Chloride contamination of Groundwater in Karnataka

Karnataka: District Wise Ground Water Quality (Concentration of Chloride in mg/L)

Legend

Chloride (in mg/L)
District
- 0 - 0 Data not available
- 0 - 250 Desirable limits
- 250 - 1000 Permissible limits

Source: Ground Water Year Book of Karnataka State (2015-16)
Figure 29: District-wise concentration of Nitrates in Groundwater of Karnataka

Karnataka: District Wise Ground Water Quality
(Concentration of Nitrate in mg/L)

Legend
Nitrate (in mg/L)
District
- 0 - 0 Data not available
- 0 - 45 Permissible limits
- > 45 Beyond permissible

Source: Ground Water Year Book of Karnataka State (2015-16)
Figure 30: District-wise pH levels in Groundwater of Karnataka

Karnataka: District Wise Ground Water Quality
(pH levels)

Legend
pH
Distrcit

- 0.00 - 0.00 Data not available
- 6.50 - 8.50 Desirable limits
- > 8.50 Beyond desirable limits

Source: Ground Water Year Book of Karnataka State (2015-16)
Figure 31: District-wise electrical conductivity in Groundwater of Karnataka

Karnataka: District Wise Ground Water Quality
(Electrical Conductivity in μS/cm at 25°C)

Legend
Electrical conductivity (in μS/cm at 25°C)
District
0 - 0 Data not available
0 - 250 Excellent
250 - 750 Good
750 - 2250 Medium
2250 - 4000 Bad

Source: Ground Water Year Book of Karnataka State (2015-16)
2.2 Water Demand

The state has a demand for 69.908 Billion Cubic Meters (BCM), to meet its requirements for agriculture, livestock, domestic and industrial needs in 2015. In addition to this, the state uses around 51.5 BCM of water for power generation in the districts of Vijayapura, Chamarajanagar, Kodagu, Raichur, Shivamogga and Uttara Kannada. The maps below (Figure 34, 35, 36 and 37 represent the sector-wise water demand for the districts of Karnataka.

Figure 32: Total Water Demand in BCM-2015

Districts with high density of population show a high demand for domestic consumption. The districts of Shivamogga, Davangere, Bagalkot, Vijayapura, Kalburagi, and Raichur show maximum water demand for crops and livestock Figure 32 describes the percentage share of water demand by various sectors for the state. The total demand for the state is 122.4 BCM as against the total water availability is only 78.27 BCM.
Figure 33: District-wise total water available to water demand 2015
Table 19: District-wise Water Budget for Karnataka

<table>
<thead>
<tr>
<th>District</th>
<th>Total Water Availability (BCM)</th>
<th>Total Water Demand (BCM)</th>
<th>Water Gap/Surplus (BCM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bagalkot</td>
<td>2.72</td>
<td>4.83</td>
<td>-2.12</td>
</tr>
<tr>
<td>Bengaluru(U)</td>
<td>0.68</td>
<td>0.72</td>
<td>-0.05</td>
</tr>
<tr>
<td>Bengaluru Rural</td>
<td>0.30</td>
<td>0.55</td>
<td>-0.24</td>
</tr>
<tr>
<td>Belagavi</td>
<td>3.93</td>
<td>3.13</td>
<td>0.80</td>
</tr>
<tr>
<td>Ballari</td>
<td>1.39</td>
<td>2.43</td>
<td>-1.04</td>
</tr>
<tr>
<td>Bidar</td>
<td>0.61</td>
<td>2.36</td>
<td>-1.76</td>
</tr>
<tr>
<td>Vijayapura</td>
<td>3.13</td>
<td>3.57</td>
<td>-0.45</td>
</tr>
<tr>
<td>Chamarajanagar</td>
<td>0.79</td>
<td>2.51</td>
<td>-1.72</td>
</tr>
<tr>
<td>Chikballapuraja</td>
<td>0.99</td>
<td>1.39</td>
<td>-0.41</td>
</tr>
<tr>
<td>Chikkamagulur</td>
<td>1.79</td>
<td>2.91</td>
<td>-1.12</td>
</tr>
<tr>
<td>Chitradurga</td>
<td>0.17</td>
<td>1.11</td>
<td>-0.94</td>
</tr>
<tr>
<td>Dakshina Kannada</td>
<td>1.44</td>
<td>0.40</td>
<td>1.05</td>
</tr>
<tr>
<td>Davanagere</td>
<td>0.43</td>
<td>4.38</td>
<td>-3.95</td>
</tr>
<tr>
<td>Dharwad</td>
<td>0.34</td>
<td>1.21</td>
<td>-0.87</td>
</tr>
<tr>
<td>Gadag</td>
<td>0.47</td>
<td>2.66</td>
<td>-2.20</td>
</tr>
<tr>
<td>Kalaburagi</td>
<td>2.56</td>
<td>8.93</td>
<td>-6.37</td>
</tr>
<tr>
<td>Hassan</td>
<td>1.74</td>
<td>3.05</td>
<td>-1.31</td>
</tr>
<tr>
<td>Haveri</td>
<td>0.87</td>
<td>3.02</td>
<td>-2.15</td>
</tr>
<tr>
<td>Kodagu</td>
<td>0.41</td>
<td>0.89</td>
<td>-0.49</td>
</tr>
<tr>
<td>Kolar</td>
<td>1.35</td>
<td>1.05</td>
<td>0.30</td>
</tr>
<tr>
<td>Koppal</td>
<td>0.99</td>
<td>3.85</td>
<td>-2.86</td>
</tr>
<tr>
<td>Mandya</td>
<td>2.89</td>
<td>2.33</td>
<td>0.56</td>
</tr>
<tr>
<td>Mysuru</td>
<td>2.30</td>
<td>3.45</td>
<td>-1.15</td>
</tr>
<tr>
<td>Raichur</td>
<td>4.36</td>
<td>6.02</td>
<td>-1.66</td>
</tr>
<tr>
<td>Ramanagara</td>
<td>0.36</td>
<td>0.69</td>
<td>-0.32</td>
</tr>
<tr>
<td>Shivamogga</td>
<td>6.00</td>
<td>8.90</td>
<td>-2.90</td>
</tr>
<tr>
<td>Tumkur</td>
<td>2.14</td>
<td>2.38</td>
<td>-0.24</td>
</tr>
<tr>
<td>Udupi</td>
<td>16.70</td>
<td>0.32</td>
<td>16.38</td>
</tr>
<tr>
<td>Uttara Kannada</td>
<td>12.98</td>
<td>13.26</td>
<td>-0.29</td>
</tr>
<tr>
<td>Yadgir</td>
<td>3.47</td>
<td>1.45</td>
<td>2.01</td>
</tr>
<tr>
<td>Karnataka State</td>
<td>78.27</td>
<td>93.75</td>
<td>-15.48</td>
</tr>
</tbody>
</table>

Source: District Irrigation Plans 2015
Figure 34: District-wise water demand for various sectors (Excluding power generation)

District Wise Total Water Demand Excluding Power Generation (in BCM)- 2015

Legend

<table>
<thead>
<tr>
<th>Total Water Demand (BCM)</th>
<th>District</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1 - 0.7</td>
<td>Belagavi</td>
</tr>
<tr>
<td>0.7 - 1.5</td>
<td>Bagalkot</td>
</tr>
<tr>
<td>1.5 - 2.5</td>
<td>Vijayapura</td>
</tr>
<tr>
<td>2.5 - 3.0</td>
<td>Kalaburagi</td>
</tr>
<tr>
<td>3.0 - 3.5</td>
<td>Yadgir</td>
</tr>
<tr>
<td>3.5 - 4.0</td>
<td>Bidar</td>
</tr>
<tr>
<td>4.0 - 6.0</td>
<td>Raichur</td>
</tr>
</tbody>
</table>

Source: District Irrigation Plan (2016)
District Wise Domestic Water Demand (in BCM)-2015

Legend

Domestic Water Demand (BCM)
District
- 0.02 - 0.05
- 0.05 - 0.07
- 0.07 - 0.09
- 0.09 - 0.10
- 0.10 - 0.13
- 0.13 - 0.30
- 0.30 - 0.55

Source: District Irrigation Plan (2016)
Figure 36: District-wise Water Demand for Agriculture and Livestock Karnataka, 2015

District Wise Water Demand for Crops and Livestock (in BCM)- 2015

Legend
Demand for crops and livestock (BCM)
District:
- 0.0 - 0.5
- 0.5 - 1.0
- 1.0 - 2.0
- 2.0 - 3.0
- 3.0 - 4.0
- 4.0 - 5.0
- 5.0 - 6.0
- 6.0 - 9.0

Source: District Irrigation Plan (2016)
Figure 37: District-wise Industrial Water Demand Karnataka, 2015

District Wise Industrial Water Demand (in BCM)-2015

Legend
Industrial Water Demand (BCM)
District
- 0.0000 - 0.0013
- 0.0013 - 0.0038
- 0.0038 - 0.0108
- 0.0108 - 0.0397
- 0.0397 - 0.3525

Source: District Irrigation Plan (2016)
2.3 Karnataka and Climate Change

The Intergovernmental Panel on Climate Change (IPCC) defines climate change as “any change in climate over time, whether due to natural variability or as a result of human activity”. A change in statistical properties of a climate system when considered over long periods of time, is called climate change. Climate change is a natural phenomenon, but recent trend has shown that the changing climates we see today are due to anthropogenic activities.

Climate change is one of the planetary boundaries as defined by a paper written by a group of Earth system and environmental scientists led by Johan Rockström from the Stockholm Resilience Centre and Will Steffen from the Australian National University. Planetary boundaries define a safe operating space for all international governments, communities and humanity in general. There are nine planetary boundaries and climate change has crossed the ‘safe zone’, which means that there is no possibility of reversal the only way out would be a drastic reduction in anthropogenic emissions. This reduction must be enough to contain the rise of global mean temperature at no more than 2°C above pre-industrial era. This has been agreed in the Paris Agreement and will come into effect after the second commitment period of the Kyoto Protocol in 2020.

India is a party to the United Nations Framework Convention on Climate Change (UNFCCC) and the Government of India attaches great importance to issues related to climate change. The government recognises the urgency and importance of the actions that need to be taken collectively to meet the ultimate objective of the Convention i.e. stabilising greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. India had submitted an Initial National Communication in 2004 and the Second National Communication in 2012 (Ministry of Environment, Forest and Climate Change, 2015).

Warming of climate system is unequivocal, as outlined in the IPCC 4th Assessment Report and without significant changes in policy, the trend in global emissions of greenhouse gases and associated climate change will continue. These changes will lead to wide ranging impacts and economic costs across different sectors and regions. (Hunt & Watkiss, 2010).

Impact of climate change as listed out by the IPCC Fifth Assessment Report:

- In recent decades, changes in climate have impacted natural and human systems in all continents and across oceans.
• In many regions, changing precipitation or melting snow and ice are altering hydrological systems, affecting water resources in terms of quantity and quality.

• Many terrestrial, freshwater, and marine species have shifted their geographic ranges, seasonal activities, migration patterns, abundances, and species interactions in response to ongoing climate change.

• Based on several studies covering a wide range of regions and crops, a negative impact of climate change on crop yields have been more common than positive impacts.

• Impact from recent climate-related extremes, such as heat waves, droughts, floods, cyclones, and wildfires, reveal significant vulnerability and exposure of some ecosystems and many human systems to current climate variability. Impact of such climate-related extremes include alteration of ecosystems, disruption of food production and water supply, damage to infrastructure and settlements, morbidity and mortality, and consequences for mental health and human well-being. For countries at all levels of development, the impacts are consistent with a significant lack of preparedness for current climate variability in some sectors.

Climate change impacts are complex; they can be both direct and indirect. For example, more rain may lead directly to either greater or smaller crop yields, depending on factors such as the type of crop, the soil and the present climate. Indirect effects could include changes in supply and demand as a result of these larger or smaller yields, and thus changes in commodity prices; the profitability of farming; and the affordability of food and effects on human health.

The impacts of climate change pose a threat to all the systems vital for the functioning of a country. It has impacts on agriculture, forestry, and biodiversity. This in turn has an effect on the economy of the country. The weakening of the economy leads to poverty, poor healthcare, inequitable distribution of resources, energy insecurity, and overall diminishing ecological resilience.

Less important direct impact include those on tourism and cultural heritage, urban biodiversity and the ancillary effects of air pollution. Whilst they are not the focus of this review, there is also a set of secondary effects on cities related to the concentration of economic activity in cities and their interdependencies with surrounding regions. These issues include the potential effects that climate change may have on the physical assets used within cities for economic production and/or services, on the costs of raw materials and inputs to economic production, on the subsequent costs to businesses, and thus on competitiveness and wider economic performance, and employment patterns in the sub-region and beyond (Hunt & Watkins, 2010)
2.3.1 Impact of climate change on water availability and resources

A changing weather pattern could severely affect the overall welfare of the state. The projected increase or decrease in temperature and rainfall will directly affect cropping patterns, productivity and yield. The availability of water will also affect the biodiversity of the state. This could potentially reduce forest cover, leading to a reduction in carbon sinks, affect coastal areas due to rise in sea levels, leading to unemployment, and migration of coastal residents.

Global surface temperature in 2015 was +0.87°C (~1.6°F) warmer than the 1951-1980 base period in the GISTEMP analysis, making 2015 the warmest year in the period of instrumental data. The temperature in 2015 was boosted by the strong El Niño, nearly of the same strength as the 1998 “El Niño of the century”. The updated global temperature record makes it clear that there was no global warming “hiatus”. Global temperature in 2015 was +1.13 (~2.03°F) relative to the 1880-1920 mean. Accounting for inter-annual variability; it is fair to say that global warming has now reached ~1°C (Hansen, Sato, Ruedy, Schmidt, & Lo, 2016).

Changes in atmospheric circulation, as evidenced by fluxes of moisture and energy at the land surface, have immediate as well as long-term effects on river systems. At short time scales, from days to months, changes in weather patterns can lead to changes in the incidence of floods. At longer time scales, from seasons to years, changes in drought characteristics are the main hydrologic manifestation of climate change (Nijssen, O’Donnell, Hamlet, & Lettenmaier, 2001).

The impending global-scale changes in population and economic development over the next 25 years will dictate the future relation between water supply and demand to a much greater degree than will changes in mean climate (Vorosmarty, Green, Salisbury, & Lammers, 2000).

As mentioned earlier, the state of Karnataka is drained by the seven-river systems. It is important to note that none of the rivers in the state are perennial in nature and are all rain-fed river systems. With no perennial sources to rely upon, it therefore becomes important to manage the water resources that are available to the state. Therefore, population growth and trends in land-use changes are definitely going to affect the rate and quantity of consumption.

Research papers give a comprehensive assessment of the effects of climate change and direct anthropogenic disturbances on the terrestrial water cycle. Robust conclusions have been drawn on the regional and global scale.

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7 Global water resources affected by human interventions and climate change
The results indicate that the impact of man-made reservoirs, water withdrawals, and water consumption on the long-term global terrestrial water balance are small. However, the impacts of anthropogenic interventions are significant in several large river basins. In particular, in irrigation rich areas in Asia and in the western United States, the effect of current anthropogenic interventions on mean annual runoff is stronger than the projected changes (Haddeland, et al., 2013).

Climate change trends could potentially increase rate of irrigation on currently irrigated lands. The districts of Udupi and Uttar Kannada have the highest amount of surface water availability; this directly correlates to that the fact that these districts receive the highest amount of rainfall as well. With changing climate and increasing temperatures there will be fluctuations in the patterns of precipitation which will lead to an increase in the amount of rainfall or a deficit leading to droughts.

According to the India Meteorological Department, meteorological drought over an area is defined as a situation when the seasonal rainfall received over the area is less than 75% of its long-term average value. It is further classified as "moderate drought" if the rainfall deficit is between 26-50% and "severe drought" when the deficit exceeds 50% of the normal.

While agricultural yield is a function of many variables, it is relevant to note that temperature and precipitation in India will likely increase under conditions of global warming, while solar radiation and evapotranspiration likely will not change appreciably (Dinar, et al., 1998). This essentially means that the crop yield could either be affected directly by the lack of rains due to increasing temperatures. It could also be affected by excessive precipitation, which would lead to crop losses, and damage and destruction to property. This is one of the major impact of anthropogenic climate change- increased frequency of extreme weather events.

Since climatic factors serve as direct inputs to agriculture; any change in climatic factors is bound to have a significant impact on crop yields and production. The major effect of a drought is reflected in the yield of the rainfed crops due to inadequate and poorly distributed rainfall. The drought need not be a lengthier one, even a short dry spell during the critical growth period can cause significant damage and harm local economy (Latha K. V., Gopinath, & Bhat, 2012).

An increase in droughts was projected for the period 2021 to 2050 for the two growing seasons kharif and rabi (Karnataka State Action Plan on Climate Change 1st Assessment). While the projections are arguably worrisome, further rigorous studies, especially of longer-term nature, need to be commissioned and results thoroughly compared to obtain a clearer understanding as to where, how and when climatic changes are unfolding in Karnataka. Nevertheless, besides the need for further studies, it emerges with great clarity that that an
Improvement of institutional preparedness is both desirable and necessary (Karnataka State Action Plan on Climate Change 1st Assessment).

The projections derived from climate models are not all reliant because many variables have to be considered. The atmospheric-ocean systems are dynamic in nature and they have global implications. The Indian monsoon system is majorly influenced by the surrounding oceans and therefore is highly unpredictable.

Dry spells are not the only cause for concern; floods also cause major destruction of life and property. This eventually leads to economic losses. The changing climate could potentially cause an increase in the rate of precipitation eventually leading to devastating floods.

On the other hand, Karnataka also witnessed heavy rainfall in 2009 in the coastal region, Malnad districts and major parts of north-interior Karnataka. The most affected districts were Raichur, Koppal, Bellary and Kalaburgi. Preliminary estimates indicate the loss of kharif crops to be about 19.0 lakh hectares by submergence, deposition of silt, deterioration of grain quality. Similarly, rabi crops, about 3.0 lakh hectares sown in the second half of September were completely washed off in Vijayapura district.

With this deficit and an ever-increasing population, it therefore becomes a challenge to ensure supply of water for different purposes of consumption. Since the states in South India are heavily dependent on the monsoons for water supply, this can lead to trans-boundary conflicts, which has been discussed in detail in subsequent chapters.
3. Water Policies

This section provides an overview of policies at the state and national levels. These policy statements are not enforceable per se. However, they serve as benchmarks and roadmaps for the development of the sector. The policies also give an insight into the intention of the government and the factors that influence decision-making. There are primarily two policies of relevance in the state, the Karnataka State Water Policy of 2002 and the National Water Policy 2012. An overview of the two policies with a focus on their thematic areas is given below.

3.1 Karnataka State Water Policy 2002

The State of Karnataka issued a policy statement in 2002, which was known as the Karnataka Water Policy (KWP). The KWP 2002 gives an overview of the water situation in Karnataka and sets certain objectives and modes by which the same are to be met. The KWP 2002 recognises that water is a scarce resource, especially because the rainfall in the state is highly erratic. Other sources of water such as groundwater and water from rivers have problems of over-exploitation and underutilisation respectively. The Policy raises concerns about growing urbanization, increasing agricultural and industrial needs, and the rising domestic consumption of water, both urban and rural. The Policy predicts that if the water sector and the growing needs are not addressed in a systematic manner, the State will face a water crisis in the next two decades. There are two main stakeholders identified by the Policy, the consumers of water (for various uses, in urban and rural settings) and the resource of water itself. To understand whether the policy in practice matches the policy statement, an understanding of key features of the latter is necessary. An overview of the same has been attempted in the following section by identifying the thematic areas of the KWP 2002.

3.2 Groundwater

The KWP 2002 notes that the utilisation of ground water within the State is not uniform. The interior parts of Karnataka (both in the North and South), utilise more ground water than the coastal regions. This has led to several wells drying and thus rendered farmers’ investments to the extent of 2000 crores infructuous. There is over-extraction of ground water in 43 Taluks of the State; in 29 Taluks, over 50% of the available groundwater has already been extracted. These 72 Taluks are critical given that it is here that the impact of rapid groundwater depletion is most severely felt. Over three hundred thousand dug wells have dried up leading to the situation of infructuous investments in ground water extraction structures as mentioned above.
To address these concerns, the KWP 2002 envisions a plan to effectuate the recharge of ground water coupled with periodic scientific assessments of the resource. This information could be used to regulate the extraction of ground water not to exceed the recharge capability (regulation of extraction being another means to address the concern of groundwater scarcity as per the policy). The Policy also proposes the conjunctive use of groundwater and surface water. It envisions management of the resource at the basin or sub-basin levels to come out with the optimal solution to alleviate poverty, reduce vulnerability to natural and human-made disasters, increase incomes, and reduce inequity.

3.3 Irrigation

As recognised by KWP 2002, the rainfall in the state is erratic and not distributed evenly. Thus, the state’s irrigation system is highly dependent on surface water from perennial rivers that flow through it. Ground water is a fast depleting source of water for irrigation. The KWP 2002 is concerned with the underutilisation of irrigation capacity. The Policy notes that focus on using investments for new projects has prevented the adequate maintenance and utilisation of present projects. It refers to how there is plenty of investment in the storage capacity of a reservoir; the same is not mirrored when it comes to the construction of field canals and drainage systems which are required to efficiently distribute water. This may be attributed to the delays in the construction of field irrigation channels which contributes to underutilisation of irrigation capacity. This prioritisation of new construction has not left funds for the modernization and rehabilitation of existing irrigation systems. The Policy notes that though agricultural income has substantially increased, revenue from irrigation has not shown a similar trend. The revenue from irrigation covers only a small part of the Maintenance and Operational costs of a project. Along with the expenditure on maintenance and operation, the expenditure on salaries and wages has been consistently increasing over the years and will continue to increase. Adding to this precarious situation, the storage capacity of most of the 38,608 tanks in Karnataka has been hampered due to siltation.

The KWP 2002 identifies the lack of farmer participation in irrigation management as a reason for underutilisation of irrigation potential. This underutilisation has had adverse impacts of not allowing for the diversification of agriculture, lowering of cropping intensity and agricultural yields. The Policy also identifies an inequitable distribution of water between farmers in the ‘head reach’ who consume excessive water and pump water out of the canals and ‘tail end’ farmers who are left with lesser than their due

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10 Id. Paragraph 5.2
11 Id. Paragraph 5.4
12 Id. Paragraph 5.6
share of water.\footnote{Id. Paragraph 5.10}

The KWP 2002 identifies the hydrological unit of water management and development as the basin or sub-basin. It envisions the conjunctive use of surface and ground water to alleviate poverty, reduce inequity, increase productivity and income, and better protect against natural and human-made disasters. Thus, it would necessitate irrigation projects to be strongly linked with groundwater extraction and usage. The capacities and status of both sources of water would have to be constantly monitored and considered while framing various Schemes in Command Areas of Irrigation projects.

3. 3.1 Cross-Cutting Thematic Areas

There are certain areas that have been identified by the KWP 2002 that inescapably impact other thematic areas as well. Such overlapping impacts are present in all areas; however, it is most pertinent in the ones discussed hereunder.

3.3.2 Participatory Management

Participatory management is identified as a necessity for water resource projects. Decentralisation is seen as a means to increase efficiency. The KWP 2002 identified the lack of community participation as a reason for incomplete utilisation of irrigation capacity.\footnote{Supra note 1, at paragraph 5.5.} The decentralisation also extends to water usage; the KWP 2002 envisions Water Users’ Association and Water Users Societies making decisions regarding the types of crops to plant (like high-value crops). This would aid in solving the problem of low agricultural productivity. The KWP 2002 notes that mismanagement of water resources has resulted in its inequitable distribution. Though no explicit means of correcting this is given, participatory management would serve, at the very least, to strengthen community voices and better articulate their demands by creating a means for doing so.

3.3.3 Preservation of Water

Preservation of water qualitatively and quantitatively is a recurrent concern addressed by the policy. The KWP 2002 states the need to monitor water quality and prevent encroachments upon water resources. The stress on the need to conjunctively use and develop water resources is also linked to the need to preserve water (especially groundwater) and not overexploit one source. The policy proposes the strengthening of rainwater harvesting systems to augment the supply of groundwater. Pollution from
domestic, chemical and industrial sources and salinisation are seen as effectively reducing the quantity of usable water thus drawing an explicit link between water quality and quantity. The need to preserve the ecology of catchment areas and prevent their pollution is also recognised, however, this is only with reference to catchment areas of storage for supply of water meant for use in urban centres.

3.3.4 Research and monitoring

The policy indicates monitoring as a key tool in the effective planning and execution of water resource projects. The KWP 2002 recognises that research must be carried out in an integrated, coordinated and applied manner. For this, it proposes to strengthen research institutions so that they may render technical assistance and strengthen participatory approaches in water management.

3.3.5 Inter and Intra-sectoral co-ordination

The policy lays emphasis on the need to co-ordinate the demand for water resources between water sectors, especially given the rise of its demand due to urbanisation and industrialisation. The policy recognises that there is no institution to co-ordinate the allocation of water and proposes the creation of a ‘Water Resource Development Board’ to carry out his function. There is also a need for intra-sectoral coordination given that different institutions handle different aspects of water resource management and development (and different water resources altogether). Thus, there is a need to develop mechanisms for the coordination of the various institutions in place that affect the water sector. The basis of such Integrated Water Resource Management (IWRM) would be the basin or a sub-basin. This would also serve to aid the objectives of demand management and the conjunctive use of water resources. For example, in the present scenario, the Major and Medium Irrigation Department (which comes under the Water Resource Department) is separated from the Ground Water Authority, and there is no institution to co-ordinate the functions of the two. Such co-ordination would also serve to give effect to and institutionalise the prioritisation given to uses of water under the KWP 2002. The prioritisation for water allocation (in descending order of priority) is drinking water, irrigation, hydropower, aquaculture, agro-based industries, non-agricultural industries, navigation and other uses.

3.4 Comparing Karnataka State Water Policy 2002 and Draft Karnataka State Water Policy 2016

The Draft Karnataka State Water Policy 2016 is an up-gradation of the State Water Policy 2002. Likewise, the 2002 water policy also recognises water as a scarce resource and increasing pressure on it from different sectors’ demands. The draft version places special focus on modernisation of irrigation to improve water efficiency and higher crop productivity without experiencing water shortages.
Both the policies stress on Integrated Water Resources Management (IWRM) and place a high priority on the sustainable and improved use and development of its water resources. But, unlike the 2002 policy, the 2016 draft version also recognises the importance of the role of women in water resources management and encourages their direct involvement at different levels of governance.

It also realises the importance of information and knowledge as a fundamental requirement for evidence-based policy making, water resources planning, development, operations and management. To utilise this, a ‘Karnataka Water Resources Information System’ at the state level is to be developed integrating data collected and maintained by various government data custodians. This will produce a State ‘Karnataka Water Resources Inventory’ which will form a basis for future policy, planning and reporting needs.

The draft Policy 2016 stresses that particular attention will be paid to capacity development, strengthening their understanding of IWRM, and to effectively use modern technical and management practices, but does not provide any further information on how to achieve it. It also focuses on managing the State’s Water Infrastructure through asset management plans and financing through water service charges and government for operation and maintenance. It further identifies the need for improved legislative backing and assistance for strengthening the Water Users Organisations as the lower level of administration in water governance.

Climate change gets due recognition and the need to manage resultant floods and droughts gets a separate mention in the new draft policy for which the preparation of a State Specific Plan on Climate Change is envisaged.

3.5 National Water Policy 2012

The National Water Policy of 2002 or the NWP 2012 draws its legitimacy from the fact that water is a scarce resource whose conservation and protection is of national importance.

Further, the management of interstate rivers comes under the Union List of the Constitution of India, so does the preservation of the environment of which water is a part.

The NWP 2012 points to the risk of conflicts between water-using groups in the face of scarcity. It is also concerned with the inequitable distribution of water, which goes against the principles of social justice. The policy thus seeks to serve as a guideline for states to formulate their own water sector laws and policies. The principle of a scientific approach to issues of the water sector is seen throughout the policy. The policy identifies some key issues and proposes some measures to improve the current scenario of water
resources, the same have been discussed as thematic areas in the following section.

### 3.5.1 Equitable Use and Allocation of Water

The NWP 2012 states that there are various uses of water: for hydropower, industry, agriculture, etc. however, drinking water and sanitation needs are to be treated as pre-emptive. The NWP 2012 recognises the need for states to set up water regulatory authorities for the inter-sectoral use of water. These would be statutory and independent authorities that would bring about the equitable use of water through appropriate pricing mechanisms. The reuse and recycling of water are to be encouraged through incentives for the same by an appropriate tariff system. Principles of social justice must guide the allocation of water. Consequently, priority must be given to domestic needs, sustenance of the poor, food security, agriculture and meeting minimum ecological needs. Water that is left over after meeting these needs may be used in an efficient manner (under the regulation of the above-mentioned authority) while keeping in mind the need to conserve it.

The NWP 2012 makes demand management through the provision of incentives and water audits an integral part of water conservation and a management which would require a regulatory authority that has jurisdiction over the water rates of various sectors. Water pricing is to be differential for pre-emptory needs such as drinking water and sanitation. Water uses other than this are to be priced according to principles of ‘economic efficiency’. Equitable allocation and use of water is not just seen as an end in itself but a means to improve access to water (and quality) and reducing social unrest.

The NWP 2012 reemphasizes the ‘public trust doctrine’ in the use of water. It draws attention to the case of groundwater, which, although a part of the hydrological cycle is often treated as individual property. The Policy emphasises that water is a community resource and is held by the state in trust for the public.

### 3.5.2 Conservation of Water

The NWP 2012 requires the scientific preservation of lakes, rivers, streams, other water bodies, and wetlands in an integrated manner so as to balance environmental and social utilities of the resource. This needs to be combined with overall planning, especially in urban areas. Importantly, the NWP 2012 recognises the needs of ecosystems such as those in the Himalayas and wetlands and the need to take them into account while planning. An important part of the conservation of water is the prevention of its pollution. Recognising the difficulty in cleaning water resources once polluted, the NWP 2012 favours a preventive approach to ensure that pollutants do not reach water sources in the first place.

### 3.5.3 Climate Change

The NWP 2012 recognises climate change as a condition that makes communities more
vulnerable because of the variability in the availability of water. The Policy sees a need to strengthen diverse water storage systems such as soil moisture, lakes, ground water etc. Demand management plays a role here as well since efficient cropping patterns and industrial use of water play a greater role when climate change effectively makes water availability less dependable. Planning and management of water resource structures must be done in a manner to equip the same with the capacity to deal with climate change; the policy also recognises the need for evolving acceptability criteria that accounts for climate change.

3.5.4 Dispute Resolution and Inter-state coordination

Drawing from the idea of inter-state cooperation with the river basin or sub-basin, the policy envisions the establishment of a forum at the national level to discuss and deliberate water-related issues there. The policy also proposes the constitution of a national water disputes resolution tribunal that would follow principles of arbitration and mediation in dispute resolution. The system of a national forum for dispute resolution may also be emulated at the state level to hear and settle inter-sectoral demands or inter-regional demands within the state.

3.5.5 Data Collection and Research

The NWP 2012 recognises the need for increased data collection, a part of which must focus on snowfall, glaciers, soil erosion, evaporation and other aspects of the hydrological cycle that are likely to be affected by climate change.

3.6 KWP 2002 vis-a-vis NWP 2012

There is not much room for conflict between the two since the National Policy only contains guidelines, which are to be effectuated by the state governments. However, there are a few commonalities and differences between the two policies. Both Policies function on the premise that water is a scarce resource and that there are increasing amounts of pressure in the form of demands from various sectors that are being put on the resource.

For instance, both recognise the need for integrated management of water resources with the basic hydrological unit being the basin or the sub-basin. Though the NWP 2012 is explicit about the need for inter-state co-ordination of states with respect to managing water resources, the KWP policy however, goes only as far as inter-sectoral and inter-departmental co-ordination within the state. There is no clear prioritisation as in the KWP 2002, but drinking water and sanitation needs seem to have the first charge upon the resource in NWP 2012. The KWP 2002 makes only a fleeting mention of demand management, the NWP 2012, however, makes demand management through the provision of incentives and water audits an integral part of water conservation and
management. Further, the NWP 2012 recognises the impact of climate change upon water resources and identifies a need to mitigate the impact of climate change while accounting for it in water resource management.

3.7 Renewable Energy Policies

There are two policies published by the Karnataka Renewable Energy Development Limited that enhances efficiency and promotes expansion of small hydel power plants.

3.7.1 Karnataka Renewable Energy Policy (2009-14)

The Department of Energy of Government of Karnataka, drafted the Karnataka Renewable Energy Policy 2009-14 in the year 2009. This policy was framed to regulate and promote development of renewable resources. The twin goals of the policy are to increase the contribution of the Renewable Energy (RE) in the total capacity of the state from 2400 MW to 6600 MW by 2014 and to conserve 900 MW through Energy Efficiency and Energy Conservation measures in all sectors.

3.7.2 Draft Karnataka Renewable Energy Policy (2014-20)

The Karnataka Renewable Energy Policy 2014-20 was drafted with the view to promote and harness the renewable potential of the state. The policy is not in derogation of any rule established by the 2009-14 policy. It is only the upgradation of the same for the next 5-year period. The main focus of the 2014-20 policy is to accelerate the capacity addition by 3600 MW during the next 5-year period and to initiate steps to make Karnataka the leading Renewable Energy (RE) State in the Country. The policy establishes KREDL as the nodal agency for the implementation of the new policy. The policy mandates the formation of a High-Level Committee for Renewable Energy (HLC-RE) for overseeing renewable energy projects. For SHP projects, the policy establishes a set of procedural rules for the implementation of the project. The policy enforces a Pre- Feasibility Report (PFR) or a Detailed Project Report (DPR) as a mandatory requirement for the development of the small hydel projects. The project can be implemented only on the approval of the Allotment Committee after the submission of both the PFR and DPR. Only a time period of 5 years from the date of approval of the Allotment Committee is given for the commissioning of the project.

On the whole, both the policies aspire to increase power generation in the state through increased focus on renewable resources like wind, solar, small hydel, biomass and cogeneration in the sugar industry. The policies envision the creation of a suitable environment for private sector participation in power production. The policies contain detailed guidelines for the promotion of RE in the state of Karnataka. It includes land allotment specifications for RE projects, specifications for the sale of electricity and
other incentives for the promotion of renewable resources in the state.

3.8 Industrial Policy 2014-19

The Karnataka Industrial Policy provides a brief outline of the water scenario in Karnataka. It states that the availability of water under different basins and as well as the allotment of water according to the requirement of different industries in various sectors has been made according to the Desai Committee Report. The allocation of water is done in accordance with the availability of the water resource along with its source and yield. The Planning Commission of India also follows the Desai Committee Report for the allocation of water resources for different sectors.

3.9 Acts and Institutions – Water Sector in Karnataka

This section provides an overview of the institutions and laws that govern the water sector in Karnataka. There are certain Schemes and Acts that require the creation of institutions at various levels within the state. This section follows the structure of the policy overview given above to the extent that it analyses institutions that govern various thematic areas identified in the water policies.

3.9.1 Irrigation

The irrigation system in Karnataka is governed by multiple Acts and institutions; each having a different role, from procurement and storage to distribution, maintenance and usage regulation. In the following part the flow of water will be looked at from the river to the field and the different institutions and legislations that influence this will be analyzed in the process.

3.9.2 The Rivers

The resources from the rivers are tapped through major and medium irrigation projects, which come under the purview of the Water Resources Department (WRD) and are undertaken either directly by the WRD or through the ‘Nigams’ (corporations wholly owned by the state government). There are three such Corporations, the Karnataka Neeravari Nigam Limited, the Cauvery Neeravari Nigam Limited and the Krishna BhagyaJala Nigam Limited incorporated in the years 1998, 2003 and 1994 respectively\(^\text{15}\). These Corporations are responsible for the planning, investigation, execution and maintenance of irrigation projects.

Visvesvaraya Jal Nigam Limited (VJNL) is another recent addition to this list. It is a completely an undertaking of the Government of Karnataka, incorporated under the

\(^{15}\) Ibid
Company’s Act 2013 as a Special Purpose Vehicle to cater to the drinking water and irrigation needs of drought-prone areas of Chikmagalur, Chitradurga, Tumkur, Davangere, Hassan, Ramanagara, Bengaluru (Rural), Kolar and Chikballapura districts.

3.9.3 Distribution, Usage and Participatory Irrigation Management

Three Acts govern the distribution and utilisation of water at the lower levels. There is no legislation that governs distribution of water for irrigation per se. Thus, the rationale for the pattern of distributive works is largely based on discretion. The legislations focus on better utilisation of the existing irrigation facilities and provide for the construction of certain distribution infrastructure like field channels. The First Act that will be considered is the Command Areas Development Act of 1980. This envisions the constitution of authorities at the project level.

3.9.3.1 Karnataka Command Areas Development Act, 1980

The Karnataka Command Areas Development Act, 1980 was enacted with the intention to ensure the systematic and scientific development of lands to better utilise irrigation facilities. The Act provides for the creation of Command Area Development Authorities or ‘CADAs’ for each Command Area and mandates that a CADA must carry out certain schemes for the comprehensive development of land, which will help improve the use of irrigation potential. The main purpose of CADAs is to bridge the gap between the potential irrigation area and the actual area where irrigation is utilised.

There are several schemes that a CADA might put into effect to realise comprehensive land development. The CADA sanctions the scheme through notification in the Official Gazette. Upon notification, the CADA may issue directions to any department of the State Government, any statutory body, or corporate body (under the control of the State Government) within the area in which the Scheme is operational, to comply with the directions of CADA given in accordance with the approved Scheme. The CADAs are the closest to the basin or sub-basin based system envisioned by the National Policy of 2012 and the State Policy (KWP) of 2002 since they are entrusted with a broad range of functions from consolidation of land records and others.

There are six Command Area Development Authorities (CADAs) in existence as of December 2016 for various projects across Karnataka.

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16 Ref. no. 18
17 Ref. no. 20
g6495132651.pdf. 26 Supra, note 1. see paragraph 6.1.
19 Ref. no. 26
3.9.3.2 The Karnataka Irrigation (Levy of Betterment Contribution and Water Rate) Act, 1957

This Act empowers the State Government to levy a tax known as the ‘betterment contribution’. This would be done when the State Government restores, alters, constructs or expands drainage or irrigation work. The betterment contribution is to be paid by the land holders (who needn’t be the owners) of the land benefited by the work. Beneficiaries may pay such tax by surrendering a part of their land after a ‘Deputy Commissioner’ appointed by the State Government is satisfied that it is free of encumbrances and not an inconvenience. The Act also empowers the State Government to levy a ‘water rate’ on the water supplied by, and work (directly or through percolation) that is owned by it, constructed by it or constructed on its behalf. The water rate may vary based on the purpose the water is being used for or based on its source.

3.9.3.3 Karnataka Irrigation Act, 1965

The Karnataka Irrigation Act, 1965 is an Act that provides for the construction, maintenance and regulation of irrigation works. There is one Section that effectively restricts the control over ‘irrigation works’ and other sections that regulate ancillary matters like land acquisition, inquiries etc. The Act also defines various Water Users Institutions and explains their functions. The Act has functions that overlap with the Command Areas Development Act when it comes to the construction of field and drain channels. The Act also defines various levels of Participatory Irrigation Management Institutions and outlines the functions of each. The Act gives power to the State Government to levy a tax known as the ‘betterment contribution’. This would be done when the State Government restores, alters, constructs or expands drainage or irrigation work. The betterment contribution is to be paid by the land holders (who needn’t be the owners) of the land benefited by the work. Beneficiaries may pay such tax by surrendering a part of their land after a ‘Deputy Commissioner’ appointed by the State Government is satisfied that it is free of encumbrances and not an inconvenience. The Act also empowers the State Government to levy a ‘water rate’ on the water supplied by, and work (directly or through percolation) that is owned by it, constructed by it or constructed on its behalf. The water rate may vary based on the purpose the water is being used for or based on its source.

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26 The Karnataka Irrigation (Levy of Betterment Contribution and Water Rate) Act. § 3 (1957).
27 Id. § 3(1).
28 Id. § 2(1)(f).
29 The Karnataka Irrigation Act. 18 (1965)
30 Id. § 4.
Government under Section 3 to appoint officers and invest them with powers and impose duties as it deems fit. The Act envisions the appointment of two such officers, the Irrigation Officer and the Canal Officer.

3.9.3.4 Role of Water Users Institutions

The Irrigation Act of 1965 discusses their role in detail which will be looked at presently. The Institutions referred to in this Act are the Water Users Society (WUS), Water Users Association (WUA), Water Users Distributary Level Federation (WUDLF), Water Users Project Level Federation (WUPLF) and the Water Users Apex Level Federation (Apex Federation). The WUA and WUS are the most decentralized level of Participatory Irrigation Management. They function at the same level and don't necessarily have an interaction with one another. From there on, the system takes on a hierarchical structure (what has been mentioned above in an ascending order) in which only the WUSs participate and not the WUAs.

a. **Water Users Society** defined as under section 2(1)(s) is a Society registered under the Karnataka Co-operative Societies Act, 1959. Members of such a Society must consist of at least sixty percent of the water users under an irrigation work within the area of operation of a Society or a majority of its members must be those who use water for cultivation and holding a land of not less than fifty-one percent under the same area. The area of operation of the Society excludes tank irrigation systems that irrigate less than two thousand hectares which are not a part of the command area of a medium or large irrigation project.

b. **Water Users Associations** are like Water Users Societies in terms of what is required for their composition. The area of operation of a WUA is precisely that area excluded from the mandate of a WUS. A WUA is registered under the Karnataka Registration of Societies Act, 1960. Section 4(1) provides that the State Government may entrust the control, maintenance and monitoring of any irrigation work to a WUS or WUA. There is however no data regarding the extent to which such discretion is put into practice.

c. **Water Users Distributary Level Federation** (WUDLF) has been defined under section 2(1) (q) of the Act; a co-operative society registered under the Karnataka Co-operative Society’s Act, 1959. The WUDLF is a Federation of WUSs within the Command of a Distributary of a major or medium irrigation project as notified by the State Government. A WUDLF must consist at least fifty one percent of the WUSs under the distributary’s Command Area. It must be stated at the outset that a WUDLF is to abide by the plans of the Project Level Federation.

d. **Water Users Project Level Federation** (WUPLF) is defined under section 2(1)(r)
and is a Society registered under the Karnataka Co-operative Societies Act, 1959. As the name suggests, this is the federation at the project level that comprises WUSs or WUDLFs under the Command area of the project. The Composition differs slightly depending on the magnitude of the project being referred to, i.e., major, medium or minor. Section 63C talks about the functions of the WUPLF – they are identical to those of the WUDLF under section 62B. The only difference being that the WUPLF must abide by the decisions of the Water Users Apex Level Federation or ‘Apex Federation’.

3.9.4. Micro Irrigation

In Karnataka, the nodal agencies for implementing Micro Irrigation Schemes like the National Mission on Micro Irrigation are the Horticulture Department and the Agriculture Department of the state. The Former mainly implements drip irrigation schemes while the latter implements sprinkler and drip irrigation schemes. The horticulture registers and approves companies supplying micro irrigation equipment. The farmers may avail the subsidies/disbursements from the scheme through the department.

At the state level, the Scheme envisions the creation of a State Micro Irrigation Monitoring Committee. This is headed by the Additional Chief Secretary to the Government/Development Commissioner. It is responsible for the implementation of the scheme at the state level, allocating Government of India funds (under the NMMI) and finalizing annual action plans of districts before sending them to the Central Government for approval. As mentioned above, there are two agencies (departments) implementing the scheme, this may lead to divergent practices in implementation and lead to inefficiencies. In 2012, the State Government proposed the creation of an apex body for the implementation of micro irrigation schemes known as the Karnataka Antharaganga Micro Irrigation Corporation. The proposal for this was made in 2012; however as of 2016, there is still no evidence of the existence of such a corporation. The NMMI scheme has been replaced with the National Mission for Sustainable Agriculture. This does not create any new institutions at the state level per se; it only requires institutions at the state level to be notified as those under the NMSA.

3.9.5 Ground Water

There were several concerns regarding the over exploitation of watersheds and the over extraction of water around sources of drinking water which lead to the enactment of the following pieces of legislation.

3.9.5.1 Karnataka Ground Water Act, 1999

The objective of this legislation was to regulate and protect sources of drinking water, in
pursuance to a directive from the Central Government.

The Act vests in the ‘appropriate authority’ several regulatory powers and places restriction on certain activities that may affect the ground water level. Most of these revolve around the ‘sinking’ of wells. The appropriate authority may declare certain areas to be ‘water scarcity areas’ under section 4 of the Act. Section 6 allows for the declaration of a watershed as an ‘overexploited watershed’ which would prohibit the sinking of wells in this area without the prior permission of the appropriate authority. The Act prescribes two broad penalties (one for a general contravention of the Act or violation of any rule made there under and the other for the damaging/obstruction of the water supply system) which range up to one year of imprisonment and Rupees 5000/- as fine or both.

3.9.5.2 The Karnataka Ground Water Act, 2011

The Karnataka Ground Water Act, 2011 was enacted with a view to regulate the indiscriminate use of the state’s ground water and it is meant to be a general legislation. The Act is not in derogation to any existing law regarding the protection of public sources of drinking water (Karnataka Ground Water Act, 1999) and is only to be read as adding to the same.

The Act creates a Karnataka Ground Water Authority which comprises of members from various already established authorities (Eg. Chairman of the State Pollution Control Board, Engineers from the Karnataka Urban Water Distribution and Sewerage Board, the Secretary of the Water Resources Department etc.) The Authority has a predominantly advisory role in terms of its core function. The Act provides for the notification of certain areas where groundwater use may be managed and regulated (section 10). However, the authority may, on consultation with expert bodies, only advise the government that a certain area be notified under section 10 of the Act. This is significant given that section 11 postulates that ‘water users’ (including the government’) would require the authority’s permission to drill and dig for the purpose of extracting ground water in the notified areas under section 10. Though the Authority may act without government approval under section 11, this capacity is contingent on the area being notified under section 10 (for which the Authority plays only an advisory role).

The Act also speaks about rainwater harvesting. The Authority is mandated to direct the construction of rainwater harvesting structure in notified urban areas (where building plan area exceeds 100 sq.ft.) and give notification to government department to include the same in the schemes that apply to such areas. The Authority is also to identify ‘recharge worthy areas’, spread awareness on rainwater harvesting, encourage community participation in watershed management in rural areas, and give farmers
who practice rainwater harvesting and other water conservation schemes subsides or other incentives. There have been no new initiatives apart from the existing Krishi Bhagya Scheme to incentivize and support efforts of rainwater harvesting by farmers. This may be contrasted with the incentives received by enterprises for adopting rainwater harvesting systems and water saving technologies as under the Semiconductor Policy of 2010. Under this, enterprises are reimbursed for installing the above systems.

The other powers and functions of the Authority include search and seizure (subject to the code of civil procedure) similar to those enjoyed by the State Pollution Control Boards (Under the Air Act and Water Act). They also have a power similar to section 5 of the Environmental Protection Act, 1986 wherein the power supply to a ground water user may be cut if s/he has not complied with a direction of the authority or has violated a provision of the Karnataka Ground Water Protection Act, 2011. The Act also describes certain offences and prescribes punishments for the same. The Act envisions the constitution of an Appellate Authority for decision made by the Karnataka Ground Water Authority and Civil Courts are barred from deciding matter that fall under the jurisdiction of this Act.

Central Ground Water Authority (constituted under s.3 of the Environmental Protection Act, 1986) which comes under the Ministry of Water Resources does not interfere with function in Karnataka and other States that have their own Ground Water Authorities.

### 3.9.5.3 Implementation framework of the Legislations

In 2013-14 the Ground Water Authority was separated from the Department of Mines and Geology (Government of Karnataka) by bifurcating the ‘Water Wing’ of the department and establishing the ‘Groundwater Directorate’. The Ground Water Directorate comes under the Ministry Department of Water Resources (Minor Irrigation). The Bangalore Water Supply and Sewerage Board oversee the implementation of the Ground Water Act, 2011 in Bengaluru (BBMP). However, there is little information on their website. Accessing the rules of the said acts is in English is an issue. By a notification dated 17/1/2011, the Government of Karnataka in pursuance to the powers given to it by section 2 of the Ground Water Act of 1999 appointed the Chief Administrative Officer and Secretary working in the Bangalore Water Supply and Sewerage Board as the ‘appropriate authority’ within Bruhat Bengaluru Mahanagara Palike (BBMP) limits. A provision under Section 2(1) of the Ground Water Act 1999 empowers the State Government to appoint an Officer not below the Rank of Assistant Commissioner of the Karnataka Water Supply and Drainage Board as the ‘appropriate authority’ for the rest of the State of Karnataka.
3.10 Rainwater Harvesting

The Ground Water Act of 2011 is not the first to bring up the need for rainwater harvesting. The Bangalore Water Supply and Sewerage Amendment Act, 2009 made it mandatory for every owner or occupier of a building with a site area of 2400 Sq. ft. more, or every owner who proposes to construct a building with a site area of 1200 Sq. ft. or more to provide for rainwater harvesting structures. This was to be done with nine months of the commencement of the Amendment, failing which the BWSSB would build the rainwater harvesting structure and recover the cost of the same from the owner/occupier as arrears in land revenue. By the notification dated 7 July, 2011, the BWSSB has the authority to disconnect water supply of owners/occupiers who fail to comply with the regulations of the BWSSB (after the said occupiers/owners have been given a fair chance to be heard. Thus, it seems that disincentives to not comply have been more influential than incentives to comply.

3.11 Lake Conservation and Development

The State legislation focuses on the prevention of pollution and encroachments, and the preservation, protection, rejuvenation and conservation of Lakes and Tanks in Karnataka. The Karnataka Tank Conservation and Development Act, 2014 applies to the rural areas (or areas outside the jurisdiction of Municipal Corporations and the Bangalore Development Authority) and the Karnataka Lake Conservation and Development Act, 2015 applies to areas within Municipal Corporations and the jurisdiction of the Bangalore Development Authority. The Autonomy of the WUAs in using and maintain minor irrigation works like tanks has been considerably reduced after the enactment of the Karnataka Tank Conservation and Development Act, 2014 (the KTCDA).

The structure of both the Acts are very similar. Even though one Act uses the term ‘lake’ and the other uses the term ‘tank’, from the definitions given in the respective Acts it is clear that both refer to the same type of water body. Both the Acts constitute state level authorities (composition of the authorities differ) which are given certain duties, powers and functions (which are almost identical between the two Acts), the offences prescribed in the Acts are the same, however the penalty differs. The functions of the Authorities

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By the insertion of s.72A

Karnataka Lake Conservation and Development Act, § 2(1) (h) (2015). The section reads: “lake” means an inland water-body irrespective of whether it contains water or not, mentioned in revenue records as sarkarikere, kharabkere, kunte, katte or by any other name and includes the peripheral catchment areas, Rajakaluve main feeder, inlets, bunds, weirs, sluices, draft channels, outlets and the main channels of drainages to and fro;
under the Acts are of a regulatory nature. The authorities are empowered to (and obliged to) remove encroachments from the lakes within their jurisdiction to promote lake conservation and reclamation, carry out desilting activities and environmental impact assessments for the water bodies, promote integrated applied research on lakes/tanks, encourage community participation and interest in lake/tank preservation, and improve and monitor water quality and ecology of the water bodies. The Acts also impose certain duties upon the public by prohibiting certain acts in and around lakes/tanks.

3.12 Prevention and Control of Pollution

The Karnataka State Pollution Control Board was constituted on 21 September, 2012 as mandated by the Water (Prevention and Control of Pollution) Act, 1974. At this stage, it was entrusted with the function of preventing and controlling water pollution and maintaining or restoring of wholesomeness of water. After the enactment of the Air (Prevention and Control of Pollution) Act of 1981, the Board was to enforce this Act as well. The Board’s functions relating to water relate the prevention and control of pollution of streams, rivers, wells, and other water bodies, the inspection and monitoring of sewage and laying down standards for it, and spreading awareness about the prevention and control of water pollution. Industries those are likely to discharge trade effluents or sewage or create a new outlet for the discharge of the same would have to abide by the guidelines of the Board as prescribed on their website. New industries likely to carry out the above activities would require the consent of the Board and would have to function subject to such conditions as the Board may specify while giving its consent. Inspections may be carried out by authorised personnel of the Board to monitor the type of effluents being released by an industry and whether they conform to the standards laid down. The Board has the power to cut the supply of power and other amenities such as electricity to industries that don't comply with orders or guidelines issues by it under any of the Acts it enforces.

3.13 Water Governance in Urban Areas

In Karnataka, four Acts govern water supply and drainage/sewerage mechanisms in urban areas. The Karnataka Municipalities Act and the Municipal Corporations Act were enacted to enforce the 73rd Constitutional amendments. The two acts charge municipalities and municipal corporations to provide adequate water and drainage facilities for the areas under their jurisdiction. The Karnataka Urban Water Supply and Drainage Board (KUWSDB) Act creates an institution to aid Urban Local Bodies (ULBs) in supplying water and drainage facilities. The Bangalore Water Supply and Sewerage (BWSS) Act creates an institution essentially replacing a municipal corporation in its functions of supplying water and creating sewerage facilities. Both the Acts have been discussed below.
3.13.1 Karnataka Urban Water Supply and Drainage Board Act, 1974

The KUWSDB Act of 1974 governs water distribution in the Urban Areas of Karnataka except the City of Bangalore. The Act is brought to life through the constitution of the board that executes various functions relating to water supply. The Board however is heavily influenced by the State Government in term of its constitution and actions thereafter.

The Board comprises a Chairman, a Managing Director, and twelve other directors out of which four shall be representatives of the government secretariat dealing in finance, public works and housing and one shall be the Director of Municipal Administration; four shall represent local authorities (one from each revenue division); and four must be such persons as having knowledge and experience in the field of public health engineering with reference to water supply and must not be employees of the government of local authority or corporation owned or controlled by the government. The mandatory function of the board is to assist local authorities of the State in water supply and drainage for urban areas and other such functions as may be entrusted to the board from time to time. The assistance referred to here is financial assistance by way of loans and grants. The Board may also investigate the type of schemes that they would be appropriate for the supply of water and drainage in an area, plan such schemes, and execute them. It may also operate and maintain drainage and water supply systems, and levy and collect water charges, fees and other rentals. The latter two functions are subject to the Approval of the State Government. The board may perform the discretionary functions *suo moto* or at the instance of the State Government or local authority. Local Authorities cannot execute any Scheme without the approval of the Board and the Act prevents the Board from approving such a Scheme that might cost more than Rupees fifty thousand.

3.13.2 Bangalore Water Supply and Sewerage Act, 1964

The BWSS Act, 1964 was enacted so as to manage the infrastructural development in Bangalore’s water supply, drainage and sewerage systems so as to effectively utilise and distribute the additional supply of water from the Cauvery Water Supply Scheme. The BWSSB is constituted under section 3 of the Act, it can comprise anywhere between three to seven members who will be appointed by the State Government. The Bangalore Water Supply and Sewerage Board (BWSSB) created under the Act enjoys more autonomy than the KUWSDB.

The first indication of this is that the BWSS Act requires the Board to make appointment of necessary staff after consultation with the State Government, however in the case of KUWSDB Act, the requirement is the approval of the State Government. Also, the mandate of BWSSB is to ensure adequate sewerage and drainage facilities and provide
sufficient water supply. Thus, its role is not restricted to providing funds to local authorities to carry out these functions like the KUWSDB’s role. Further, the Board does not have discretionary functions and the Act provides that it shall (not may) ascertain the wholesomeness and sufficiency of water in Bangalore, prepare and carry out schemes for the supply of wholesome purposes for domestic uses, and for proper sewerage and disposal of sewage. Per Section 30 of the Act, all house connections must be maintained, altered repaired and kept in order by the owner of the premises.

The SAAP states that the KUWSDB and the BWSSB will be restructured in the medium term to become publically owned independent providers (like a government company) to provide ULBs having low capacities with technical and managerial assistance.

3.13.3 Urban Development Department (UDD)

The Urban Development Department of the Government of Karnataka supervises the functions of the KUWSDB and BWSSB and oversees policies relating to urban water supply and sanitation along with overall urban planning and development. The Budget allocation for plan and non-plan expenditure among various water supply schemes, KUWSDB and BWSSB is done by the UDD. The UDD does play a role in the allocation of water and also co-ordinates the various water supply schemes, i.e., piped water supply scheme and the accelerated water supply scheme.

3.13.4 AMRUT (Atal Mission for Rejuvenation and Urban Transformation)

AMRUT is a scheme that provides large amounts of money for the water sector in Karnataka. The Scheme requires Urban Local Bodies (ULBs) to contribute 33 percent of the funds (other than Bangalore whose share is 47 percent) while the State and Centre contribute 20 percent and 47 percent each (respectively). The KUWSDB and BWSSB act as executors of the scheme in their jurisdictions along with the ULBs. The funds are allocated to a State based on the proposals submitted to the Centre for the same. The AMRUT guidelines require the creation of certain institutions at the State and District levels which are as follow:

a. **State Level High Powered Steering Committee (SHPSC)** that steers the mission at the state level. It ensures the creation of Service Level Improvement Plans (SLIPs) at city level for the provision of water and sewerage facilities. Karnataka has created such a committee vide G.O. No. UDD121css 2015, Dated 11.08.2015.

b. **State Level Technical Committee (SLTC)** that gives the technical and financial approval of the Detailed Project Reports (DPRs) Prepared by the Project Management and Development Consultant or ‘PMDC’. PMDCs are to be appointed by the State Government along with a Mission Director and Project
Management Unit (PMU). A per the SAAP, the mission director is the Secretary
of Urban Development and the Directorate of Urban Development is the State
Level Nodal Agency (SLNA) that functions as a PMU for the state.

c. **Urban Local Bodies (ULBs) and Parastatal Agencies:** ULBs and Parastatal
agencies are the enforcers of the project at the City Level. In Karnataka, the
KUWSDB and the BWSSB function as the parastatal agencies. The ULBs are to
work closely with the PMDCs in developing the SLIPs and getting the latter
approved at the State Level. The SAAP 2015-16 does not evidence the creation
of a SLTC in Karnataka, thus it is safe to assume that the function of the SLTC is
carried out by the SHPSC.

d. **District Level Review and Monitoring Committee:** The AMRUT Guidelines
require the formation of a District Level Review and Monitoring Committee
(DLRMC) and an Independent Review and Monitoring Agency (IRMA). The
SAAP 2015-16 commits to creating the above-mentioned monitoring agencies.
A tender for the appointment of an IRMA was floated on the 26 August, 2016.

### 3.14 Water Governance in Rural Areas

The lowest level of a participatory institution provided in the Karnataka Panchayat Raj
Act of 1993 or ‘the Act’ for ensuring water security is at the Gram Sabha Level for
ensuring water security. This is in the form of advising the Gram Sabha as to where the
taps or sanitation units must be located, and suggest remedial measures where the Ward
Sabha has identified deficiencies in water supply schemes. The Gram Sabha is also to
spread awareness on pollution and maintain public properties such as tanks and ground
water. The Gram Panchayat is charged with the construction of household and public
latrines, and maintaining water supply works through contracts (by generating adequate
resources) or on its own. The Grama Panchayat is also in charge of granting licenses to
hotels and certain management industries (thus giving it an opportunity to control the
inter-sectoral allocation of water). The Grama Panchayat may also issue orders to protect
public sources of drinking water and is charged with their overall protection and
maintenance. It may also make bye-laws for regulating and maintain water supply works
and water supply subject to rules made by the State Government in this regard. Though
the Grama Panchayat is charged with various duties relating to the provision of water
under Schedule I of the Act, if the State or Central Governments provide funds for the
discharge of any of the duties, the Grama Panchayat is to comply with the guidelines
issued by them.

According to the 2014-15 annual report of the Rural Development and Panchayat Raj
Department, the Schemes for the provision of drinking water in rural areas are according
to the updated guidelines (2013) of the National Rural Drinking Water Programme
The Annual Report of the year 2014-2015 speaks about the state of implantation of various aspects of NRDWP which forms the backbone of rural water supply in Karnataka. The Scheme envisions the creation of various institutions (mentioned below) at the state and district levels to bring its objectives to life.

3.14.1 State Level Water and Sanitation Mission (SWSM)

This institution is to be a registered society at the State Level. It should comprise the secretaries in charge of rural development, Panchayat raj, health, women and child development, information and public relations and public health and engineering (PHED). It is to be headed by the Chief Secretary, Additional Secretary or Development Commissioner. The main functions of the SWSM are to co-ordinate between various departments that are involved in the rural drinking water sector, provide policy guidance, facilitate the integration of water supply and sanitation policies, monitor and evaluate the physical and financial performance of projects, and maintain accounts for funds and carry out audits for the same. The SWSM is to provide operational flexibility to the States/UTs to institutionalize community participation. Vide Government Order dated 4.3.2014, the State Government created the Rural Drinking Water Supply and Sanitation Department (KRDWSSD) to deal with rural water supply schemes and sanitation activities.

3.14.2 State Level Scheme Sanctioning Committee (SLSSC)

The SLSSC consists of representatives from various relevant departments of the Government of India (Eg. Central Ground Water Board, Ministry of Drinking Water and Sanitation), representatives from relevant State Departments including the State Technical Agency, and technical representatives from reputed state/national institutions. The Secretary of the PHED or Rural Water Supply Department is the Chairperson of the SLSSC. The main objective of the SLSSC is to avoid administrative bottlenecks in implementing rural drinking water schemes by giving technical and administrative approval of schemes to state governments. Karnataka has a State Level Scheme Sanctioning Committee as evidenced by the record of its proceedings held on the 29 of June, 2012. However, there is no official website for the same.

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33 These funds are the programme fund and support fund. The former is for the implantation of schemes, the latter is for ‘hardware’ and ‘software’ activities such as improvement of technology and knowledge respectively.

34 Annual report 2014-15

3.14.3 State Technical Agency (STA)

These institutions are identified by the SWSM (in consultation with the Ministry of Drinking Water and Sanitation) and serve to fill the technical gaps of the PHED without having to resort to recruitment and creation of new posts. One of their functions is to provide technical approval to the SLSSC. Apart from this, STAs’ functions include scrutinising and giving feedback on existing programmes to SLSSCs and the PHED, planning projects in a scientific and cost effective manner with a special focus on the sustainability of the same, assisting PHEDs in planning ‘software’ and ‘hardware’ activities, and carrying out State Specific Research and Development Activities.

3.14.4 Water and Sanitation Support Organisation (WSSO)

The NRDWP requires States to form a WSSO which will come under the SWSM. The main function of the WSSO is to deal with the software aspects of the rural water supply sector and bridge the gap between government departments and community organisations. The WSSO is also to assist PRIs like the Gram Panchayat and Standing Committees to take up water security plans and implement rural water supply projects, take up Human Resource Development and IEC (Information, Education and Communication) programmes, conduct evaluation and impact assessment studies, carry out computerisation and GIS mapping, and set up online monitoring systems including those for water quality monitoring and surveillance. There is no evidence of Karnataka having a WSSO.

3.14.5 District Water and Sanitation Mission (DWSM)

The DWSM is to function under the supervision of the Zilla Parishad. The Executive Engineer of the PHED/Zilla Parishad shall be the member secretary of the DWSM and it shall be headed by the Chairperson of the Zilla Parishad. The main functions of the DWSMs are, the formulation, management and co-ordination of projects, and the scrutiny and approval of Grama Panchayat Schemes. Its other functions include spreading of public awareness (social mobilisation), imparting trainings, capacity building and co-ordination of various programmes related to health, water and sanitation. According to the 2011-12 calculations, there is a high proportion of filled in positions for consultants of DWSMs. Thus, it would be safe to assume that Karnataka has constituted DWSMs.

3.14.6 Block Resource Centres (BRCs)

Block Resource Centres are institutional set ups at the block level that provide guidance and support to villages so that they may strengthen their water supply and sanitation systems. It is essentially an extended arm of the DWSM and will attempt to better connect the community to GP/VWSCs and will facilitate the formation of the latter. Conducting trainings for grassroots level workers, Anganwadi workers etc., co-
ordinating with district laboratories and alerting villages, and aiding in the formulation and implementation of village action plans of the GP/VWSC are some other important functions performed by the BRCs. The Block Panchayat is to supervise the BRCs activities and ensure that its functionaries act in accordance with the approved plans. The release of funds for staff expenses, administrative activities and other activities of the BRC will be from the support fund of the National Rural Drinking Water Programme (NRDWP) and will be released by the DWSM.

3.14.7 Gram Panchayat/Village Water and Sanitation Committee (GP/VWSC)

These would be standing committees of the Gram Panchayat under section 61A of the Panchayat Raj Act 1993. These institutions are meant to increase community participation in rural water supply and sanitation schemes and to plan, design and implement water supply schemes within the village. They are also responsible for opening a bank account for the community contributions, Operation and Maintenance funds and other project management funds. Though it is the Gram Panchayat that is equipped with funds functions and functionaries to plan implement and monitor water supply schemes at the village level, the body through which actions are taken will be the Committee.

3.14.8 Types of Schemes implemented in the rural areas of the State

There are three types of schemes that operate within the Rural Areas of the State, bore wells fitted with hand pumps, Mini Water Supply Schemes, Piped Water Supply Schemes, and Multi Village Water Supply Schemes. The decision as to which Scheme must be implemented in which village will depend upon the population of the latter.

Bore wells with hand pumps are the main source of drinking water in the rural areas. In the Mini Water Supply Scheme, water is pumped into a cistern from a bore well. Villagers can collect the water from the taps attached to the cistern. Piped Water Supply Schemes provide piped water to households. Multi Village Water Supply Schemes (MVS Schemes) have been formulated under the Rajiv Gandhi National Drinking Water Mission for rural areas. These schemes have a specific focus on tapping surface water resources for drinking water purposes. The scheme provides for the treatment of contaminated surface waters which can then be supplied to villages.

3.15 Hydropower

3.15.1 Karnataka Power Corporation Limited (KPCL)

Karnataka Power Corporation Limited is a company owned by the Government of Karnataka, and is engaged in the service of generating electrical power in the state of Karnataka in India. The modes for generation of electric power are hydroelectric,
thermal and diesel. The company was started in the year 1970 due to a vision of the Karnataka government for separate entities for generation and distribution of electric power.

3.15.2 Karnataka Renewable Energy Development Limited (KREDL)

The Karnataka Renewable Energy Development Limited\(^{36}\) is the organisations that controls and operates Small Hydro Power (SHP) – Micro, Mini and Small Hydro in the state. It is an organisation that works under the purview of the Energy Department, Government of Karnataka. It was established in the year 1996. This organisation works under various Governmental agencies, the Civil Society and other Auditors. One of the main aim of the organisation is the promotion of the renewable energy resources in the state of Karnataka. It mainly supports private sector participation in the power generation. It acts as an advisory body to the Government of Karnataka on various policies adopted for power generation from the non-conventional resources. It also supports various projects for harnessing energy from the wind, water, sun and biomass and makes recommendations on the various practices adopted for renewable energy generation and regulation at the national and the state levels.

3.16 Issues of Water Governance

3.16.1 Groundwater

Despite the dire situation of groundwater, the state policy does not recognise ground water as a non-renewable resource. Groundwater takes millions of years to collect in an aquifer and the amount that can be recharged varies depending on the type of aquifer. In fact, one of the objectives of KWP 2002 is to increase the irrigation capability to the tune of an additional one million and six hundred thousand hectares by using ground water. However, the Policy does recognise that the growing need for drinking water cannot be met solely through ground water. It envisions the need to develop surface water resources and acknowledges that this might come at the cost of diverting water from irrigation.

State level ground water legislations address the concerns of the KWP 2002 relating to the recharge of ground water and the regulation of its extraction. At the outset, the legislations mainly govern the extraction of water and not its use (say, through sectoral allocation). Thus, it is unclear how they effectuate the priorities and ‘equitable’ distribution as identified in the Policy. Further, the institutions created by the legislation may not be able to regulate water extraction based on scientific principles given that there is a huge potential for vested interests to dictate decisions ground water

\(^{36}\) KREDL Website [http://kredlinfo.in/projhydro.aspx](http://kredlinfo.in/projhydro.aspx)
management.

3.16.2 The Karnataka Ground Water Act, 2011

The government is a party of interest being defined as a ‘water user’ under the Act. It thus may not be the best judge of its whether or not an area must be ‘notified’ thus impeding free use the ground water there. This is just the direct interest, other influences on the government may be more difficult to pin point (lobbying), and however, they still strengthen the doubt regarding the impartiality in the notification of an area.

Another Challenge to the autonomy of the Authority would be the fact that its funding (through the Karnataka Ground Water Authority Fund) is dependent on government loans and grants for the most part (which needn’t be consistent or based on a set rationale). Further, the Authority may not take loans without the concurrence of the government.

3.16.3. Issues with overlap in Karnataka Ground Water Act, 1999 & 2011

Both Acts can be said to have different function; however there is considerable room for overlap. The latter Act is more general in nature and will not affect actions specifically to protect sources of drinking water. Both Acts are complementary and as such there is no room for conflict (though there is enough for confusion). Given the statement of overriding other legislations in the former Act and non-derogation in the latter Act, it would be possible for the ‘appropriate authority’\(^{37}\) to restrict the sinking of wells even in notified areas (under section 10 of the 2011 Act). The overriding effect of the 1999 can be said to be rightly placed because the later gives more of a say to the authority constituted under it. However, there does a possibility of partiality since the appropriate authority taking the call is the Deputy Commissioner (a government servant whose place of duty is decided by the government) or an officer appointed for the purpose by the government.

3.16.4 Karnataka Command Areas Development Act, 1980

However, the CADAs have limited authority in the sense that their functions are closely tied to the utilisation of irrigation facilities. Thus, even though the conjunctive use of surface and ground water is a part of ‘comprehensive development’, it is not likely to be fully effectuated given that CADAs do not have the authority to regulate the use of ground water. There is also no institution to co-ordinate the functions of Ground Water Development Authority and CADA to make them complementary and ensure that they treat ground water and surface water as one resource. Further, the CADAs frame and

\(^{37}\) Section 2(1)
implement Schemes in a largely unilateral fashion. Discussions with other authorities related to the water sector are not mandated, thus despite the broad mandate given to CADA, there is not enough integration with other aspects of water resource development.

The Act is silent on how the community participation and responsibility will be fostered through this system given that decisions will be taken by the authority, which is also responsible for the formulation of schemes. People affected by the Scheme may file objections that will be considered\(^\text{38}\), however, this is not emblematic of participatory governance. Even for such objections to be robust and well informed, it is necessary for the responsibility and participation to be inculcated early on. The Act has no provision for holding public meeting or raising awareness about efficient irrigation practices etc. Even though one CADA is in charge of more than one district, public meetings at the Zilla Parishad level can be held on a rotational basis at each district. There is also no grievance redressal mechanism for issues that may arise during the implementation of a scheme. Thus, barring the representative of the Zilla Parishad, there is no public accountability that the CADAs are subject to.

There is ambiguity when it comes to understanding how districts within the jurisdiction of two CADAs will be dealt with, for example the direction of which of the two CADAs will be implemented by a statutory corporation functioning in such a district? Section 11A of the Act mandates the creation of a Directorate for all CADAs who would be entrusted with the co-ordination and supervision of the activities of all CADAs. However, there is not website for this Directorate and it unclear how the Directorate would decide the extent of authority of each CADA in a district that comes under more than one CADA.

### 3.17 Participatory Irrigation Management System

The Government has the discretion as to whether or not to entrust irrigation work to a WUS or WUA and is not accountable to give reasons as to why control has not been transferred. The NWP 2002 makes specific reference to women’s participation in irrigation management, however, there is no mechanism to ensure or even promote or incentivize this in the Acts discussed above.

The Apex Federation may give directions to WUSs, WUDLFs and WUPLFs for the purposes of carrying out the provisions of this Act. However, the Apex Federation is not a body comprising water users, but has the capacity to give directions to water user’s institutions. This is relevant even when considering the second function of the Apex

\(^{38}\) Karnataka Command Areas Development Act. § 13(1) (1980).
Federation which is to give recommendations to the State Government for framing policies relating to the construction, maintenance and regulation of irrigation works are water supply there from. There seems to be a break between the water users and policy makers at this stage. Further, from the existing structure, the actual amount of control exercised by water users is dependent on not just the State Government’s discretion (under section 4), but also the extent to which the Apex Federation allows for decision making at the level of water users by not issuing directions to them. This applies to participation under the irrigation Act of 1957 as well, the supply of water to such Societies in contingent on a choice made by the State Government or a ‘Nigam’. Leaving so much of space for discretion leaves the system vulnerable to volition that might not always be committed to Participatory Irrigation Management.

3.18 Water Governance in Urban Areas

3.18.1 Karnataka Urban Water Supply and Drainage Board Act

The system of water governance under the Act is highly centralized and gives the State Government virtually all control over the water supply and drainage of the urban areas of the State. The local authorities must bear all the costs but have very little decision-making power given that the implementation of the decision is subject to a Board (that is not independent) and the State Government. With such little control, it makes democratic structures in urban areas merely namesake.

3.18.2 Bangalore Water Supply and Sewerage Act

While the KWSDB has a budget of ten lakhs after which it would need Government Approval, the BWSSB has a budget of rupees one crore; if the estimated budget of a scheme were to exceed one crore, only then would the BWSSB need the State Government’s approval for it. This situation is strange given that the area wise mandate of the KWSDB is greater than that of the BWSSB. It may be said that the nature of the KWSDB’s role is only to provide finance, and other assistance (to the local authority) may be provided at its discretion. However, the local authority itself is not given much autonomy and has a budget of Rupees fifty thousand for scheme’s it may carry out on its own. Thus, the local authority is heavily dependent on the Board for approval and the Board is heavily dependent on the State Government for the same under the KWSDB Act.

The BWSSB is financed by levying fees, charges and other rates for its operations under this Act. The basis of this is a no-profit-no-loss scheme. But, according to the website of the BWSSB, they recover lesser than fifty percent of their operational costs. Further, about 50 percent of the water is supplied is not accounted for. Sections 49 and 50, talks about the wastage or misuse of water but in a limited sense. It does not include wasteful
consumer practices; it only looks at supply side efficiency. Thus, there is no demand management as envisioned by the KWP 2002.

3.18.3 Water Governance in Rural Areas

Karnataka has successfully devolved operational and management functions to the PRIs, however, the same cannot be said for the constitution of standing committees, there is no government order that mandates this. Thus, the decentralisation process stops at the sub-district level with the formation of Block Resource Centres (BRCs). Ideally, these BRCs are to provide support to standing committees and act as a link between the standing committees and the District Water and Sanitation Mission. Further, zero percent of the water charges are collected by PRIs in the State. This is not surprising given that the GP/WVSCs are responsible for tariff collection. They also perform a crucial function of mobilising the community and spreading awareness on issues relating to water security. Though other institutions are also charged with this function, in Karnataka, the institution closest to the community (the GP/WVSCs) have not yet been constituted.

The lack of complete decentralisation will hinder the transition from a supply based to a demand driven approach (as envisioned by the 2013 guidelines of the NRDWP). Evidence of this is already seen as there is no proof of the percentage of water demand charges collected by PRIs. This is likely because there aren’t sufficient standing committees that would be responsible for such collection.

There is no contribution from the consumers’ side in the construction of the water supply structure under the schemes, and this may diminish the sense of responsibility that a community feels in maintaining the resultant infrastructure. Community participation also seems to be a concern in water quality testing. The 2014-15 Annual Report of the RDPR Department does not refer to training programmes or awareness campaigns that teach the community to look out for signs of contamination. Further, there seems to be no mandate on the Grama Panchayat to carry out the periodic testing of water sources. It is thus unclear on how water quality will be maintained and monitored in the long run.

3.19 Rainwater Harvesting

The Karnataka Ground Water Act of 2011 reduces the minimum site area that would make rainwater-harvesting mandatory in notified areas\(^{39}\). There were large compliance issues with the enactment as noted by the former chairman of the BWSSB\(^{40}(1\text{May,}

\(^{39}\) Section 22(3), Karnataka Ground Water Act, 2011

The implementation of the same for Bangalore carried out by the BWSSB; however, it is unlikely that this will be effectuated. The reason the public does not care to construct rainwater harvesting structures is because the alternatives are not disincentives enough. The construction of the said structures has a high capital cost, the incurring of which is not incentivized given that ground water is provided at cheap rates (rupees eight per kilo liter as per 2015). However, increased compliance is seen among people applying for new water connections since this is denied sans the adoption of rainwater harvesting systems.

3.20 WUAs and the Karnataka Tank Conservation and Development Authority

The water bodies and structures affected by the Karnataka Tank Conservation and Development Act, 2014 exclude those that are medium irrigation tanks that have a command area of more than 2000 hectares (each). This excluded area is the area of operation of Water Users Societies. However, the areas that would be included such as minor irrigation tanks with a command area lesser than 2000 hectares comes under the area of operation of Water Users Associations. This might also be the reason why the authority is chaired by the Minister for Minor Irrigation who would be in the best position to understand the irrigation related uses of the tank. The Authority may specify that water from certain tanks may be used for the irrigation and human consumption. But despite this, the autonomy given to Water Users Associations in operating irrigation canals, develop irrigation works and carry out related functions is diminished and contingent on notification by the Karnataka Tank Conservation and Development Authority.

3.21 Concluding Thoughts

Following are some brief general issues with respect to Water Governance in Karnataka.

a) Incomplete/ Partial Decentralisation: No/very less financial autonomy is imparted to institutions entrusted with very important responsibilities. Most of them depend upon State Agencies and Departments for grants and approval of their budgets. They have very little decision-making power as well.

b) Silence on community participation/Engagement/Ownership: Some of the policies speak briefly about it but none of them specifies the means or channels through which it can be achieved.

c) No demand side Management: Though KWP 2002 briefly touches the topic, the

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41 ‘Harvest Rainwater or pay fine from May 1’, http://www.thehindu.com/news/cities/bangalore/harvest-rainwater-or-pay-fine-from-may-1/article8506756.ece, 22 April, 2016, 05:46 IST
42 supra at note 2.
Acts and institutions created do not mandate demand side management and no targeted solutions or channels are reflected in them.

d) **Overlap of Jurisdiction:** Many of the institutions [*existing or created*] provide for room enough for confusion in terms of the jurisdiction area and the functions allotted.
Inter-State Issues of River Basin wise - Agreements, Awards and Decisions of Tribunal
Godavari River Basin

43 Disputes and awards as reported by the Further Report and Report of the Godavari Water Dispute Tribunal; Link:
http://irrigationap.cgg.gov.in/img/tribunaryDisputes/GWDT%20AWARD.pdf
Terms of the Agreements as reported in Inter State Agreements under Water Resources Information System of India (WRIS); Link: http://india-wris.nrsc.gov.in/wrpinfo/index.php?title=Godavari#Inter-State_Agreements
4.1 Godavari River Basin

The Godavari basin extends over the states of Maharashtra, Andhra Pradesh, Chhattisgarh and Orissa, in addition to smaller parts of Madhya Pradesh, Karnataka and the Union Territory of Pondicherry. The river rises from Trimbakeshwar in Nashik district of Maharashtra. The total length of Godavari from its origin to its outfall into the Bay of Bengal is 1,465km. The major part of the basin is covered with agricultural land accounting to 59.57% of the total area and 3.6% of the basin is covered with water bodies. The basin spreads over 51 parliamentary constituencies comprising 21 of Maharashtra, 18 of Andhra Pradesh, 4 of Madhya Pradesh, 3 each of Chhattisgarh and Odisha and 1 each of Karnataka and Puducherry.44 The tributaries of Godavari are Upper Godavari, Pravara, Purna, Manjra, Middle Godavari, Maner, Penganga, Wardha, PranhitA, Lower Godavari, Indravati, Sabari. Manjari is the only tributary of the river Godavari that has its origin in Karnataka.

4.1.1 Status of Surface Water Development45

During the pre-plan period, many storage and diversion projects were taken up in this basin. Against the utilizable surface water potential of 76.3 cubic km the present utilisation has been assessed as 38 cubic km. The ground water utilisation is about 13% of the utilizable potential. A number of inter-state agreements exist between the basin states regarding sharing of water of this basin.

The Godavari Water Dispute Tribunal has not allocated the flows among the basin States, but observed that the existing agreements between the basins States so far as they relate to the projects on the Godavari river and in the Godavari river basin, be carried out.

4.1.2 Godavari River Tribunal

The Government of India Act, 1935 made water an exclusive provincial subject and a specific provision was made for the settlement of water disputes. Before independence, the provinces of Madras, Bombay and Orissa, the Central Provinces, the State of Hyderabad and other princely States such as Baster and Kalahandi had riparian interests in the Godavari basin. In 1950, when the new Constitution came into force, the entire Godavari river basin fell within the territories of the States of Madras, Bombay, Madhya

Pradesh, Hyderabad and Orissa.

A conference was held in the Planning Commission, New Delhi, on the 27th and 28th July, 1951 with the representatives of Bombay, Madras, Hyderabad, Madhya Pradesh and Mysore Governments to discuss the utilisation of supplies in the Krishna and Godavari river basins so that an assessment could be made of the relative merits of the projects proposed for inclusion in the second part of the First Five Year Plan. A memorandum of agreement allocating the flows of the river basin amongst the concerned States was drawn up. The memorandum of agreement was divided into three parts. Part I related to Krishna & Part II related to Godavari. The dependable annual flow in the Godavari basin based on the rerecorded gauging at Dolweshwaram was taken to be 2500 TMC. The balance flow of 1900 TMC after meeting the requirements of the existing utilisations and the requirements of projects under construction was allocated to various states. It was provided that the allocation should be reviewed after 25 years.

Apparently, the memorandum of agreement drawn up at the Inter-State conference in July, 1951, had settled the conflicting claims of the riparian States with regard to the supply of the Godavari river system for a period of 25 years. In the meantime, projects were cleared on the assumption that the memorandum of agreement of 1951 was binding upon the States. Extensive territorial changes were made in the Godavari basin by the Andhra State Act 1953 and the States Reorganisation Act 1956. The new States of Bombay, Mysore, Madhya Pradesh and Andhra Pradesh became the riparian States in place of the old States of Bombay, Hyderabad, Madhya Pradesh and Madras. In view of the territorial changes, the Central Water and Power Commission drew up a scheme for re-allocation of the Godavari Waters, but the scheme was not accepted by the states.

By 1960, the five riparian States proposed important schemes for the development of water resources and there were disputes between them relating to the utilisation of the waters of the Godavari river system. In January 1962, the then Mysore Government applied to the Central Government for reference of the water dispute to the Tribunal. The State Governments began to raise objections to the clearance of new projects on the basis of the 1951 allocations. The Central Government tried their best to settle the dispute by negotiations. Several Inter State conferences were held but the dispute could not be settled. Fresh applications for reference of the dispute to a Tribunal to be constituted under the Inter State Water Disputes Act, 1956 were made by the State Government of Maharashtra, Mysore, Orissa and Madhya Pradesh in 1968. Eventually in April, 1969 the Central Government constituted the Godavari Water Disputes Tribunal.

**4.1.3 Godavari Water Disputes Tribunal (GWDT)**
Government of India constituted on 10 April 1969 the Godavari Water Disputes Tribunal (GWDT) to adjudicate the river water utilisation disputes among the river basin states under the provisions of Interstate River Water Disputes Act, 1956. The Tribunal gave its Award in July, 1980. It has not allocated flows among the basin states, but observed that the existing agreements between the basin States so far as they relate to the projects on the river and the river basin, be carried.

4.1.4 Various Agreements between the States and Outcome

The Agreement dated the 19th December, 1975 was duly filed before the Tribunal pursuant to the stipulation mentioned in the said Agreement. Each of the other Agreements mentioned below was filed before the Tribunal by the States, which entered into the Agreement stating that the Agreement had been reached between them.

4.1.4.1 Karnataka and Andhra Pradesh, dated 17 September, 1975

The states of Karnataka and Andhra Pradesh made an Agreement on 19th December 1975 and the same was filed before the Tribunal on 12th July 1976. The outcomes of the tribunals are:

- Upstream of the Nizamsagar reservoir, Karnataka can build reservoirs at Karanja and Chulkinala and can utilise 13.10 TMC ft and 1.17 TMC ft.
- Andhra Pradesh can construct a reservoir at Singur, for the withdrawal of 4 TMC ft to obtain drinking water for Hyderabad city.
- Building a reservoir at Singur may require submersion of land in Karnataka. The details of this land will be furnished to the Government of Karnataka. Karnataka states that any evaporation loss related to the reservoir should come out of the share of Andhra Pradesh.
- Regarding the construction of projects at the Manjra sub-basin, details of the agreement between Maharashtra and Andhra Pradesh shall be provided to Karnataka, so that all three State governments can arrive at mutually consistent schemes.

4.1.4.2 Karnataka and Andhra Pradesh, dated 4 August, 1978

Another agreement between Karnataka and the erstwhile state of Andhra Pradesh was

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46 http://irrigationap.cgg.gov.in/img/tribunaryDisputes/GWDT%20AWARD.pdf
47 http://india/wris.nrsc.gov.in/wrinfo/index.php?title=Godavari#Inter-State_Agreements
filled before the Tribunal on 18th October 1978. The outcomes are as follows:

1. Karnataka would utilise one TMC of water more for lift irrigation from the Manjra River, in addition to its existing utilisation above the proposed Singur project in the Manjra sub-basin and the utilisation for Karanja and Chulkinala projects (as agreed on 17th September 1975, read with 19th December 1975).

2. Karnataka can put up pondage on the Manjra if required, in agreement with Andhra Pradesh, to utilise this quantity or any other additional quantity that may be agreed to later.

3. Karnataka may utilise 2.5 TMC of water in the Manjra sub-basin in its territory in the catchment below Nizamsagar project.

4. Andhra Pradesh can construct the Singur reservoir, with maximum capacity of 30 TMC of gross storage with FRL/MWL of plus 523.6 above MSL. Karnataka will acquire land and structures that may be submerged/affected due to the Singur project. Andhra Pradesh will bear the cost of acquisition and rehabilitation of the displaced families and the construction cost of bridges and roads that may become necessary. Such acquisition and rehabilitation shall happen as the prevailing norms in Karnataka. Karnataka also agrees to submergence of the riverbeds and stream-beds.

5. If Andhra Pradesh builds a hydro-electric power plant at Singur, Karnataka and Andhra Pradesh will bear the cost and benefits in a said proportion.

6. From the Polavaram reservoir, Andhra Pradesh and Karnataka agree that of the 80 TMC water diverted from Godavari into Krishna River, Andhra Pradesh will utilise 45 TMC whereas Maharashtra and Karnataka will together utilise 35 TMC.

   a. Subject to the clearance of the Polavaram Project, by the Central Water Commission for FRL/MWL plus 150 ft. the State of Andhra Pradesh agrees that 80 TMC at 75 percent dependability of Godavari waters from Polavaram project can be diverted into Krishna river above Vijaywada Anicut displacing the discharges from Nagarjunasagar project for Krishna Delta, thus enabling the use of the said 80 TMC for projects upstream of Nizamsagar.

   b. The said quantity of 80 TMC shall be shared in the proportion of Andhra Pradesh 45 TMC, Karnataka and Maharashtra together 35 TMC.

   c. If the diversion at 75 percent dependability exceeds the said quantity of 80 TMC due to diversion of Godavari waters from the proposed Polavaram project into Krishna River, further diminishing the releases from Nagarjunasagar project, such excess quantity shall also be shared.
between the three states in the same proportion.

d. Andhra Pradesh agrees to bear the full diversion cost.

e. Maharashtra and Karnataka are at liberty to utilise their share of 35 TMC from the date of clearance of the Polavaram Project by Central Water Commission with FRL/MWL of plus 150 ft. irrespective of the actual diversion taking place.

It is also agreed that if the diversion at 75 percent dependability as stated in clause (a) above exceeds the said quantity of 80 TMC due to diversion of Godavari waters from the proposed Polavaram Project into Krishna river, further diminishing the releases from Nagarjunasagar Project such excess quantity shall also be shared between the three States in the same proportion as in sub-clause (b) above.

4.1.4.3 Maharashtra and Karnataka 50, dated 2 February 1979

An agreement was made between Maharashtra and Karnataka and was filed before the Tribunal on 2nd February 1979. This agreement was regarding the sharing of Godavari waters by diverting it into the Krishna River was adopted and acted upon, where the two states agreed to use their aforesaid joint share of 35 TMC in the proportion of Karnataka 21 TMC and Maharashtra 14 TMC subject to variation in case of Godavari waters in excess of 80 TMC.
West Flowing Rivers: Mahadayi River

48 The Award of the Mahaydi Water Dispute Tribunal has not been released in the public domain. This report is based on information available on South Asia Network on Dams, Rivers and People; Link: https://sandrp.wordpress.com/2016/08/02/mahadayi-water-disputes-tribunal-trouble-brewing-in-paradise/#_edn1
4.2 Mahadayi River

The Mahadayi River rises in the Jamboti Ghats in Karnataka State. At the origin, near the village Mabulyesheir, it is known as Bhaburnal, which is at an elevation of 600m above M.S.L. The total length of this West Flowing River from its origin to its out fall into the Arabian Sea is 62 km. The Mahadayi River drains an area of 1,550 sq km., in the state of Goa. The important tributaries of the river are Sarang, Mahainada, Udel, Lohi, Velvota Bicholim, Mapuce, Nanoda and Khandepar.

4.2.1 Constitution of the Tribunal

The Central government has constituted Mahadayi Water Disputes Tribunal (MWDT) vide notification dated 16th November, 2010. The Tribunal is a three-member bench headed by Justice J.M Panchal. In July, 2002, the State of Goa made a request under Section 3 of the Inter-State River Water Disputes Act, 1956 (as amended) for constitution of the Tribunal and referred the matter for adjudication and decision of dispute relating to Mandovi (Mahadayi) River. The issues mentioned in the request included the assessment of available utilisable water resources in the basin at various points, allocation of this water to the three basin States keeping in view priority of the use of water within basin as also to decide the machinery to implement the decision of the tribunal etc.

The Hon’ble Union Minister for Water Resources (MOWR) convened an inter-State meeting on 4th April, 2006 of Chief Ministers of the States of Goa, Karnataka and Maharashtra. Subsequent actions of Government of Goa with regard to follow up action on decisions taken in the inter-State meeting gave impression that State of Goa is not ready to pursue the negotiation process further and wants constitution of tribunal and reference of the dispute to the Tribunal immediately. Accordingly, the Central Government and the MOWR concluded that the dispute contained in the request of State of Goa of July, 2002 cannot be resolved by negotiation and initiated further action in the matter. Meanwhile the Govt. of Goa filed a suit in the Supreme Court on 6th September 2002 for setting up of a water dispute tribunal for adjudication of the above river water dispute and an Interlocutory Application (IA) for stay in construction activities.

4.2.2 The dispute between Karnataka and Goa


50 Source: South Asia Network on Dams, River and People. Link: https://sandrp.wordpress.com/2016/08/02/mahadayi-water-disputes-tribunal-trouble-brewing-in-paradise/#_edn1

4.2.2.1 Karnataka’s Application for Interim-Relief

Karnataka approached the Tribunal in December 2015 with an Interim Application for the state be allowed to lift only 7 TMC water (not 7.56 TMC, which is a part of Karnataka’s original application at KalasaBhanduri, under the MWDT) to alleviate extraordinary drought situation that prevails in the Malaprabha Basin. It supported its claims by stating that it be allowed to lift 7 TMC every year at 75% dependability at Kotni Dam site and that Karnataka’s original claim of 24.15 TMC water for consumptive use from Mahadayi basin will be adjusted accordingly. It claimed that the present stated utilisation of Goa about 9.395 TMC, while yield available to Goa is 108.72 TMC at 75% dependability. Karnataka also stated that total utilisation of Goa, as per its own master plan till 2051 would be 94.4 TMC. Thus, even if Goa succeeds in its claims before the tribunal, there will be no loss to Goa if Karnataka lifts 7 TMC water on immediate basis in view of extreme drought situation, which is likely to persist in future. According to Government of Karnataka, Goa has 14.32 TMC surpluses after accounting for all uses including forest management, domestic water needs, irrigation, salinity control etc., and Karnataka will lift water only during monsoons months.

4.2.2.2 Goa’s Rejoinder

Goa responded to Karnataka’s plea by highlighting the some of the issues as listed below

- **Lack of Proven Predicates of Irreversible Loss** - To obtain interim relief, Karnataka should prove at least 3 mandatory predicates of irreversible loss.

- **Excessive Usage of Water due to Sugarcane** - Goa pleaded that Hubli and Dharwad, by Karnataka’s own admission, is a sugarcane growing region. As a result, drought is mainly due to misuse of water. It pointed out that in 2011-12 areas under sugarcane in Malaprabha Basin was 1,81,470 hectares and it would need nearly 160 TMC of water to cater to this. Excessive sugarcane and its processing has left aquifer dry in Belagavi and Dharwad regions. Goa further stated that drought severity is not only dependent on rainfall intensity and geographical extent, but on the demands made by the human activities and changing cropping pattern like water guzzler cane.

- **Usage of Water by Pepsico Unit in Karnataka** - Pepsico unit in Dharwad is supplied 4 lakh liters of Malaprabha water per day which can satisfy the domestic requirement of at least 16000 people and as such it is difficult to accept Karnataka’s claim of “Extraordinary drought” when such diversions continue unharmed.

- **Water required by Goa for other Purposes** - Goa’s requirement cannot be
fixed only at
9.395 TMC as water is needed for hydropower, marine fisheries, navigation, etc. and that considerable draft is required in Mahadayi river for vessels to enter, when navigation is the backbone of Goa’s economy.

- **Feasibility Report not provided by Karnataka** - Karnataka claims water from Mahadayi river without studying options, or developing a Feasibility Report or PFR Pre-Feasibility Report.

- Environmental clearances not obtained - Karnataka has proposed massive project to divert water through ducts and canals & dams through sanctuary without any clearances under the Environment Protection Act, Forest Conservation Act or the Wildlife Protection Act.

### 4.2.2.3 Karnataka’s Rejoinder

Karnataka filed a rejoinder that 7 TMC will not make any difference to Goa and that the inflow to Malaprabha reservoir for the year 2015-16 was only 11.42 TMC as against normal inflow of 23.82 TMC with a shortage of 52.06%. There has been a shortfall in the inflow of Malaprabha reservoir for the past five consecutive years. Karnataka says that it is ironic of Goa to talk about 4 lakh liters to Pepsico every day, given that 200 TMC go waste to Sea in Goa. The state claimed that the diversion of 7.56 TMC of water from KalasaBhanduri is for drinking water of Hubli Dharwad, but current intermediate application for 7 TMC is for shortages of irrigation and drinking water needs on Malaprabha Command and that the Project will be commissioned only after clearance from Central Government and MoEF and CC.

### Sur-Rejoinder of Goa

To this Karnataka rejoinder, Goa filed a Sur-rejoinder and raised that Karnataka is deliberately placing Goa in disadvantageous position by creating a fait accompli of diversion works. Goa’s 1999 demand of 94.42 TMC water from Mahadayi did not include environmental needs. However, demands of Goa especially of environmental needs are present day requirement and therefore lifting 7 TMC should not be permitted without requisite studies. If such an interim order is passed, it would mean that the Tribunal accepts that Mahadayi is a surplus basin, or that Goa’s demands are only 94 TMC.

- Goa claimed that pumping by Karnataka will be from a flowing river and not a dam or reservoir and it will be impossible to know how much is pumped by Karnataka.

- Shortage in the Malaprabha reservoir is only due to mismanagement of water and nine irrigation schemes upstream of the Malaprabha reservoir.
- Goa repeatedly claimed that parts of Mahadayi are water stressed and that there is no mention of Mahadayi’s water balance in any of Karnataka’s studies.
4.2.2.4 Karnataka’s Amended Appeal

In a surprising move, Karnataka filed a totally Amended Statement and now demanded 7 TMC water for three schemes for the years 2016-17 and 2017-18 with temporary infrastructure for lifting the water by pumps at three points, which can be manually dismantled at any time.

- 3 TMC for protective irrigation in DPAP (Drought Prone Area Program) area of Ramdurga, Soundatti, Bailhongal by Lift.
- 2 TMC drinking water and irrigation by recharge of Groundwater in DPAP parts of Ramdurga, Soundatti and Bailhongal.
- 2 TMC by Malaprabha Command which are not getting water as planned.

Goa pleaded that the amended application should not be entertained as the basis of appeal has been completely changed from the interim application. The Amended Application talks about reduced inflows in Malaprabha Reservoir when filling up of Malaprabha reservoir has no correlation with rainfall and contended that reservoir filling is related with upstream lifts and mismanagement of water. Goa also asserted that water flowing to sea is not a waste and stated that it will be impossible for Karnataka to secure all clearances and continue with and complete heavy-duty work in two years.

4.2.2.5 Interim Verdict of the Mahadayi Water Dispute Tribunal

On 17th March 2014, the Tribunal declared its Interim Award. It gave Karnataka the following directions:

- In response to the original Interim Relief application by Karnataka, it is non-maintainable now as Belgavi, Dharwad, Gadag have all received surplus rainfall in 2016 monsoon.
- Karnataka will not be allowed to utilise or divert water under Kalasa Bhanduri Project until disputes are settled and finally adjudicated by the tribunal.
Pennar & Palar Basin (East Flowing River)

4.3 Pennar River

The Pennar basin extends over the states of Andhra Pradesh and Karnataka having an area of 55,213 Sq.km. The Pennar rises in the ChennaKasava hill of the Nandidurg range, in Chikkaballapur district of Karnataka and flows towards the east, eventually draining into the Bay of Bengal. The total length of the river from the origin to its outfall in the Bay of Bengal is 597 km. Principal tributaries of the river joining from the left are Jayamangali, Kunderu and Sagileru whereas the Chiravati, Papagni and Cheyyeryu join from the right. A major part of basin is covered with agriculture accounting to 58.64% of the total area and only 4.97% of the basin is covered by water bodies. The basin spreads to over 14 parliamentary constituencies (2009) comprising 10 of Andhra Pradesh and 4 of Karnataka\(^{53}\). There are no indicative issues and disputes with regard to the river.

4.4 Palar River

The Palar drains an area of 17,871 Sq.Kms out of which nearly 57% lies in Tamil Nadu and the balance in the states of Karnataka and Andhra Pradesh. The river Palar rises beyond Talagvare village in the Kolar district of Karnataka state at an elevation of about 900 m above mean sea Level. The total length of this East flowing river from its origin to its outfall into the Bay of Bengal is about 348 km. The two important tributaries, the Ponni and the Cheyyar together account for nearly 25 percent of the total catchment of the Palar basin.\(^{54}\)

4.4.1 Various Agreements between States and Outcomes

4.4.1.1 Governments of Mysore and Madras, dated 18February 1892

This agreement refers to the rules defining the limits within which no new irrigation works are to be constructed by the Mysore state without previous reference to the Madras Government. According the agreement, the Mysore Government without the previous content under rule 4\(^{55}\) shall not build:

   a. any "New-Irrigation Reservoirs" across any part of the fifteen main rivers named in the appended Schedule A, or across any stream named in Schedule B

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\(^{55}\) Rule 4, as mentioned in the Agreement Dated 19\(^{th}\) February, 1892 between Mysore and Madras Governments- ‘Any increase of capacity other than what falls under Repair of Irrigation Reservoirs as defined above shall be regarded as a New Irrigation Reservoir.’
b. or any "New Anicut" across the streams of Schedule A, Nos. 4 to 9 and 14 and 15, or across any of the streams of Schedule B, or across the following streams of Schedule A, lower than the points specified hereunder:

- Tungabhadra - lower than the road crossing at Honahalli,\(^{56}\)
- Cauvery - lower than the Ramaswami anicut
- Kabani - lower than the Rampur Anicut

Should the Mysore Government desire to construct a New Irrigation Reservoir or any New Anicut detailed information regarding the proposed work should be forwarded to the Madras Government and consent should be obtained prior to actual commencement of work. Madras Government shall be bound not to refuse such consent except for the protection of prescriptive right already acquired and actually existing, the existence, extent and nature of such right and the mode of exercising it being in every case determined in accordance with the law on the subject of prescriptive right to use of water and in accordance with what is fair and reasonable under all the circumstances of each individual case.

The agreement states that, if a difference of opinion arises between the two Governments, the matter should be referred to arbitrators appointed by both Governments, or of the Government of India.

**4.4.1.2 Governments of Mysore and Madras, dated 4 – 5 September 1933**

This agreement between the Governments of Mysore and Madras is based on the previous agreement with a focus on the aspects of repairs to reservoirs and the construction of new anicuts in place of existing old ones. In addition this agreement also details the various water distribution and diversion mechanisms between the two states.

**4.4.2 Palar River Water Dispute**

A meeting held in Bangalore on 29 June and 1-2 July 1956, the Government of Madras raised the following complaints referring to construction of new tanks and anicuts and extraction of water in violation of the Agreement of 1892.

The complaint of infringement of 1892 Agreement by Mysore was discussed at length and an amicable settlement was arrived at. It was concluded that the Government of Mysore has not infringed the Agreement. However, to safeguard against future disputes, and to find out the causes of complaint of diminution of the supplies at Palaranicut, the Madras Government suggested certain measures to be implemented by both the Governments of Mysore and Madras.

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\(^{56}\) Provisions of this clause in respect of Cauvery and Tungabhadra rivers and their tributaries have been superseded by decisions of Cauvery and Krishna Water dispute Tribunal and are no longer valid.
Krishna Basin

4.5 Krishna River Basin

The Krishna basin extends over Andhra Pradesh, Maharashtra and Karnataka. It has a total area of 2,58,948 sq.km which is nearly 8% of the total geographical area of the country. It rises from the Western Ghats near Jor village of Satara district of Maharashtra at an altitude of 1,337m. The total length of the river from its origin to its outfall into the Bay of Bengal is 1,400 km. Its principal tributaries joining from the right are Ghatprabha, the Malprabha and the Tungabhadra whereas joining from the left are Bhima, Musi and the Munneru. A major part of the basin is covered with agricultural land accounting to 75.86% of the total area and 4.07% of the basin is covered with water bodies. The basin spreads over 56 parliamentary constituencies comprising 23 of Andhra Pradesh, 18 of Karnataka and 15 of Maharashtra. The tributaries of Krishna are Koyna, Panchanga, Dudhganga, Ghataprabha, Malaprabha, Bhima, Tungabhadra, Dindi, PeddaVagu, Halia, Musi, Paleru and Munneru of which Dudhganga, Ghataprabha, Malaprabha, Bhima and Tungabhadra flow through Karnataka.58

4.5.1 Constitution of Krishna Water Disputes Tribunal I

The Krishna Water Disputes Tribunal (KWDT) was set up by the government of India in 1969 under the Interstate River Water Disputes Act of 1956 to resolve the disputes between the Karnataka, Maharashtra and Andhra Pradesh over sharing of Krishna river water. The KWDT I was headed by R. S Bachawat, a former judge of the Supreme Court. Shri Shamsher Bahadu and Shri D.M Bhandari were its members. The Tribunal was set up to adjudicate disputes emerging from the letters of the Mysore Government dated the 29th January, 1962 and the 8th July, 1968, the letters of the Maharashtra Government dated the 11th June, 1963 and the 26th August, 1968 and the letters of the Andhra Pradesh Government dated the 21st April, 1968 and the 21st January, 1969.

4.5.2 History of the Dispute

Under the Government of India Act, 1935, water became an exclusive provincial subject and specific provision was made for settlement of water disputes. Before Independence, the Provinces of Madras and Bombay, the States of Hyderabad and Mysore and a few other Princely States had riparian interests in the Krishna basin. In 1950, when the Constitution came into force, the entire Krishna basin fell within the territories of the States of Bombay, Mysore, Hyderabad and Madras. At an inter-state conference held in July, 1951 at New Delhi, memorandum of agreement apportioning the available supply of the Krishna river system among the four riparian States was made, apparently settling conflicting claims of the riparian States with regard to the supplies of the Krishna river system for a period of 25 years. But the settlement was more apparent than real. As the

58 Source: Water Resources Information System of India (WRIS)
State of Mysore refused to ratify the agreement, it was inevitable that disputes regarding the validity of the agreement would arise sooner or later. In the meantime, the Planning Commission continued to clear projects on the assumption that the memorandum of agreement of 1951 was binding upon the States.

4.5.3 Various Agreements between States and Outcome

4.5.3.1 Validity of 1951 Agreement Challenged

Extensive territorial changes were made in the Krishna basin by the Andhra State Act, 1953 and the States Reorganisation Act, 1956. The new States of Bombay, Mysore and Andhra Pradesh became the riparian States in place of the old States of Bombay, Hyderabad, Mysore and Madras. In view of the extensive territorial changes, the Central Water and Power Commission drew up a scheme for re-allocation of the Krishna waters, but the scheme was not accepted by the States. An inter-State conference was held on the 26th and 27th September, 1960, but no settlement could be reached. The legal existence and validity of the agreement of 1951 were now vigorously challenged.

On the 23rd March, 1963, the Union Minister for Irrigation and Power stated that according to legal opinion at the highest level, the agreement of 1951 had become void, if it was not initially void, at least partially. He stated that new projects should not be held up pending final allocation of the Krishna supplies and should be cleared on the footing that the withdrawals of supplies by Maharashtra, Mysore and Andhra Pradesh should not exceed 400, 600 and 800 TMC respectively. However, the States concerned were not agreeable to this interim allocation. The Central Government tried their best to settle the dispute by negotiations. Several inter-State conferences were held, but the dispute could not be settled. Fresh applications for reference of the dispute were made by the State Governments in 1968 and 1969. Eventually in April 1969, the Central Government referred the disputes to this Tribunal.

4.5.3.2 Agreement between Karnataka and Andhra Pradesh

Jurala Project – Dated 4 August 1978

A summary record of discussions regarding Jurala Project between the Chief Ministers of Karnataka and Andhra Pradesh is as follows:

- Andhra Pradesh can construct the Jurala Project in the Krishna river basin with Full Reservoir Level (FRL) / Maximum Water Level (MWL) of plus 1045 feet above Mean Sea Level (MSL).
- Karnataka will take necessary action to acquire lands, riverbed, streams and structures that may be affected submerged due to the project. Andhra Pradesh agreed to bear the cost of acquisition, the cost of rehabilitation of displaced families, the cost of construction of bridges and roads and cost of
protection/shifting of religious shrines that may be affected, as decided by Karnataka. The acquisition and rehabilitation shall be done as per norms prevailing in Karnataka at the time of acquisition/rehabilitation.

4.5.3.3 Agreement between Maharashtra and Karnataka

Dudhganga Project – Dated 18 August 2011

Pursuant to the directives of the Central Water Commission, Government of India in September, 1969, the project report of Dudhganga Project was recast and the Government of Karnataka was requested to agree to the provisions of irrigation in Karnataka State as contemplated in the revised project report. The Government of Karnataka agreed before the Krishna Water Disputes Tribunal to undertake Dudhganga Project as a joint venture between the two States of Maharashtra and Karnataka. Details of the project are as follows:

- Total Irrigation Proposed: 59,993 ha
- Land Irrigated in Maharashtra: 46,948 ha
- Land irrigated in Karnataka: 12,985 ha
- Utilisation of Water: 27.43 TMC
- At 75% dependability, water will be shared in the proportion of planned gross water utilised on of each State, viz. 85:15. For deciding whether there is surplus or deficit of water the opinion of Standing Committee shall be taken.
- Maharashtra can utilise 23.43 TMC of water, inclusive of proportionate lake evaporation losses and loss in conveyance
- Karnataka can utilise 4 TMC of water, inclusive of proportionate lake evaporation losses and loss in conveyance.
- Hydro-electric power generated will not be shared and the entire power shall be utilised by the Government of Maharashtra. Similarly, the entire cost of the hydro-electric power component shall be borne by the Government of Maharashtra.

4.5.3.4 Agreement between Andhra Pradesh, Maharashtra and Karnataka

Supply of 5 TMC water to Tamil Nadu – April 1976

Terms of the Agreement between the States are as follows:

- Considering the acute scarcity of drinking water for the Metropolitan City of Madras in Tamil Nadu and the limited water resources available to the State of
Tamil Nadu to meet such requirement, the Governments of Maharashtra, Karnataka and Andhra Pradesh agree to spare 5 TMC each out of their respective shares of the Krishna waters, to enable the Government of Tamil Nadu to draw 15 TMC of Krishna waters per annum from a convenient location, for water supply to Madras City.

- The Officers of the Department of Irrigation, Government of India, the Irrigation Engineers of the three States and the concerned Officers of the Government of Tamil Nadu shall meet to decide the location from and the manner in which the Government of Tamil Nadu would draw waters for Madras City.

The expenditure to be borne by the Government of Tamil Nadu towards construction, maintenance and operation of storage works and conveyance system leading up to the point from where Tamil Nadu would draw 15 TMC of waters shall be decided between the State Governments concerned.

4.5.3.5 Agreement amongst Andhra Pradesh, Maharashtra, Karnataka and Tamil Nadu

Conveyance of Krishna Water for the benefit of Madras City – Dates 28 October 1977.

The terms of the agreement are as follows:

- The Government of Tamil Nadu shall be permitted to draw not more than 15 TMC water in a water year from Srisailam reservoir during the period of 1st to 31st October through an open lined channel from Srisailam to Pennar designed to carry a discharge not exceeding 1500 cusecs which will enable conveyance of water to Madras City. The arrangements for the conductor system shall be agreed upon by Andhra Pradesh and Tamil Nadu.

- The Government of Andhra Pradesh will co-operate in the acquisition of land and in providing necessary storages. Andhra Pradesh will also provide facilities for the construction of the canals and other structures and also for the maintenance and operation of the water supply system.

- Tamil Nadu shall bear the cost of the arrangements for conveying of water from Srisailam to Poondi and will bear the maintenance and operational charges. The details can be worked out by the Governments of Andhra Pradesh and Tamil Nadu.

- The lined channel between Srisailam and Somasila from the point of off-take to be agreed upon by Andhra Pradesh and Tamil Nadu shall not be utilised for irrigation or other consumptive purposes.

- The Central Government will make arrangements to inspect the system during operational stages and ensure that the withdrawal of water into this water supply
system from Srisailam does not exceed 15 TMC in a water year and that the system is utilised only for water supply to Madras City and for no other purpose.
### 4.5.3.6 : Key Issues

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<tr>
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<th>Issue</th>
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<tr>
<td>1</td>
<td>Validity of the 1892, 1933, 1944, 1945 and 1946 Agreements after re-organisation of States, the merger of Princely State of Mysore and Hyderabad with Republic of India and the Indian Independence Act.</td>
<td>The Tribunal held that the Agreements of 1892, 1933, 1944, 1945 and 1945 have been superseded by the Order of the Tribunal-I.</td>
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<td>2</td>
<td><strong>Issues Related to Tungabhadra Reservoir</strong></td>
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<td>a)</td>
<td>Sharing Water of the Tungabhadra Canal</td>
<td>On 7th May, 1971 the States of Mysore and Andhra Pradesh agreed to share the benefits as follows:</td>
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<td>Tungabhadra Right Bank Low-Level Canal:</td>
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<td>- Mysore: 19 TMC</td>
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<td></td>
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<td>- Andhra Pradesh: 24 TMC</td>
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<td>Tungabhadra Right Bank High Level Canal Stages I &amp; II:</td>
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<td>- Mysore: 7.5 TMC</td>
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<td></td>
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<td>- Andhra Pradesh: 32.5 TMC</td>
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<td>b)</td>
<td>Reservoir Loss of Tungabhadra</td>
<td>The Tribunal decided that the reservoir loss shall be shared equally by the Karnataka on the left side and the works on the ride side of the river. Andhra Pradesh and Karnataka shall share half share of the right side in the reservoir loss in the ratio of 5.5 to 3.5.</td>
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<td>c)</td>
<td>Evaporation Loss in Tungabhadra</td>
<td>Karnataka and Andhra Pradesh agreed that evaporation loss of 9 TMC of the Tungabhadra Left Bank Low Level should be protected. Consequently, the Tribunal granted protection to evaporation loss under Tungabhadra Left Bank Low Level Canal.</td>
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<td>d)</td>
<td>Sharing Electricity: The power house on the right side of Tungabhadra Dam has four generating units of 9000kW each. The power house on the Right Bank Canal at Hampi has four generating units of 9000kW each.</td>
<td>Agreement Between the States: Karnataka and Andhra Pradesh will share benefits of the power houses in the ratio 4:1.</td>
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<td>e)</td>
<td>Vesting of control and administration of the Tungabhadra dam and reservoir and the main canal on the left side in the Tungabhadra Board.</td>
<td>The Tribunal decided that the Tungabhadra Board should continue to retain charge of works on or connected with the Tungabhadra Project, common to the two States, until</td>
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another joint control body is established. If such a control body for the entire Krishna valley is established, the Tungabhadra Board may be abolished and all the powers of the Tungabhadra Board may be vested in such control body.

| f) | Vesting of Control of the Rajolibundha Diversion Scheme | The Tribunal decided that there was no sufficient ground for vesting the administration and control of Rajolibunda headworks and the common portion of the canals within Karnataka in Tungabhadra Board or any other Joint Control Body. However, it gave directions on sharing of benefits of the scheme. Karnataka can utilise 1.2 TMC and Andhra Pradesh can utilise 15.9 TMC. |
| g) | Sharing of Water of the Rajolibandha Diversion Scheme | As per the agreement between Karnataka and Andhra Pradesh, Karnataka can utilise 1.2 TMC and Andhra Pradesh can utilise 15.9 TMC. |
| h) | Tungabhadra Left Bank Low Level Canal | The Tribunal allowed Karnataka to utilise 82 TMC, sufficient to meet the requirements of irrigation for an area of 5,80,000 acres. |
| i) | Tungabhadra Left Bank High Level Canal | The KWDT-I found that annual utilisation of 83 TMC and evaporation loss of 9 TMC under the Tungabhadra Project Left Bank Low Level Canal including Left Bank High Level Canal of Karnataka, should be preferred to the contemplated uses. |

3. Rajolibundha Diversion Scheme
Karnataka and Andhra Pradesh agreed that, 1.2 TMC be utilised by Karnataka and 15.9 TMC by Andhra Pradesh.

4. Power House on Right Bank Canal
Karnataka and Andhra Pradesh agree to shares benefits of the above power houses in the ratio 4:1.

5. Vijaynagara Channels
It was found that the committed use as up to September, 1960 was 5.71 TMC, which should be preferred to contemplated uses.

6. Kurnool- Cuddapah Canal
The Tribunal concluded that annual utilisation of 39.9 TMC under the Canal should be preferred to contemplated uses.
<p>| 7. | Minor Irrigation particulars | The Tribunal awarded Karnataka protection on account of minor irrigation of 0.18 TMC in K-1 sub basin, 2.47 in K-2 sub basin, 1.3 in K-3 sub basin, 4.57 in K-4 sub basin, 0.02 in K-5 sub basin, 6.47 |</p>
<table>
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<th>Claim</th>
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<tr>
<td>a Release of Water from the Koyna Project</td>
<td>Tribunal’s Award: Karnataka is not entitled to water from the Koyna Project, to irrigate land in Vijayapura.</td>
</tr>
<tr>
<td>b Release of water from a storage dam at Ajra</td>
<td>Tribunal Award: Maharashtra is not bound to supply water to irrigate land in Mysore. Section 108(2) of the States Reorganisation Act does not apply to the Ajra on the Hiranyakeshi river and the Ghataprabha Right Bank Canal under the Ghataprabha Valley Development Scheme Stage II. Mysore’s claim is denied.</td>
</tr>
<tr>
<td>c Extension of the Tungabhadra Left Bank Low Level Canal to Andhra Pradesh</td>
<td>Tribunal Award: The Tribunal stated that though Andhra Pradesh wants the canal to be extended, the state of Mysore opposes it and without close cooperation the extension cannot materialize.</td>
</tr>
<tr>
<td>d Extension of a project on the Bhima in Mysore to Andhra Pradesh</td>
<td>Tribunal Award: The Tribunal stated that Andhra Pradesh is not entitled to any relief under section 108(2) for extension of irrigation facilities to Mahboobnagar District from any Project at Tangadgi in Mysore.</td>
</tr>
<tr>
<td>e Extension of Upper Krishna Project to Andhra Pradesh</td>
<td>Tribunal Award: The Upper Krishna Project, proposed by Mysore to irrigate Kalaburgi and Raichur districts cannot be extended to Andhra Pradesh as section 108(2) of the States Re-organisation Act, 1956 does not apply to the Project.</td>
</tr>
<tr>
<td>f Munirabad Power House: Claim of Andhra Pradesh for 3376 kW of power</td>
<td>Tribunal Award: After reorganisation of States, the Munirabad Power House devolved to the State of Mysore. Earlier the Power House was controlled by Hyderabad. But the Tungabhadra Hydro Electric Project did not establish a scheme of distribution of power benefits. Thus, Andhra Pradesh is not entitled to any relief under section 108(2) of the States Re-Organisation Act.</td>
</tr>
<tr>
<td>g Munirabad Power House: Claim of Andhra Pradesh for 10,000 kW of power</td>
<td>Tribunal Award: The Project did not envisage supply of power to Hyderabad city. It is not established that there was any</td>
</tr>
<tr>
<td>Section</td>
<td>Description</td>
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<tr>
<td>123</td>
<td>Power</td>
</tr>
<tr>
<td>9</td>
<td>Legality of Diverting Krishna Waters outside the Basin</td>
</tr>
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<td>10</td>
<td>Diversion of Godavari Water into Krishna</td>
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<td>11</td>
<td>Use of Groundwater</td>
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<td>12</td>
<td>Return Flow</td>
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<td>13</td>
<td>Determination of Dependable Flow</td>
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<td>14</td>
<td>Apportionment of Krishna Water</td>
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</table>
4.5.4 Krishna Water Disputes Tribunal – II

4.5.4.1 Constitution of the Tribunal

The Government of India by a Gazette Notification dated April 2, 2004 notified the Constitution of the present Krishna Water Disputes Tribunal. The Tribunal is chaired by Justice Brijesh Kumar, Former Judge, Supreme Court of India. The members of the Tribunal are Justice S.P Srivastava and Justice D.K Seth. The Government of India extended the term of KWDT II by two years with effect from 1st August, 2014 to adjudicate on fresh terms of references as stated in Andhra Pradesh Reorganisation Act, 2014.

4.5.4.2 History of the Dispute

Complaints by Karnataka against Maharashtra and Andhra Pradesh as below:

a) Andhra Pradesh has been utilizing since before allocation, the surplus waters by constructing permanent large-scale projects and also refusing to share the surplus waters namely, water in excess of 2130 TMC.

b) Andhra Pradesh and Maharashtra will have no right to object the raising of height FRL of Almatti Dam from 519.6 m to 524.256 m as planned by the Karnataka.

c) Maharashtra by creating a live storage capacity of 560 TMC in Krishna basin may give rise to use of water beyond its share.

d) Maharashtra failed in maintaining adequate summer flows into Bhima river in Krishna Valley at the Inter-state border during the period from November to May

e) The surplus water as available in Krishna River would not be less than 517 TMC and the same should be shared in the proportion of 25 per cent, 50 per cent and 25 per cent by the States for Maharashtra, Karnataka and Andhra Pradesh respectively.

Complaints by Maharashtra against Karnataka and Andhra Pradesh as below:


b) Andhra Pradesh has been utilizing water of river Krishna in excess of its share of 800 TMC, which was permitted only temporarily but Andhra Pradesh had been constructing and planning large scale projects and water storages for the use of surplus water.
c) Karnataka is planning to raise the height of Almatti Dam which would result in further submergence of territory of Maharashtra.

d) Karnataka constructed the Hippargi Barrage without consent of the Maharashtra.

e) Construction of Bhima Barrage on the river Bhima by Karnataka unilaterally may also result in submergence of the territory of Maharashtra.

f) There should be review and reassessment of available waters after 31.5.2000 as decided by the KWDT-1 and it should be redistributed equitably amongst the three riparian states.

g) Andhra Pradesh is not entitled to construct large scale projects like Telugu Ganga project, Srisailam RBC, Srisailam LBC and Bhima Lift and also that on construction of Pulichintala storage.

h) 44.3 TMC, water saved from inevitable wastage should also be now available for equitable distribution between Maharashtra and Karnataka.

i) The FRL at Almatti should be maintained at 518 m otherwise it would result in submergence in territory of Maharashtra.

j) The Supreme Court of India placed condition in allowing Karnataka to raise the height of Almatti Dam upto 519.6 m.

Currently, Maharashtra needs more hydro-electric power. Andhra Pradesh sent its complaint dated January 20, 2003 under Section 3 of the Inter State River Water Disputes Act, 1956. Complaints by Andhra Pradesh against Maharashtra and Karnataka as below:

a) The height of the Almatti Dam in Karnataka, which is sought to be raised with intention to impound waters of river Krishna, is in excess of its entitlement and requirements as per the award of KWDT-1.

b) The entire project called upper Krishna Projects has been prepared unauthorisedly and in contravention of the award of the KWDT-I.

c) Illegal and unauthorized action of the State of Karnataka in respect of Almatti Dam under UKP, construction of canals/Lift Schemes on Almatti Reservoir, UKP in K-2 sub basin, Hippargi Weir/Irrigation Scheme and construction of Indi and Rampur lift schemes on Narayanpur reservoir and the canals.

d) The indulgence granted to Karnataka to construct Almatti Dam upto the height of 519 m. was subject to certain safeguards e.g. clearance by all other competent authorities functioning under different statutes as well as from CWC and that it was subject to any further direction, if any, obtained from any future Water Disputes Tribunal as constituted by the Central Government.

e) The clearance subsequently given by Planning Commission for UKP projects
was based on clearance given by CWC which was erroneously given by the above authorities without seeking views of the Andhra Pradesh Government.

f) Clearance given by Ministry of Environment and Forest was only upto the level +512.2 m and subject to number of conditions which had not been fulfilled.

g) No Dam Break Analysis has been conducted.

h) The height of Almatti Dam at 519.6 m prejudicially affects the rights of the inhabitants of the State of Andhra Pradesh.

i) Karnataka draws more than its allocation in the upper reaches of High Level Canal (HLC), Low Level Canal (LLC) and Rajolibundha Diversion Scheme (RDS), denying Andhra Pradesh of its rightful share of waters of Tungabhadra. This is in violation of the orders of KWDT-1.

j) There have been instances of over withdrawal by Karnataka.

k) The command and maintenance of left half of the dam, LLC and RDS systems should be entrusted to Tungabhadra Board.

l) Storage capacity of Tungbhadra Dam has been reduced to 111.5 TMC from 133 TMC due to siltation and overall irrigation utilisation has come down from an average 212 TMC to 164 TMC which is making it difficult to provide drinking water in drought prone area in the District of Anantapur.

m) The Karnataka has taken up Upper Tunga and Singatlur Projects in Tungabhadra sub- basin in violation of the award of KWDT-1.

n) A Dam with storage capacity of 60 TMC would be sufficient; instead a dam at Ujjani has been constructed by Maharashtra with a storage capacity of 110 TMC. It has reduced the stream flow in River Bhima by 50 TMC every year. For utilizing the remaining 205 TMC a storage of about 130 TMC would be sufficient, but storages of the capacity of 180 TMC have been illegally constructed by Maharashtra.

o) Karnataka has an allocation of 41.74 TMC in K-6 Lower Bhima sub-basin, but in its guise Karnataka has taken up construction of several barrages across the river Bhima as well as lift irrigation schemes to utilise water of Bhima far in excess of its entitlement

p) Karnataka has wrongly claimed its reduced utilisation of 230.34 TMC in Bhima sub-basin. It is utilizing much more quantity of water in the sub-basin.

q) Upper Riparian States are not entitled to build oversized carry over reservoirs as they would create great scarcity in the lowest riparian State even in 75 per cent dependability years. It is also averred that KWDT had expressly rejected the plea of the upper riparian States regarding construction of carryover storages/reservoirs which was allowed to Andhra Pradesh for safeguarding its
interests in 25% of the years.

r) Andhra Pradesh also objects to westward diversion of the water of river Krishna by Maharashtra for hydro-electric power station at Koyna in K-1 sub-basin and hydro power station at Bhira, Bhivpuri and Koppol (Tata Hydel projects) in K-5 sub-basin.

s) Maharashtra and Karnataka achieve their normal utilisation and have considerable storages in their reservoirs which have precariously/worsened the situation in Andhra Pradesh affecting the agricultural operations and there is shortage of drinking water in several municipal areas. Andhra Pradesh pleaded that it has full right to use the remaining water in River Krishna and it is also entitled to construct projects viz Telugu Ganga, Srisailam Left Bank canal etc. which is objected to by the other two States.

t) Maharashtra and Karnataka are not disclosing nor making data available to Andhra Pradesh except for some period during which Original Suit No. 2 of 1997 was pending before the Supreme Court. It is violative of clause XIII of the Report/decision of KWDT-1.

u) Restriction ought to be placed on storage capacity in relation to Ujjaini Dam in K-5 sub-basin in Maharashtra, Almatti and Naryanpur Dams in K-2 sub basin and Middle Krishna sub-basin and Tungabhadra sub basin falling in K-8 sub basin.

4.5.4.3 Final Award of the Tribunal

The Krishna Water Dispute Tribunal II gave its draft verdict on 31st December, 2010. The final verdict was given on 29th November 2013, which did not change the water allocations drastically, except increasing allocation made to Andhra Pradesh by 4 TMC with corresponding decrease in allocations made to Karnataka.
### 4.5.4.4 Key Issues

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<tr>
<th></th>
<th>Issue</th>
<th>Outcome</th>
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<tbody>
<tr>
<td>1</td>
<td><strong>Almatti Reservoir</strong></td>
<td><strong>Tribunal’s Order:</strong>&lt;br&gt;Karnataka could go ahead with FRL 524.256 m at Almatti Dam. The hurdle of submergence raised by Maharashtra and that of nil inflows into Andhra Pradesh by raising the FRL to 524.256 m, are not substantiated.</td>
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<td></td>
<td>a) Karnataka demands storage of water up to the level of 524.256m in the Almatti Dam. Disputed by Andhra Pradesh and Maharashtra.</td>
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<td>b) Should storage in Almatti Dam be regulated to have timely releases to safeguard the loss of kharif crop, if any, in the State of Andhra Pradesh?</td>
<td><strong>Tribunal’s Order:</strong>&lt;br&gt;With FRL 524.256m, there may be some delay in availability of sufficient water for kharif crop in Andhra Pradesh. Therefore, it has already been provided that during the months of June and July, Karnataka shall release 8-10 TMC from Almatti Dam for inflows into Andhra Pradesh.</td>
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<td>2</td>
<td><strong>Madras City Drinking Water Scheme:</strong> Maharashtra and Karnataka allege that Andhra Pradesh violated conditions of the Agreement dated 28th Oct., 1977 by constructing a channel with a carrying capacity of 11500 cusecs in place of 1500 cusecs and the canal is used to carry water for irrigation purposes for Telugu Ganga Project at Pennar and not just to supply drinking water to Chennai.</td>
<td><strong>Whatever the capacity of the canal built by Andhra Pradesh, it shall not be used except to carry 15 TMC of water meant for Madras City Drinking Water Scheme. On equitable distribution of the surplus flows, Andhra Pradesh is entitled to utilise and carry only that amount of surplus flows through this channel which may be allocated to it, if at all, by this Tribunal.</strong></td>
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<td>3</td>
<td><strong>Projects Proposed by Karnataka</strong></td>
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<td>a)</td>
<td>Karnataka proposes to construct Upper Tunga, Singatlur, Basapur, Sasalwad Stage-I and II, Guddada-Mallapur Lift Irrigation Scheme, Varada, Bennur balancing reservoir, Upper Bhadra Project, Lakya dam and lift irrigation schemes from foreshore of Tungabhadra reservoir. Andhra Pradesh has objected mainly to Tungabhadra project requiring, Upper Bhadra Stage-I and II Project and Singatlur LIS Project. Other smaller projects are not very seriously objected to.</td>
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<td>Tribunal’s Order:</td>
<td>Andhra Pradesh’s objections were proved to be unwarranted and thus the Tribunal allocated water for irrigation in Karnataka under three major projects, namely, Upper Bhadra, Upper Tunga and Singatlur LIS. Since the State of Andhra Pradesh did not seriously objected to the small projects, no order is required to be passed in that respect.</td>
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<td>b)</td>
<td>Andhra Pradesh alleged that due to lack of control over left side of the dam and left bank canals, the Board cannot effectively control excess utilisation of water by Karnataka. Hence, Andhra Pradesh argued that the control of the left side of the dam and bank canals should be with the Tungabhadra Board.</td>
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<tr>
<td>Tribunal’s Order:</td>
<td>The control of maintenance and operation of the entire Tungabhadra Dam, reservoir and spillway gates on the left and right sides should be vested in a single control body. When a control body for the entire Krishna valley is established, the Tungabhadra Board should be abolished and all the powers of the Tungabhadra Board may be vested in such control body.</td>
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<td>c)</td>
<td>Andhra Pradesh raised the issue of bringing RDS under the control of Tungabhadra Board on account of excess withdrawals by Karnataka during 1976-77 to 2004-05, as well as the construction of Mini-Hydel Power Plant by Karnataka without the consent of Andhra Pradesh.</td>
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<td>Tribunal’s Order:</td>
<td>Mini Hydel Project cannot be constructed by Karnataka. The Tribunal has already taken a view that a single authority is required to undertake administrative control and regulation of the Tungabhadra basin, the administrative control and regulation over the RDS system should also be vested in one unified authority looking over the whole basin. On coming into force of the one unified authority, the Tungabhadra Board is to be abolished, there is no occasion to pass any order for vesting of control in Tungabhadra Board.</td>
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</table>
d) Andhra Pradesh states that due to siltation, the storage capacity of Tungabhadra reservoir has reduced from 132.47 TMC to 104.34 TMC, resulting in a loss of 28.13 TMC of storage capacity. Thus, the state is unable to utilise its capacity in full. It thus proposes to construct a new Parallel High Level Canal at higher contour from the foreshore of Tungabhadra Reservoir.

<table>
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<tr>
<th>Tribunal’s Order:</th>
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<td>Siltation is a very natural and obvious process in the reservoirs. It is a factor that is taken into consideration while making the project and dead storage is provided to take care of siltation. Hence, Andhra Pradesh cannot construct a Parallel High Level Canal, nor can it raise the height of the dam by two feet and of widening the Right Bank High Level Canal.</td>
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4. Diversion of Surplus Krishna Water outside the Basin

<table>
<thead>
<tr>
<th>Tribunal’s Order:</th>
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<td>It would be permissible and legal to consider diversion of surplus flow for use outside the basin depending on the merit of the claim.</td>
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5. Protection for Projects of Riparian States

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<th>Tribunal’s Order:</th>
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<tr>
<td>All the projects and works of the riparian States, as provided for by KWDT-I, stand protected and none of them is being disturbed by this decision.</td>
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6. Determination of Storages of Upper Riparian States

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<th>Tribunal’s Order:</th>
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<tr>
<td>Capacity of reservoir should be determined taking into consideration the requirement of the project. But in the case in hand, there is no occasion to determine the storage capacity of any reservoir since the storages having larger capacity are causing any vital or substantial legal injury to any co-riparian State</td>
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7. Construction of Carryover Storages by Upper Riparian States

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<th>Tribunal’s Order:</th>
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<td>Yes, any State can construct over the year storages provided a suitable site for the same is available as well as the amount of water to store into it. In case construction of such a carryover storage by an upper riparian State causes any legal and vital injury to the lower riparian State, which cannot be compensated or may result in more damage than the benefit which may there be an impediment in the way of an upper riparian State to construct a carryover storage</td>
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<td>8.</td>
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TMC in an average water year from Upper Krishna project (it includes allocation of 130 TMC for UKP Stage-III with reservoir level of Almatti Dam at 524.256 m).

c) Karnataka shall not utilise more than 799 TMC in a 65% dependable water year and not more than 904 TMC in an average water year.

| 12. Distribution and Apportionment of Water | The Tribunal allocated Krishna waters to Karnataka in the following manner: 734 TMC at 75% dependability with return flows, 72 TMC at 65% dependability, including 7 TMC out of minimum flows, 105 TMC out of surplus flows, totaling to 911 TMC. |
| 13. Krishna Water Decision-Implementation Board | With the approval of Andhra Pradesh, Karnataka and Maharashtra, a machinery called ‘Krishna Water Decision- Implementation Board’ to better implement provisions made by the Tribunal was set up. Upon constitution, the administrative control and regulation over Tungabhadra Dam and its Reservoir including Head Regulators of all the canal systems both on the left and the right sides and all its gates as well as the administrative control of Rajolibunda Diversion Scheme shall vest in the Board and the notifications dated 29th September, 1953 and the 10th March 1955 issued under Section 66(1) and (4) respectively of the Andhra State Act, 1953 shall cease to be operative. |

**Review of the Decision of the Tribunal**

The Tribunal decided that at any time after 31st May, 2050, order may be reviewed or revised by a Competent Authority or Tribunal, but such review or revision shall not as far as possible disturb any utilisation that may have been undertaken by any State within the limits of allocation made to it.
Cauvery Basin\textsuperscript{59}

\textsuperscript{59} Disputes and awards as reported in the book ‘A Bend in the Cauvery: An Account of the Cauvery Water Dispute’ by A.Ravindra. Final Award as reported by the Cauvery Water Dispute Tribunal(Volume 5); Link : http://india-wris.nrsc.gov.in/wrpinfodoc/Volume-V.pdf
4.6 Cauvery River Basin

The river Cauvery originates at Talakaveri in Coorg District of Karnataka in Brahmagiri Range of hills in the Western Ghats. It drains a total area of 81,155 Sq.Kms. of which 34,273 Sq.Kms lies in Karnataka, 43856 Sq.Kms. in Tamilnadu, 2866 Sq.Kms. in Kerala and 160 Sq.Kms in Union Territory of Pondicherry. Cauvery basin extends over an area of 81155 sq.km. this is nearly 2.7% of the total geographical area of the country. The total length of the river from origin to outfall is 800 km. The river drains into the Bay of Bengal. The major part of basin is covered with agricultural land accounting to 66.21% of the total area and 4.09% of the basin is covered by water bodies. The basin spreads over 33 parliamentary constituencies (2009) comprising 18 of Tamil Nadu, 11 of Karnataka, 3 of Kerala and 1 of Puducherry. The tributaries of Cauvery are Arakavathy, Harangi, Hemavathy, Kabini, Lakshmana Tirtha, Shimsha, Suvarnavathy, Bhavani and Noyyal of which Arakavathy, Harangi, Hemavathy, Kabini, Lakshmana Tirtha, Shimsha and Suvarnavathy flow through Karnataka.

4.6.1 Constitution of Cauvery Water Dispute Tribunal

A request for the establishment of the Tribunal had emerged from a letter dated 6th July, 1986 from the Government of Tamil Nadu. Government of Tamil Nadu alleged that the State of Karnataka had failed to implement the terms and agreements of the Agreements of 1892 and 1924 and constructed projects at Kabini, Hemavathi, Harangi, Swarnavathi and expanded the ayacut which resulted in diminished water supply to Tamil Nadu. The Government of India tried to settle this dispute by negotiations but failed.

The Cauvery Water Disputes Tribunal (CWDT) was constituted by the Government of India on 2nd June 1990 to adjudicate the water dispute regarding inter-state river Cauvery and the river valley. Shri. Chittatosh Mukherjee is the Chairman of the Tribunal and Shri N.S Rao and Shri. Are S.D Agarwala are its members. The Tribunal passed an Interim Order in June, 1991 and further Clarificatory Orders on the Interim Order in April, 1992 and December, 1995. The Cauvery Water Disputes Tribunal submitted its reports and decision under Section 5 (2) of Inter-State River Water Disputes Act, 1956 to Government on 5th February, 2007.

4.6.2 History of the Dispute

Prior to 1928 when the first storage in the basin viz. Krishnarajasagara of Karnataka came into operation, the total area irrigated in the basin was 19.80 lakh acres both major and minor, utilising about 510 TMC of water. This was all only through the diversion systems created over a period of time by several rulers and the people and the major part

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of this was in the delta area.

4.6.2.1 Agreements of 1892 and 1924

The 1892 Agreement is a general agreement relating to a number of interstate rivers. The 1924 Agreement relates to the irrigation development in the basin of the interstate river Cauvery alone. It was framed by both Mysore and Madras Governments to define the terms under which the Mysore Government would construct the Krishnarajasagar dam across Cauvery and to provide for extension of irrigation in both the States utilising the flows in the river Cauvery. The basic tenet enshrined in both the interstate agreements is that no injury could be caused to the existing irrigation lower down, by the construction of new works upstream. And when such works are planned, the prior consent of the State Government of the lower down area shall be obtained and the rules of regulation so framed as not to make any material diminution in supplies to the established irrigation downstream. This is to ensure that nothing shall be done in Mysore which will have the effect of curtailing the customary supply of waters for the ayacut in the lower riparian State. Mysore Government was permitted to complete the Krishnarajasagar of capacity 44,827 M.cft. with an ayacut of 1,25,000 acres and also have other reservoirs of an effective capacity of 45,000 M.cft. with an ayacut of 1,10,000 acres under them. As against this, the Madras Government was permitted to construct the Mettur dam to form a reservoir of 93,500 M.cft. effective capacity and have new irrigation for 3,01,000 acres. Besides this, Mysore Government was entitled to construct new reservoirs, on the tributaries of Cauvery, of capacities not exceeding 60% of the capacities of the reservoirs the Madras Government may choose to form on the tributaries Bhavani, Amaravathi or Noyyil.

4.6.2.2 Alleged Violation of the Agreement by Karnataka

Tamil Nadu alleged that Karnataka constructed the Harangi, Kabini, Hemavathi and Suvarnavath reservoirs without obtaining consent of the State of Tamil Nadu, thus violating the stipulation made in Clauses II and III of the 1892 Interstate Agreement. Tamil Nadu further stated that Karnataka started impounding the flows in all the above four new reservoirs from 1974 onwards and acted unilaterally without any concern for the needs and rights of the Tamil Nadu Government. They thereby violated the terms and conditions stipulated in Clauses 10 (vi), (vii), (viii) & (xiv) of the 1924 Agreement. In 1969, the Tamil Nadu Government appealed to the then Prime Minister in 1969, who stated that interstate aspects should be settled satisfactorily before these projects could be sanctioned. But when the Karnataka Government proceeded with the projects anyway, the Tamil Nadu Government made a formal request for adjudication of the dispute under Section 3 of the Interstate Water Disputes Act of 1956. Discussions chaired by the Union Minister of Irrigation and Power between the States did not bear any fruit. The Tamil Nadu therefore requested the Prime Minister multiple times for the
4.6.2.3 Claims of Karnataka

The stand of the Karnataka is that until the end of the 19th century, utilisation of Cauvery water in the States of Coorg and Mysore was primarily from channels drawn from the river bed and from tanks in small quantities not exceeding 73 TMC. There was no facility of storage; agricultural operations depended on the rainfall. The efforts made by the State of Mysore to utilise the waters of Cauvery for irrigation were frustrated by the continued protests of the British Government of Madras. The State of Mysore being the upper riparian contributed highest flow to the river. Post the Re-Organisation of States Act, more than 42.2% of the drainage area of the Cauvery basin is in Karnataka. The State was not allowed to exercise its powers so far utilisation of waters for irrigation was concerned, because of the protests made by the lower riparian Province of Madras. It had also been pointed out that Madras had completed the work of the Mettur Dam for storage of 93.5 TMC of water, while the storage capacity of the Krishnarajsagar Dam in Karnataka was only 44.8 TMC. A report by the Irrigation Commission, 1972 Vol. 1, alleges that Karnataka has the largest extent of drought prone area in the Cauvery basin, although it has very large areas of cultivable and cultivated lands in the Cauvery basin. There is an imperative need to give relief to such areas by providing proper irrigation facilities.

4.6.2.4 Cauvery Fact Finding Committee

Meanwhile, in a meeting of the Chief Ministers of Tamil Nadu, Mysore and Kerala convened by the Union Minister for Irrigation and Power from 29.05.72 to 31.05.72, it was decided that a Committee would be constituted to collect factual details on the yield and utilisation of waters in the Cauvery basin. The Chief Ministers also agreed that pending settlement of the problem, no State would take any steps to make the solution of the problem difficult either by impounding or by utilising the waters of the Cauvery beyond what it was on 31.05.72.

Formal Request for Constitution of Tribunal Dated 16th July, 1986:

For 16 years, the Central Government, Karnataka Government and the Tamil Nadu Government tried to settle the dispute through negotiations. Finally, in meeting convened by the Union Minister of Irrigation and Power, the Tamil Nadu Government formally requested him for the constitution of a Tribunal.

4.6.2.5 Interim Order of the Tribunal

Tamil Nadu’s Plea to the Cauvery Water Dispute Tribunal:

After the constitution of the Cauvery Water Disputes Tribunal, the Civil Miscellaneous
Petition (No.4 of 1990) was filed on behalf of the State of Tamil Nadu. The petition stated that the State of Karnataka ought to be directed to not utilise Cauvery waters beyond the extent impounded by them as on 31st May 1972, as agreed upon in the meeting of the Chief Ministers of Kerala, Karnataka, Tamil Nadu and Union Territory of Pondicherry in the presence of the Union Minister for Irrigation and Power. A petition was made to restrain Karnataka from undertaking any new projects, dams, reservoirs etc. and to direct Karnataka to make timely and adequate releases of waters from its storages and reservoirs that ensures availability of inflow into the Mettur reservoir of Tamil Nadu on week to week basis.

**Order:**

The Tribunal observed that it will refrain from making any pronouncement about the Agreement of 1892 between the then princely State of Mysore and then State of Madras regarding irrigation reservoirs over thirteen major rivers flowing through the then State of Mysore, including the Cauvery and its five tributaries viz. Hemavathi, LaxmanThirtha, Kabini, Suvaranavathi and Yagachi as well as the Agreement between the then Mysore and the then Madras Governments dated 18th February, 1924 under which Mysore Government became entitled to construct a dam and a reservoir across and over the river Cauvery at Kannambadi, now known as Krishnarajasagar. The Tribunal stated that its prime consideration was to ‘preserve as far as possible, pending final adjudication, the rights of the parties and also to ensure that unilateral action by one party, the other party is not prejudiced from getting appropriate relief at the time of passing of the final order.

Having said that, the Tribunal gave the following directions to Karnataka:

a) Release Cauvery waters monthly, as per the below schedule:

<table>
<thead>
<tr>
<th>Month</th>
<th>TMC</th>
<th>Month</th>
<th>TMC</th>
</tr>
</thead>
<tbody>
<tr>
<td>June</td>
<td>10.16</td>
<td>December</td>
<td>10.37</td>
</tr>
<tr>
<td>July</td>
<td>42.76</td>
<td>January</td>
<td>2.51</td>
</tr>
<tr>
<td>August</td>
<td>54.72</td>
<td>February</td>
<td>2.17</td>
</tr>
<tr>
<td>September</td>
<td>29.36</td>
<td>March</td>
<td>2.40</td>
</tr>
<tr>
<td>October</td>
<td>30.17</td>
<td>April</td>
<td>2.32</td>
</tr>
</tbody>
</table>
In respect of a particular month, the releases were to be made in four weeks in four equal instalments. Any deficiency during a particular week was to be made good in the subsequent week.

b) The Tribunal also directed Karnataka to not increase its area under irrigation from Cauvery waters to more than 11.2 lakh acres.

4.6.2.6 Impediments to Implementation of the Interim-Order

The State of Karnataka maintained that the interim relief granted to Tamil Nadu was arbitrary and without proper assessment of the yield, utilisation, basin needs and other relevant issues. The quantum of 205 TMC of water ordered to be release was considered excessive and did not take into account the varying availabilities of water. The restrictions placed on area to be irrigated at 11.2 lakh acres was regarded unjust as it had ignored the areas committed with the completion of works in Bagur, Navile Tunnel, Kanive etc. Both the Houses of Karnataka State Legislature passes a unanimous resolution on 6th July, 1991 that as the interim order of the Tribunal adversely affects the interest of the State and does not meet legal, factual and practical aspects, they urge the Government to reject it. The Legislature further urged the Central Government to stay all further proceedings until a National Water Policy was formulated and an appropriate amendment was brought to the Inter-State Water Disputes Act, 1956. Karnataka issued an Ordinance called the ‘Karnataka Cauvery Basin Irrigation Protection Ordinance, 1991 intended to protect and preserve irrigation to an extent of 8,49,700 hectares under the command of various projects or under construction in the area of Cauvery and its tributaries. Simultaneously, Karnataka challenged the Tribunal’s order in the Supreme Court.

4.6.2.7 Intervention of the Supreme Court

The Supreme Court heard the parties and gave its opinion on 22nd November, 1991 stating:

- The Ordinance promulgated by the State of Karnataka as invalid, unconstitutional and beyond the legislative competence of the State.
- In the order dated 26th April, 1991 the Supreme Court had already held that the Tribunal had jurisdiction to consider the question of grant of interim relief.
- The order of the Tribunal constituted a report and decision of the Tribunal was required to be published in the official gazette. The Government of India published the Interim Order in its Official Gazette on 11th December, 1991.
4.6.2.8 Clarification Provided by the Tribunal in 1992

On 25th November 1991 the State of Karnataka filed Civil Miscellaneous Petition No.15/91 with a prayer that the Tribunal may recall its aforesaid order dated 25th June 1991 or clarify the same. On 3rd April, 1992 the Tribunal provided the following clarification:

- The Tribunal rejected the contention that undue hardship would be caused to Karnataka by ensuring the flow of 205 TMC water at Mettur. It clarified that 205 TMC water was inclusive of 25 TMC contributed from the catchment areas of Tamil Nadu between Biligundlu and Mettur. Thus, Karnataka was required to only ensure 180 TMC of water from its own catchment.

- It held that it had regulated releases as per monthly schedules so that whatever water is available, it would be put to optimum use.

- It justified its direction limiting the area under irrigation in Karnataka to 11.2 lakh acres as an interim measure in public interest to avoid future possible difficulties which might arise by fixation in the allocation of waters in the final award.

- In case there is any change of circumstance or undue hardship is caused, in a particular year to any party, it will be open to such party to approach the Tribunal for appropriate orders.

4.6.2.8 Appeal for Peace in Both States:

In 1991-92 and 1992-93 there was adequate rainfall at the Krishnasagar and Mettur dam. Eminent persons from both the states joined together and issued an appeal on 14th February to the Prime Minister and the two Chief Ministers to initiate steps to explore all alternatives with an open mind in an atmosphere free of prejudice and suspicion to decrease the gap between the stance of both the parties. This statement was followed with a meeting on 28th March, 1992 presided over by Justice VR Krishna Iyer. The meeting was attended by farmers representatives from both states, experts, former ministers, judges and professionals. The resolution adopted at this meeting was to avoid extreme and provocative positions before the Tribunal, in legislature, public forums and the media and to co-operate with each other and with the Tribunal.

4.6.2.9 Tamil Nadu’s Petition to the Tribunal and the Tribunal’s Subsequent Order, 1995

The year of 1995 proved to be a water deficit year. In December, 1995 Tamil Nadu filed a petition before the Tribunal seeking implementation of its order dated 25th June, 1991 that directed Karnataka to ensure 205 TMC of water was available in the Mettur
reservoir. After hearing the position of both the parties, the Tribunal made the following observations:

- Karnataka should release 11 TMC of water to Mettur apart from the stipulated monthly releases.
- It is not open to any party to unilaterally decide that there was distress and determine the formula for reducing its obligation while purporting to comply with the Tribunal’s order for release of water. The procedure prescribed by other Inter-States Water Dispute Tribunals for relieving such difficulty which might be caused by deficit in a particular span of time would have to be followed.
- It is no longer open to Karnataka to claim that its obligation under the Tribunal’s order of 25th June, 1991 was limited to 180 TMC at Biligundlu and not 205 TMC at Mettur. The contention of Karnataka that its obligation was to release with reference to the measurement taken at Biligundlu was rejected.
- The deficiency in a particular week has to be made good in the subsequent week and not necessarily within a particular month in which deficit occurs. Until the deficit is made good, the deficit would accumulate.

4.6.2.10 Implementation of Tribunal’s Order of 19 December, 1995

Tamil Nadu filed an application seeking implementation of the Tribunal’s Order dated 19th December, 1995. Consequently, the Supreme Court asked the Prime Minister to convene a meeting of the Chief Ministers, floor leaders of all political parties, opposition leaders in the Legislature Assemblies and the Members of Parliament from the basin area of both states to evolve a solution by consensus, regarding release of water to save the standing crops. Accordingly, the Prime Minister P.V Narasimha Rao held meetings on 30th and 31st December 1995 and wrote to the Chief Minister of Karnataka to release 6 TMC of water. He appointed an expert committee under the chairmanship of Y.K Alagh, Vice-Chancellor of Jawaharlal Nehru University, to assess water required to save standing crops. To maintain a cordial interstate relationship, Karnataka decided to release 6 TMC of water to Tamil Nadu.

4.6.2.11 Cauvery River Authority (CRA), 1998

As an outcome of the directions of directions of the Supreme Court Constitution Bench in May 1997, the Prime Minister convened a meeting of the Chief Ministers in August 1998. It was decided that to give effect to the to the interim Order of the Tribunal dated 25th June 1991 and all its related subsequent orders, a scheme called ‘Cauvery River Scheme, 1988’ shall be established. Under the scheme, an authority called the Cauvery River Authority (CRA) was formed, with Prime Minister as its Chairman and the Chief Ministers of Karnataka, Kerala, Tamil Nadu and Pondicherry as its members. To assist
the Cauvery River Authority, the Cauvery Monitoring Committee was also constituted.

4.6.2.12 Drought of 2002

When the South-West monsoon failed in 2002, both states faced scarcity of water. Tamil Nadu insisted on release of water as per the interim award of the Tribunal, meanwhile Karnataka pleaded its inability to do so for the available water was insufficient to meet its own needs. On August 27\textsuperscript{th}, the then Prime Minister Atal Bihari Vajpayee convened a meeting of the Cauvery River Authority and appealed to both the States to make rational and efficient utilisation of the water. Jayalalita, Chief Minister of Tamil Nadu walked out of the meeting and approached the Supreme Court regarding the same issue. The Court ordered release of 1.25 TMC of water a day to Tamil Nadu but observed that the CRA could revise it. On 8\textsuperscript{th} September, the CRA directed release of 9000 cusecs of water per day. Karnataka did not adhere to the directions.

Consequently, Tamil Nadu filed a contempt petition against S.M Krishna, Chief Minister of Karnataka, H.K Patil, Water Resources Minister of Karnataka and A. Ravindra, Chief Secretary of Karnataka for non-compliance of Supreme Court’s orders. Thereafter, Karnataka released water.

4.6.3 Final Award of the Tribunal

The final order of the Tribunal came on 5February, 2005. The content of the order is as follows:

4.6.3.1 Agreements of the years 1892 and 1924:

- The Agreements of 1892 and 1924 were not declared invalid, but they were held to have been superseded by the current order of the Tribunal. The Agreement of 1924 survived and continued even after coming into force of the Indian Independence Act, 1947. Karnataka is bound by the terms of this Agreement, subject to review and consideration.

4.6.3.2 Utilizable Quantum of Waters:

- Utilisable quantum of waters of the Cauvery at Lower Coleroon Anicut site, determined on basis the basis of 50% dependability, was 740 TMC.

- The available utilisable waters during a water year will include the waters carried over from the previous water year as assessed on 1st of June on the basis of stored waters available on that date in all the reservoirs with effective storage capacity of 3 TMC.

4.6.3.3 Apportionment of Water amongst the States:
• The waters of the river Cauvery were allocated to three States of Kerala, Karnataka and Tamil Nadu and U.T. of Pondicherry for their use in the following manner: Kerala- 30 TMC, Karnataka-270 TMC, Tamil Nadu-219 TMC and Pondicherry- 7 TMC.

4.6.3.4 Water Reserved for Environmental Protection and Inevitable Escapages into the Sea:

• Quantity reserved for environmental protection - 10 TMC
• Quantity determined for inevitable escapages into the sea – 4 TMC

4.6.3.5 Monthly Deliveries for the State of Tamil Nadu:

• Karnataka has to discharge water for Tamil Nadu at Billigundulu gauge in the following quantity: January- 3 TMC, February- 2.5 TMC, March- 2.5 TMC, April- 2.5 TMC, May- 2.5 TMC, June- 10 TMC, July- 34 TMC, August- 50 TMC, September- 40 TMC, October- 22 TMC, November- 15 TMC, December- 8 TMC; total 192 TMC. The quantum of 192 TMC of water comprises of 182 TMC from the allocated share of Tamil Nadu and 10 TMC of water allocated for environmental purposes.

The Regulatory Authority shall break the monthly releases in 10 daily intervals. The Authority shall properly monitor the working of monthly schedule with the help of the concerned States and Central Water Commission for a period of five years and if any modification/adjustment is needed in the schedule thereafter, it may be worked out in consultation with the party States and help of Central Water Commission for future adoption without changing the annual allocation amongst the parties.

• Upper riparian states shall not take any action that will affect the scheduled deliveries of water to the lower riparian states. However, the states concerned can by mutual agreement and in consultation with the Regulatory Authority make any amendment in the pattern of water deliveries.

4.6.3.6 Allocation of Water in Distress Year:

• In case the yield of Cauvery basin is less in a distress year, the allocated shares shall be proportionately reduced among the States of Kerala, Karnataka, Tamil Nadu and Union Territory of Pondicherry.

4.6.3.7 Contact Points for Monitoring of Deliveries:

• The following inter-State contact points are identified for monitoring the water
deliveries: between Kerala and Karnataka- Kabini reservoir & between Karnataka and Tamil Nadu- Billigundulu G.D. site/any other site on common border.

4.6.3.8 Groundwater

- The use of underground waters by any riparian State and U.T. of Pondicherry shall not be reckoned as use of the water of the river Cauvery.

4.6.3.9 Hydro-Power Projects in the Common Reach Boundary

- Karnataka and Tamil Nadu have a few hydro-power projects in the common reach boundary that are being negotiated with the National Hydro-Power Corporation (NHPC). In such a case, whenever such hydro-power project is constructed and Cauvery waters are stored in the reservoir, the pattern of downstream releases should be consistent with our order so that the irrigation requirements are not jeopardized.

4.6.3.10 Use of Water by States

- Use of water will be measured by the extent of its depletion of the waters of the river Cauvery including its tributaries; the depletion will include the evaporation losses from the reservoirs. The storage in any reservoir across any stream of the Cauvery river system except the annual evaporation losses shall form part of the available water. The water diverted from any reservoir by a State for its own use during any water year shall be reckoned as use by that State in that water year.

4.6.3.11 Regulation of Water Unused in a Month

- If any riparian State or U.T. of Pondicherry is not able to make use of any portion of its allocated share during any month in a particular water year and requests for its storage in the designated reservoirs, it shall be at liberty to make use of its unutilised share in any other subsequent month during the same water year provided this arrangement is approved by the Implementing Authority.

4.6.3.12 Regulation of Water Unused in a Year

- Inability of any State to make use of some portion of the water allocated to it during any water year shall not constitute forfeiture or abandonment of its share of water in any subsequent water year nor shall it increase the share of other State in the subsequent year if such State has used that water.

4.6.3.13 Machinery for implementation of Final Decision/Orders of the Tribunal
The Tribunal recommended the establishment of the Cauvery Management Board by the Central Government on the lines of Bhakra Beas Management Board to securing compliance and implementation of the final decision and directions of the Cauvery Water Disputes Tribunal. The Board shall be under the control of the Government of India, Ministry of Water Resources. Board ought to be entrusted with the function of supervision of operation of reservoirs and with regulation of water releases there from with the assistance of Cauvery Water Regulation Committee (to be constituted by the Board). The Regulation Committee will implementation provisions of the final order of the Cauvery Water Disputes Tribunal by to collecting daily water levels, inflows and storage position at reservoirs ensure ten daily releases of water on monthly basis from the reservoirs as directed by the Board, to collect data of water released from the aforesaid reservoirs on 12 hourly basis, collect daily water flows passing through presently identified inter-State contact point i.e., Billigundulu gauge discharge site and keep the Board suitably informed, to prepare seasonal and annual report of the water account and submit the same to the Board etc.

4.6.4 Special Leave Petitions

The States of Karnataka, Tamil Nadu and Kerala were not satisfied with the Tribunal’s order and filed a Special Leave Petition under Article 136 of the Constitution in the Supreme Court. All the riparian states also filed review petitions before the Tribunal in May, 2007. The Tribunal ordered that these petitions could await the disposal of the civil appeals in the Supreme Court.

4.6.4.1 Brief of Special Leave Petition filed by Karnataka:

1. The Tribunal has enforced the Agreement of 1924 subject to reconsideration, which is not mandated by law of the case between the same parties by the Constitution Bench in the Presidential Reference of 1991.

   Non-consideration of 20 TMC of ground water while reckoning the burden of 192 TMC annually against Karnataka at Billigundlu has resulted in higher allocation of 30 TMC to Tamil Nadu.

2. Double counting of paddy in minor irrigation resulted in allocation of 4 TMC more to Tamil Nadu.

3. Non-allocation of 5 TMC water to Karnataka out of the 10 TMC reserved for environmental needs.

4. Two-thirds of Bangalore city was not considered for estimating its drinking water needs on the ground that the said two-thirds part does not lie in Cauvery basin. Right to access drinking water recognised under Article 21 of the Constitution does not depend on hydrological boundaries of the basin.
5. Out of the balance 45 TMC, the Tribunal allocated 25.71 TMC to Tamil Nadu for use in unknown projects while rejecting the claims of Karnataka to the extent of 4.13 lakh acres in the disclosed projects in drought prone areas.

6. Tamil Nadu failed to provide any evidence on crop water requirements. The Tribunal established water requirements based on advice of Assessors without any input from experts.

7. While purporting to apply the rules of Equitable Apportionment in reviewing the Agreement of 1924, the Tribunal applied the Rule of Priority creating a huge disparity between Karnataka and Tamil Nadu.

8. The decision of the Tribunal was discriminatory and biased in favour of Tamil Nadu. Moreover, the decision of the Tribunal was vitiated by the lack of collegiality on the Bench.

4.6.5 Present Day Dispute

4.6.5.1 Drought in 2012:

After a gap of 10 years, Karnataka and Tamil Nadu experienced a drought in 2012. Jayalalitha, Chief Minister of Tamil Nadu wrote to Prime Minister Dr. Manmohan Singh stating that Karnataka has not discharged Cauvery water in the crucial June to September period, defying the tribunal's final order. The Prime Minister then convened the seventh Cauvery River Authority meeting on 19th September 2012 wherein Karnataka directed to to release 9000 cusecs of water, from September 21 to October 15. This was supplemented by the Supreme Court’s order that asked Karnataka to comply with the CRA directive. Although Karnataka complied with the order, it filed a revision petition in the Supreme Court seeking a stay of its order.

The action of Karnataka government to release water provoked the farmer organisations in Mandya and Mysore to agitation. The Karnataka Okkuta called for a statewide bandh on October 6th 2012 and life was brought to a standstill in most parts of the state. Karnataka then approached the Prime Minister for a review of the CRA's decision to release 9000 cusecs which was promptly rejected. Alleging failure by Karnataka to release water as per directions, Tamil Nadu filed a contempt case against the former in the Supreme Court on 9th October 2012.

4.6.5.2 Notification of Final Award in 2013:

In December 2012, the Supreme Court observed that the Central Government should have gazetted the Final Award, by which a Management Board would have been set up to regulate the flows. The Court clarified that such a publication of the final order will not affect the interest of the states in the pending Civil Appeals and the Reference Petition before the
Tribunal. Finally, the Tribunal Award of 2007 was notified by the Central Government in the gazette on 19th February 2013.

4.6.5.3 Cauvery Management Board (CMB):

The Tribunal felt the need to set up an appropriate mechanism and thus recommended an independent machinery to implement its decision. It recommended the constitution of the Cauvery Management Board and the Cauvery Water Regulation Committee (CWRC). It mandated the Centre to constitute the Board simultaneously with the gazette notification of the Final Award of the Tribunal dated February 19. Tamil Nadu was in favour of Cauvery Management Board and Regulation Committee. Meanwhile, Karnataka opposed them. Chief Minister Jagadish Shettar (Karnataka) stated that the CMB should not be constituted until the appeals were disposed of. There is a fear that with the constitution of the CMB, Karnataka will lose its supervisory control over the Cauvery basin reservoirs. While Tamil Nadu appealed to the Supreme Court for constitution of the CMB, Karnataka responded by terming the move an unwarranted exercise and a gross interference with the autonomy of the States.

On 19th March, 2013 Tamil Nadu moved the Supreme Court to give directions to Water Ministry for constitution of CMB. The Election Commission directed the Union Water Resources Ministry to defer constitution of the CMB and the CWRC till May 5 in view of Karnataka Assembly polls.

4.6.5.4 Temporary Scheme for Implementation of the Award:

The Supreme Court, in its interim order on May 10, 2013, directed the Centre to constitute a Supervisory Committee for implementation of the final order of the CWDT dated February 5, 2007, as notified on February 19, 2013. Thus, on 24th May, 2013 the Central Government notified the establishment of a temporary Cauvery Water Scheme, 2013. Under the Scheme, the Ministry of Water Resources notified the formation of a Supervisory Committee headed by the Water Resources Secretary with Chief Secretaries of the Cauvery basin states (Tamil Nadu, Karnataka, Puducherry and Kerala) as members. The Chairman of the Central Water Commission will also be a member, while the Chief Engineer of the CWC will be the Member-Secretary. This scheme was termed as a purely temporary measure until a permanent Scheme, namely the Cauvery Management Board, as recommended by the Cauvery tribunal order of February 5, 2007, is considered and constituted.

4.6.5.5 Tamil Nadu Seeks Damages from Karnataka

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On May 9th, 2013 the State of Tamil Nadu approached the Supreme Court seeking damages amounting to Rs. 2,480 crore from Karnataka, for not following orders of the Cauvery Water Disputes Tribunal (CWDT). Of the amount claimed by Tamil Nadu, Rs. 1,045.7 crore was on account of loss of production of food grains (paddy), biomass and electricity, the remaining Rs. 1,433.91 crore was due to the cultivation of paddy, sugarcane and semi-dry crops by Karnataka in areas that were in excess of the neighbouring State’s entitlement, as per the interim order. Tamil Nadu also pleaded before the apex court to direct Karnataka to release 53.18 TMC ft water to it at Mettur Reservoir.

4.6.5.6 Contempt of Court Petition Filed by Tamil Nadu, June 2013

In June 2013, Tamil Nadu demanded its share of water as per the Final Award of the Tribunal in a meeting convened by the Cauvery Supervisory Committee. The Committee stated that looking into the data such as deficit in inflows and very low storages in the reservoirs in Karnataka and Tamil Nadu, the request of Tamil Nadu for release of water by Karnataka was considered and found not feasible as of now. The request would be reviewed late in July. On 28th June Tamil Nadu filed a contempt petition in the Supreme Court against Karnataka Chief Minister Siddaramaiah, Water Resources Minister H.K Patil and Chief Secretary S.V Ranganath alleging that they had committed contempt of court by taking a defiant stand before the Supervisory Committee that the final award of the Cauvery Tribunal would not be implemented. Tamil Nadu also requested the Court to constitute the Cauvery Management Board given that the Supervising Committee had proved to be a futile exercise.

4.6.5.7 Clashes over the Mekadatu Project Proposed by Karnataka

On 8th September, 2013, Chief Minister of Tamil Nadu, Jayalalithaa requested the Centre to instruct Karnataka to not take up any schemes in the Cauvery, including hydro-electric projects, without the prior consent of Tamil Nadu, such as the Mekedatu project. Tamil Nadu observed a bandh opposing the plan for the Mekadatu project this side of the border. Bus services between the two states were disrupted and pro-Kannada organisations burnt effigies of Tamil Nadu leaders for opposing the project. The Chief Minister of Karnataka was, however, committed to the project.

4.6.6 Clarification of Final award

On 15th July, 2014 the Cauvery Water Disputes Tribunal heard applications filed by the Centre, Tamil Nadu, Karnataka and Kerala seeking clarification on the final award it had

issue-state-seeks-damages-from- karnataka/article4760157.ece
passed on February 5, 2007, allocating the quantum of water for each State. The Tribunal was meeting for the first time in seven years, since it passed its award.

4.6.6.1 Deficient Rainfall in 2016

As per the Karnataka State Natural Disaster Monitoring Committee, with the southwest monsoon on the retreat, Kodagu, which is the main catchment area for the Cauvery, has received minus 35 per cent of the normal rainfall during 2016, and this has accentuated the water crisis this year. The Government of Karnataka has declared 42 out of 48 Talukas under Cauvery basin as drought affected Talukas based on Central Government guidelines. Data from the Water Resources Department of Karnataka states that the Krishnarajasagara Reservoir is facing a 35 per cent shortage in the inflow of water and 60 per cent shortage in the Kabini reservoir. There has been large number of suicides amongst farmers in Mandya district due to failure of crops. Whatever water is left in the four reservoirs will be required to meet the drinking water needs of the State till the next monsoon, i.e June 2017.

Tamil Nadu had sought a direction from the Supreme Court to Karnataka to release 50.52 tmc feet of Cauvery water to save 40,000 acres of samba crops this season. Urging Karnataka to embrace the principle of ‘live and let live’, the Supreme Court on 5th September, 2016, directed Karnataka to release 15,000 cusecs of Cauvery water for the next 10 days. (Supreme Court of India, 2016) Karnataka adhered to the decision of the Supreme Court and released 16,000 cusecs of water (1000 cusecs added to make up for evaporation losses) from the Krishnasagar and Kabini reservoir.

4.6.6.2 Karnataka’s Plea to Modify the Supreme Court Order\textsuperscript{65}

Large scale protests erupted in Karnataka over the release of water. All services of the Tamil Nadu State Transport Corporation to Karnataka remained suspended. Succumbing to political pressure and the wave of public protests, on 10\textsuperscript{th} September the State of Karnataka filed a plea to modify the Supreme Court order directing it to share Cauvery water with distressed Tamil Nadu. Apart from the disruption of normalcy and destruction of property, Karnataka argued that the total water in its reservoir was less than the water in the reservoir of Tamil Nadu. And that the outflow from the Mettur reservoir to dependent systems was 1,250 cusecs a day for samba crops, so Tamil Nadu’s agony is actually sheer anxiety. The application said that 66,000 cusecs of water had already been released to Tamil Nadu as a gesture of goodwill from September 5 till September 10. In response, the court reduced the quantum of daily water release ordered earlier, from 15,000 cusecs to 12,000 cusecs, but asked the releases to be continued till 20\textsuperscript{th} September, 2016.

4.6.6.3 Revision of Quantum of Releases by Cauvery Supervising Committee

On 19th September 2016, the Cauvery Supervisory Committee (CSC) ordered Karnataka to release 3,000 cubic feet of water per second (cusecs) between September 21 and September 30. The decision on the quantum of release was arrived at after calculating water availability in the river, monsoon performance, agricultural and drinking water requirements in both States. The committee arrived at its numbers by calculating the average inflow over the last 15 days. Both the States rejected the decision and will approach the Supreme Court to seek fresh directions.

4.6.6.4 Order of the Supreme Court

Revisiting the directions of the Cauvery Supervising Committee dated 19th September, the Supreme Court on 20th September asked Karnataka to release 6,000 cusecs of Cauvery water to Tamil Nadu every day from September 21 till September 27. The apex court also asked the Centre to constitute the Cauvery Management Board within four weeks. Despite Karnataka’s protests, a bench comprising justices Dipak Misra and U.U. Lalit ordered the state to release 6,000 cusecs of Cauvery water per day to Tamil Nadu from 28-30 September.

4.6.6.5 Resolution of Karnataka State Legislature

The state's legislature passed a unanimous resolution on September 23 saying that they cannot release water from the river for anything but drinking purposes in Bengaluru and other towns and villages in the Cauvery basin. According to the mandate, they cannot release water to Tamil Nadu until their reservoirs have enough to spare.

4.6.6.6 Further Directions from the Supreme Court

On 30th September, the Supreme Court gave Karnataka a last chance to release 6000 cusecs of Cauvery water to Tamil Nadu between October 1, 2016 and October 6, 2016 before the “wrath of law falls on the State”. Invoking its limitless powers under Article 144 of the Indian Constitution to enforce its orders, a Bench of Justices Dipak Misra and U.U. Lalit warned Karnataka in its order that it was “bound to obey the orders of the Supreme Court”. The apex court simultaneous asked the Centre to set up the Cauvery Water Management Board by 4 October, 2016 so that the Board can visit the Cauvery basin.

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68 Source: http://supremecourtofindia.nic.in/FileServer/2016-09-30_1475235003.pdf
sites to check the ground realities.

4.6.6.7 Jurisdiction of Supreme Court Challenged

The Centre argued that the parliamentary law of Inter-State Water Disputes Act of 1956 coupled with Article 262 (2) of the Indian Constitution excluded the Supreme Court from hearing or deciding any appeals against the Cauvery Tribunal's decision. The Centre claimed the tribunal award was final. Quoting Section 6 (2) of the 1956 Act, the Centre said it was left to the government to frame a scheme for implementation of the tribunal award, and the scheme, once prepared, would be placed before both Houses of the Parliament for approval. It argued that the tribunal takes on the mantle of the Supreme Court, and its award should be treated as the latter's judgment. So, any appeal to the Supreme Court against the tribunal award would mean “an appeal to the Supreme Court challenging the Supreme Court's decision”, Attorney-General Mukul Rohatgi had submitted. All three States have opposed the Centre's stand, contending that a parliamentary law cannot stop the Supreme Court from exercising its constitutional power to hear appeals.

On 9th December, 2016, the Supreme Court upheld its constitutional power to hear the appeals filed by Tamil Nadu, Karnataka and Kerala against the Cauvery Water Disputes Tribunal final award in 2007. Justice Misra said the interim order to Karnataka to release 2000 cusecs to Tamil Nadu would continue till further orders.69

4.6.6.8 Centre Opposed to Formation of Cauvery Management Board

On September 30, the Centre represented by Attorney-General Mukul Rohatgi, had readily agreed to the Court's direction to form a board by October 4 and submit a field report on the ground realities at the Cauvery basin by October 6.70 Karnataka moved a review petition in the form a Cauvery management board in "violation" of the National Water Policy of 2012, which gives Karnataka's requirement for drinking water first priority over Tamil Nadu's needs of irrigation. Karnataka argued that the Cauvery Management Board Cauvery is vested with powers and functions that are ‘unnecessary’ and ‘intrude’ into the legislative and executive powers of the State. Thereafter, the Central government on 3rd October 2016, said the Supreme Court has no jurisdiction to direct it to constitute a Cauvery management board, saying such orders amounted to encroachment into legislative turf and will lead to "other complications". On 4th October, 2016 a Bench comprising Justices Dipak Misra and U.U. Lalit deferred its order asking the Centre to set up the Cauvery Water Management Board till it finally decided on the civic appeals relating to the dispute.

70 http://supremecourtofindia.nic.in/FileServer/2016-09-30_1475235003.pdf
4.6.6.9 Compliance by Karnataka

On 4th October, 2016 Counsel F.S Nariman of Karnataka filed a note that Karnataka has not released water on 1st October or on 2nd October. The note mentioned that on 3rd October it was decided that the orders of the Supreme Court shall be honoured and water will be released in the following manner:

- 12000 cusecs of water released from Billigundlu reservoir on 3rd October. 12000 cusecs of water will be released again on 4th October.
- 12000 cusecs of water will be released on 5th October.

4.6.6.10 Further Directions from the Supreme Court

1. As per Civil Appeal No. 2456/2007, Item No. 57, on 4th October, 2016 a Bench comprising Justices Dipak Misra and U.U. Lalit in an interim order, directed Karnataka to release 2,000 cusecs of Cauvery water every day to Tamil Nadu from October 7 to 18. 73
2. As per Civil Appeal No. 2456/2007, Item No. 57, on 18th October, the Supreme Court directed Karnataka to release 2000 cusecs of water for Tamil Nadu until further orders. 74
3. On 4th January, 2017 a bench of Justice Dipak Misra, Justice Amitava Roy and Justice AM Khanwilkar reiterated its October 18, 2016 order and said that it will remain effective till further orders and fixed the pleas on the vexatious dispute for final hearing on 7th February, 2017.
4. Stressing the urgency to resolve the dispute at the earliest, a Bench of Justices Dipak Misra, Amitava Roy and A.M. Khanwilkar scheduled the back-to-back hearing from February 7 for a period of three weeks. 75

4.6.6.11 Compensation for Tamil Nadu

The Tamil Nadu government, in January, sought a compensation of Rs 2,480 crore from Karnataka for not releasing the water as specified by the SC. The court had asked Karnataka government to allow release of 2000 cusecs of river water to Tamil Nadu until the matter was heard on 7th February, 2017.

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71 Source: Supreme Court of India, Civil Appeal No. 2456/2007, Date: 4/10/2016
72 http://www.thehindu.com/news/national/New-Supreme-Court-Bench-to-hear-Cauvery-dispute-on-October-18/article15477409.ece
73 Source: http://supremecourtofindia.nic.in/FileServer/2016-09-05_1473077569.pdf
74 Source: http://supremecourtofindia.nic.in/FileServer/2016-09-05_1473077569.pdf
Conclusion

This status report is unique considering the vast amount of data compiled and reported. All the important policies with regard to the water sector have also been analysed and the institutional arrangements at all levels across sectors have been mapped and assessed. This status report (Outcome 1) is the first step towards achieving the larger goals and objectives of the NWM and forms the basis for the preparation of the following outcomes/reports:

**Outcome 2 (Interim report):** Identification of the set of probable solutions to address the key issues/problem areas giving pros and cons of the solutions.

**Outcome 3 (State Specific Action Plan):** Preparation of the detailed Action Plan for each of the Strategies identified in the NWM to be implemented by the State/Union Territory.

This study has used a systems approach to assess the status of water resources in the State. This provides a means of understanding and analysing the design and construction of water resource management as an integrated, complex composition of interconnected systems that need to work together. The system referred here is the River Basin which should be considered while identifying solutions and preparation of the SSAPCC.

A ‘Basin’ is recognised as the ideal and practical unit of water resources management because it allows the holistic understanding of upstream-downstream hydrological interactions and solutions for management for all competing sectors of water demand. The practice of basin planning has developed due to the changing demands on river systems and the changing conditions of rivers due to human interventions. The multiple uses of water and varying demands on a river basin require an integrated approach to managing river basins. The data compilation in this report will help assess the likely impact of climate change on water resources, with a focus on drought and flood prone areas, coastal regions and areas with over-exploited groundwater sources at the district level and it is recommended that the same be aggregated to formulate an Action Plan based on river basins within Karnataka.