WATER RESOURCES OF ODISHA

ISSUES AND CHALLENGES

Bikash Kumar Pati
Regional Centre for Development Cooperation


RIVER AND DAM OF ORISSA

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Preface

It is said that prosperity and economic development of a region is intertwined with the nature and extent of water resource development. Rain God has not been too unkind to Odisha. With an average annual rainfall close to 1500 mm, the state has been quite well-off compared to many others, in terms of quantity that is quite huge-114 lakh hectare meters. Majestic rivers like Mahanadi, Brahmani, Baitarani and Subarnarekha; 480 kilometers long pristine of coastline; Chilika - the largest brackish water lake of Asia, all these have historically shaped Odisha's social and economic tradition. In addition, numerous water bodies dotting the landscape and a perceived ground water abundance has had made people and rulers laid back.

Given this, Odisha should have been featuring among prosperous regions. The irony is that... it is not. Despite being resource rich, Odisha is ranked amongst the poorest of the states in India. Water rather than being a boon for the state has turned out to be a bane. We have to blame ourselves for managing it very badly and earn its wrath. Odisha presents a study in contrasts – of water excess as well as scarcity. Even as one part of the state witnesses long and serpentine queues of women walking barefoot under the scorching summer sun to fetch a pitcherful of water, the other part sees thousands people marooned by marauding water surpluses for long periods. If it is a severe drought one year, it is devastating floods the next. There are myriad problems like drinking water scarcity, quality issue, lack of proper operation and maintenance of drinking water assets, depleting ground water table, huge deviation in the pattern of rainfall and above all with the changing climatic condition, the natural calamities like flood, drought, cyclone, sea and riverbank erosion. Industrialisation has only added to the woes by aggravating water problems substantially.

It is nothing but an abject anarchy brought in by absence of prudent, well thought-out water management policies and practices. It also throws open the limitations ignoring or overriding traditional management practices. This book attempts to capture some of the major problems that water sector of the state is facing today. Hope the effort will help in understanding the state of Odisha's water resources closely and envision a way for better management of precise water resources.

Bikash Kumar Pati

Acknowledgement

Allow me this opportunity to express my deep sense of gratitude towards the persons and institutions those have helped me a lot for elucidating water issues of Odisha in the form of this book. This has been one of the beautiful learning phases of my life. This book is a fruit of constant efforts by entire team members in water programme of RCDC for four years. While understanding the issues, numbers of organizations working in water sector along with the communities, have generously contributed their inputs and thoughts. I sincerely acknowledge the financial support by Simavi, the Netherlands; and Concern World Wide, India, without which it would have been difficult to bring out this publication. I gratefully acknowledge all the people and institutions helped us for better understanding of the sector. At last, but not least, I thank my colleague Mr. Manas Kumar Biswal and Mr. Bimal Prasad Pandia, who have contributed a lot for developing this book.

In developing the book, if I have missed out acknowledging the support of anybody or any institution and omitted references inadvertently, I request your apology.

Bikash Kumar Pati

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Chapter

1

Water Resources of Odisha

The Availability

Estimations give an impression that Odisha has plenty of water resources. But the rate at which the myth of water being an infinite resource is breaking, also pose genuine questions on the belief of Odisha being a water resource rich state. Warning bells already have started ringing. Despite efforts by the governments and huge investments, population not having access to adequate quantity of water is increasing in leaps and bounds with every passing year. So what the status in Odisha really is? Let's have a look at some stats and facts.

Precipitation

When we say about the water resources, the list starts with rainfall, which comes directly to us every year. Precipitations form the basis of our water availability. The state receives 231 BMC (Billion m^3) of rainfall annually. The average annual precipitation of Odisha is around 1500 mm. and 80 percent this occurs during June to September. Most of the rainfall in Odisha is due to southwest monsoon. The state experiences about 70 rainy days during monsoon. We can get the detail picture through the volume of rainfall of each district as per the figure mentioned below.

Table-1

District wise Precipitation

Sl	District	Volume (Mm)	Rainy Days
01	Angul	1253.3	71.9
02	Bolangir	1444	80.6
03	Balasore	1600	67.5
04	Bargarh	1398	65
05	Bhadrak	1568.4	75.6
06	Boudh	1302.5	72.6
07	Cuttack	1351	70.4
08	Deogarh	1573	79.3

09	Dhenkanal	1421.1	69.6
10	Gajapati	1295.6	54.8
11	Ganjam	1296	49.2
12	Jagatsinghapur	1489.9	69.1
13	Jajapur	1600	70.5
14	Jharsuguda	1456	73.7
15	Kalahandi	1657	87.6
16	Kandhamal/Phulbani	1592	76.5
17	Kendrapara	1435.1	55.6
18	Keonjhar	1800	54
19	Khordha	1500	66.6
20	Koraput	1430.5	90
21	Malkangiri	1594.6	82.4
22	Mayurbhanj	1648.2	84.7
23	Nabarangapur	1472	77.7
24	Nayagarh	1449.1	72.6
25	Nuapada	1245	59.5
26	Puri	1449.1	63.8
27	Rayagada	1640	67
28	Sambalpur	1599	73.1
29	Sonepur	1260	54.6
30	Sundargarh	1647.6	78.2
	Odisha	**1482.2**	**77.85**

Source: Odisha Prasanga, Said Umar

Table-2

State Precipitation since 1951			
Sl.	**Year**	**Actual (mm)**	**Normal (mm)**
01	1951	1350	1482.2
02	1955	1509.8	1482.2
03	1960	1395.4	1482.2
04	1965	997.1	1482.2
05	1970	1660.2	1482.2
06	1975	1325.6	1482.2

07	1980	1321.7	1482.2
08	1985	1606.8	1482.2
09	1990	1865.8	1482.2
10	1995	1607	1482.2
11	2000	956	1482.2
12	2001	1616.2	1482.2
13	2002	1007.8	1482.2
14	2003	1663.5	1482.2
15	2004	1273.6	1482.2
16	2005	1451.2	1482.2
17	2006	1682.7	1482.2
18	2007		1482.2
19	2008		1482.2
20	2009		1482.2
21	2010		1482.2

Source: Water Resources Department, GoO and Statistical Abstract of Odisha, GoO

The temporal distribution monthly average rainfall of the state is as given below:

Table-3

Monthly Average Rainfall		
Month	**Rainfall in mm.**	**Percentage**
January	14.0	1
February	25.9	2
March	21.4	1
April	35.3	2
May	70.8	5
June	213.2	14
July	351.6	24
August	335.6	23
September	236.5	16
October	131.6	9
November	39.9	3
December	6.4	0
Annual	**1482.2**	**100**

Source: Water Resources Department, Govt. of Odisha

It means rainfall in Odisha is highly uneven. As high as 77 percent of annual rainfall occurs in four monsoon months – June to September. And nearly half of annual precipitations fall in two months-July and August. Other months get acutely insignificant or no rainfall.

The major part of rainfall i.e. about 80 percent is received from southwest monsoon from June to September and balance 20 percent in rest eight months. It has been estimated that we get about 230.76 Billion Cubic Meter (One Billionm^3 equals one km^3) of rainfall in a normal year. A portion of this is lost by evaporation, transpiration and deep percolation. Some part is stored as ground water resource and balance flow down to sea as surface runoff, which is about 80 percent of the rainfall and this happens as adequate storage have not been developed. During monsoon, there are very wet days and also long dry spells. In some years, both the extreme events like flood and drought occur. However flood has became recurring phenomenon and almost occurs in every third year.

Ground Water

The people of Odisha depend on three sources – rivers, surface storage and ground water – for water. But over the years, the dependence on the first two has progressively dwindled. Most of rivers in Odisha, once perennial, have lost their features significantly. They flow for 6 to 10 months a year depending on the size and health of the catchments. Experienced people do unanimously inform that the rivers and their drainage lines are no more as dependable as they used to be. River flow statistics also substantiate such perception. The state of the surface water bodies is no better. Improper management of surface storages, the quality of water, the dwindling number of common as well as private ponds due to the pressure on land, degradation of wetlands and water bodies etc. have seriously eroded the dependability of surface storages, most of which do not even last till the summer months. Depletion and deterioration of the first two sources has inevitably led to over-dependence on ground water for drinking, domestic and irrigation. Even industries have started using ground water.

Technological advancements has helped in increasing preference for ground water as source for virtually every need, as they are less exposed to public, save time and cost and there is an absence of legislations and policies to regulate ground water. But the perception that Odisha has abundant ground water has led to promotion of ground water and as preferred source for all uses, including industry and agriculture.

Government organizations have estimated that Odisha has annually replenishable ground water of 2.10 Million Hectare Meter (mham) or 21 BCM. The overall annual ground water draft, as per estimations made in 2004, was 3.85 BCM. Thus, the stage of ground water was assessed at 14.8 percent. The development blueprint for the state is heavily dependent on ground water both for water supply to its citizens and irrigation to the drought-prone areas of Kalahandi-Bolangir-Koraput(KBK) region. This statistics may otherwise give an impression that, ground water development in the state being so low, the potentials of it is grossly untapped. But the grassroots facts do reveal a different picture, i.e., of dwindling water levels, ground water sources going dry and ground water quality getting affected. The English proverb 'Lies, Damned Lies and Statistics' may very well apply to Odisha's ground water scenario.

Table-4

Ground Water Resources of Odisha

Sl. No.	Districts	GWR Assessed (HM)	Annual GW Draft as on 31.03.2004				Stage of GW develop-ment (%)
			Irrigation use	Domestic use	Indus-trial use	Total	
01	Angul	86673	11881	2509	770	15160	17.49 %
02	Bolangir	71349	9049	2727	186	11962	16.77 %
03	Balasore	99888	43018	4146	240	47404	47.46 %
04	Bargarh	56073	5105	2777	147	8029	14.32 %
05	Bhadrak	51209	20294	2387	491	23172	45.25 %
06	Boudh	36977	5350	789	31	6170	16.69 %
07	Cuttack	105367	14635	4790	216	19641	18.64 %
08	Deogarh	21225	1859	535	31	2425	11.43 %
09	Dhenkanal	65195	8040	2207	147	10394	15.94 %
10	Gajapati	27754	4033	962	67	5062	18.24 %
11	Ganjam	113804	22548	5966	467	28981	25.47 %
12	Jagatsinghpur	139699	18378	1919	52	20349	14.57 %
13	Jajapur	58997	17267	3437	437	21141	35.83 %
14	Jharsuguda	17267	2733	915	228	3876	22.45 %
15	Kalahandi	89520	9530	2826	404	12760	14.25 %
16	Kandhamal	62396	5159	1373	105	6637	10.64 %
17	Kendrapara	32344	8852	1348	47	10247	31.68 %

18	Keonjhar	132291	13977	3360	240	17577	13.29 %
19	Khordha	90183	7728	4106	630	12464	13.82 %
20	Koraput	82136	2116	2052	1297	5465	6.65 %
21	Malkangiri	32880	914	909	156	1979	6.02 %
22	Mayurbhanj	152064	27553	4583	883	33019	21.71 %
23	Nabarangpur	48103	3145	2169	57	5371	11.17 %
24	Nayagarh	51429	6082	1803	95	7980	15.52 %
25	Nuapada	36729	4702	1102	33	5837	15.89 %
26	Puri	88348	5946	3133	208	9287	10.51 %
27	Rayagada	62882	4699	1541	1770	8010	12.74 %
28	Sambalpur	66332	4432	1941	484	6857	10.34 %
29	Sonepur	29940	2196	1127	40	3363	11.23 %
30	Sundargarh	92074	9680	3980	488	14148	15.37 %
	State Total	**2101128**	**300901**	**73419**	**10447**	**384767**	**18.31 %**

Source: Water Resources Scenario of Odisha – 2009, Govt. of Odisha

River Basin

The state has 11 major river basins. Almost all the Rivers are interstate Rivers. Major basins like Mahanadi, Brahmani, Subarnarekha originate in other states but a significant portion of their catchments lie in Odisha and they drain out to the Bay of Bengal. Similarly there are other basins like Indravati, Vansadhara, Nagabali and Kolab which originate in Odisha but then meet their major parent basins in other states or drain out in other states. Most of the catchments of Budhabalanga and Baitarani basin lie in Odisha.

Table-5

River Basin					
Sl. No.	**River**	**Catchments in Odisha (Sq.Km)**	**Catchment area (in % to Odisha total) (%)**	**Annual flow (M^3M)**	**Drainage area (esq.)**
01	Mahanadi	65,628	41	51,061	65,579
02	Brahmani	22,516	14	18,311	22,248
03	Rushikulya	8,963	6	1,762	7,753
04	Indrabati	7,400	5	2,800	7,512
05	Kolab	10,300	7	2,615	7,639
06	Vanshadhara	8,960	6	3,460	8,015
07	Baitarani	13,482	9	5,452	12,789
08	Budhabalanga & Jambhira	6,354	4	6,37	4,847
09	Subarnarekha	2,983	2	7,941	2,123
10	Nagabali	4,500	3	2,430	3,746
11	Bahuda	890	1	4,044	1,478
	Area directly draining to sea	3,731	2	-	-
TOTAL/ ODISHA		**1,50,460**	**100**	**99,876**	**143,729**

Source: Water Resources Department, Govt. of Odisha

Mahanadi is the largest basin within the state boundary as it is covering about 41 percent of total geographical area of the state, which is 65,628 sq.km. Next to Mahanadi is Brahmani basin, which covers 14 percent of the total geographical area with 22,516 sq.km catchments area. Bahuda has the lowest coverage with just 1 percent to total area which is 890 sq.km Other than River Mahanadi and River Brahmani, all the rest nine rivers basins cover less than 10 percent individual area of total geographical area and the figure varies from 1 percent to 9 percent. About 2 percent of the state, in the extreme coastal area, directly drains to the sea.

Inflow

River flow is a dynamic phenomenon. But still, their flows, when not subjected to obstructions, establish a definite pattern. The average annual run-off in the rivers of Odisha has been estimated at 1.2 Million Cubic Meter (MCum). Most of the rivers in Odisha being inter-state rivers, inflow and outflow of water become quite significant consideration

for planning and management of river sources. The Rivers that originate in other states and then enter into Odisha bring in run-offs from those states into Odisha. To have a real picture of the entire water resources of the state, we have to cast a sight on the amount of water that flows into Odisha from neighboring states. It has been estimated, as per estimations made in year 2001, that flow from other states contribute about 31.2 percent of the total river run-off in Odisha. Run-offs from others states into Odisha is expected to reduce quite significantly. Projections made for year 2051 reveal that runoffs into the state will drastically fall to a mere 23.3 percent of the total river runoffs.

Table-6

Average Annual River Run-off (In MCum):							
Sl No	River	Average Flow: 2001			Projected Flow: 2051		
		Own	Outside	Total	Own	Outside	Total
01	Mahanadi	29900	29255	59155	29900	21039	50939
02	Brahmani	11391	7186	18577	11391	3118	14509
03	Rushikulya	3949	00	3949	3949	00	3949
04	Indrabati	6265	00	6265	6265	00	6265
05	Kolab	11089	00	11089	11089	00	11089
06	Banshadhara	5083	00	5083	5083	00	5083
07	Baitarani	7568	00	7568	7568	00	7568
08	Budhabalanga	3111	00	3111	3111	00	3111
09	Subarnarekha	1193	1115	2308	1193	1115	2308
10	Nagabali	2853	00	2853	2853	00	2853
11	Bahuda	438	00	438	438	00	438
12	Total/ Odisha	82841	37556	120397	82841	25272	108113

Source: Water Resources Department, Govt. of Odisha

Surface Water Storages

Given the rainfall pattern, storage become seven more important. Till now, the tilt has been towards large and medium dam projects. Through such sources, by the end of March 2009, a storage potential of 1700 MCum. has been created, which is about 14 percent of total average surface water availability in Odisha. Dam and reservoir across the Mahanadi at Hirakud is the largest, in terms of water spread area, of all dams in India. It also is the largest water storage structure of the state and contributes to about 31 percent of total storage potentials. There are many other large dams across different rivers in various parts of Odisha. Most of the large reservoirs like Hirakud, Rengali, Balimela, Kolab and Indravati are multipurpose reservoirs. In addition to providing irrigation, they generate hydro power and some of them also are designed to manage floods.

Table-7

Major Reservoirs in Odisha:			
Sl. No.	**Reservoir**	**Storage Area (sq. km)**	**Utilizable Storage(Ham)**
01	Hirakud	743.00	483155
02	Rengali	414.00	341371
03	Balimela	194.40	267600
04	Upper Kolab	113.50	93500
05	Indravati	110.00	148550
06	Salandi	12.29	55650
07	Badanala	4.30	6714
08	Bankabahal	7.70	2578
09	Bhanjanagar	8.94	5766
10	Bhaskel	6.42	2778
11	Budhabudhiani	0.07	1616
12	Dadaraghati	7.59	2407
13	Daha	5.52	2195
14	Derajang	9.43	4648
15	Dhanei	8.40	1312
16	Domerbahal	7.56	1872
17	Ghodahada	1.50	3052
18	Gohira	10.94	6535
19	Harabhangi	12.15	8625
20	Hariharjora	18.45	5868
21	Jharbandh	4.60	1081
22	Kalo	5.34	2424
23	Kanjari	5.17	3452
24	Kanshbahal	5.06	2872
25	Khadakei	9.80	5622
26	Kuanria	4.86	1750
27	Nesa	1.70	658
28	Pilasalonki	5.25	1440
29	Pita mahal	3.55	2016
30	Ramiala	16.69	7584
31	Remala	1.98	1570

32	Saipala	5.37	1839
33	Salia	9.84	5275
34	Sarafgarh	1.52	1215
35	Satiguda	11.77	6768
36	Sorada	9.87	4975
37	Sundara	6.98	4440
38	Sunei	6.82	6911
39	Talsara	3.51	1665
40	Upper Jonk	14.70	3525
41	Jalaput	91.00	96993
42	Baghalati (I)	3.36	1388
43	Baghua (II)	8.69	3100
44	Haldia	0.72	670
45	Jambhira	29.28	1620

Source: Water Resources Scenario of Odisha – 2009, Govt. of Odisha

Wetlands

There are six important wetlands in Odisha. But owing to gross bad conditions, in reality two wetlands, i.e. Chilika and Anshupa figure in the map. Chilika is a Ramsar site and is considered as the largest brackish water lagoon. Rest four wetlands act as the buffer space during flood. However, those four wetlands have been subjected to aggressive anthropogenic encroachments and huge portions of such critical wetlands have been converted as agricultural land. Even the mighty Chilka and Anshupa have been encroached extensively.

Wetlands are quite critical for their contribution in supplementing human dietary requirements; supplying for domestic use; and to maintain an ecological balance in terms of flood control, water purification, aquatic productivity & micro climatic regulation, and as habitats of fish and other aquatic species.

Chilika Lake

The wetlands consist of two categories:

1. Inland wetlands
2. Coastal wetlands

Table-8

Major wetlands in Odisha			
Name	**Coordination**	**Size**	**Location (District)**
Chilka	19^0 28' to 19^0 54' N and 85^0 05' to 85^0 38' E	906-1165 km²	Puri, Ganjam and Khurda district
Anshupa	20^0 27' $N85^0$ 36' E	1.5 km²	Cuttack
Sara	19^0 52' $N85^0$ 53' E	8.1 km²	Puri
Samanga	19^0 49' $N85^0$ 48' E	3.5 km²	Puri
Kanjia	20^0 24' N 85^0 49' E	0.54 km²	Khurdha
Jatadhar	20^0 24' $N86^0$ 32' E	80 km²	Jagatsinghpur

Source: Water Resources Department, Govt. of Odisha

Table-9

District Wise Break-up of Wetlands					
Sl	**Name of the District**	**Area in Hect.**	**Sl**	**Name of the District**	**Area in Hect.**
1	Angul	25175.50	15	Kendrapara	30748.25
2	Balasore	16809.50	16	Keonjhar	3777.00
3	Bhadrak	8629.75	17	Khurda	3872.25
4	Bargarh	794.00	18	Koraput	17400.00
5	Baolangir	826.00	19	Malankangiri	16869.00
6	Boudh	63.00	20	Mayurbhanj	2671.25
7	Cuttack	2889.25	21	Nuapada	1626.00
8	Deogarh	1062.00	22	Nabarangpur	744.00
9	Dhenkanal	506.25	23	Nayagarh	594.25
10	Gajapati	694.25	24	Phulbani	428.75
11	Ganjam	12779.75	25	Puri	117523.75
12	Jagatsinghpur	10440.00	26	Rayagada	294.00
13	Jajpur	1407.50	27	Sambalpur	62794.00
14	Kalahndi	194.00	28	Sundergarh	6265.00

Source: Water Resources Department, Govt. of Odisha

The total area of wetlands in the state is 690904 ha. If we will look at the distribution of wetlands of each district, we can find that Puri district has highest area of wetland, i.e. 117523.75 hect, which is 34 percent of total wetlands of the state.

Table-10

Inland and Coastal Wetlands in Odisha				
Category	**Inland Wetlands**		**Coastal Wetlands**	
	Numbers	**Area in ha.**	**Numbers**	**Area in ha.**
Natural	3111	238867	560	143978
Man-made	7871	220207	724	21678
Total	10982	459074	1284	165656

Source: Ministry of Environment & Forests, GoI

Table-11

Coast Lines		
Sl	**Name of the district**	**Area (in Kilometer)**
01	Balasore	80
02	Bhadrak	50
03	Jagatsinghpur	67
04	Kendrapada	68
05	Puri	155
06	Ganjam	60
	Odisha/Total	**480 km**

Degrading Health of Wetlands

Water Availability and Requirement

The state of water sources and resources will be incomplete without making any reference to the present and future water availability and requirement equations. The State Water Plan, prepared by the Odisha government has tried to make a present assessment and future projection. The plan assumes that by the year 2051 some kind of stability established with regard to population and use pattern.

Table-12

Estimation of Water demand				
Demand	**Surface Water**		**Ground Water**	
	2001	**2051** (Estimated)	**2001**	**2051** (Estimated)
Domestic	789	1202	1198	1803
Agriculture	18000	40000	4688	9408
Industry	606	1750	100	200
Environment	21000	21000	8400	8400
Others	100	200	100	200
Total	40504	64152	14486	20011
Water available	70000	70000	21000	21000

Source: Water Resources Department, Govt. of Odisha

Note:

Water demand under various disciplines is approximate and environment demand has been taken as 30 percent for surface water and 40 percent of ground water.

The projections are quite frightening as it shows that requirement will be as high as 92 and 95 percent of average surface and ground water availability. Many experts are even more apprehensive as the above projection assumes that water availability from both the surface as well as ground water sources will be same. Their argument is that water availability is bound to decrease in the time to come as has been seen in cases of inflow from other states to Odisha and reduced ground water percolation and recharge.

Clearly, Odisha is neither abundant or certain about its water resources. This does not augur well for the future. Thus we all have the added requirement to be considerate of all these.

* * *

Chapter

2

Drinking Water

Still a Mirage for Common

The contest is glaring – whether or not people have access to drinking water in Odisha. As an indicator of development, it is difficult to adumbrate the actual drinking water scenario in the State of Odisha. While the media paints the scenario black; highlighting water scarcity in almost all communities' development blocks of the State and insufficient access to portable water, the State Government claims to arranged drinking water provisioning for all. While the government takes recourse to the statistics, others display bare facts. These two different pictures of drinking water scenario in the state are so widely different that one fails to draw a conclusion about the real drinking water scenario in the State of Odisha.

While many of the villages are yet to be provided with safe drinking water, those villages having sources of water also have their share of problems. There are also a whole gamut of issues associated with drinking water like the issue of right and entitlement, quality of water, operation and maintenance of sources, both financial and technical sustainability of water supply systems, sustainability of water resources feeding drinking water sources and a range of social issues around it. Over the last few decades, the focus of the state has been on creating drinking water sources. In other words, on quantitative increase. But now it is the time to also concentrate on the other issues plaguing provision and sustainability of safe drinking water to all.

An ill defined right

Right to drinking water has been interpreted by the Supreme Court of India and different High Courts as a fundamental right under right to life. But, how much water and of what quality (that is definition of drinking water) has not been specified in any legal documents. The Rajeev Gandhi Drinking Water Mission assumes that a rural person requires a minimum of 40 litresper day. But this primarily is a guiding principle only.

The 40 liters per capita per day (lpcd) standard includes the requirement of drinking (3 lpcd), cooking (5 lpcd), bathing (15 lpcd), washing utensils and house (7 lpcd) andabdulation (10 lpcd). Quality-wise too there is an absence of a valid entitlement. The Accelerated Rural

Water Supply Programme (ARWSP), however, categorizes water as safe *"if it is free from bacteriological contamination (cholera, typhoid, etc.) and chemical contamination (excess arsenic, fluoride, salinity, iron, nitrates, etc.)".* But it does not force the government to adhere to a minimum quality benchmark. The Prevention of Food Adulteration Act has no standards prescribed for drinking water as drinking water does not come under food category. While clarity on a very important issue like drinking water is plagued by a gross absence of well laid definition, there are also other enactments which cause bottlenecks in asserting the right to drinking water. Forest Conservation Act debars any development activities within the reserve forest areas. Growing slums in urban areas, when considered illegal, are denied drinking water facilities. As people in the grassroots grapple with these problems, the issues need to be fought at a higher level to bring in required administrative attention, policy and implementation changes. It may even require judicial interventions, considering the tardiness in the governance system.

Water is LIFE

The number game

One aspect of the problem is the age-old government tendency to cite statistics to exonerate itself without bothering to go into the ground realities. But then statistics, as they say, hide more than what they reveal. A case in point is the provision of drinking water through erection of tube wells. As high as 78.6 percent of habitations depend on tube wells for their drinking water needs. As per government figures, (till October 2010) there are a total of 2,80,193 tube wells in the state, besides 9,838 sanitary wells. There are also 6,204 Rural Pipe Water Supply Schemes. The government statistics do reveal that even if we do not take into consideration the piped water supply and the water supply to the urban areas, still it works out to one tube well for every 131 persons. This ratio is lower than the revised 1:150 ratio fixed as per new norms laid down by the government of India. So, the statistics want us to believe that things are in really good shape in Odisha, as far as sources are concerned. But, not many agree with such statistics. The simple argument they pose, why the water crisis all over the state then? So many habitations in Odisha do not meet those norm of 40 lpcd. Even a government survey, made in year 2009, had disclosed that 44.7 percent of the rural habitations were fully covered while 52.6 percent habitations were only partially covered and 2.7 percent habitations still stay uncovered. This means that more than half of the habitations did not even have the access to 40 lpcd water. The government now wants to raise the standard further. It is now in the process of enhancing minimum supply at the rate of 70 lpcd. While this definitely is an welcome step, the first thing it will do is that many habitations presently consideredas 'Fully covered' will fall back to 'Partially covered' or 'Not covered' category.

Quality concern

If number of tube wells and drinking water sources become the yardstick, Odisha is surely quite comfortable. But then numbers do not reflect the exact truth. Despite having adequate number of drinking water sources and water availability as per the norm, i.e. 40 lpcd, one cannot say that all the sources are yielding drinkable water. It is the quality of water that differentiates drinking water from any other water. In this sense, there are many habitations in Odisha having severe quality problem, both chemical and biological contaminations. Sources contaminated with iron, salinity, fluoride and chloride are growing in alarming leaps. Biological contamination has always remained a problem because a belief is given that tubewells water is less biologically contaminated, which is not exactly true or at best partially true. Due to geo-hydrology, growing population, depletion of ground water and rapid industrialization etc. the drinking water quality is deteriorating day by day and this has become a major threat for drinking water provisioning. Government agencies have assessed that 12.45 percent of rural habitations in Odisha have acute quality problems, primarily chemical contamination related problems.

Table: 13

Quality Affected Habitations Contamination Wise (as on 01.04.2010)					
Total rural habitations habitations	Quality affected	Nature of chemical contamination			
		Fluoride	Iron	Salinity	Nitrate
141928	17668	639	15408	1593	28

Source: Department of Drinking Water and Sanitation, Government of India

However, experts working in the sector vigorously contest this figure as till date the water quality of only one-fourth of the total sources have been done. Three-fourth of the so called drinking water sources are yet to be tested for contamination or water quality. The argument is that when 25 percent tube wells have been tested, the extend of quality affected habitations are bound to grow. The other dimension of the problem is that the users are not sure or nor aware about whether those sources are fit for drinking or not. Unless the quality of drinking water is ensured, provisioning of only water is of no use. Quality of water is undoubtedly an integral part of the right to water. But the efforts of the state government in ensuring quality leave a lot to be desired.

SEM sealing a fluoride contaminated tubewell

Operation and maintenance

A major reason for the drinking water crisis in rural areas is lack of maintenance of tube wells. There are many habitations, where we can find adequate drinking water sources having no quality problem. But most of the sources are defunct due to lack of proper operation and maintenance. In the present context, the sole responsibility of operation and maintenance of drinking water sources are with community (in case of sector reform projects) and with the Panchayati Raj Institutions in other cases. In many cases people, even the Panchayat institutions, are starkly unaware to carryout operation and maintenance of the sources. This is another challenge in provisioning of drinking water. To overcome this problem; the state government initiated an elaborate plan to appoint Self Employed Mechanics (SEMs) in every village. While the SEMs have improved the efficiency of fixing machinery related problems, plenty other bottlenecks plague their full utilization. Thus we see many instances of sources not repaired expeditiously. The repair work gets delayed for a variety of reasons like non-availability of spares, non-payment of their dues and non-cooperation of the people and Gram Panchayats. The pipe water supply projects carry a set of different problems, which is much more complex than management of tube wells. The pipe water supply projects require three types of technical expertise for maintenance and repair i.e. mechanical expertise for pump set, electrical expertise for motor and electricity and the civil expertise for pipe line and stand post. It is hard to find the combination of these three expertise in a row in the rural area. Again, as the pipe water supply requires recurring expenditure like electricity bill etc, after few months of operation, the system automatically closes due to non-payment of electricity bill. Due to lack of proper institution building and structural approach ignoring social dimensions, the system fails to deliver desired output. In absence of community developing ownership over the sources the state machineries and Panchayats seem overburdened and financially constrained.

Summer draw-down

Depletion of ground water has emerged as the major area of concern as there is no much effort to recharge the ground water. Information gathering by the state on the state of affairs of drinking water provisioning is poor. The drinking water sector in Odisha depends on ground water for more than 80 percent of its supplies. But in the recent years, ground water table is in decline due to poor level of recharge. Central Ground Water Board has warned the state regarding decline of more than 2 metres in ground water table (over 10 years time) in 24 districts of the state. Despite this, ground water recharging is yet to be mainstreamed in the state. Another aspect affecting it further is that many sources do not meet the prescribed depth norm of the government while installing a tube well, as most of the tube wells are of 70-80 ft depth only. This is creating a condition of seasonal defunct, despite each part of the tube wells remaining intact.

Tubewell mechanic at work

The technology option

People dig *chuan*s on riverbeds and wells in agricultural fields to tide over the problem of water crisis. This implies that there is subsurface water that can be harvested even if ground water is too deep to be extracted through bore wells. In hilly terrains, dug wells have been found to be much more effective than bore wells. But the department of Rural Water Supply and Sanitation is moving through 'one dimensional approach' and are obsessed with bore wells - presumably because they are easy to dig. There is a strong case for adopting an area-specific technology rather than resorting to a 'one size fits all' approach and an integration of various sources that supplement each other. After running behind tube wells for several years, the pipe water supply system has been introduced and in these years, the major focus is on this. Here too the dependence is very high on ground water sources. Given the manner it is being implemented, the pipe water supply schemes are going to put further burdens on people. Even when pipe water supply is installed, nobody bothers about the overhead tank, which leads to huge water loss through frequent breakage in pipeline for pressure from pump and water scarcity during non-availability/ failure of electricity. Again the functional tube wells are also getting defunct due to lack of use, where pipe water supply has been installed.

Shifted responsibility

After the Sector Reforms in the drinking water sector, the onus of providing drinking water has dramatically shifted. Earlier it was supply driven and now it is demand driven. So the communities have to demand and pay for their part of the contribution. This clearly defies the basic principles of right to water as the market and paying capacity will now determine access. The market or the ability of a person to pay is to take care of the right to drinking water. Again recently the operation and maintenance of drinking water sources and also their ownership (only in case of the government owned infrastructures) has been vested with the Gram Panchayats. While it enables further decentralization, the Panchayats find it hard to manage resources to shoulder that burden. Under the sector reform programmes the onus of operation and maintenance of drinking water infrastructures has to be with the user committees, which is a parallel organization not under the GP. Hence the right to drinking water has to be looked at more critically in the changed context.

Availability of water in the desired quantity and quality, at the right time and right place, has been the key to the survival of all living forms. The government has to take its duty of providing drinking water to its citizens more seriously. Rather than juggling with statistics, providing drinking water to the people should be the measuring criteria. The quality aspect should come to the forefront because it is the quality of water that differentiates drinking water from any other water. It is high time the department adopted a holistic rather than a fire-fighting approach to address the problem of drinking water. Presently, it seems as if tube wells and of late the pipe water supplies are the only solution to the drinking water crisis. The technology option needs to be flexible, creative and location-specific. The tendency to go for a single, uniform solution to all types of problems must be curbed. And last but not the least, conservation of water and water harvesting has to be an integral part of water provisioning.

* * *

Chapter

3

Ground Water

Infinite Consumption of Finite Resource

In a country like India which receives most of its rainfall during the monsoon and where most of the precipitation takes place in a span of about 100 odd days, sub-surface water and ground water resources hold quite significance to sustain us for the rest of the year. All these years, the emphases have been primarily on harnessing surface water. Ground water resources have got differential treatment. It has led to an absence of adequate initiatives to sustainably use and augment ground water resources. As we discuss elsewhere in this book, surface water sources are not a trust-worthy source as its availability varies wildly from season to season and from year to year. Thus when it comes to meeting requirements, the tendency has been to look elsewhere - the precious ground water resources.

Climate's hit

As high as 80 percent of average 1,482 mm rainfall that Odisha receives occurs during the monsoon period in the months of June to September. The state experiences about 70 rainfall days during monsoon. Various studies have revealed that the rainfall pattern is changing quite drastically, more so in last decade and half. Out of 1,482 mm rainfall, about 500 mm to 700 mm rainfall taking place within a span of 3-4 days, which is causing severe flood and drought in subsequent days. Due to deviation in the pattern of rainfall, and prolonged dry periods in non-monsoon months, flow in Odisha's rivers have reduced drastically. Most of the rivers are lying dry for about two-third of the year. This has been forcing all to depend upon ground water to meet all sorts of water requirements. While the dependency on ground water has increased significantly, efforts to augment it has been the opposite. Changes in rainfall pattern and drastic changes in land use pattern is increasingly affecting percolation of rainwater. Even when we get enormous amount of rainfall that hardly makes any contribution as that flow away as high velocity runoffs.

Demand vs. Supply

Around 80 percent of rural population in Odisha depends upon ground water for drinking and domestic uses. At the same time, due to change in the pattern of rainfall, people have

started shifting from rain-fed agriculture to irrigated hi-yielding agriculture. This is again increasing significant pressure on ground water as the government and people choose ground water as convenient and dependable source. Shockingly, these aquifers are being sucked dry not to provide water for drinking and domestic use, but to meet the demand of agriculture, industries and other services. As if all this was not enough, large industries have now joined the race to dry up the ground water aquifers. Massive industrialization in Odisha is another additional threat to ground water, as even heavy water consuming industries like steel plants are also extracting enormous quantity of ground water to run their industrial operations. The most recent ground water assessment made by the Central Ground Water Board (CGWB) shows that ground water levels is depleting rapidly in 24 out of the 30 districts in Odisha. The ground water aquifers in many regions of our state are already quite stressed and on the verge of drying up.

But State Government statistics give a different picture. They say that only a fraction of utilizable ground water is being used. A 2004 assessment had estimated that the overall

Ground water depletion is a major concern for Odisha

ground water 'development' is a little more than 18 percent. That means, Odisha was utilizing 18 percent of its replenish-able ground water resources. Though the newest assessment report brought out by the Directorate of Ground Water Survey and Investigation (DGWSI) puts state's average ground water development rate at 26 percent - which is significantly higher than the previous assessment made in 2004, that assessment is still doubted. The grassroots experiences and perception is the opposite where people clearly establish that ground water level is decreasing rapidly. There are other doubts about ground water resource estimations also. The methodologies of assessing water drafts, i.e., water extracted and estimations of ground water have been questioned by many experts. The doubts over accuracies of the assessments get more glaring by the assessment released by the DGWSI in June 2010. The newest assessment reveals that ground water resource has dropped by a whopping 21 percent in just six years. The 2004 estimation had assessed Odisha's ground water resource at 21 Billion Cubic Meter (BCM). The 2010 estimation assessed it at 16.69 BCM. This revelation directly contradicts the claims of under-utilization of ground water potentials.

Who bothers?

Everybody believes that there is plenty of water inside the ground. But they forget that it has taken nature lakhs of years to build up its ground water reserves. Rainwater first goes into the soil and then moves under the ground. It is not static, but dynamic - an ongoing process. If this process is disrupted for some reason - whether by way of a reduction in the amount of water going into the soil, disruption in the underground movement of water or over-extraction – there will be depletion of the resource. It takes thousands of years to create an inch of the top soil that helps the seepage of water into the ground and preserve ground water. But this soil can be destroyed easily, affecting the process of seepage, underground movement and storage of water. Even if the water is artificially sent into the ground, it takes its own time to reach the ground water aquifer. It's a natural process and takes its time. The process cannot be expedited artificially. Water flows at a speed of not more than 5-10 cm a day. Hence, serious problems would be faced if there is disruption in the water cycle. Current situation gives serious indications that the water cycle is disturbed and damaged. It will reduce not only the availability of water, but also its quality. Poor quality water is as good as no water or even worse. Though artificial recharge has its own limitations in addressing immediate ground water situation, still that is the most important avenue available before us to mitigate serious damage to ground water cycle. Everybody is saying that rain water harvesting is the need of the hour. But definite steps are awfully lacking. The irony is that, it is not yet being taken seriously. Water harvesting and water recharge is a big problem

everywhere, especially in urban areas. But mandatory enforcement of rainwater harvesting is hardly enforced. When the case is so bad in urban areas rural areas feature nowhere as far as ground water recharging is concerned. People who are dependent on ground water do not put a value to it. They are not aware of the dynamics of ground water or the approach has been such that they do not care to be aware.

Prompt policy

Water being a state chapter, Government of Odisha is expected to take tangible steps to enhance ground water. But, that is precisely lacking. Leave aside efforts to enhance ground water potential at state government level; lack of coordination among various wings of state government is causing more depletion in the water table. In one hand, looking at the serious water crisis throughout the state, the Rural Development Department is talking of conservative approach for use of ground water. But at the same time, Irrigation Department is providing subsidy for bore well and pump-set to extract ground water for irrigation. In another hand, while allocating water to industries, government is less bothered about the suffering of the commons. The Odisha Water Policy 2007 clearly says that water for drinking and domestic should be treated as first priority. But who will ensure this, when there is no coordination among the various departments within the government and each department is operating with a tunnel vision.

Unfortunately, as discussed earlier, ground water assessments have hardly anything to generate any trust in them. The data available on the available ground water, how much of is utilizable, how much is being actually used is, at best, a guesswork.

The effort

Efforts have been made by Government of Odisha to bring Water Resources Department and Rural Water Supply and Sanitation (RWS&S) Department together as earlier is dealing with surface water and later is dealing with drinking water provisioning. Despite knowing that the association of these two departments can save ground water a lot as well as can provide both qualitative and quantitative drinking water to all, both departments are blaming each other ignoring the right of the commons. Half-hearted attempts have been made so far by the state government to come out with an enactment to regulate use and extraction of ground water. The first one formulated in the year 2000 was put in the deep freezer for five years, after which the Water Resources Department came out with a memorandum in 2005. One wonders when a proper legislation will be in place to regulate the wanton extraction of ground water! In any case, the opinion has been sharply divided on the need for ground

water legislation. A section of it demands that the extraction of ground water should be restricted. At the same time, there is also another school of thought that believes that any enactment in this regard will create a license and permit raj that will give a handle to the bureaucracy to harass the common man. While the rich can get around such legislation, the poor will bear the brunt of harassment, it apprehends. This apprehension is not ill founded and needs to be addressed while formulating legislation on ground water.

Legislation, though, is not an end in itself. What is more important is that the state should demonstrate the sense of urgency that the situation warrants. But there is no sign of it as yet. In the absence of a strong desire to regulate the use of water, even the best of legislation cannot address the problem or lead to sustainable use of ground water. Summer after summer the precious resource will decrease and tragedy of commons will increase. If the pond dries up, one goes to the river. If the river dries up, one digs a pothole on the river bed. If the pothole in the river bed fails to yield water, one digs deep into the womb of Mother Earth to get the succor of life. And if the womb of Mother Earth also dries up, where does one go? That is the end of the sequel. Ground water is the last hope for a water starved population. It is like a bank account, where only debits take place. We do not deposit anything but continue with our withdrawals. Of course, there is a limit where our withdrawal request will be refused. Hope that time does not come, at least not in Odisha.

* * *

Chapter

4

Climate Change

Nothing is Predictable here

Mid-summer rain and flood in 23 districts of Odisha in 1995, death of 2,042 people due to heat-wave in Odisha during 1998 summer, two devastating cyclones (including the Super Cyclone) in Odisha during 1999, flood in 2001, massive flood in 23 districts of Odisha in 2003, 14 depressions along with flood in 27 districts of Odisha in 2006, largest ever flood in Balasore and flood in 19 districts of Odisha (Mahanadi basin) in 2008 along with occurrence of drought and cyclone at frequent intervals. One trend they clearly reveal is about the growing climatic uncertainties and extremities across Odisha. There are also many more to list out, which can open our eyes to realize the climate change in Odisha. Summer temperature is regularly crossing 50^0 Celsius mark in a few places of the state. Odisha coast has come under severe erosion threats as sea water growingly engulfs landareas in Kendrapara and Puri districts. Making predictions have become a tough job for the weathermen and they have almost lost people's trust in them as their predictions are going haywire. Monsoon itself has become severely unpredictable'. However, one thing that is certain about the changing nature of the monsoon is that rainfall days are decreasing but intensity of few rainy days are on increase. Many areas are experiencing flash flood for the first time. Public perceptions clearly spell out that they aren't any more experiencing six seasons. Deviations in plenty! Many studies and findings have already established that Odisha has started facing huge impact of climate change and this aspect of Odisha has also placed it prominently in the global disaster canvas.

All these climatic irregularities, deviations and extremities have affected Odisha's water scenario.

Rainfall - The most unpredictable one

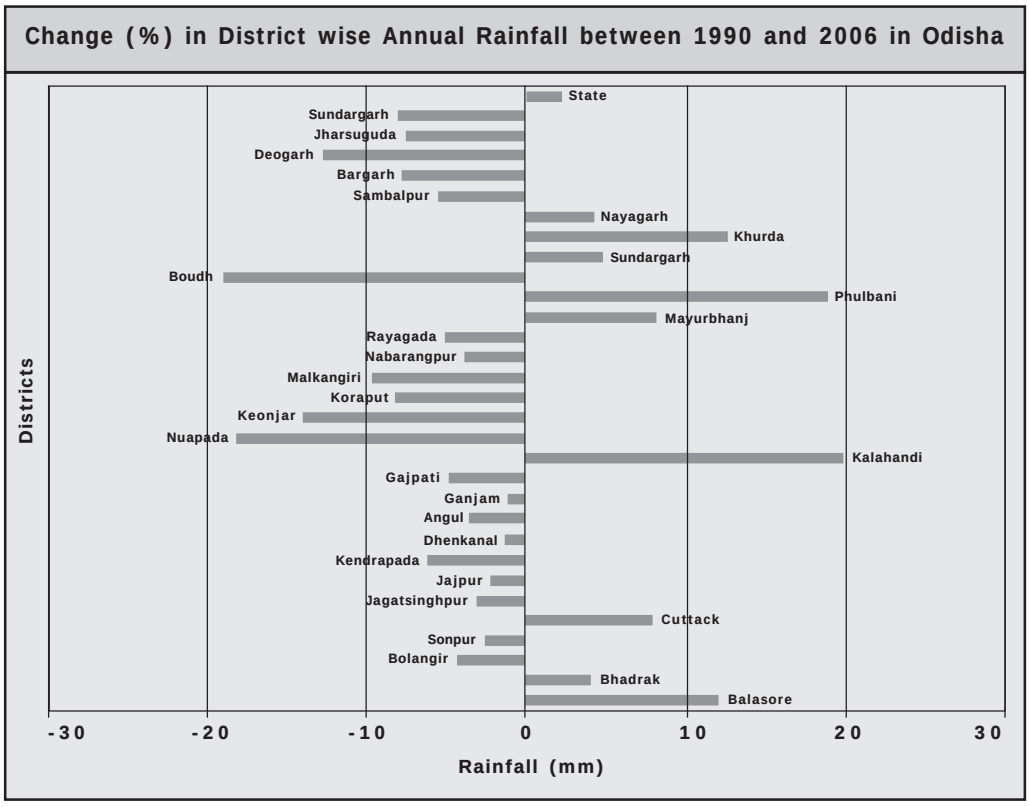
If we look at the pattern of rainfall of Odisha, we can easily feel the footsteps of climate change. When costal districts of the state like Balasore, Puri and Ganjam are experiencing more rainfall than their normal, the hinterland of Odisha like Bolangir and Nuapada districts are experiencing less. Simply told, rainfall is increasing in areas where more rainfall is a curse, and decreasing in areas which were already drought infested and are on the threshold of becoming arid regions. This is putting further pressures on the water supply scenario of the state which gets more than 80 percent of its annual rainfall within a span of 100 days. Spread of monsoon

rainfall is causing acute climatic disasters. Out of 1,482 mm of average annual rainfall, about 500 mm to 700 mm rainfall taking place within a span of 3-4 days. Dry spells are increasing and thereby causing droughts and severe water insecurities at other times of the year. Thus, the state is now witnessing increasing instances of severe floods and severe droughts occurring in same season. While the spread of the monsoon has become more unstable and extreme, days with rainfall are on constant decline. Studies have revealed that rain days are reducing by a day in every 5 years in the state. Due to deviation in the pattern of rainfall, the flow of river in Odisha has been reduced drastically and around 8 months in a year, rivers are lying dry.

Calamities - Unpredictable but regular

Calamities like drought and flood have become a common phenomenon in our state. They have a direct link with the volume and spread of precipitation as former one is the indicator of scarce water and the later one is the indicator of surplus water. Experts who have studied Odisha's climate have come out with startling revelations. They say that between 1955 to 2008, Odisha has experienced 28 years of flood, 19 years of drought and 7 years of cyclone along with the Super Cyclone in 1999. Due to massive change in climate, within last 18 years

Rainfed agriculture is at stake due to climate change



(Between 1990 to 2008), Odisha has experienced 12 years of flood, 5 years of drought, one Super Cyclone and many depressions and cyclones. Years with both flood and drought are becoming more pronounced. Not only in scale, disasters are spreading to newer territories too. When flood was common in coastal plain, drought was in upper terrain. But with the changing climate, both drought and flood are becoming common in almost all parts of the state. 10 districts of Odisha had experienced flood up to 1991 and after 1994 more and more districts figured in the list. The height is that, in the year 2006, 27 districts out of 30 in Odisha experienced the flood.

High erosion - Less productivity and more floods

Increased intensity of rainfall and thinning plant foliage makes a deadly cocktail – of severe soil erosion in the upper catchments of the river basins and chocking of drainage channels in the river mouths. It is starkly in evidence in Odisha. The eroded soils drain out through the steams to river and river to sea.The natural drainage lines including streams are getting vanished and rivers, thus, become flat of high sediment depositions. As rivers are getting flatter, the water retention capacity of rivers are decreasing causing flood in catchments. Out of total 231 BCM

(Billion m^3) of water that Odisha gets from rainfall in an average year, 161.7 BCM water gets discharged through various streams and rivers. They in turn carry with them about 3,65,00,000 ton of eroded soil every year. Study by experts has found out that in just 13 years, from 1991-92 to 2004-05, severely degraded land in the state has increased by 136 percent. This is about 7 percent of Odisha's total geographical area. Land becoming barren has increased by 69 percent over that period. The government too has estimated thatabout 29 lakh hectares of cultivable land, nearly 45 percent of total cultivable land in Odisha, are facing high degree of soil erosion. All these have a direct impact on agriculture, which sustains close to 90 percent of rural population. By 2004-05, as high as 17.5 percent of Odisha has turned barren or unsuitable for agriculture. Emphasis on industrialization has started aggravating land and water degradation in the state due destruction natural resources in the process of mining and setting up industries and then releasing toxic and pollutant effluents to the atmosphere and water streams.

Rising Mercury - Sun is a Killer

While the global mean temperature rose by 0.5 degree Celsius in the last 50 years that of Odisha rose by 1 degree Celsius. Weather is becoming extreme like never before. In ten years average of highest recorded temperatures has increased by 4.4 to 6.6 degree Celsius and the average of lowest recorded temperatures has further decreased by 3 to 5.1 degree Celsius in various parts of Odisha. During 1998 death of 2,042 persons due to sunstroke for the first time taught Odisha that rising mercury and sunstroke has emerged as a major killer in the state. Despite several precautions and expenses of crores of rupees in creating awareness among masses to beat the heat, death due to sunstroke is regular every year and as many as 2,712 persons are dead in between 1998 to 2008. In 1999, as many as 91 people had died followed by 29 deaths in 2000, 25 in 2001, 41 in 2002, 68 in 2003, 45 in 2004, 236 in 2005, 21 in 2006, 47 in 2007 and 67 in 2008. It has been an recurring phenomenon and who knows where the death toll will reach. Rising temperature has a close relationship with water and forest resources of the locality. Declining water resources in the summer months and thinning forest cover, which otherwise help in moderating temperature and providing adaptation, is a cause of serious worry.

Sea erosion - history may repeat

Odisha has 476.6 km coast line covering Balasore, Bhadrak, Kendrapada, Jagatsinghpur, Puri and Ganjam districts. In general notion, prosperity of any district or state generally determined by connectivity in terms of water ways. In this sense, above stated six districts of Odisha are in get advantages. But the sea is becoming a curse for residents of large parts of the coastline. The Satabhaya cluster of hamlets in Odisha's Kendrapara district has been termed by environmentalist and subject experts as "climate's first orphan". Rajnagar block of Kendrapada district is now under high threat due to sea erosion. Starting from Gahirmatha to Barunei

confluence point-25 km of coastline is getting severely eroded. Every year, sea is grasping around 50 meters of land mass of Satabhaya region. According to revenue department, during 1930 settlement, Satabhaya region was of 320 square km. But in 2000, the region had a land mass of mere 155 sq.km. Severe coastal erosion in popular tourist places like Puri and Gopalpur have begun since a decade or so. Sea erosion coupled with saline ingression is putting water security into jeopardy. Odisha's coastal areas require a relook. As per a report published in journal 'Global Environmental Negotiation', if sea level rises by 1 meter from the current level, 1,70,000 hector of cultivable land in Odisha will be submerged.

Ground water – The last hope

Due to deviation in the pattern of rainfall, river flow pattern is undergoing drastic changes in Odisha. This has forced users and planners to look at ground water as the most dependable and secure source of water to meetvarious water requirements. While dependence on ground water has increased its recharge has reduced – primarily owing to high velocity run-off and uneven spread of rainfall. Due to lesser percolation, the sub-surface storages are getting emptier leading to thinner flows in the rivers and streams causing further capacity decrease in ground water recharge. The Central Ground Water Board (CGWB) has clearly indicated that the ground water of 24 out of 30 districts in Odisha is depleting. The ground water aquifers in many regions of our state have already gone dry. Ground water is the last hope for a water starved population. It is like a bank account, from which we are withdrawing without any deposit and our withdrawal is not judicious.

Climate change is probably the biggest threat ever the world is facing today. Odisha is in the forefront of victims and many more impacts are yet to be faced. Everybody is responsible for this and everybody has quite a lot of responsibility to combat the climate change. Joining hands to fight against the will of nature is the need of the hour. It is not easy when things are not quite predictable, but we do not have any escape route but to fight hard to mitigate growing climatic unpredictability.

* * *

Chapter

5

Flood and Drought

The Twin Problem

When taken as a whole it does gives an impression that Odisha has plenty of water resources. But rather than being a boon for the state, water has turned out to be a bane for it in the absence of proper management of it. While drought stalks the upper reaches of the rivers, the flood plain i.e. the coastal region, has to face the fury of flood almost every year.

If we will analyze the occurrences of calamities in our state from 1955 to 2008, we will find that Odisha has experienced 28 years of flood, 19 years of drought and 7 years of cyclone including the Super Cyclone of 1999. Due to massive changes in climate within last 18 years (Between 1990 to 2008), Odisha has experienced 12 years of flood and 5 years of drought. At times, flood and drought are simultaneously experienced in a single year due to remarkable change in the pattern of rainfall. When flood is common in coastal plains, drought is so in upper terrains. But with the changing nature of climate, both drought and flood are common in almost all parts of the state. 10 districts of Odisha have experienced flood up to 1991 and after 1994, more and more districts figured in the list. The height is that, in the year 2006, 27 districts out of 30 in Odisha experienced flood.

Checks and balances

Flood and drought have been the major impediments for the development of the state. But the government's approach to flood and drought has not been very foresighted. They at best have tried to be stop-gap and temporary arrangements to a problem. The state government has always seen these problems as separate ones rather than as two sides of the same coin. In the post independence era, the state has continued with the colonial legacy of subjugating the rivers for flood control. Embankments in the flood-prone areas and creation of water storage reservoirs have been the interventions for flood control. This approach aggravated the problem, more than addressing them. Through embankments only certain flood excluded zones have been created. But, this has accentuated flood in the areas where there is no protection of the embankments. By restricting the flood-waters within the confines

of the riverbed or the embankments, silt deposition in the river beds accelerated. To make the things worse, the intensity of flood is rising in leaps and bounds with every passing year. While the major embankments of the state were constructed to accommodate 9-11 lakh cusecs of flood, the present peak flow is to the tune of 17 lakh cusecs. And the experts predict that it may cross 20 lakh cusecs in the next decade.

Nurturing disaster in the name of development

Other than embankments, various other structures like concrete buildings etc have also aggravated the problem. Due to rapid industrialization and urbanization, open land mass has been reduced substantially, which was holding the flood water a lot. On the other hand, 'wetlands' and 'wastelands' which are regarded as the health of a state, have been encroached over a period of time due to rapid growth in population. In any condition, the wetlands and wastelands hold highest amount of flood water, which is not happening these days. Current developmental approach of Government, particularly in terms of rural connectivity, has also contributed a lot to increase in flood. Particularly the roads constructed in rural areas through

Water logging and flash floods are common in the state

Canals lying dry in drought hit patches

'Pradhan Mantri Grama Sadaka Yojana' (PMGSY) have grossly neglected the natural drainage line, for which the flood water hardly finds way to get discharged and intensity of flood increases. Even the state and national highways are also being constructed in same manner. The lesson has been learnt from the flood in Balasore district in 2008 which was aggravated due to National Highway - 60.

Climate stakes

As discussed elsewhere in the book while flood moderation capacities of our systems and institutions leaves a lot chinks, the projections are fearsome. Climate change has its own stake in aggravating flood. According to the report 'Climate Change Impacts in Drought and Flood Affected Areas: Case Studies in India' released by World Bank on 1st June 2008, has projected that all river systems will have dramatic changes and design flood flow may increase quite substantially both in intensity and occurrence. This suggests a clear need for improved and accurate forecasting tools to guide the appropriate location, design for flood protection infrastructures and other high-value assets. The infrastructure created so far in terms of flood control, whether big or small, proven to be of no use in the changed context.

While the state tries to find different fixes for the problems of drought and flood, the intervention that can fundamentally address both these problems is rainwater conservation in the upper catchments. If rainwater can be conserved in the upper reaches and it gets into the subsurface then the overall soil-water regime can be improved and it will help the local agriculture in a big way. On the other hand, with proper rainwater harvesting, the rivers which have been reduced to storm water drains in the rainy season and are dry for the rest of the year, can flow for longer periods. All the flood water would not find its way within 3-4 days of rainfall to the main river which cause devastating flood in the state.

Flood and drought management should come out of the ambit of a "post disaster relief approach" and should be dealt with in a more sustainable manner. If the state can not prevent floods and droughts to happen, at least it should restrict its ways not to aggravate them.

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Chapter

6

Sea Erosion

Climate's Fury

Odisha has 476.6 km coast line covering Balasore, Bhadrak, Kendrapada, Jagatsinghpur, Puri and Ganjam districts. 'Sea is the route to prosperity', goes a saying. In this sense, above stated six districts of Odisha are in an advantaged condition. But in the changing climatic condition, these districts are facing severe threat due to erosion of the seashore. Hoards of habitations along the coasts are living in constant fear as problems of coast erosion grow bigger. A recent assessment made by the government of Odisha identifies 107 kilometers of coast as erosion affected.

Few locations along the coast line have drawn international attention for the severity of sea ingress. Kanpur village in Kendrapada, 55 years ago, was at least 5 km from the sea. Today, the sea waves are touching it frequently. One of the two tube wells, which was once located in the middle of the village, is now 100 feet inside the sea. Even the sand bags that were laid around the village after the first inundation at an expense of nearly one lakh rupees have been submerged under sea water. The 303 households that still remain in the village are in a state of constant panic thinking another inundation would completely engulf the village. The story sounds same in nearby Satabhaya village. Five villages under the Satabhaya Panchayat have already disappeared in the sea and the people of Satabhaya village are waiting with fear for their turn. Every year, sea is expanding 50 meters landward. In just seven decades, the famed Satabhaya region has lost more than 50 percent of its land mass.

While the scourge of sea erosion in Satabhaya-Kanhupur or erosion in major tourist destinations like Puri and Gopalpur have often hogged the newspaper headlines, very few are aware of the fury of this form of natural calamity that has already wrought worst havoc in other parts of the coast. Petha, another village along the coast, is witness to people's helplessness to the cruel sea. Initiatives by government and other agencies have been too less and too insignificant in raising any resistance to the fury of the sea. The Pentha cluster faces the imminent threat of extinction from civilization map. But unlike Satabhaya, these cursed hamlets and its inhabitants have escaped the attention of government agencies till date. Villages like Pentha, Endulasahi, Prasanapur, Sundaripala and Khandamara in the Kendrapada district had escaped the 1971 cyclonic devastation. But the safety of these villagers is now at stake as

An attempt to combat seashore erosion

intensity of sea erosion is alarming and frightening to say the least in the face of regular coast erosion.

The efforts so-far

Gulping sea and disturbed habitations! Challenges are definitely gigantic. In such backdrop two options exist, i.e, to move away from the coast or mitigate erosion through other means. If the experience of relocating those who have already lost their home and hearth due to erosion is anything to go by, it is amply clear that rehabilitation of all the villages threatened by erosion would be a mammoth task. Let us take the case of the five villages of Satabhaya region, where efforts to relocate the marooned inhabitants started way back in the 1970s. In 1992, the then Biju Patnaik government prepared a master plan to rehabilitate the people of these five villages in the Sunei-Rupei jungles at an expense of Rs. 95.25 lakhs. But work on the plan was stalled fearing adverse impact on the environment after spending over Rs. 13 lakh in digging ponds and constructing roads and dwelling places. The rest of the sanctioned amount still lies unspent in the government's PL account.

A full 12 years after the first abortive attempt to rehabilitate the displaced, Chief Minister Navin Patnaik – who, incidentally, is the son of Biju Patnaik – laid the foundation for the

construction of 'Biju Nagar', a township named after his father, for them at Magarkanda. Speaking on the occasion, Patnaik promised that a strong ring embankment would be constructed along the coast to protect the people from the sea at an expense of Rs. 35 lakh to be spent from the unutilized money lying in the PL account of the original plan. But the local people are sceptical about the latest plan since the area earmarked for the construction of the proposed township is under occupation and control by the residents of the nearby Okilapal village since 1971. If the government goes ahead with its plan to rehabilitate the displaced there, it would only lead to conflict between them and the neo-settlers, they apprehend.

The government has been making plans for the people of Satabhaya since 1977, but none of them has seen the light of the day, they rue. Sceptical about the government's rehabilitation measures, hundreds of families in the two remaining villages in Satabhaya have now shifted out to relatively safer places of their choice. 72 families of Satabhaya village have settled down at Magarkanda and have named their new hamlet Atasala. 60 families from Satabhaya and 20 from neighbouring Kanpur have taken refuge under a mound near the Ekakula mouth which now goes by the name of Balisahi. The newly established village of Barahipur near the Wheeler Island houses 40 erstwhile families of Satabhaya and five of Kanpur.

This brings into fore the problems associated with displacements and rehabilitations. Sea erosion is sooner or later going to make thousands of households take refuge elsewhere. The complexities will be enormous. The government, quite aware of the problem, is now piloting the second option – of using technology to stop or reduce coast erosion. A large project, supported by a loan from World Bank, has just begun. The project aims to use geo-tubes to mitigate tidal impacts along the shores. However, it remains to be seen how far men with its modern technologies will be able to curb fury of the ferocious sea. Till then people are destined to stay at the mercy of the nature, helpless and clue less.

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Chapter

7

Riverbank Erosion

Largest Displacing Factor

Odisha has many rivers, most of which overflow in the rainy season. These rivers, too, have started showing their fury as river bank erosion and river course change is increasing in instances and intensities. Given the enormity of the situation, when focus lies on sea erosion in Odisha, riverbank erosion could be the largest displacing factor in the state – bigger displacing factor than all the mining and industrial operations put together. In many parts of the state, it is not the sea but rivers which are giving sleepless nights to thousands of people living along their banks.

While many expert pass off river bank erosion and river course change as normal and a natural phenomenon, the intensity of the problems bare starkly about the anthropogenic or man-made causes that make the problems more serious and complex. Hundreds of villages; a majority of them in the coastal belt of the state; are in serious danger of being swept away by the swirling waters of rivers in spate. Nearly the entire coast; from the extreme south to the fertile plains of central Odisha – is now threatened by river bank erosion. Villagers watch with trepidation the rivers inching towards the habitations gradually and menacingly. As the banks draw new boundaries, rivers engulf agricultural fields, orchards, village commons and finally the houses in the village. Inch by inch, the river swallows them all; like a python engulfing an animal under the spell of anesthesia. One notices everything, feels the thumping of the footsteps of death, but is not able to do anything - not even run away. The villagers can do nothing other than waiting for doomsday when the village completes the journey from geography to history. While the people have no alternative place to move into, the government is yet to even acknowledge the problem. Meanwhile, the scale and intensity of riverbank erosion is continuously on the rise.

Every year, a few villages pass into oblivion meriting no more than an obituary in the form of a news item in the inner pages of newspapers. An apathetic state government, which has a disastrous record in rehabilitating people displaced by industrial projects despite the fact that the rehabilitation packages are funded by the industries, neither has the political will nor the

funds to undertake resettlement measures for them. If there has not yet been a hue and cry over the issue, the reason is the fact that the villages are consumed by the rivers one by one, not at one go.

The fury

If we look at the victims in urban set-up, Cuttack; the oldest city in the state; figures in the list of endangered patches of river bank erosion. With Mahanadi; the biggest river in the state and its two branches – Kathajodi and Kuakhai – constantly expanding and changing their course, nearly 10,000 people living in a cluster of villages under Cuttack Sadar Assembly constituency are living in perpetual fear of being washed away by the surging waters of the three rivers. Erosion of river banks threatens several villages under Bhubaneswar Municipal Corporation too. Kuakhai, once the lifeline of the area, has now become a bane for the people. It has changed course leading to the weakening of the embankment.

In Rajkanika block under Kendrapada district, there is consternation among the people – every time there is a flood in the river Kharasrota. They spend sleepless nights fearing the worst till the flood waters recede. Elsewhere in the district, there is constant erosion of the embankment of river Luna threatening a host of villages in Kendrapada and Garadpur blocks. In the Mahanadi-Chitrotpala Island too, erosion of embankments has emerged as a major problem threatening scores of villages.

Erosion of the Mahanadi embankment has assumed alarming proportions and is giving nightmares to people in scores of villages in Jagatsinghpur district. With river Bhargavi changing course all too often in the recent past, vast areas in Puri district are facing a constant threat of submergence. River Brahmani has already engulfed villages in Sukinda block of Jajpur district. The threat of submergence stares even the people of the coal town of Talcher in the face. Brahmani has wiped out some villages in Bhadrak district too while several others could soon join the list of erstwhile villages. On its part, river Baitarani is all set to take in its lap villages in Bhadrak district and villages under Rajkanika tehsil in neighbouring Kendrapada district. Villages around Bhanjanagar town in Ganjam district are threatened by the erosion of the embankments of Rishikulya, the biggest river in southern Odisha, and Loharakhandi rivers. River Subarnarekha is also in same trend in Balasore district. River Nagavali changing the course at Hatipathara in Raygada town is a classic example of the series.

The list of villages in Odisha threatened by erosion of embankments already runs into hundreds and is steadily growing. Unless remedial steps are taken urgently, it could soon emerge as the single largest factor for displacement in the state.

The reasons

Erosion of river banks is a natural phenomenon that accelerates once the river leaves rocky, mountainous terrain and enters the plains. This is so because the water carrying capacity of a river reduces once it enters the plains. The swirling water of a river in spate looks for an outlet and creates a path for itself creating a branch river in the process. As long as human interference with the course of a river was minimal, rivers had no problem changing course. But once habitations grew in the flood plains and embankments were constructed for flood control, they could not change course at will. They were forced to remain within the confines of their beds, which resulted in erosion of their banks.

There are other factors too aiding the process of erosion. The beds of rivers are getting progressively shallower due to siltation, further restricting their water carrying capacity. The construction of roads and dams etc. also arrests the release of flood waters. As a result, the intensity of floods in the state is continuously on the rise. The maximum water carrying capacity of embankments constructed to moderate floods in the Mahanadi system in the state is between 9 to 11 lakh cusecs. But during severe floods, the amount of water that flows through the rivers system is much higher than this. Then there is this practice of constructing spurs to save a particular town or village, unwittingly endangering other villages and towns in the process. The mushrooming of brick kilns on the banks of rivers, construction of bridges and indiscriminate lifting of sand from the river bed also abet the process of a

Bank of River Devi

change in the course of the river. However, the single largest factor responsible for accentuating the problem of erosion is the environmental degradation in the catchments areas of rivers.

The remedy

Unfortunately, government efforts to check erosion of river banks have been marked by some short-term measures like stone patching, construction of spurs, stacking up sand bags there and so on, basing on the political clout. But there has been no systematic effort to address the problem in its entirety so far. Ironically, the government's efforts to arrest floods through construction of embankments have added substantially to the problem of riverbank erosion in the state. This is so because most rivers in the state flow for less than half the year leading to excessive 'rainy flow' or floods though the annual precipitation has remained more or less constant in the state. But given the dimensions of the problem, finding a solution will be well impossible without taking a holistic view and drawing up a long term strategy to combat it. Such a strategy has to be based on the premise that there are no lasting local solutions available. An integrated approach taking the entire state and all the rivers flowing through it is a lasting solution of the problem of erosion.

The answer to the question of how to arrest erosion lays where the process starts and not where the actual erosion takes place. What is needed is an improvement in the general health of the rivers, which would ensure that the flood waters get released into sea over a prolonged period lasting at least nine months a year rather than in three months as is the case at present. The measures that are needed to bring about the necessary improvement are regeneration of forests in the catchments areas of rivers, conservation of soil and rain water.

There is an urgent need for the state to do a thorough stock-taking of the situation and devise sustainable ways and means to prevent this phenomenon from snowballing into a major disaster in the near future. The fact that the remedies available are daunting should not deter the state government from initiating them. For one thing, it should make all out efforts to improve the general health of rivers so that they maintain their flow for the greater part of the year. For another, it has to rethink its policy of embanking rivers and find alternative ways of controlling floods. No matter how difficult these twin tasks prove, the government has no choice but to take them since it simply does not have the wherewithal to rehabilitate the huge number of people who stand to be displaced by riverbank erosion in the coming years. Prevention, as popular notion, is better than cure – and cheaper too.

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Chapter

8

Mega Dams

Nurturing the Disaster

According to the report 'Climate Change Impacts in Drought and Flood Affected Areas: Case Studies in India' released by World Bank on 1st June 2008 climate change is projected to bring a dramatic increase in the incidence of flooding in Odisha. The study cautioned that probabilities of flood discharge of 25,000 Cubic Meter per Second (CUMEC) or more at Naraj, from where Mahanadi delta begins, which was assessed to be 2 percent may dramatically rise to 10 percent. Anything in excess of this discharge causes large scale flooding in the Mahanadi river delta. This implies that the current flood management mechanisms need a comprehensive relook. There is, also, a clear need for improved and accurate forecasting tools to guide the appropriate location and design for flood protection infrastructure and other high-value assets.

Odisha is running in the forefront of the states in India in terms of dam building. There are 163 large dams and according to Government of Odisha, 40 more projects are proposed so far. While dams have been built or are lined up in plenty, a sheer absence of reliable database on the performance and impact of large dams makes no reasoning. There is total absence of efficient evaluation to ascertain if the investment is justified, if dams have delivered what they initially promised, how efficiently and more importantly at what cost? The picture speaks something else – of a disastrous reality.

Flood control – Checks and balances

The infrastructures created so far in terms of flood control, whether big or small, have proven to be of no or very limited use in the changed context. In the post-independence era emphasis has been laid on construction of large dams like the Hirakud, the Rengali and the Indravati with the objectives of flood control and irrigation. They were supposed to serve many a purpose. Provide irrigation, generate electricity and allow flood cushion. But these projects cause further geographical discrimination. More than 45 percent of irrigation potentials created in the state are through major and medium irrigation projects. But they fail to ensure a mere 35 percent of minimum coverage in 194 blocks, nearly two-third of the total blocks in Odisha. Engineers do try to justify that reservoirs like Hirakud have been instrumental in

moderating downstream floods. They say prior to the construction of the dam, between 1931 and 1957 - incidences of years having flood in the Mahanadi system was 78 percent. That has reduced to 44 percent in the post-dam period - 1958 to 1984. But government's figure also reveals that incidences of floods of lesser intensity have increased more than double from 24 percent to 58 percent. While the short duration floods have decreased from 64.5 percent in the pre-dam period to 30.8 percent in the post dam period, medium and long duration floods have increased from 12.9 percent to 28.5 percent and 12.9 percent to 38.5 percent respectively. While government sources site their own statistics to argue that Hirakud has successfully moderated floods, common people's perception is entirely different. What they know is that in just one decade the Mahanadi system experienced three very large floods in 2001, 2006 and 2008 in the known history of Mahanadi river system. Of these at least two were made severe by flood water discharge from Hirakud. Many experts too say that bad management of Hirakud reservoir made the 2008 flood, what otherwise would have been a mere big flood, into a devastating one. Other studies have also documented trends that show that incidences of flood have increased in the post-Hirakud dam period. A contributing paper to the World Commission on Dams says, "India's Hirakud dam was first justified in the name of flood control, yet extreme floods in the Mahanadi delta between 1960 and 1980 were three times more frequent than before the Hirakud was built." In September 1980, hundreds of people were killed after releases from Hirakud breached downstream embankments. Odisha's the then Chief Minister had publicly admitted that panic releases of water from Hirakud were responsible for much of the devastation. But then he also argued that had it not been done the dam could have failed and the disaster could have been massive. A 2002 Planning Commission of India report on disaster management documents 2001 flood in Mahanadi as follows, "one major controversy about the recent flood in 2001 is the alleged mismanagement in the release of water from Hirakud dam". The report goes on to say that "this has raised questions on the scientific management of flood control and release of water to reduce devastating impact that the people in the State had to face."

Dams: The Moder Temples

Table-14

Pre-dam and post dam flood of Hirakud			
Pre Dam		**Post Dam**	
Flood Year	**Gap in Year**	**Flood Year**	**Gap in Year**
1834	-	1961	8
1855	21	1970	9
1866	11	1972	2
1872	6	1973	1
1896	24	1975	2
1926	30	1980	5
1933	7	1982	2
1937	4	1986	5
1940	3	1990	4
1955	15	2001	11
		2003	2
		2005	2
		2006	1
		2007	1
		2008	1
		2009	1

Source: Gaunli Bichaara

There are other statistics and compilations also. One compilation says that in the pre-dam period, only 9 floods had occurred in between 1834 to 1955. That means one flood occurred in every 13 years. But in the post dam period, within 47 years i.e. 1961 to 2009, 16 floods have occurred in the span of just 47 years. In other words, in the post Hirakud-dam period one flood has occurred in every three years. The impacts of floods have also resulted in more areas becoming submerged. A study has revealed that water logging due to flood has increased in the post-Hirakud period considerably. Due to flood and water logging, the crop damage has been substantially increased.

Hirakud is only a case study. Other dams fare no better. The Indravati dam has increased fury of flood in the Mahanadi system further as it is adding water of Indravati basin into the Mahanadi basin. In fact, no large dam in Odisha has dedicated space for flood cushioning.

Irrigation – Fields feel thirsty

Apart from increasing productivity of land, 'irrigation' also decides votes. Thus, irrigation continuous has stayed prominently in the mainstream political agenda. Though each of the dams constructed so far in the state carry irrigation as the first objective, but due to rapid industrialization and to quench the thirst of the industries, which is adding on as another objective, irrigation seems to have lost the priority it deserves. This has not down too well as conflicts between traditional users and new users have seen a spurt around major sources where new users are beginning to assert their claims. Farmer movement over right to Hirakud water is emerging as one of the more serious social movement that we have witnessed in modern Odisha.

Hirakud is an exemplary case. The more than 56 year old dam is rapidly losing its storage and irrigation potential. Many studies have revealed how Hirakud irrigation command area is shrinking rapidly. Ahmedabad based "Development Support System" had analyzed the irrigation potential of various mega dam projects of the country for Central Planning Commission. The report shows that Hirakud has the least irrigation efficient among major irrigation commands. It

Hirakud dam

states that in Hirakud project irrigated area, as high as 65 percent of command area in the middle reaches and a whopping 82 percent of the command area in the tail are not getting cover anymore. In the initial plans for the project, 1,59,106 hectares were to be provided irrigation cover for Kharif cultivation and 1,08,385 hectares were to be provided irrigation for Rabi irrigation. Now according to government sources 79,371 hectares are cultivated in Rabi season. In the delta area plans were made to provide irrigation to 2,51,000 hectares in Kharif and 11,498 hectare in Rabi. But now the Rabi cultivation area has decreased. Farmer organisations have in the Hirakud command area alleged that as high as 20,000 acres of designated command area are not getting irrigation anymore.

Large projects are very complex to manage on another count. Because most of the rivers on which they are built are inter-state rivers not every thing stays in the control of the dam managers. From the 83,400 square kilometer catchment area of Hirakud reservoir; 75,229 sq. km of area lie in Chhattisgarh. Chattisgarh government is now on a dam building spree. Most of the dams are being constructed in the Mahanadi river catchment area. It has caused changes in land use pattern and run-off pattern. In contrast to average annual 25 Million Acre Feet inflow in 1950, now only 16 Million Acre Feet water is entering into the reservoir per year. Non-monsoon flow has decreased drastically.

Water use conflict arising out of competing and conflicting demands like industrial use, irrigation, drinking water, flood control and power generation is taking a critical shape in the state. The government is developing a distinct tilt in favour of industries. Government had denied construction of Pipalpanka reservoir project on the river Rusikulya on feasibility ground. But that was when the project was an irrigation project. Few years later, the government realised the project feasible. Not only had the government found the project feasible, it even aggressive pursued for the project. The government was in hurry because the Tata Company was planning to procure water from the project. A project which was earlier declared not feasible for want of sufficient flow suddenly found the situation different when it was considered to serve industrial purposes. Hirakud reservoir is a classic example of conflicting water uses. Flood control objective requires that the reservoir should be as empty as possible. Power generation and irrigation require the reservoir should be filled up to the brink. To add to this, mines and industries located around Hirakud requires share from it too. At least three major urban areas are now drawing water from it. This has forced the dam managers to significantly alter water level management during the monsoon. While the demands have increased, supply has reduced and confrontations have escalated. As the demand supply scenario is likely to worsen further conflicts around the reservoir are bound to increase.

Allied benefits – far from reality

When a dam is being constructed, some allied benefits are highlighted to justify the benefit of the nation like hydroelectricity generation, pisciculture etc. A perception is spread that the ultimate benefit will go to the people. But looking at the track record of the dams in Odisha, those never seem real. South Odisha has four large hydro-electric project. This region lightens up the state but itself remains in darkness. South Odisha produces 70.33 percent of total hydroelectricity generation of the state but consumes only 6 percent of the total energy consumed in Odisha. The rural areas of the southern districts fare even worse. The rural areas of these districts consume only 12 percent of total electricity consumed in the region.

Table-15

Power consumption rate for the year 2000-01 (In million units)				
District	**Urban**	**Rural**	**Kutir Jyoti**	**Total**
Malkangiri	18.515	3.231	0.375	22.121
Koraput	177.317	8.762	0.714	186.793
Raygada	58.502	18.051	2.878	79.431
Nabarangpur	46.096	11.155	1.482	58.733
Total	300.430 (87%)	41.199 (12%)	5.449 (1%)	347.078 (100%)

Source: District Statistical Hand Book, 2001

While energy generation is still stated as a higher priority than supply to industries, what is practiced is quite opposite. Power generation has been the most significant casualty in the face of growing water allocation to industries. Hirakud gives a stark picture where power generation has given a complete thumb down. In fact, the high level technicality that studied various aspects of Hirakud project, did agree that power generation from the reservoir will decrease because of supply to industries. In its report of August, 2007 the technical committee suggested to raise the minimum draw down level from the present 590 ft to 595 ft to facilitate irrigation and industry water requirements. The committee estimated that that this will result in loss of about 32.4 million units of electricity. It further estimated that 1 cusec of water drawn for industrial use would involve a loss of 0.067 million units of power considering an average head during November to June. The expert committee, which had a clear mandate to calculate exact loss to power generation, cleverly avoided making any such calculation. Still the formula that they gave indicates that generation loss from Hirakud will be enormous. The capacity of the state hydro-electicity generation centers was brutally exposed in the year

2009 when hours long power cuts were forced upon the consumers in summer months as the dams closed their gates for power generation to guard interest of industries and other uses.

Changes in water use pattern have also affect livelihoods of thousands of people who have adapted to fishing as their livelihoods. The difference here is that most of such fishing dependent households were not from traditional fishermen communities. Most of them are descendants of people displaced by reservoir projects. In absence of livelihoods they have adapted fishing as their livelihood. Their livelihoods are in jeopardy now. Fish catch has gone down drastically in Hirakud, on which more than 4000 fishermen of 250 villages depend. Not only the production in quantity suffered, but also several species are now hard to find. A recent study finds that only 43 species of fish are now available in Hirakud. In the earlier period of the reservoir 104 species of fish were present. This decline is more prominent in the recent decades, particularly after industrial take off in the vicinity and effluent discharge.

Displacement – One tangible achievement

Though lakhs have been displaced in the name dams, no reliable database exists on the extent of displacement and rehabilitation. This shows the attitude of carelessness of the State Government towards displaced people. According to the Indian Social Institute, about 1.4 million people have been displaced and affected by development projects in Odisha, during 1951-1995.

Studies have estimated that government has acquired as high as 15.43 lakh acres of land for dams. Of this 803549.63 acres are private land, 423436.85 acres are common land and 316341.77 acres are forest land. Of this land, 65 percent was acquired for different projects during 1951 to 1995. In absence of solid database, conservative estimations of dam displaced people put the figure at about 8 lakhs. Around 54 percent of this forced displacement occurred in between 1951 to 1995. Tribal people have been the worst sufferers. Out of total displaced people tribals constitute 37.54 percent and Dalits 10.33 percent. Out of displaced people by dam only 72 percent of the identified families are resettled. Nobody even cares to learn about their existence.

Some of the major dam projects, which have displaced families of significant size are Hirakud Dam Project (32718 families), Machhakund Dam Project (2938 families), Upper Kolab Dam Project (3179 families), Rengali Multipurpose Dam Project (10872 families), Upper Indravati Hydro Electric Project (5301 families), Balimela Dam Project (1200 families).

Table-16

Dams and Displacement in Odisha				
Sl	**Projects**	**Displaced Village**	**Displaces Families**	**Acquired Land (Ha)**
01	Machhakund	-	2938	-
02	Upper Kolab	49	3179	11350
03	Upper Indravati	99	5301	11000
04	Lower Indravati	25	1460	4500
05	Balimela	91	2000	17180
06	Rengali	263	10899	39887
07	Rengali (Gohiriabandha)	56	828	7264.44
08	Hirakud	285	32718	74300
09	Salandi	5	589	1229
10	Subarnarekha	75	5214	6655
11	Lower Indra	25	1460	4500
12	Ib	29	3092	14000
13	Suktel	32	-	7516
14	Ang	20	-	3917
14	Medium Irrigation	18	3076	14403.55
15	Minor Irrigation	92	2822	12180.05

Source: Development Induced Displacement and Rehabilitation in Odisha, 1951-1995; Database of its Extent and Nature, by Walter Fernadez and Mohammed Asif

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Chapter

9

Water for Agriculture

Are We Learning From Experience?

Agriculture and allied sector in Odisha provides livelihoods to more than 70 percent of the workforce. However, the share of Agriculture and Animal Husbandry in the Gross State Domestic Product hovers around a lowly 23.43 percent per cent. It reflects the gross underdevelopment of the sector and the abject poverty of the people involved in the sector. In such backdrop, development of irrigation holds the key to agriculture development.

Table-17

Importance of agriculture in Odisha economy

Sl	Indicators	1950-1951	1960-1961	1970-1971	1980-1981	1990-1991	2006-2007
1	Share of Agriculture in NSDP (%)	66.8	-	54.6	-	30.0	23.4
2	Percentage of total population living in rural area	95.9	93.7	91.6	88.2	87.0	87.0
3	Percentage of total workforce engaged in agriculture	-	73.8	77.4	74.7	73.0	65.0
4	Percentage of Cultivators to Main Workers	-	56.8	49.2	46.9	44.3	35.82
5	Percentage of Agricultural Labourers to Main Workers	-	17.0	28.3	27.8	28.7	21.87
6	Per Capita Availability of Cultivated Land (Ha)	0.39	0.38	0.31	-	0.18	0.14

Odisha gets rainfall which is more than double of most parts of Rajasthan, parts of Andhra Pradesh, Vidarbh and other arid and semi-arid regions. Yet, state's agriculture suffers from perpetual water scarcity. The largest share for creating new infrastructures in state's budget goes for development irrigation infrastructures. Odisha has a total cultivable area of about 65.59 lakh hectare. It has been assessed that about 49.90 lakh hectares can be brought under irrigation. The state government was claiming to have created irrigation potential in

29.31 lakh hectares, about 47.5 percent of total cultivable area, by year 2009-10. Out of this created potential, as high as 45.1 percent was through major and medium irrigation projects; while 18.8 percent was through flow based minor irrigation sources, 16.8 percent through lift based minor irrigation projects and 19.3 percent of sources created were though other sources. However, these claims are refuted repeatedly by experts and farmer organisations. There exists a very large gap between potential created and utilized. Coverage of most of the irrigation structures is shrinking. The claimed growth in irrigation potential seems to have miserably failed in increasing agriculture production or at least in stabilizing it. Production paddy, the major crop that covers more than 70 percent of net sown area, is as fluctuating as earlier. Droughts are still causing as much, if not more, havoc and loss it was earlier. Since 1991-92, the year that had a bumper food grain production, 72 lakh tons, the production of food grains is gradually on the decline.

The government is showing signs of desperation. It knows that irrigation statistics are hiding gross inefficiency of the irrigation sector. In the year 2005-06 it got the awakening that as high as 198 of 314 blocks in Odisha did not even have 35 percent of cultivable land under irrigation. The government then declared that by the end of the eleventh five-year plan period, i.e, by 2012, every block of the state will have a minimum of 35 percent of their cultivable land under irrigation cover. Well said... but by the end of June 2011, only 41 of the 198 blocks with less were able to meet the minimum 35 percent coverage. To achieve the target the state is required to create additional irrigation potential in 6.6 lakh hectares in the targeted blocks alone. But only 3.73 lakh hectares of new irrigation potential could be created in five years, out of which a meager 2.53 lakh hectares were created in the deficit blocks. A clear case of target going astray.

While irrigation coverage, demarcated in terms of potential created, has lagged behind; management of irrigation sources is a cause of greater worry. The focus, over the years, has been more on major and medium irrigation projects. But they are the ones where user participation is the least, where efficiency of water is the minimum, but cost of creating the potential is highest. Odisha is one of the first among major Indian states to provide legislative support to water users, to form their associations, known as *Pani Panchayat*, to manage irrigation installations and processes in the year 2002. But implementation of the idea has never really taken off. *Pani Panchayat* functionaries have hardly gained ownership over the total processes and installations. Rather, partial transfer of responsibility is being seen as shifting of difficult burdens to the farmers. Transfer of management has not happened at the top and middle level which is still controlled by department engineers. The problem is less

pronounced in case of smaller irrigation sources where community engagement is more evident. Large irrigation projects are also leading to further mono-cropping of paddy and wasteful cropping practices. This is evident in every major and medium irrigation project where the chasm between designed cropping pattern and actual cropping pattern is very high.

Apart from this, the major and medium irrigation projects have their fair share of environmental and social burdens. Still, the government's perspective plan is highly tilted in favour of major and medium projects and of late on ground water. As large and medium projects are not coming up in expected manner, ground water sources are being touted as an easy way out. This new phenomenon stems from an assessment that Odisha's ground water potentials are being grossly underutilized and that development of ground water stands at a mere 15 percent of its potential. But real experiences tell something else. Depletion of ground water is becoming a cause of serious concern in non-coastal areas, where its utilization rate has been assessed as very low. In absence of supplementary system to recharge ground water sources, serious headway in exploiting ground water sources will be catastrophic.

Agriculture is the mainstay of Rural Livelihood in Odisha

Failure in agriculture, largely a product of absence of supplementary irrigation, has become a common phenomenon. It adds to the misery of the agriculture dependent persons and pulls back Odisha's economy badly. The way we develop our irrigation sources also create impact on water availability for other sources.

The state government approaches both flood and drought as two different sets of problem and tries to address them separately. Their lies the fundamental error of judgment. Small irrigation sources can also mitigate floods in the mighty rivers. That has to be way.

The government Water Resources Department still stays rooted as an engineer driven organisation. It tries to find solution in engineer and technology alone. It has failed to raise above the erstwhile Irrigation department which was refurbished as Department of Water Resources to include and integrate everything related to water for holistic planning and development. With this backdrop, they hold the view that they have offered the best possible system design, which needs no change. It is the people, who must change their habits and use the system as per the design provisions. They are not prepared to accept the fact that the design provisions and the system performance to support the desired crops are incompatible.

Nothing is sacrosanct in this world. Much less is a design methodology of an irrigation system. To the onlookers it is already obsolete. If the present system has defied improvement for about half a century now, logically there is a case for reviewing it by a group of high powered onlookers. The chinks have been identified since long. But community participation and addition of a socio-environmental perspective to irrigation planning has still eluded. Unfortunately the irrigation fraternity is so deeply entrenched and their lobby with any Government is so strong that it has been ordinarily impossible to make any dent on their capital intensive and engineering driven fortress. It requires an extra-ordinary effort of the kind of public demonstration to shake the immobile.

* * *

Chapter

10

Water for Livelihoods

Troubled Waters

Water is an essential element in supporting a wide range of domestic and productive needs of livelihood. It provides for food security and economic benefits to the rural poor. Water is one of the most vital natural resources used not only for direct consumption but also as an input in the process of production in different sectors of the economy.

Water-based livelihoods, fishing being prominent of those, provide income and employment to nearly 3 percent of the state's total population. The 2001 census had identified 135,934 households as fishing households and a fishermen population of the State at 10.84 lakhs, of which about 7.51 lakhs were engaged in Inland Sector and 3.33 lakhs in Marine Sector. As high as 3,878 villages are identified as fishing villages, as most of the villagers therein depend on fishing as a prime source of livelihood. Among those 3,289 are inland villages and 589 are coastal villages. Some kind of formal arrangements have been tried in important fishing areas through formation of societies and cooperatives. There are 977 primary fishermen co- operative societies, central primary fishermen cooperative societies and one apex society with 1, 11,184 members (2004-05).

Odisha has huge variety of potentials to lean on. Apart from the 480 long coastline, Odisha has 6.73 lakh hectares of inland freshwater water area and 4.18 lakh hectares of brackish water area where fish culture and capture takes place. After agriculture, fishery is considered as the backbone of the costal Odisha economy. However, the fish community lives a pitiable life. While they constitute about 2.75 percent of the total population, their contribution to the Gross State Domestic Product (GSDP) hovers between 1 to 1.5 percent only. The scope of fishing, both inland and marine is a viable economic activity to strengthen nutritional food security, promote growth in exports and alleviate poverty. State expenditure of developing the fishery sector is quite negligible. The state plan investment for development of fisheries increased only a meager amount during the period of first plan to tenth plan. Odisha has high potential for fish cultivation and capture, but this potential is poorly reciprocated. The present level of fish production in the State is only about 59.7 percent of the overall fisheries potential of 5.14 lakhs Metric Tonnes.

Table-16

Fishing's share to GSDP	
Year	**Share (%)**
1950-51	1.49
1960-61	0.34
1970-71	0.57
1980-81	0.73
1990-91	1.25
2000-01	1.55
2009-10	1.11

Source: Odisha Economic Survey, 2009-10

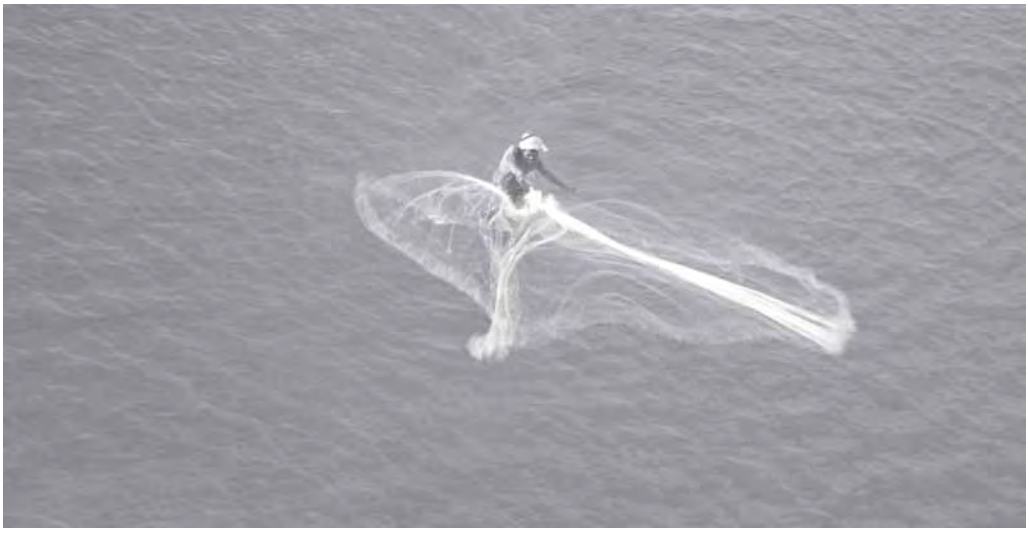
Traditional Capture Fishing

Fisheries can be broadly classified into marine fisheries and inland fisheries. The marine fishery has abundant resources to fetch a boom in the State. The State's 480 km long coastline, which provides a fishing area of about 23,830 sq.km, has huge potential for marine fisheries development. There are 589 marine fishing villages. The total marine fisher population of the State was 332,772 including 94,491 males, 86,140 females and 152,141 children in 53,020 households. Of this marine fisher population 66,597 are full-time fishermen, 14,736 part-time and 4,979 are occasional fishermen.

Odisha is the seventh largest fish producing state in India. In the year 2006-07 it produced about 342.7 Thousand Metric Tonnes. Marine fish catch constituted a substantial part of this. However, marine fish catch has hit plateau. Marine fish catch is hardly increasing. Rather its share to total fish catch has sharply decreased in the last decade. In the year 1990-91, marine fish catch contributed more than 48 percent of total fish catch. By year 2008-09, even though it registered a meager increase in catch, its share to state's total fish catch fell down to about 36 percent. Despite improvements in use of technologies, marine fishing has hardly taken off. Post fishing losses are also a cause of worry. There is a need to increase the unit value of the marine fish products by reducing post-harvest losses through provision of waterfront and shore based infrastructure facilities for landing and berthing of fishing vessels, ice plants and cold storage etc. Challenges are too many for these unfortunate fishermen families. The bio-diversity/ecosystem which acts as main breeding and spawning grounds for the marine organisms are in the process of degradation. Neither the policies have stricter provisions for restriction and regulation of the operation of vessels, nor does an effective monitoring and surveillance system exist. Instances of high capacity and modern fishing trawlers encroaching into Odisha territory is a regular phenomenon. Adding salt to the wound is the

seasonal ban on fishing in large part of the coast. Long stretches of the sea area is prohibited for fishing to facilitate nesting of Olive Ridley tortoise. But that ban causes immense financial losses as they stay unemployed. This problem is gaining in proportion as a conflict may grow between environmental interests and livelihoods interests. The fishing ban has resulted in suicide instances among the fishermen which stirred Odisha in the past.

While marine fishing is in rough sea, inland fishing is not much better. The fish production per hectare is decreasing due to delay in harvesting of ponds and tanks by fish farmer's development agencies. Natural calamity is another determinant of declining fish production. There is no strong database on various aspects of the fresh water fishing. Among other challenges, lack of periodical census and systematic data collection in fisheries sector in general and fresh water sector in particular is one. The multiple uses of community ponds greatly hinder the adoption of recommended aquaculture technologies involving inputs during pond preparation, manures and fertilizers. Lack of maintenance in many ponds has led to heavy siltation and eutrophication resulting in low fish production. While inadequate seed rearing and transport, policy woos, lack of district wise master plan and inappropriate leasing policy has only fuelled low productivity; inadequacy and ineffectiveness of reservoir fishing policies have been are other gray areas. The 1982-83 survey of the Fisheries Department in the State identified 1,442 reservoirs, covering an area of 197,198 ha, which are suitable for fisheries development activities. The 1,442 reservoirs produce only 4,192 tons of fish at the rate of 21.26 kg/ hectare. In Hirakud, the fish production has declined by more than 50 percent within 10



Fisherman in action

years (1995-96 to 2004-05) and the yield rate has also decreased accordingly (now 4,5kg/hect). So more than 4,000 fishermen from 6 primary cooperatives societies, who were mainly dependent on the Hirakud fishing, are now struggling with their livelihoods. The fishermen complain that the production and productivity of the reservoir has declined due to various reasons like extensive siltation, extensive use of gill (zero) nets, catching small sized fish at river mouth, fishing in closed seasons (Hirakud fishing was banned from 15th June to 31st August), use of dynamites and pesticides for catching fish and effluent discharge from nearby industries, etc. The declining fish production in Hirakud can be seen as under:

Table-17

Fish production in Hirakud reservoir	
Year	**Fish production (m tones)**
1961-62	51.9
1962-63	32.4
1963-64	14.4
1964-65	15.1
1965-66	12.4
1985-86	332.6
1986-87	483
1987-88	192
1988-89	263.5
1989-90	337.4
1990-91	489.5
1991-92	380.2
1992-93	336.9
1993-94	426.4
1994-95	4003.3
1995-96	385.6
1996-97	267.3
1997-98	260.2
1998-99	274.8
99-2000	259.24
2001-02	186.31
2002-03	199.5
2003-04	163.78
2004-05	151.54

(Source – Jala Jeevana Sambad)

Fish Farmer's Development Agency (FFDA), a centrally sponsored scheme, is being constituted for development of pond areas and to impart training to the fish farmers in modern pisciculture techniques. Towards the end of 2004-05 only 628.40 hectares of tank area had been developed and 1,483 fish farmers were trained. All districts of the state have formed FFDA, but their functioning remains quite out of mark.

But the greatest hit to fishery potential is the grossly depleted and degraded state of the rivers. Riverine fishery, apart from low productivity, is greatly threatened by the industrial pollution. Pollution by mining waste and industrial wastewater etc greatly degrade its quality. The environmental assessments hardly take consideration of impact on aquatic species and the livelihoods dependent thereupon. Increase of evaporation in the river basin mainly in arid and semiarid regions hinders the fish catch in rivers. Day by day the riverine fish production is declining due to the use of gill nets at the river mouths for which the egg bearing fish are prevented to enter the river mouth. The migration of fish in rivers also has been affected due to barrages and dams in the rivers. The Gahirmatha marine sanctuary where fishing is legally banned under Wildlife Protection Act, 1972, is an important breeding area of marine shrimps and crabs. However, due to sheer lack of enforcement, trawlers and gill-netters are found fishing regularly during the breeding season at the river mouth. The egg bearings fish are caught at the barrage and dam gates which is a key drawback.

Poor marketing infrastructure has also depleted the incentive and returns of the fishermen. Most of the cooperatives have financial problems. There are seldom quick transportation/ distribution channels to market fish. Lack of post-harvest and market infrastructure facilities, unsound primary fisheries cooperative societies, limited mobility, poor investment capacity, communication facilities and seasonal variation in catching, are the challenges of fish marketing in Odisha. The fish farmers in the State lack facilities to get advised during crisis, due to non-existence of aquatic health care centers.

The brackish water fishing has a greater role in sustaining livelihoods in Odisha. Chilika is a major source of livelihood for the local fishermen. The total brackish water potential area of the State is 4.18 lakh hectares including shrimp culture areas, estuaries, brackish water lake and backwater. Siltation of river and canal beds results in the poor flow of water. The major challenges to brackish water fishing include lack of rain which heightens the salinity beyond the tolerable limits of the fishes. Apart from this, degradation of soil and environment due to the extensive use of drugs and chemicals and need of infrastructural support hinders the brackish water fish production. Conflict, pollution and unregulated fishing activities are major concerns for Chilika today.

While fishing is the identifiable water-based livelihood, salt production too is small but very important source. This sector too is depleting in absence of adequate support. The State which once supplied salt to others States, is now dependent on imports to meet its own demand. The salt workers who were mainly dependent on the salt extraction have now taken up other occupations. Salt extraction has now given way to intensive prawn cultivation in Inchudi, which had pride of place as the biggest salt producing area in the state before independence. Erstwhile Health Minister Mr. Debi Prasad Mishra on 1st April 2004 had said, "The total salt requirement in the state is 3 lakh tonnes for both human and industrial consumptions out of which the demand for iodised salt was 2.27 lakh tonnes. The State has a capacity of producing around 76,000 tonnes of salt but it is producing barely 40,000 tonnes". A state having 480 kilometer long coastline barely produces only 13 percent of its demand. The major reasons for the decline in the trade are: excessive labour required in the salt manufacturing, rain playing spoilsport, lease problems of salt field, shortage of storage area, and progressive decline in the profit margins. As per the decision of the government notified on 18th October 2001, the state government has banned the production and consumption of non-iodised salt throughout the State now. The traditional salt workers had neither machines to add iodine to the salt nor knowledge to decide the ratio of salt to iodine. This has resulted in a drastic fall in salt production since 2001. Farmers and producers suffered huge losses after that notification as tones of harvested salt had no takers. Since then most of the salt producers have stopped producing salt. They have shifted to other livelihoods.

Another water based livelihood option is that of the boatmen/ *Ghatiya*. Most of the boatmen are now occupationally displaced due to the closing down of Ferry Ghats, mostly due to construction of bridges and improper rehabilitation of boatmen, use of motor launches and accidents. Performance of various welfare activities in terms of both self-employment and wage employment programmes are needed to rehabilitate these occupationally displaced boatmen of Odisha.

Water supports many allied livelihood practices indirectly. The dry fish trading can be taken as an instance which provides livelihood support during summer and part of winter to the fishermen of coastal Odisha. The dried fish gets less attention and care by the fishermen as well as the market. Major challenges in dry fish trading can be summed up as presence of big businessmen in the trade, decrease in fish production, unscientific and unhygienic processes, poor quality product, sale at low prices, non availability of adequate space etc. Developing local market as well as establishing market network in potential areas along with training and infrastructure building is vital to augment the trade of dry fish. Net making is another source of earning a

Dryfish preparation near Devi River

livelihood. Net making is mostly the secondary work of fishermen communities, after primary ones like fishing, agriculture, dry fish vending, etc. The problems with this as a livelihood option lie in the substitution of traditional know how with modern technologies and use of nylon nets etc, more labour and less profit, replacement of natural thread and materials, etc. Technology and advancement in mechanized systems has not only hindered the traditional net making, but also the traditional boat building. The fishermen communities preferred the mechanized boats due to its longevity and ease in driving. Manufacturing industries came up in some places for boat building thus affecting the livelihood option of boat building in Odisha.

Water also supports minor livelihood options like collection of snail, lotus leaf etc. As though the dependency level is less, it has local and individual significance as a livelihood option.

Water, apart from agriculture, sustains livelihoods in varied ways. Its environmental significance often overshadows the socioeconomic significances which are more imminent in nature. Any policy regarding a source should be planned and implemented keeping in view the varied dependencies on it so as to secure the livelihood options.

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Chapter

11

Water for Industries

Beyond the Law of Humanity

After the beginning of the era of globalization, liberalization and industrialization, many national and multi-national companies started coming Odisha to set-up large, medium, and small scale industries. What drew them? The answer is one 'unique selling proposition' (USP) i.e. abundant water, sufficient minerals, cheap land and cheaper labour. Odisha has 90 percent India's chrome ore and nickel reserves, 70 percent of bauxite, 26.5 percent of iron ore and 24 percent of India's coal reserves. Odisha has substantial reserves of other minerals which go into steel making, like coal- 51,571 million tones (24.37 percent of the national deposit), dolomite- 434 million tones (10 percent) and lime stone- 1,032 million tones (1.36 percent). But what adds the most to lure of setting units in Odisha is its stated abundance of water.

In Odisha there are about 2,750 industries of which 638 are in the large and medium sectors. The major industries that have come up in Odisha are the iron, ferro-alloys, sponge iron plants, aluminum industries, thermal power stations and some other industries. About 70 percent of the large scale industries are mineral based. There are 10 coal based thermal power units (with generation capacity more than 30 MW). These industries are mostly located at Roulkela, Rajganjpur, Jharsuguda, IB Valley, and Angul- Talcher Region. New industries are coming up in Duburi of Jajpur, Paradeep of Jagatsingpur districts and areas in Southern Odisha.

The State is now poised for an industrial revolution or to be more specific, a steel making revolution. Several big names, both national and international, have shown definite interest in launching projects in the State. The Odisha Government has identified 3 belts in the state, where steel, iron, sponge iron units are to come up in a big way. These include the Barbil-Duburi belt, the Cuttack- Dhenkanal belt and the Sambalpur-Jharsuguda belt.

With the increasing industries, the requirement of water for industrial purpose is also increasing. All the water related structures in our state have been constructed keeping in mind the water requirements for drinking and domestic purposes, irrigation, water based livelihoods

and hydro electricity generation. Industrial requirement, which is at the higher end, was nowhere in the list. Despite our economy being an agrarian one, thinking industrialization as the most viable tool for economic prosperity, the authorities are allocating water to industries, ironically suppressing the water requirement of common man.

Steel production in Odisha is assumed to increase from 5 million tones per year in 2001 to 15 in 2010 and 25 in 2050. The increase is expected to be the result of additional capacity installation in the Brahmani, Rushikulya and Baitarani basins. The aluminum industries at present are operating at 3 levels- mining, refining, and smelting. For mining and refining local rivers and stream water are used and for smelting power intensive input is required for which captive power plants are installed. Industry uses water for cooling, cleaning, processing and removing wastes.

Policy prescription

The 'Industrial Policy 2001' speaks that 'in case of drawl of water by a new industrial unit from any Government water source as defined in clause-6 (a) of section-4 of the Odisha Irrigation (Amendment) Act, 1993 (Odisha Act 3 of 1994), water charge will be payable in the manner as indicated below:

i. At 50 percent of the rates prescribed for the purpose under the provisions of the Irrigation Act for a period of five years.
ii. Thereafter, at full prescribed rates.

In respect of water to be drawn by a new Industrial Unit from any existing Government controlled irrigation source, water charges at the prescribed rate will be payable from the date of commercial production as indicated below:

i. At 75 percent of the rate prescribed for the purpose for drawal of water from such Government controlled irrigation source for a period of three years.
ii. Thereafter a full prescribed rates:
   Provided that where an industrial unit makes financial contribution for creation/completion of the irrigation source, no water charge will be payable at the rates stipulated in sub-para (i) & (ii) till full adjustment of the amount contributed by the industrial unit in question for creation/completion of the irrigation sources.

The intake and consequences

While large scale resentments have started against water allocation to industries, few cases have made startling impacts. POSCO's proposed 12 million ton capacity integrated steel unit

near Paradeep has courted a lot of resentments. Government of Odisha has allocated water for POSCO's steel factory from the Mahanadi barrage at Jobra in Cuttack. Social movements of very high magnitude have come up fearing water shortages when POSCO starts drawing water. The way an irrigation canal has been allowed to be used by POSCO has also been questioned. This decision to allow POSCO water from Mahanadi river near Cuttack and allowing one the important canal to procure water for its plant may lead to an acute water crisis in four districts of the state i.e. Cuttack, Jajpur, Kendrapada, and Jagatsinghpur. The company needs huge quantity of water for its operation. This will affect irrigation in these districts. Since, it alone requires one lakh cubic meters of water for production of one tone of steel, its total consumption will be 1.2 trillion cubic meters of water annually. The Mahanadi barrage supplies water to five canals Taladanda, Machhagaon, Puri, Badachana and Pattamundi which provide irrigation coverage in about 2.6 lakh hectares of fertile lands in the deltaic coastal regions of Odisha. During the peak production period, POSCO will require about 45 cubic meters of water every second which may well dry up the barrage reservoir and affect water supply in the five canals. The POSCO plant will destroy the complex system of myriad natural creeks, *nallahs* and water ways. Not only that, POSCO holds threat to other water estuaries, wetlands and water-based livelihoods therein. The proposed plant is very close to the Bhitarakanika mangrove forests (which has now got the status of sanctuary). The Proposed port of POSCO at Jatadhari, only 6 K.M from the Southern side of Paradeep Port, will deprive more than 30,000 fishermen of their livelihood. The proposed port at Jatadhari will impede the movement of fishes in the rivers and sea. Large tracks of Mangroves forests near the river mouth will be denuded if the port comes up and consequently millions of fishes will perish as the mangroves forest area near the rivers are breeding of several species of fishes. Construction of a port at Jatadhari would create problem of water logging in Jagatsinghpur district and parts of Cuttack District.

Not only allocation of water, the upcoming industrial and mining activities are bound to put strains on water sources and water availability. Bauxite mining atop the Niyamgiri hills is one of the most controversial projects in this aspect. State Government had allocated Niyamagiri hill forests for bauxite mining to Vedanta Aluminum Limited. Even when the mandatory clearances were to be obtained the company had already set up a 3 MTPA capacity refinery plant at Lanjigarh, in the foothills of Niyamgiri. The Niyamagiri hills are also source of water for two impartment rivers, namely Nagavalli and Vansadhara. Many perennially streams originate from Niyamagiri hill top that feed the rivers. There are 22 traditional water bodies in the foothills which provide water round the year. Lakhs of people of South Odisha and Andhra Pradesh depend for drinking water and irrigation on these rivers. Mining atop the hill will destroy the

character and potentials of the streams. Local people and environmentalists fear that it may also cause drying up of Vansadhara and Nagabali rivers. This will affect more than 100,000 people in general and people of two Gram Panchayats who are directly dependant on Niyamagiri hills for livelihood in particular. Besides affecting water resources because of mining activity, the plant also requires water for its operations. As per the Environmental Impact Assessment report initially Vedanta was envisaged to draw water from River Vansadhara and a dam was to be constructed for this purpose. But, the plant is drawing water from the River Tel, 65 kilometers away from the plantsite. River Tel is an important source of water for irrigation and drinking for the lakhs of people of the often parched Bolangir and Kalahandi districts.

Bhusan's 1.2 MTPA steel plant in Sambalpur district is drawing water from the Hirakud reservoir. In the process of drawing water, the plant has flouted innumerable laws. The reservoir area, a no go area for the public, has used and abused in plenty by the industry. Not only did it construct its intake well at a very critical location, it also constructed a more than two kilometer long road inside the reservoir. This operation stopped water flow into the reservoir from river Bheden and IB side and caused serious irrigation problems in Sasan canal command areas which led to serious farmer movement. The industry also encroached into river Bheden's water ways, squeezing it on both sides and choking the drainage area. Many other large industries have come up near the Hirakud reservoir. The purpose of Hirakud reservoir was to supply water for the agriculture fields not to the industry. They are not only sourcing their water requirement from the reservoir, they are also degrading it by releasing untreated effluence and pollutants into it.

In 2000, Oswal Fertilizer was set up at Paradip, on the banks of the Athabanki creek, which joins the River Mahanadi. Right from the start, the company has been indiscriminately releasing its toxic effluents in to the sea, seriously affecting the environment, health, and livelihood of coastal communities of fishermen and coastal agricultural farmers.

Another major confrontation area, like Niyamgiri hills, is Utkal Alumina Industries Ltds's (UAIL) plan to mine Bauxite from Baphlimali hills in Rayagada district. The Baphlimali Hills are being eyed for its rich Bauxite deposits. But then, these hills are also sources of perennial springs, which serve the water for drinking and irrigation needs of the local people. Mining will cause definite affects to the water sources. The siltation caused by the mining of the Baphilimali hills would affect the Indravati River. Mining project may cause reduction in flow and contamination of water. It may even cause damage to the large Indravati Irrigation project. The mine would require approximately 1,000 to 1,500 cubic meters (cum) of water per day

to suppress mining dust and for use in the office complex and housing settlement for employees. The diversion of water for these purposes will also affect water availability in nearby villages that are reliant on the perennial springs. Hindalco's proposed mining of bauxite in the Kodinga hills situated in Laxmipur block of of Koraput District would destroy Vansadhara River. However in Kashipur, there is no suitable river to meet the refinery's water requirement; instead it will only have access to two streams: the *Sana Nallah* for water requirements and the Bara Nala for effluent discharge. The diversion of water will, again affect water available for local use and irrigation. The *Bara Nallah* will also be contaminated with highly toxic heavy metals. The impact of the mine and the refinery on water sources in the area together create serious risk of water shortages, something that has rarely been a problem to date. It has already been reported that tube wells in nearby villages are no longer functional because ground water levels have fallen and that water available for agriculture has become scarce because UAIL has taken over the Bahgrijhola MIP. The loss and contamination of perennial springs can lead to desertification that negatively impacts agricultural lands, natural forests lands and grasslands. This desertification, coupled with the UAIL's encroachment on forests lands can lead to deforestation that also negatively impacts ground water levels, adding to the potential for water shortage in the area. Biodiversity in the Baphlimali Hills will also be affected by bauxite mining.

Industrialisation: Boon or bane for Odisha?

Mining activity, particularly the open cast mines lead to loss of productive top-soil and forestland usually forever. Often natural drainage system is affected and ground water table is disturbed. Besides the active mining area, surrounding areas are also affected due to change in surface drainage patterns and formation of gullies which disturb the land use pattern.

Most of the sponge iron plants are concentrated in Sundergarh, Keonjhar and Jharsuguda districts. There are 93 sponge iron plants already operating and many more are in the pipeline. But the truth is that many of these are already operating without proper environmental clearances. The total installed capacity in sponge iron sector is about 20,000 TPD (Tones Per Day). This sector alone consumes about 20 MLD of water.

Table-18

Sponge Iron Industries Operating in Odisha						
Sl.No.	**District**	**Nos**	**Capacity (TPD)**	**Iron Ore (TPD)**	**Coal (TPD)**	**Water (KLD)**
1	Sundergarh	46	6625	10600	9275	6625
2	Keonjhar	19	5450	8720	7630	5450
3	Jharsuguda	08	1750	2800	2450	1750
4	Angul	03	600	960	840	600
5	Jajpur	03	600	960	840	600
6	Mayurbhanj	01	200	320	280	200
7	Sambalpur	08	2300	3680	3220	2300
8	Dhenkanal	02	800	1280	1120	800
9	Cuttack	03	1250	20000	1750	1250
	Total	**93**	**19575**	**31320**	**27405**	**19575**

Source: State of Environment of Odisha 2006

Consumption of ground water

It is Odisha, where industries like steel and iron run through precious ground water, despite knowing that the aquifer of the state is depleting fast. Kalinganagar in Jajpur district is now at the centre of world attention. As many as 13 plants coming up in the Kalinga Nagar area. While some like Neelachal Ispat, Visa, Jindal and Mesco have already started production, others like JK, Aditya and Maharashtra Seamless are in various stage of completion. Drinking water sources has been the first casualty of this rush. Under the agreements signed with the government, the industries are supposed to draw water from river Brahmani. But in reality, nearly all of them meet their water needs by digging bore wells inside their premises rather than drawing water from the Brahmani. The indiscriminate exploitation of ground water by

the companies has resulted in the water table in the area falling drastically over the last few years. A decade ago, one used to strike water after digging just 12-15 feet in areas like Dasharathpur, Binjharpur and Korei. But now one has to dig at least 30 feet to get water. This is a case of bad decisions going worse. The state government had committed to supply water to these industries from the Brahmani river. Since the government is yet to complete its water delivery systems, the companies have chosen to make their own arrangements even while paying lip service to their obligation to wait for the government to make water available to them. Surprisingly, the administration has chosen to look the other way even though in a letter to all industries on 7th May 2005, it had itself asked them not to use ground water for industrial purposes. At a high-level meeting chaired by the Chief Minister on 6th July 2005, it had been decided to take action against the erring industries. At last count, there were no less than 40 deep bore wells dug in an area with a radius of 5 Kms.

Pollution of rivers by industries

Poised for rapid industrialization, Odisha could in the years to come face serious water pollution problems. The water in certain stretches of six major rivers- Brahmani, Mahandi, Baitarni, Rushikulya, Nagavali and Subarnarakha – in the state is unfit for human consumption.

The rapacity of the companies has not only led to scarcity of water in the surrounding villages. It has also contributed to the pollution of the water available. The situation is likely to worsen with over 40 steel, 13 thermal and 3 alumina plants, besides some cement plants, expected to come up in the state in the next five years.

River Brahmani is one of the major perennial rivers of Odisha. Two major industrial belts namely Roulkela and Talcher and new establishments downstream around Duburi along the bank of the river are polluting the water by discharging domestic, mining as well as industrial toxic effluents. At the upper end of river Brahmani, Rourkela Steel Plant, Rourkela Fertilizer Plants, Tensa Mining belt; along the middle belt, many coal mines of Mahanadi Coalfields Ltd, sponge iron factories, aluminium smelter plant of National Aluminium Company Ltd. at Angul, numerous thermal power plants in Talcher coal basin, use Brahmani river water and also degrade it with their effluents. Talcher Fertilizer Plant, Talcher Heavy Water Plant and at down stream mine discharges of Sukinda belt and industrial activities at Duburi are polluting the river water further. The deterioration in water quality has an adverse impact on human health and aquatic life directly.

The Ganda Nallah in Marthapur used to be the sole source of water for nearly 30 villages in Danagadi block of Jajpur district. Oblivious of this, Jindal and Neelachal Ispat have been releasing their industrial waste into it, polluting its water in the process. Of course, Jindal authorities maintain that they are releasing their waste into *Ganda nallah* only after necessary treatment. But given the fact that even public sector companies merrily continue dumping pollutants into Brahmani in the Angul-Talcher industrial area, the other major industrial belt in the state, the claim by a private – and by definition, profit-making company like Jindal has to be taken with a bagful of salt.

Neelachal Ispat contributes its share to the pollution of Brahmani by releasing its wastewater into the Andhari Nallah, which later merges with the Ganda Nallah. Ganda Nallah falls into the river Kharasrota which, in turn, falls into river Brahmani, the lifeline of the entire area. Thus, the pollution of the Andhari Nallah leads to the pollution of both Kharasrota and Brahmani. The people living in villages along the Andhari Nallah, who have been using it for bathing for decades, are now worry of taking a dip since it leads to skin diseases. Besides causing skin diseases, the pollution of Andhari also seriously threatens the fisheries project at Jokadia anicut, where Ganda merges into the Kharasrota.

Like Ganda, the Damashala Nallah too originates from the Mahagiri hills in the Sukinda valley and winds its way through the chromites mines belt before falling into the Brahmani. Misrilal Mines and BC Mohanty Mines of Saruabil, the IDC Mines of Talarangi and the Odisha Mining Corporation and Tata Mines of Kaliapani and several other mines use the water of Damashala for their mining operations and release their wastewater into it. Besides, chromites particles from these mines also mingle with Damashala, adding to its contamination. Over 70,000 people spread over scores of villages have been seriously affected by the pollution of Ganda and Damashala. The harmful effects of the pollution of these two water sources are not limited to Jajpur district alone. Several villages in neighboring Dhenkanal district too have suffered due to it. There was a time not long ago when hundreds of small farmers in Bhuban block used to meet their irrigation needs from Damashala. But this is no more. Apart form the facts that, simply is there not enough water in it, they also have to contend with the falling fertility of their land due to use of Damashala water for irrigation. The people of the area, like their counterparts in scores of villages in Jajpur district, also have to contend with the disease causing potential of Damashala.

The contamination of Odisha's water sources, particularly the Brahmani River, due to effluents coming from mining and other industrial projects, also had profound impacts on the livelihood

of non-Adivasis. About 500,000 people, mainly fishermen and farmers, comprising 1,800 villages were affected. The Brahmani River is the prime source of irrigation as well as soil nutrition for thousands of farms running through the Angul, Dhenkanal, Jajpur and Bhadrak districts of Odisha. There are reports of damage to seasonal crops and fruit-bearing trees which came in contact with this polluted water. There are even reports of pests becoming resistant to pesticides after coming in contact with the water. In the Damashala Basin, harvested paddy and leafy vegetables were found to contain chrome poison. Sugarcane and paddy cultivation have decreased considerably due to the polluted water. About 40 years ago, the Bramhani was the lifeline for the inland fishermen of Angul, Dhenkanal, Jajpur and Bhadrak. However, mining and industrial effluents have adversely affected the breeding and species composition of fishes, turning fishermen who have lost their livelihoods into daily wage earners or migrants. The pollution of the rivers also affects fish breeding in the river mouth of the region and the mangrove forests in the estuarine region.

The Mahandi river water is no better. Water in most part of the river has been categorised in C to E category by the Pollution Control Board. The Mahandi river water is not directly potable, except in the middle stretches near Kiakata where the pollution density is less. The pollution load on Mahandi is mainly from municipal and other domestic waste waters except Choudwar. The total industrial effluent released to the river Mahanadi at Sambalpur, Cuttack and Paradeep amounts to about 736 KLD, 2,780 KLD and 5,280 KLD respectively.

Mining: Making Greenary a Dream

River Ib, which is a tributary of Mahanadi, falls into the Hirakud reservoir. Pollution of this river had led to filing of, what is believed as, the first ever environmental law suit in India. The suit was filed against effluent discharge by Orient paper industry into the river at Brajarajnagar. The suit, filed way back in 1950s, was decreed in favour of the applicant. But subsequent legislation, under intense industry lobby, led to the decree being set aside by the High Court. The paper mill has closed its operations since more than a decade, but the pollution of Ib has increased further as hordes of coal mines and other industries now release their effluents into it. An exactly similar situation exists with the river Nagavali. Whose water flow is much less than the River Ib. On its bank, is situated another paper mill-M/S Straw Products Ltd. The problem of pollution of rivers Ib and Nagavali can not be solved unless effluents of the paper mills are totally diverted for Irrigation purposes after necessary treatment.

The most hazardous pollution of Rushikulya is due to Jayashree Chemicals, which discharges its mercury bearing effluent into the river. The poisonous gas from the factory and the effluents with mercury causes pollution in Ganjam and its nearby areas. Thousands of acres of agricultural field have lost their crops. Diseases like T.B. and other skin diseases are spreading due to this gas. Due to the pollution of Rushikulya, fishes die, causing decreases of catch day by day. Facing this acute problem, fisher folk have migrated from their native places. Due to chlorine gas emission, respiratory and other diseases like dysentery, night blindness, nerve weakness, anemia, loss of weight and skin diseases are seen in this area.

The MIG factories at Sunabeda, Aluminium factory at Damanjodi etc are the sources of pollution of the river Kolab. Subarnarekha's rich resource base has spelled doom for the basin. Between Mayurbhanj and Singhbhum districts, on the right banks of the Subarnarekha, are the country's richest copper deposits. The proliferation of unplanned and unregulated mining and mineral processing industries has led to a devastating environmental degradation of the region. Subarnarekha also has to bear radio active waste that enters the river through seepage from tailing ponds of the Uranium Corporation of India at Jadugoda.

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Chapter

12

Sharing Water

Sharing Antagonism

Water is no more finite contrary to the age old belief. Ringing bell has already begun. Doomsday prediction that third world war will be fought over water no more seems to be irrelevant. Rather war has already begun, right at our doorstep. Scarcity of water is causing conflict between neighbours, villages, states and nations. Odisha, the state perceived as water abundant, is in the thick of the things.

Interstate conflicts

Rule and constraints of political and geographical boundaries do not normally apply to water flow. But when that does, conflicts start. Rivers have their own geo-hydrological boundaries determined by their respective basins. When that rule is defied, natural nature of rivers are altered. As incidences of such unnatural interventions over interstate rivers are on increase by respective states on the basis of political considerations, serious conflicts are arising.

Water is a vital input for the current mode of development. Interest of the state governments in constructing different water projects has led to a boost in water economy. As the use of river water by one state affects the use in another, conflicts are mounting over planning or execution of projects on interstate rivers. The issue is no longer a legal one, as it affects the political and social strata of the riparian states. The conflicts heighten with ever-shrinking river flows.

Odisha has interstate river conflicts with all its neighbouring states. In fact, Odisha is a party to a conflict which has forced formation of river tribunal. The state is home to many interstate rivers like Subarnarekha, Mahanadi, Brahmani, Indravati, Kolab, Sileru, Nagavali, Vanshadhara and Bahuda. Serious conflicts have emerged over Jhanabati project, Bahuda, Balimela project, Jaunra, Upper Sileru project, Machhakunda and Ib river issues. The majority of conflicts arise for sharing water, sharing hydro electricity and flood control.

At different times, Odisha has entered into agreements with its neighbouring states like West Bengal, Bihar (then), Madhya Pradesh (then) and Andhra Pradesh to share interstate

river water. Some kind of agreements have been reached for sharing of rivers like Mahanadi, Ib, Subarnarekha, Bahuda, Vanshadhara, Nagavali, Indravati and Kolab. For other interstate rivers like Brahmani, Baitarini, Budhabalanga and Rushikulya, there are no such agreements. The following table shows the agreements entered into by the Odisha government from time to time:

Table:19

Agreements by Odisha Government		
Year	**Name of the basin**	**Name of the state-parties**
1983	Mahanadi	Madhya Pradesh, Odisha
1978	Subarnarekha	Bihar, Odisha, West Bengal
1978	Bahuda	Odisha, Andhra Pradesh
1962	Vanshadhara	Odisha, Andhra Pradesh
1978	Nagavali	Odisha, Andhra Pradesh
1978	Indravati (Godavari)	Maharashtra, Madhya Pradesh, Odisha, Andhra Pradesh
1975	Kolab	Odisha, Andhra Pradesh
1980	Godavari (Polavaram)	Odisha, Andhra Pradesh

Regardless of these agreements, Odisha is knotted in the web of conflicts with the neighbouring states. With rapid change in contexts and conditions, the terms of the agreements do not hold good in recent times. Rivers have changed characters, river flow assessments found improper or flow reduction have caused violation of agreements. These factors and dynamics have put severe strains on the existing agreements. Due to various reasons Odisha has found itself engaged with the neighbours on sharing Polavaram, Vanshadhara, Jaunra, Mahendratanaya and Machhakunda river water.

The legal and constitutional questions have put interstate river disputes into a more critical place. The provisions of Interstate River Disputes Act, 1956 rests the right of applying for a tribunal to a state when a conflict is not solved with negotiation. This provision brings unnecessary delay in solving such disputes. Polavaram is a bright example of this. It has been seen that negotiations persisted even after the decisions of the tribunals. There is no machinery to see the decisions of tribunals being implemented and there is no sanction if the decision is not respected. This provision restricts the central government to act in *suo motu* and requires a state to file complaint first.

Rivers are lifelines. The dependency of people on rivers is on constant rise but flow of it is decreasing. So these interstate conflicts are also directly affecting the livelihoods of people.

Intra-state conflicts

Apart from the interstate conflicts, Odisha is home to multiple intrastate conflicts. Various competing and conflicting users and uses are staking claims over the scarce resources and leading to emergence of conflicts.

Drinking Water vs. Irrigation

Food scarcities of 60's have encouraged government policies towards increased irrigation coverage. In this way, the users of drinking water and irrigation, which had until then been a singular entity, faced a process of separation. This change affected the basic foundations of common water resources management. It has led to degradation of water sources like tanks, lakes and rivers which were the common drinking water sources.

In the later stages, when ground water took the centre stage of water provisioning for drinking and domestic purposes, irrigation sector also saw potentials in that. As a result, the depth of extraction of ground water for irrigation purposes superseded the depth of extraction for drinking and domestic purposes, leading to drinking water crisis. The tunnel vision of both the departments aggravated the conflict, as, when drinking water sector forced to think conservative measures considering the scarcity, at the same time irrigation sector promotes more and more sources in the name of irrigation efficiency through subsidies.

Rushikulya river is a good example of the conflict between drinking water and irrigation. Water scarcity in Ganjam district turned crucial in recent years as Rushikulya, which is the lifeline of lakhs of people of the district, is reducing in flow. Rushikulya provides water for irrigation, drinking purposes and domestic uses of villages in 14 blocks and 8 small urban centres. The reduction in water availability has led to escalation of interest conflicts. In summer, people of the district are deprived of getting minimum supply of water from the Rushikulya system. If the proposed Pipalpanka dam project for TISCO (Tata Iron and Steel Company) will be constructed, it will have disastrous consequences not only on drinking water but also on existing irrigation system which covers about 70 percent geographical area of the district.

Drinking Water vs. Industries

High quantum of water intake by large and small industries in Odisha is straining poor people's access to drinking water. As industrialization is taking place with great strides, problems of

Sharing the limited resource

access to drinking water are getting that more complex. Day by day industries are booming in a larger scale and as their water requirement is also increasing rapidly, there is overdrawing of water from ground and as well as from existing reservoir sources. The basic requirement of drinking water has been affected. Examples can be cited of industries in Kalinga Nagar Industrial Complex at Duburi, which are extracting and using huge amount of ground water. The water table in the industrial complex is going down each day and local people are finding it hard to fulfill needs of drinking water.

Irrigation vs. Industries and Others

Water use conflict among the industrial use, irrigation, drinking water, flood control and power generation is taking a critical shape in the state. An impression is growing among common public and concerned citizens that government is more interested in providing water to the industries, that meeting the needs of irrigation. Government denied construction of Pipalpanka reservoir on river Rusikulya on the grounds of feasibility but later it vigorously pursued the same project for benefiting multinational companies like the Tatas in Gopalpur. Hirakud reservoir

is a classic example of conflicting water uses between irrigation and water intake by industries. Even after 25 years, canal network of Rengali dam project is yet to complete, irrigation coverage from it a miniscule. But large industrial projects, which were nowhere in the picture when the dam project was envisaged, have already started drawing water from it.

There are also other conflicts in and around Hirakud. Flood control objective requires that the reservoir should be as empty as possible before the monsoon period. Power generation and irrigation require the reservoir should be filled up to the brink. To add to this conflict, mines and industries located around Hirakud reservoir depend upon the reservoir for water intake as well as for disposal of affluent. As a result of this, fields in the tail end of canals of Hirakud are rapidly going dry. Water use conflict will emerge as a serious problem in the years to come as the state is wooing the industrial houses head over heals.

The lack of political will and conventional framework governing water resource planning, norms of access and service delivery in the water sector is responsible for many conflicts among the direct stakeholders. Water conflict in the nation and the state has now percolated in every level. They are aggravated by the existing framework, policies and mechanism to govern use of water resources. Conflicts basically arise over faulty water management and over drawals. Water conflict divides every segment of our society, political parties, states, regions and sub-regions within the states, districts, castes and groups and individual farmers. Water conflicts within and between many states now days are also taking a very serious shape. Water is radically alerting and affecting political boundaries all over the state, between as well as within the States. In Odisha, water conflicts are likely to worsen. Simultaneously mismanagement of water resources pose a significant threat to economic growth, social stability, security and health of the ecosystem.

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Chapter

13

Traditional Knowledge

Disappearing Acumen

An effective and efficient water management as the key to human survival and develop ment has emerged as a contemporary global issue, given its high requirement and scarce availability. This realization has necessitated evolution of new water management regimes aiming at striking a balance between the use of water as a basis of livelihood and its protection to help ensure its sustainability through present to future generations. This emerging trend has its repercussions in India since independence and newer water management interventions are being proposed and implemented throughout the country in different forms for providing basic necessities like food, drinking water, electricity, etc with more or little success.

Water harvesting and its management are as old as the civilization itself. In fact, village water harvesting structures are the most vital resources in providing basic necessity of water, security to both rural livelihoods and against disasters like drought and flood since the human settlement moved away from the riverbanks to the hinterland. The importance of water as a vital resource to all life forms and as an essential component of societal development can not be overemphasized. And under this presumption, traditional societies and communities must have some forms of water management and harvesting which ensured their life and livelihood. Recognizing the importance of water resource development, many ancient civilizations emphasized on various mechanisms of water appropriation, collection and distribution. In fact, water had taken a sacrosanct place and was deeply associated with the traditional custom, culture and development. Water management and irrigation systems in Odisha existed during the iron age, even irrigation works spread to the regions of ancient Andhra Pradesh and Tamil Nadu around 300 BC (M.S. Randhawa: A history of agriculture in India, Vol. 1. New Delhi). Though, comprehensive historical documents regarding water harvesting and its management in Odisha is not available, records still confirm the state was significant in paddy cultivation.

People of Odisha have traditionally been conserving and managing water through innovative methods. Some of these methods have survived the onslaught of time, erosion of values in the society, especially in water scarce parts of the state where these systems are still in

Traditional Water Harvesting Structure

vogue. Common and universal water harvesting and conservation structures like wells, ponds, tanks and step wells (*chua*) in coastal part of the state and *kata, bandha, munda, chahala, sagar* in western part of the state are outcomes of the farmer's deliberate and planned exposure to their natural environment. All these structures have definite roles and function and they supplement each other. There are a series of tanks found scattered across the villages of the state. These structures are excellent soil and water management structures used to stop the high runoff and recharge the groundwater, which in turn was used for irrigation and other agricultural purposes. The ubiquitous tanks, variously called as *gadia, pokhari, bandha, dighi, sagar* depending on its size and the associated geographical location are the important land and water management structures which save the villagers from natural disasters and insured their livelihoods. The structures save the villages from soil erosion and made the agricultural fields fertile and productive, simultaneously met their drinking and domestic water needs.

Village tanks or riparian commons (*Kata, Bandha, Munda, Pokhari* or even a community managed check dam) are the common property resources that encompass the intricate web of land, water plant and animal life. They encompassed complex issues related to ecology, economy and society. Rural social, economic, cultural and religious lives are deeply associated to village tanks and they are virtually inseparable parts of a village. The complex web of riparian commons and the interlinking among the ecology, economy and society for the sustainable use of

natural resources is quite significant. It suggests that village economy have bearing on the continued survival and management of the village common properties resources. This vital framework essentially strengthened village communities with the onus of its proper upkeep and sustainability. Under this assumption that the village's ecological, economical and societal framework is dependent upon the common resource and vice versa, village institutions developed to cope with that. The resource in this case is not land, water or forests in isolation, but an interacting system of all.

These traditional structures played a major role in reducing severity of droughts and famines. In 1897, when most parts of the country suffered from one of the worst famines of the 19th century, western tract of the state was scarcely affected. Despite the severe 1900 famine, the cultivators of Sambalpur managed to save half of their crops due to *kata*s. Because of the patronage extended by the Gond kings to the *gauntia*s, the *gauntias* kept these traditional water harvesting structures maintained for a certain period. For this they were given land called *bhogra* lands, free of revenue, equivalent to only 25 percent of the rent by the cultivators.

In other parts, political disturbances led to gradual patronage of water harvesting. Political instability during 1750 caused serious disturbances in the local community management mechanism. With the abolition of tribal authority, which resulted in the decay of irrigation works, the *gauntias* who were later known as *zamindar*s or landlords occupied more and more fertile lands. The peasants remained landless farmers and either worked for the landlords or captured lands on an annual lease basis. Thus the traditional western Odisha villages, which primarily constituted a settlement of peasants, started to disintegrate. The independent village economy gradually got diversified and the traditional community, which managed the water harvesting structures eroded. Consequently, the environmentally viable and sustainable water harvesting systems were subjected to large-scale abuses as in the recent times.

The Present Scenario

Land, water and forests are the three most important and essential natural resources for human existence. Communities have developed, over generations, their own knowledge system that took care of the conservation and sustainable use of the natural resource. In a multi-diverse country like India, where the indigenous knowledge system is much more profound than that of some other parts of the world that are not so rich in biodiversity, this phenomenon can easily be observed. To meet their respective physiological and sociological needs under different geographical set ups, communities have developed their specific indigenous knowledge

systems over centuries through layers of experimentation and validation with the environment, geography, and the whole ecosystem. These indigenous resource management options not only relate to sustainable development of their landscapes and livelihoods but also maintain their social relationships and institution.

The relative remoteness of most of our hill communities from external influences and contacts has kept these knowledge systems more or less intact. It has often been seen that these systems are quite resilient and possess the ability to withstand natural disasters. However, over the last few decades, development induced threats and invasion of neo-knowledge systems have caused havocs to these age-old knowledge based livelihood support systems.

Since time immemorial the tribal residing in the southern tract of the state, especially in Koraput, Malkangiri, Nabrangpur, and parts of western Odisha in Kalahandi, Sambalpur and Bolangir have been taking up shifting cultivation on such common lands on hill slopes with traditional knowledge governed by customary rules. These skilled natural resources managers have invested considerable time and energy in developing stone bunds, maintaining hedgerows and building nice terraces. These tribals have developed specific indigenous knowledge over generation of their constant exposures to the local biodiversity and experimentation with land and water. Indigenous land reclamation and its management is topographic specific and are intricately associated with local weather. There are various bunding technologies developed and validated over the years to tame water and soil for life sustenance.

Traditional knowledge, practice and the systems are deeply rooted culturally, socially and economically to the agrarian livelihoods. But in recent times, the process of modernization has influenced the whole systems into disarray. The disastrous situation to the community water management phenomenon is observed here, because the traditional village institutions are no longer existent. Farmers now prefer water sources to suit their crops and desire. They no longer want to breed conflicts of sharing and rationing among themselves with these common water harvesting structures. Village panchayats lease out the sources to private parties to carry out fishing and pisci-culture activities and farmers are left in the lurch.

The same incidences signify in regions where traditional institutions are non-existent. Farmers prefer their own sources and the liberty to use their own water. It may be due diversified economic pursuits and the disintegration of the whole system. The modern exploitative, intensive and extensive agricultural practices have caused affects to the natural vegetation in

the whole ecosystem and feeder channels. Now the village *munda*s are less protected and stand vulnerable to siltation and most of them are without any catchments to feed themselves.

The Decline

The traditional water management systems, which were interwoven finely with the social and cultural fabric of villages and with the village ecosystems, are now eroding fast. There are host of reasons for which our rich tradition could barely withstand and the very institution that developed on the edifice of morality started disintegrating.

Traditional water management was universally in practice in the state until 1886, the year famous for the worst ever famines that strike Odisha. It was only after the famine, well known as Naanka Durbikhya, that the idea of protective agriculture took shape. By 1900, the state had brought 2 lakh hectare under canal irrigation, but that confined to the four coastal districts Cuttack, Puri, Balasore and Ganjam (Maddox, 1920). The other parts of the state including undivided Koraput, Kalahandi, Bolangir, Sambalpur, Sundargarh, Mayurbhanj, Boudh, Dhennkanal and Keonjhar were dependent upon tanks, streams and other sources of water depending upon the suitability of topography.

The low rainfall in 1887-88 further boosted up the demand for canal irrigation while ample rainfall in 1892-95 resulted in steady decline in its demand. However, in the years of adequate rainfall there was no significant difference between yields in irrigated and un-irrigated fields (Maddox). And the contribution of canal irrigation to double cropping was marginal. (Choudhury, 1991)

The progress of irrigation during the pre-plan period suggests that though there was development of irrigation, a decline in total irrigated area was evidently noticed during the period from 1920 to 1950. In the coastal plains (undivided Cuttack, Puri, Ganjam, and Balasore) the total irrigated area decreased by 53.4 thousand acres due to demolition of canals and weirs by recurring floods (Census of India, 1951) on the other hand in the inland regions (comprising of the 9 undivided districts) dependent upon traditional sources like tanks, bunds, katas, diversion of hill streams, nallahs, and wells as the main source of irrigation. The irrigation systems in these areas was being controlled, managed and operated by local people.

The entire parts of western Odisha comprising parts of undivided Koraput, Bolangir, Sambalpur and Kalahandi were dependant upon tanks and wells for irrigation purposes. It is mentioned that Kuda communities are experts in creating such structures and the management group

popularly known as 'Sagar Rakhsya Jagir'. During the early 20th century there were 9087 water harvesting structures including 4,792 *Munda*, 1,455 *Bandha*, 1,240 *Kata* and numerous other sources used for irrigation purposes in Bolangir district alone. There were 405 tanks in Bandhapada, 244 in Tureikela, 600 in Sindhekela, 733 in Loisingha, 42 in Agalpur, 588 in Dhungripally, 272 Bangomunda, 667 in titlagarh, 552 in Khaprakhol, 79 in Kantabanji and 1,243 in Bolangir. (Patna State Settlement Record, 1935-37)

It is informed that by 1937, all these sources provided irrigation to 131,744 acres of agricultural land. Moreover, there were 39 irrigation projects in Jogisirda, 26 in Kutasingha which irrigated 557 acres, 20 in Budibahal, 21 in Nuagaon, 20 in Buguda which irrigated 507 acres, 22 in Bahalpadar, 20 in Nehrubanda. And most surprisingly all these irrigation projects are interlinked to each other. (Patna State Settlement Record, 1935-37)

It is informed that these traditional structures provided irrigation to 82,111 acres in 1919 and it increased to 126,743 acres through 5,630 water harvesting structures in 1936, which is further increased to 131,744 acres by 1937. What is more surprising and awe inspiring about the fact that all the irrigation projects and sources were maintained and operated by the local village communities or users associations. But with the state government's intervention, the minor irrigation department was handed over the functions of water distribution, operation and maintenance. Even the recommendations of M Visveswaraya in 1938 about entrusting distribution of water to cultivators by organizing Pachayats was least heeded. In order to further strengthen its grip over water resources, the state government initiated Command Area Development Agency. By then most of the indigenous experiments of managing water distribution and its maintenance of the water bodies has been phased out. Late eighties and early nineties once again witnessed the reemergence of people's participation through Pani Panchayats in managing their water resources. But this has achieved little or no success, because we have failed to understand the whole concept of people's participation in water management from traditional standpoint.

A typical traditional village of Odisha was characterized by an independent economy in itself. This economic relationship among the villagers contributed to a stronger social, cultural and religious bondage and intertwined the individual villagers together. Thus the commons properties or resources in a village was maintained and operated by the villagers as whole. This aspect of rural life ensured equity among the different water users. But in recent times, economic diversification, according to individual choice has brought sea change into the traditional caste-based profession. Now, a youth belonging from a farmer's family does not opt for

agrarian occupation. Increasing rural economic disparities and hierarchical societal orders have tremendously affected the commons property rights now a day. Influential and rich people have access to more water while poor and landless people are devoid of the entitlement.

Traditional knowledge, practice and the systems are deeply rooted religiously, culturally, socially and economically to the agrarian rural lives. In fact, traditional village communities are larger or joint families, having a common interest, the same religious spirit, common folks, norms and cultural values and a sense of religious sentiment more or less is attached to the common property resources like pond, grazing land, the village forests, etc. Village common properties, especially water resources and sources in a traditional village had been associated to their religious sentiments. They were inseparable parts of many religious, cultural and social rites and rituals of the village communities. Thus, any work related the resource or source considered sanctity and the objects revered among the villagers. It is the awe inspiring fear mingled with reverence; they see to it that their commons properties were well maintained. But in recent times, the process of modernization has disintegrated the unique religious fabrics.

Community participation cannot be an outcome of a guided effort; it comes from within- from their attitude towards each other. Just like familial rules and regulations can not be directed so also organizing communities into a common whole is rather spontaneous. Now as it has been noticed that village communities are disintegrating and village Panchayats remain a political group than anything else, the farmer entities are individually going for private owned water sources for farming. While a rich farmer goes for a borewell or set up a tank for irrigation purposes, a poor farmer goes for a dug well; unmindful of the quota of water entitled to him. On the other hand a land less farmer does not have the voice to claim his entitlement.

In certain cases, especially in tribal belts, where the villages are associations of people of the same race, the remarkable achievement in managing their commons properties are very noteworthy. It is observed that the racial feeling, the socio-economic relationships among the villagers and certain religious sentiments are important factors in preserving and maintaining the economically and environmentally feasible sustainable sources as a whole.

In the pre-independence era the rulers, *zamindars* (landlords), *gauntia*s and village communities took a keen interest in tank construction and encouraged to construct such structures. Abolition of *zamindari* and *gaunti* in the post-independent era led to an end of private ownership, and the confiscated tanks were vested in State Governments and, in some cases,

handed over to village Panchayats. On the one hand, state was not so efficient, and Panchayats lacked resources to manage the property, and on the other people, bereft of access to tanks, lost interest in their management. The general presumption that Panchayats should managed the tanks efficiently fell flat, since these bodies are not as coherent as the traditional local village councils and village institutions that used to operate on the principle of caring and sharing. Consequently, tanks became open-access systems, and all the farmers in the command area could receive access to water even without any obligation to help in the management. It became business of everybody but responsibility of none. This resulted in a gradual breakdown of the traditional system due to lack of repair and maintenance of the tanks.

In case of other structures that were taken over by the state government, operation and maintenance laid with the government through a separate department. State intervention in irrigation caused an intensification of inequality and began the process of alienating the peasants from irrigation water. This process deprived the local farmers and landless of control over water and resulted in an increasing dependence on colonial state. This accounts for the gap between the beneficiary and the facilitator. It is the duty of the state government to provide irrigation - such mindset developed among the farmers and it continues till date. Thus the traditional village institutions that took care of the sources lost its significance.

Non-maintenance of the water harvesting structures with the absence of a responsible caretaker led to encroachment of the catchments in many of the *Kata*s and *Munda*s in western Odisha. This led to disappearance of almost 80 percent of such traditional structures.

The post independence era witnessed major developments in water resources with construction of large irrigation projects like Hirakud, Rengali etc. as a need based requirement of Green Revolution. The government's focus turned to large-scale irrigation schemes and this replaced the traditional small structures with large dams and reservoirs. Dams became modern temples for the country. The laboratory-generated seeds needed more water, more fertilizers and more pesticides which could be met only by such large irrigation projects with a lot of water. When subsidized water was made available to the farmers, they started to neglect their old traditional structures. People no longer needed to contribute for the upkeep of the existing water sources. This resulted in the large-scale encroachment on tank-beds and embankments for farming, establishment of the industry and several other reasons.

At the administrative and policy making level the far reaching changes in land and water use, taxation, forest policy, and administrative structural changes in the colonial government in the

19th and 20th century severely disrupted traditional water management practises. The subsidized availability of inputs for agriculture, subsidized electrical devices to lift water, subsidized fertilizers contributed less dependence upon tank silts- all this led to disintegration of traditional water harvesting structures.

Plethora of options and alternatives are now available to the farmers in the post independence period such as canal and deep bore wells. During the British rule these community management systems survived because they were efficient and made possible collection of land revenue at higher levels. After independence agricultural land was not seen as important source of revenue. Instead, state's policy to enhance the control over the resources resulted in the takeover of the tanks by the Minor Irrigation Department. This led to breakdown of the community control and management practices that were so vital for the sustainability of the system. A substantial number of tanks so acquired by the state have fallen into disrepair because on the one hand village communities have stopped contributing the voluntary labour for desilting and upkeeping of the tanks and on the other state is not able to perform or pay for the functions earlier executed by the people. State has on the other hand shown, by design or default, that it is better to construct the new large dams rather than revive the efficient network of the village tanks across the geography.

Critical Appreciation

The traditional structures have excellent water management capacities – both of excess supply and of water stress conditions. The interventions are small but crucial to the life. This way the farmers can protect their fields from being infertile, check soil erosion, and harvest water for future use, and insure their crops from vagaries of monsoon.

It is still noticed that indigenous knowledge in water and land management is in practice in most backward villages where the village institutions are very strongly interwoven. But social, cultural, economical differences among the village community in recent days have contributed disintegration to such village institutions and the traditional institutions is fast eroding to the onslaught of modernization. It was clearly perceptible that the structures of riparian commons traditionally managed by village formal or informal institutions are no longer existent. There are many hypothetical and perceptible reasons that contributed to this disintegration of such informal groups.

The mid-eighties and early nineties witnessed reemergence of participatory irrigation management with user groups entrusted with the operation and maintenance process. This

Traditional method of irrigation

was considered as forced departure from government owned management system as that model of management was found severely incapable of delivering and the government too was looking an escape route from escalating burdens. But as it has been observed this participation is rather a 'guided participation' rather than a 'voluntary spontaneous one' and it is more bureaucratic centric and empirically it underlined that 'Operation and Maintenance' has to be done by user groups in consultation with Irrigation Department.

For these above reasons or may be due to certain region specific circumstances dissolution of such local management groups boosted up privately owned sources which are apparently breed less conflict and requires less maintenance. The check dam constructed by the effort of three farmers is an ideal case here. They belong to the same village, and are blood relations. Water rationing, repair and maintenance are done through mutual understanding. But labour sharing among the farmers is not seen in these days. If one has to water his land situated on two three plots away from the source, he himself has to make the arrangement of canals to his land.

* * *

Chapter

14

Participation

Confined in Policy Prescription

The growing world population has not only led to more requirements for water, but with that it has also led to an increase in the per capita demand of it. As various needs have grown in size, dimension and nature, competitive and conflicting uses and users have also grown. This alters a fragile balance of demand and supply of water. The possible fall in the availability of water due to global warming further complicates the situation. In the present context, traditional approaches with their top-down and sector-based approach; and failure to integrate ecosystems and land management in planning and implementation of water resource use and development can hardly be expected to work. That is why there is need for new thinking and solutions. Integrated Water Resources Management (IWRM) has evolved out of this yearning for a new approach that takes into consideration all these factors, besides emerging realities. IWRM gives optimum emphasis on participatory approach; involvement of users, planners and policy-makers at all levels for water development and management.

Considering the global demand for better management of water and experiencing the above said problems in water sector, both central as well as state government have started thinking in the same line. Even the thought has been reflected in various policies related to water from time to time. 'Participation has become the new *mantra'* that is supposedly a panacea for all the ills afflicting government schemes in the field of water - irrigation management, drinking water, watershed development, operation and maintenance of tube wells and so on. The government-centric approach that was followed for decades had spawned a system where the community increased its dependence on the government apparatus for everything from the creation of the infrastructure to its repair and maintenance without any stake in it. In any case, it was becoming increasingly clear that the government was in no position to deploy the huge amount of financial and human resources to run these facilities. The realisations that the assets created are highly unlikely to achieve their intended objectives unless people have a stake and a sense of ownership in them led to the creation of institutions like Pani Panchayats, Water Users' Associations, Watershed Committees etc. to facilitate the process of people's participation. But the experience of the drive to ensure participation so far has thrown up a host of questions. Is participation an end in itself or only a means to the larger

goal of giving the people 'ownership'? How serious is the bureaucracy about ensuring genuine participation of the people? Is there a mechanism to measure the level of people's participation? Does it foster unity among the people? Of particular interest to us is the process that has been followed in ensuring participation and the institutions created to facilitate such participation. Let's have a look into the policy and practice aspect of participation.

The Policy Prescription

The National Water Policy of 1987 was probably the first policy related to water management, that spoke about participation. In 1994, Odisha Government came out with a water policy for the State with an objective- "Promotion of citizen participation in all aspects of water planning and management". Following the National Water Policy of 2002, where it has been clearly mentioned that the involvement and participation of beneficiaries and other stakeholders should be encouraged right from the project planning stage itself, Odisha Government again came out with a water policy in 2007. This policy spoke more about participation in segments like State Water Plan, project planning, irrigation and water resources management and promotion of citizen participation in all aspects of water planning and management. The policy mentioned about 'Participatory Irrigation Management'. It has also stated that management of water resources for diverse uses should incorporate a participatory approach; by involving not only the various Governmental agencies but also the users and other stakeholders, NGOs in an effective and decisive manner in various aspects of planning, design, development and management of the water resources schemes. Water Users' Associations and the local bodies such as municipalities and Gram Panchayats should particularly be involved in the operation, maintenance and management of water infrastructures/facilities at appropriate levels in a progressive manner with a view to transfer eventually the management of such facilities to the user groups/local bodies. In 2007, the State Water Policy of Odisha came in the line of National Water Policy of 2002, which speaks clearly about participation starting from planning and development of water resources to irrigation.

In drinking water sector, the prescription for participation was rather prominent. In 'Sector Reform Project' (SRP), the term 'participation' is used in the introduction of the programme. Reforms were introduced in Rural Water Supply sector to institutionalize community participation in Rural Water Supply Programme for ensuring sustainability of systems and sources. The Sector Reform Project was introduced in April 1999 in 67 districts of 26 States including three districts of Odisha that are Balasore, Ganjam and Sundargarh. Adoption of a demand-driven approach based on empowerment of villagers to ensure their full participation in the project planning, decision making in the choice of scheme design and management arrangement was the focus. It has also been written that "the main objective of the Sector

Women participating in a village meeting

Reforms Project is not just physical implementation of a water supply scheme, but institutionalization of the concept which envisages to enhance the awareness among the rural people by demystifying various possible RWS technological options, the merits and demerits of each option, their cost differences, the importance of people's participation, and to equip the rural population to plan, sanction, partially fund, implement, operate, maintain, manage and replace the Rural Water Supply Scheme of their choice themselves".

After that 'Swajaldhara' scheme came. This was an extended and wholesale version of 'Sector Reforms'. This scheme spoke a lot about participation. In the preface of the policy guideline it has been clearly mentioned that "The basic concepts of the reforms include community participation in the planning, implementation, operation and maintenance of the schemes of its choice. This is a paradigm shift from supply driven to a demand responsive approach, centralized to the decentralized service delivery, from the top down to the bottom up approach and ultimately to change the role of the Government from that of a service provider to a facilitator. The Guidelines provide operational flexibility to the State Governments and implementation flexibility to the districts and Gram Panchayat level institutions. Community participation has been further strengthened. Role of the Panchayati Raj Institutions and, involvement of women in the entire scheme cycles have been emphasized". In principles also it has been mentioned that "adoption of a demand-responsive, adaptable approach along with community participation based on empowerment of villagers to ensure their full

participation in the project through a decision making role in the choice of the drinking water scheme, planning, design, implementation, control of finances and management arrangements". In institutional setup, it has been mentioned that "Village Water and Sanitation Committee (VWSC) under the Gram Panchayat will implement Swajaldhara schemes in the Gram Panchayat".

In irrigation sector also participation appears in the forefront. The National Water Policy of 1987 has strongly recommended the adoption of Participatory Irrigation Management (PIM) as an essential strategy for improvement in the performance of all irrigation projects in the country and involvement of farmers in various aspects of management of the irrigation system; especially in water distribution and collection of water charges. The Water Resources Consolidation Project (WRCP) was the new generation irrigation project assisted by the World Bank. The first step made in this process of reform was to hand over a part of the network of the canal/ irrigation system for its O&M to the farmers or the beneficiaries through water user's associations (WUA) or Pani Panchayats. Odisha is one of the pioneering States to legislate PIM with Odisha Pani Panchayat Act-2002 and Odisha Pani Panchayat Rules-2003.

The Practice So Far

The prescriptions made in various State and National policies include a grassroots based approach and are people centric design. But there is no clear cut room for monitoring. No such legislation is there to track and assess the field level executions and practices. If we will look at the drinking water sector, which speaks much about participation, there is hardly any information about assessing participation at the community level. The participation level is not reflected truly by the indicators provided through the policy.

In the drinking water sector, the aim of adopting a participatory approach in the policy was to enable the community to participate in the planning phase, implementation phase and operation and maintenance phase. The planning phase includes community participation in planning the technology, cost, location etc. The implementation phase includes the execution as per the plans. The operation and maintenance phase include the community participation in decisions regarding the timing of supply, duration of supply, person(s) responsible and his remuneration, repairing etc. The practice so far reveals that the problem starts in the pre plan phase, when the Village Water & Sanitation Committee (VWSC) is instituted. VWSCs are formed in pen and paper and projects are executed on a target basis. The VWSC is a representative of the community which ensures 10 percent contribution towards installation of the structure and opening of an account. The reason behind asking the community to contribute was to make the community feel responsible for the maintenance and develop a sense of ownership. But

in actual practice, it is seen that this amount is deposited by a couple of persons who are lately refunded by the contractors for this. Public contribution, which is the first step to ensure participation, is often made by contractors who take it as an investment for the profit in the project contract. After the refund, the persons do not take interest in raising a corpus fund. As the community does not contribute for the deposit, no corpus fund is been created to meet the expenditure for operation and maintenance. Finally, the inability to pay for the electricity bill and other maintenance needs lead to a permanent dysfunction. If we will give a fresh look to the structures created under Sector Reforms and Swajaldhara projects, we can find those mostly defunct or mal-functional.

Let us have a look at the Participatory Irrigation Management, popularly known as *Pani Panchayat*, in the irrigation sector. According to provisions, irrigation management transfer is defined as the transfer of responsibility and authority for management of irrigation services from the government agency to the users association. But the ownership of the irrigation scheme and infrastructure etc still rests with the government. Only tertiary or secondary canals, minors, sub-minors and water sources are handed over to the user groups where the irrigation agency manages the head works such as dams, weir head regulators and main canals etc. There is a clash between the impressions of the Irrigation Department and farmers. The department is of an impression that the farmers cannot maintain the head irrigation

Lack of community participation in projects leading to privatization and community unrest

system properly and in the other hand there are farmers who think that they can manage the head system better than the departmental staffs. Under the provisions of Pani Panchayat Act, farmers will assist the revenue department for collection of water charges but they have no right to collect the water charges from the farmers. In this case, it is absolute that the government has no faith upon the farmers and it believes that if the latter would collect the water charges, it is most likely that they would misuse the fund. In this mistrust prevailing between the government and the farmers, one can see how participatory the Participatory Irrigation Management is. Apart from this, there is a growing confusion and misunderstanding over the powers and jurisdictions exercised by the Irrigation Department and the Revenue Department. The Irrigation Department is empowered to supply water and maintain the canal system. However, it does not feel accountable to the farmers as it does not receive payment for its services. It is to be noted that the Revenue Department collects water charges from the farmers. There is also no proper assignment of the water charges for operation and maintenance (O&M) of the concerned project. At the grassroots level, the farmers are under the impression that the funds, administrative power, financial power and the equipments supplied to them by the government are grossly misused by the Pani Panchayats and no transparency is maintained by the executive members of the Pani Panchayats or the project committees. In some other cases, the farmers feel that the O&M of irrigation structures is the duty and responsibility of the irrigation staff and the government is exerting extra pressure on farmers through Pani Panchayats without any additional benefits. All these above-mentioned problems stand in the way of smooth formation and operation of the Pani Panchayats.

Genuine community participation remains a far cry even after years of efforts to bring the people on board. None of the institutions listed above can be called an institution 'by the people, of the people and for the people'. The institutions that have replaced existing ones are essentially meant for 'consumers' of water rather than the community as a whole. How else does one explain the fact that only those who can share a part of the capital cost, besides expenses on account of operation and maintenance, can become members of such bodies? The structural aspects in the policies have always superseded the social aspects. The hasty transfer of the system to the community leaded to non fulfillment of social aspects like ensuring the responsibility sharing, ownership feeling etc. As a result, a gap between the policy and its beneficiaries came up. Ground level initiatives are needed for strengthening the policy objectives. After all, we do not formulate policies for the sole sake of formulating policies.

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References

- Water Resources Department, Government of Odisha
- Department of Drinking Water Supply (DDWS), Government of India
- Rural Development Department, Government of Odisha
- Panchayati Raj Department, Government of Odisha
- Waterwise (An electronic newsletter of RCDC)
- *Jala Jeevana Sambad* (A quarterly newsletter of RCDC)
- Odisha Prasanga
- Odisha Economic Survey, Government of Odisha (for various years)
- Statistical Abstract of Odisha, Government of Odisha (for various years)
- Odisha Budget, Government of Odisha (for various years)
- Audit Reports of Comptroller and Auditor General, Government of India (for various years)

Abbreviations

ARWSP	-	Accelerated Rural Water Supply Programme
BCM	-	Billion Cubic Meter/Billion M^3
CGWB	-	Central Ground Water Board
GoI	-	Government of India
GoO	-	Government of Odisha
GP	-	Gram Panchayat
GSDP	-	Gross State Domestic Product
Ham	-	Hectare Meter
Hect / Ha	-	Hectare
IWRM	-	Integrated Water Resources Management
KBK	-	Kalahandi-Bolangir-Koraput
KLD	-	Kiloliters Per Day
LPCD	-	Liter per Capita Per Day
Mham	-	Million Hectare Meter
MIP	-	Minor Irrigation Project
MLD	-	Million Litre Daily
MM	-	Millimeter
MT	-	Million Ton
MTPA	-	Million Ton Per Annum
NGO	-	Non-Government Organisation
NSDP	-	Net State Domestic Product
O&M	-	Operation & Maintenance
PIM	-	Participatory Irrigation Management
PMGSY	-	Pradhan Mantri Gram Sadak Yojana
RWS	-	Rural Water Supply
SEM	-	Self Employed Mechanics
Sq. Km.	-	Square Kilometer
SRP	-	Sector Reform Project
TB	-	Tuberculosis Bactrum
TPD	-	Tons Per Day
VWSC	-	Village Water & Sanitation Committee
VWSC	-	Village Water Sanitation Committee
WHS	-	Water Harvesting Structures
WRCP	-	Water Resource Consolidation Project
WUA	-	Water Users Association

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