

WATER RESOURCES

Moot Points

- Chhattisgarh covered by 4 major water-systems of India: Ganga, Mahanadi, Narmada and Godawari.
- Mahanadi & Godawari cover 85% of the total basin area.
- CG has fairly good rainfall, yet frequent droughts in recent times plague the State. One reason for this: neglect of traditional water harvesting practices.
- Water is a catalyst for development anywhere, but especially so in CG where 80% people have agro-based livelihood.
- Estimated utilizable water resource in CG: (a) Surface Water: 41,720 MCM; and (b) Ground Water: 11,960 MCM.
- Water largely untapped. Potential irrigable area: 4.30 m ha. Irrigable potential created: 1.34 m ha.
- Irrigation potential created is also not fully utilized. Only 69% of created potential is utilized in CG. (In India: 89%.)
- Irrigation projects managed by WRD: Major (3); Medium (26); Minor (2,892).
- Incomplete / Ongoing projects: Major (4); Medium (9); Minor (348).
- State budget for irrigation enhanced to Rs.246.47 Cr. (= 20% of total budget)
- On current enhanced budget trends, 39 more years to create full potential.
- Ground water is un-regulated in CG. WRD manages only surface water.
- No apex water authority in CG. 3 bodies manage water: WRD, PHE, LBs
- Around 150 urban ponds / lakes rejuvenated in CG since 2001.

STATE

- Fair rainfall, good water resources.
- Resource tapping poor in CG.
- Traditional water harvesting practices neglected
- Frequent droughts in recent times.



PRESSURES

- Limited irrigation potential created.
- Irrigable land to cultivable land ratio unbalanced in districts. Dhamtari: 131%; Dantwada 6%. Chhattisgarh: 24%
- Low budget for maintenance of created irrigation facilities.
- Over dependence on paddy cultivation



IMPACT

- Low irrigation potential created also not fully used
- Low agricultural production, compared to potential.
- Agriculture not uniformly spread in all districts.
- Agriculture production profile lop-sided in favor of paddy.



RESPONSE

- Budget for irrigation enhanced to 20% of State's total budget.
- New irrigation projects launched.
- Around 150 urban lakes / ponds rejuvenated.
- Campaign launched to diversify crop-pattern.

State of Water In Chhattisgarh: *Shortage Amidst Plenty*

7.1 Chhattisgarh is often described as a rich State inhabited by poor people. This paradox is most pronounced, perhaps, in respect of water. The State is part of four major river systems. A large portion of it is the Mahanadi-Godawari basin. It is watered by several perennial rivers, and many more seasonal streams. Important rivers include Mahanadi, Indrawati, Sheonath, Rinand, Hasdeo, Mand, Ibb, Pairi, Sabari and Arpa. Yet frequent droughts plague the State. The web-document of the State states: "Although nature has been relatively kind to Chhattisgarh in terms of the average rainfall as compared to several other States of the Union, neglect of the traditional water conservation practices in recent times has led to visitations by drought year after year...."

The irrigated area in the State is only 16% of the total cultivable area, while potential exists to raise the irrigated area to 75%.”

7.2 The State commissioned an Action Plan for Infrastructure Development. The plan was prepared by PriceWaterhouseCoopers (PWC). This Chapter hereafter draws heavily from the final report of PWC on the State of Water in Chhattisgarh¹. For the purpose of form, the contents of the report have been freely subsumed into the pattern of this chapter, without separate acknowledgement every time.

7.3 As the report says, the importance of water as a catalyst for the development of a region or a State cannot be understated. This is particularly true for Chhattisgarh, where almost 80% of the population is dependent on agriculture and allied activities for livelihood. The agriculture sector contributes around 38% to the State’s Net Domestic Product.² Besides irrigation, the other key uses of water in the State include:

- Drinking or domestic purpose
- Industry
- Power plants

7.3 As shown in Table 7.1, the State seems to have sufficient water resources and a large untapped potential. Utilizable surface water potential in the State, if properly harnessed, can irrigate an estimated 4.3 m ha area, against the existing irrigation potential of 1.38 m ha.

Table 7.1: Potential & Utilization of Water In Chhattisgarh

| Surface Water In Million Cu. Mtr | |
|---|------------|
| Est. Utilizable Potential | 41,720 MCM |
| Potential Irrigable Area | 4.30 m ha |
| Actual Irrigated Area | 1.34 m ha |
| Ground Water | |
| Net Utilizable Potential | 11,960 MCM |
| Actual Potential Utilized | NA |

Source: WRD-GoCG

¹ Infrastructure Development Action Plan for Chhattisgarh – Final Report, Position Paper – Water Resources II

² Rs. 8400.18 Crores out of Rs. 21,910.74 Crores in 1999-00.

7.4 The apparent abundance of water resources needs to be efficiently and effectively planned to develop and utilize these resources for the overall benefit of the State. The need for efficiency and effectiveness in the management of water resources can be gauged from the following:

Table 7.2: Potential & Utilization Pattern In Chhattisgarh & India

| Type of Irrigation | Potential | | Utilization in % | |
|--------------------|----------------------------|-----------------------------|------------------|-------|
| | Potential Created [Lac ha] | Potential Utilized [Lac ha] | Chhattisgarh | India |
| Major ³ | 5.94 | 4.53 | 76% | 87% |
| Medium | 2.68 | 2.44 | 91% | 87% |
| Minor | 4.97 | 2.35 | 47% | 89% |
| Total | 13.59 | 9.32 | 69% | 89% |

- In the irrigation sector, utilization of irrigation potential is significantly lower than the national figure. For example, as shown in the Table 7.2, percentage utilization of created potential for minor schemes and cumulative for the State compares unfavorably with corresponding figures for the country.
- Besides low utilization of created potential, the average yield of key crops in Chhattisgarh is much lower than national average and some international benchmarks. Table 7.3, presents this picture clearly.

Table 7.3: Crop Yield In Chhattisgarh, India, China & Egypt [Kg/ha]

| Crop | Chhattisgarh | India | | China | Egypt |
|-------|--------------|--------------|-----------|-------|-------|
| | | Un-irrigated | Irrigated | | |
| Paddy | 1005 | 1050 | 2090 | 5807 | 7659 |
| Jowar | 1138 | 1080 | 1320 | NA | NA |
| Maize | 1485 | 1580 | 1980 | NA | NA |

³ Major = Culturable Command Area (CCA) > 10,000 ha. Medium = CCA 2,000-10,000. Minor = CCA < 2,000

| | | | | | |
|-------|-----|------|------|------|------|
| Wheat | 924 | 1830 | 3180 | 3295 | 5255 |
|-------|-----|------|------|------|------|

Source: Commissioner of Land Records, MP; GoI (1993); CMIE (1996)

- 7.5 The Government of Chhattisgarh is ceases of the gravity of the situation. It has earmarked Rs.246.47 crores (= 20% of its plan budget) for development of water resources.
- 7.6 Chhattisgarh is served by four river basins: Ganga, Mahanadi, Godawari and Narmada. The areas served by each of these is as shown in Table 7.4.
- 7.7 Currently there are 3 major, 26 medium and 2,892 minor irrigation projects in the State that are managed by the Water Resources Department. Besides these, there are a number of tanks, ponds etc that are managed by the Panchayats.

Table 7.4: Spread Of River Basins In Chhattisgarh

| Basin | Area Served (Sq. Km) | Area as % of total Geographical Area of Chhattisgarh |
|--------------|----------------------|--|
| Ganga | 18,600 | 14% |
| Mahanadi | 74,997 | 56% |
| Godawari | 39,553 | 29% |
| Narmada | 1,950 | 1% |
| Total | 1,35,100 | 100% |

- 7.8 Surface water harnessed by irrigation projects is primarily used for irrigation, but other (drinking / industrial) uses are also involved. The use of water from the Mahanadi Project illustrates this point. See Table 7.5.

Table 7.5: Mahanadi Project Water: Pattern Of Use

| Use | Qty in TMC | Use as % |
|--------------------|------------|----------|
| Irrigation | 14.64 | 75% |
| Bhilai Steel Plant | 3.60 | 18% |

| | | |
|-----------------------|-------|------|
| Drinking Water Supply | 1.28 | 6% |
| Total | 19.52 | 100% |

Source: CE, Mahanadi Project, Raipur

- 7.9 The State has a number of incomplete/on-going projects. These include 4 major, 9 medium and 348 minor irrigation projects. These projects involve a total investment of Rs.2,619.39 crores, of which Rs.1,4,34.91 crores had been spent till March 2001. When completed, these projects will add irrigable land 7.13 lac ha area.
- 7.10 Ground water is an unregulated area in Chhattisgarh. Unlike Surface Water, Ground water development and use is covered under any Act. The land-owner reserves the right to harness ground water beneath his land. The Water Resources Department of the State is responsible only for the surface water. Chhattisgarh is comfortably placed with regard to ground water (GW). Table 7.6 below indicates this.

Table 7.6: Ground Water Position In Different Districts of Chhattisgarh

| District | GW available for use [MCM / Yr] | Level of GW development % |
|---------------------------------|---------------------------------|---------------------------|
| Bastar, Kanker, Dantewada | 1366.70 | 1.06 |
| Bilaspur, Korba, Champa-Janjgir | 1647.80 | 9.62 |
| Durg | 682.00 | 12.97 |
| Raigarh, Jashpur | 849.20 | 4.97 |
| Raipur, Dhamtari, Mahasamund | 1955.20 | 6.43 |
| Rajnandgaon, Kawardha | 876.00 | 3.40 |
| Surguja, Korea | 812.30 | 17.29 |
| Total | 8189.20 | |

Source: Central Ground Water Board North-Central Region (1995)

- 7.11 The spread of irrigation potential created in various districts is not uniform vis-à-vis the cultivable land available in the district. Dhamtari district is way ahead of others, with potential facility (131.27%) far exceeding the cultivable area. On the other extreme are Dantewada, Korba and Jashpur districts where the potential facility created is just above 6% of the cultivable land available.

Table 7.7: District-wise Spread Of Irrigation Facilities

| District | Cultivable Land [Lac ha] | Potential created [Lac ha] | Potential created as % of cultivable land |
|-----------------|---------------------------------|-----------------------------------|--|
| Raipur | 7.06 | 1.43 | 20.25 |
| Mahasamund | 2.87 | 0.61 | 21.25 |
| Dhamtari | 2.11 | 2.77 | 131.27 |
| Durg | 7.94 | 1.88 | 23.68 |
| Rajnandgaon | 4.69 | 0.83 | 17.70 |
| Kabirdham | 2.28 | 0.33 | 14.47 |
| Bastar | 0.36 | 0.22 | 61.11 |
| Kanker | 2.33 | 0.35 | 15.02 |
| Dantewada | 3.05 | 0.19 | 6.23 |
| Bilaspur | 5.05 | 1.18 | 23.37 |
| Janjgir-Champa | 3.05 | 2.22 | 72.79 |
| Korba | 1.46 | 0.10 | 6.85 |
| Surguja | 5.58 | 0.52 | 9.32 |
| Korea | 1.25 | 0.19 | 15.2 |
| Raigarh | 2.84 | 0.37 | 13.03 |
| Jashpur | 2.88 | 0.18 | 6.25 |
| Total | 54.8 | 13.37 | 24.29 |

Source: WRD-GoCG

Water Management Mechanisms

- 7.12 Water is managed in the State by three different departments: Water Resources Department, Public Health Engineering, and the Local Self-governance Bodies.
- 7.13 Water Resources Department (formerly known as Irrigation Department) manages only a part of the surface water. It does not deal in ground water. The primary task of the department is to harvest water for enabling irrigated

agriculture. However, in rare instances it also supplies water for industrial use (E.g., to Bhilai Steel Plant) and for municipal water supply.

- 7.14 The Public Health Engineering Department (PHED) is involved mainly in sinking bore-wells for the urban and rural local bodies. In some cases it is also involved in the function of domestic water supply.
- 7.15 Subsequent to the 73rd and 74th Constitutional Amendments, water management is part of local self-governance. Responsibility for managing locally available water (surface and ground) is that of the local body. In urban areas it is the Municipal Corporation /Council. In rural areas it is the local Panchayat Raj Institution (PRI) that has to manage its water resources. This pattern is practiced in Chhattisgarh.
- 7.16 Under a Scheme of the Department of Urban Development, around 150 urban lakes and ponds in the State have been developed in the last 2 years. The development work included cleaning, deepening, reclamation of dry-lake area, and bunding. Catchment area has also been developed in certain cases. This has been done after a span of over 50-100 years in many cases. This has perceptibly changed the profile of the lakes. It is also bound to have a positive impact on ground water table in these towns.

Key Issues Relating to Management of Water Resources In Chhattisgarh

- 7.17 The key issues confronting the water resources sector in Chhattisgarh have been classified and discussed in the PriceWaterhouse Coopers study under three broad categories:
- Resource Utilization
 - Institutional
 - Financial

Resource Utilization

- 7.18 **Absence of an Apex Water Authority & State-Wide Water Resources Plan** – Water resources available to a region through various sources (such as rainfall, net surface run-off, rivers/streams, groundwater aquifers, etc.) are hydrologically linked, and are subject to competing demands by various

sectors or user categories (such as for drinking purposes, irrigation, industrial use, etc.). Chhattisgarh has large untapped surface water and groundwater resources. It is therefore prudent to map these existing resources and develop long-term plans based on demand-supply projections. Such a State-wide water resources plan does not currently exist. The plan is developed through detailed technical studies and forms a basis for efficient and effective planning, development and monitoring of water resources. As a first step in this direction, it would be necessary to appoint an Apex Water Authority that should broadly guide and co-ordinate the work of various field agencies involved in water management viz., WRD, PHE and ULBs.

7.19 Low Utilisation Of Developed Water Resources – As observed earlier, though the State has an irrigation potential of 13.37 lakh ha, the year-on-year actual utilisation of the designed potential is a poor 69% (see Table 7.2). Actual utilisation (i.e. area irrigated) is least for minor projects. Though natural phenomena such as low rainfall could be one of the reasons for such low utilisation, in most cases the key reasons usually are poor maintenance of the canal system and inequitable distribution between head and tail farmers. The Paralkot Dam in Pakhanjore (Kanker district) is a case in point.

Table 7.8 : Index of Creation of Irrigation Potential

| District | Cultivable Area (lakh ha) | Potential Created (lakh ha) | Area Irrigated (lakh ha) | Fractional Cultivable Area | Index of Creation |
|---------------|---------------------------|-----------------------------|--------------------------|----------------------------|-------------------|
| Rajnour | 7.06 | 1.43 | 0.66 | 0.13 | 0.83 |
| Mahasamund | 2.87 | 0.61 | 0.41 | 0.05 | 0.87 |
| Dhamtari | 2.11 | 2.77 | 2.47 | 0.04 | 5.38 |
| Durg | 7.94 | 1.88 | 1.79 | 0.14 | 0.97 |
| Rajnendrapur | 4.89 | 0.83 | 0.48 | 0.09 | 0.73 |
| Kawardha | 2.28 | 0.33 | 0.24 | 0.04 | 0.59 |
| Bastar | 0.36 | 0.22 | 0.03 | 0.01 | 2.50 |
| Kanker | 2.33 | 0.35 | 0.13 | 0.04 | 0.62 |
| Dantewada | 3.05 | 0.15 | 0.02 | 0.06 | 0.26 |
| Bilaspur | 5.05 | 1.18 | 1.22 | 0.09 | 0.98 |
| Jainpur | 3.05 | 2.22 | 1.21 | 0.06 | 2.98 |
| Korba | 1.46 | 0.1 | 0.05 | 0.03 | 0.28 |
| Surghua | 5.58 | 0.52 | 0.09 | 0.10 | 0.38 |
| Koriya | 1.25 | 0.18 | 0.03 | 0.02 | 0.62 |
| Rajnagarh | 2.64 | 0.37 | 0.3 | 0.05 | 0.53 |
| Jashpuranagar | 2.88 | 0.18 | 0.07 | 0.05 | 0.26 |
| Total | 54.8 | 13.37 | 9.38 | 1.00 | 1.00 |

Source: Compiled from data from WRD

7.20 Inequitable development of resources – The State has an imbalanced development of surface water resources. The Pricewaterhouse report arrives at

this conclusion after examining a factor called ‘Index of Creation of Irrigation Potential.’ The calculation of the Index assumes that irrigation potential in a district is in the same proportion as the cultivable area of a district. As can be seen the focus of development of irrigation potential has been concentrated in few districts such as Dhamtari, Janjgir and Bastar (though Bastar has amongst the lowest utilisation); and least in districts such as Dantewada, Jashpur and Korba.

7.21 **Low coverage for urban water supply** – Though the State is purported to have sufficient water resources, the situation of urban water supply needs to be improved. The district-wise status of towns that have organised water supply in Chhattisgarh is set out in Table 7.9.

Table 7.9: Situation Of Urban Water Supply In Chhattisgarh⁴

| Districts | Situation of Urban water Supply | | | |
|-----------------|-----------------------------------|--|----------------------------|--|
| | Towns with organised water supply | Population with organised water supply | Estimated urban population | % population with organised water supply |
| Bastar | | | | |
| Kanker | 2 | 105270 | 161883 | 65% |
| Dantewada | | | | |
| Bilaspur | | | | |
| Korba | 11 | 498738 | 644803 | 77% |
| Janjgir Chhampa | | | | |
| Durg | 4 | 452435 | 845400 | 54% |
| Rajnagarh | 5 | 147400 | 163059 | 90% |
| Jashpur | | | | |
| Raipur | | | | |
| Dhamtari | 9 | 703879 | 771622 | 91% |
| Mahasamund | | | | |
| Rainandgaon | 5 | 200528 | 226787 | 88% |
| Kawardha | | | | |
| Surguja | 8 | 124601 | 251159 | 50% |
| Koriya | | | | |
| Total | 42 | 2232652 | 3064693 | |

Source: Central Ground Water Board-North Central Region, 1995

7.22 As can be observed, 42 towns have an organized water supply. Most of the water supply network in urban areas is quite old and in need of urgent repair. It is estimated that Unaccounted For Water (UFW) could be as high as 50% in many areas.

7.23 **Low funds for O&M** – Though no detailed studies have been carried out to determine actual O&M requirements for schemes within the State, the budgetary allocations for O&M seem to be on the lower side. Total budgetary

⁴ This table is old. There are more towns in Chhattisgarh now. Data is being updated.

allocations for O&M works out to about 373 Rs./ha⁵ of which establishment charges constitute a hefty 54%. This would leave only 172 Rs./ha for actual O&M. These allocations are significantly lower than O&M estimations (Rs. 538 Rs./ha in today's costs) made by Vaidhyathan Committee in 1992 for sustainable maintenance of irrigation systems. It may be noted that on the basis of an exhaustive study conducted in Rajasthan, O&M expenses worked out to 533 Rs./ha for the year 1999-2000. Low O&M budgets lead to deterioration of the system and results in low utilization vis-à-vis designed irrigation potential. Unmet maintenance requirements over a period of time also result in high rehabilitation costs to bring the system back to design potential.

Institutional Framework

The key issues under this category are:

- 7.24 **Limited Skill Sets** – The law in force envisages an active participation of farmers in the management of irrigation systems. It also entrusts a lot of responsibility of O&M to the respective WUAs. Since the traditional role of WRD did not involve significant user interface, the changed scenario would place a lot of additional demands on the skills of WRD staff, particularly at the field level (i.e. Executive Engineer and below). Such skills would hence need to be developed in WRD cadre. In breaking away of the WRD department from undivided MP, the technical functions such as those related to survey, investigation and design, environment planning, etc. for large schemes have continued to reside primarily at Bhopal in MP. However, skill sets for such functions would be required in Chhattisgarh to undertake development of further irrigation potential and other surface water schemes. Similarly, in case of urban water supply since some cities (viz. Raipur, Bilaspur, Raigarh, etc.) are expected to grow at a higher rate than in the past, it would be essential to review the available skill sets of municipal corporations and municipalities to assess their readiness to cope with the increased demand for water and associated services through innovative means such as private sector

⁵ Source: *ibid*

participation, raising of financial resources through municipal bonds, designing water supply projects, etc.

- 7.25 **Absence of a high level body** – Chhattisgarh shares its river basins with many States, and within the State itself water resources are subjected to competing demands of different sectors. In order to take speedy policy level and in-principal decisions pertaining to inter-sectoral allocations and sharing with other States, it is preferable to have a high level body comprising ministers and/or secretaries of key departments (viz. WRD, Agriculture, PHED, Urban Development, Industries, etc.) to represent various stakeholders. Such a high level decision making body is currently absent in the State. In order to facilitate informed decision making based on the analysis of actual data, creation of a special technical cell (within WRD, if so desired) may also be explored. This cell should have skill sets pertaining to engineering, hydrology, hydrogeology, geology, environment engineering, sociology and economy.
- 7.26 **Absence of an independent regulatory body** – WRD in its current form carries out the dual role of an operator as well as a regulator, i.e. WRD supplies water through its schemes, and decides the tariff it would charge to various categories of users. Being a Government department it is also prone to various pressures while fixing its tariff levels and enforcing revenue recovery. As a step towards ensuring self-sustenance and addition in capacities through private sector participation, an independent regulatory body may be required to be created to ensure viability of the sector while keeping consumer interests in mind.
- 7.27 **Ground Water Regulation** – As in most of the states in India, groundwater is an unregulated resource in Chhattisgarh. However, many States have realised the need to regulate this resource in order to prevent its over-exploitation. States like Rajasthan and Delhi have also introduced bills for regulating this resource. In order to take a long term view of sustainable development of water resources in the State, Chhattisgarh would also need to take a decision on regulating this resource.
- 7.28 **Need for strengthening of internal systems** – Internal systems and controls in RD and local bodies are attuned towards government system of accounting (i.e. they follow a cash based PWD accounting system focussed on tracking

expenditure against budgetary allocations) rather than a commercial accounting system (i.e. double entry accrual based accounting that is focussed on matching revenues and expenditures). Such an accounting system impedes commercial orientation of the department/bodies. Similarly, lack of computerization and of an effective management Information System (MIS) needs to be addressed for efficient management of the department/bodies.

- 7.29 **Need for strengthening coordination amongst various departments** – In case of supply of water for irrigation purposes, since the ultimate objective is to improve crop productivity or yield per ha, it is imperative that the concerned departments i.e. WRD and the agriculture department work in close co-ordination at the field level. Such co-ordination is essential as the use of high yield variety seeds, time of cropping, time of watering, use of fertilisers/soil nutrients, etc. are critical for obtaining good yields. There is therefore a need to strengthen effective co-ordination amongst the departments.

Financial

The key issues under this category are:

- 7.30 **Limited capacity of the government to fund development.** The State has a number of on-going schemes. On the basis of cost estimates of these on-going schemes and their design irrigation potential, the average cost of a surface water scheme works out to 36,088 Rs./ha of irrigation potential. When these surface water schemes are completed, the State is expected to have an irrigation potential of 16.25 lakh ha. As per quick estimates (Table 7.10), the State would require a hefty investment of about Rs. 9,651 crores to fully develop the estimated 43 lakh ha of its irrigation potential.

Table 7.10: Future Fund Estimation For Irrigation Development

| Future Fund Estimation for Irrigation Development in Chhattisgarh | | |
|---|---------|-------------|
| Existing Irrigation Potential in the State | 13.37 | lakh ha |
| Irrigation potential from ongoing schemes | 2.88 | lakh ha |
| Total potential on completion of schemes | 16.25 | lakh ha |
| Estimated Irrigation potential in the State | 43.00 | lakh ha |
| Balance potential that can be utilised | 26.75 | lakh ha |
| Avg. cost of creation of irrigation potential | 0.36 | Rs. Lakh/ha |
| Funds required to develop balance irrigation potential in the State | 9651.87 | Rs. Crores |
| 2001-02 plan budgetary allocation | 246.47 | Rs. Crores |
| Time required for development assuming current plan budgetary allocations to continue | 39 | Years |

Source: PriceWaterHouseCoopers analysis

- 7.31 Assuming a continuation of current level of budgetary allocations (in today's terms), it would take almost 39 years to develop this potential.