Seven New Barrages: Giving birth to many conflicts

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Chhattisgarh became the 26th state of Indian union on 1st January, 2001. One of the reasons behind the demand for a separate state was the economic and social backwardness of region despite the abundance of natural resources. Chhattisgarh to enable economic development had introduced a new industrial policy in 2009 to attract investments from private players and spur economic development in the state. These private companies have shown great interest in setting up new power plants and steel plants in the state due to easy availability of coal, iron ore and water in the area. As industries have grown, the industrial demand for water has increased rapidly.

The state government has decided to build new barrages and anicuts on the rivers of the state to fulfil this increasing demand of water from industry. The state government is currently building 495 small, medium and big projects on different rivers in state to fulfil water needs of state (Singh, 2009). Some of these structures are being built with private capital, which may change the nature of ownership of water resources. There will be far reaching impacts if these water resources become private property as, a lot of consumers will subsequently be excluded. As shown by studies, the cost[1] for excluding consumer or users from water is very high (Pacific Coast Environmental Metrics, 2009). One such case is the new industrial barrages being built on the Mahanadi with private capital, which the evidence shows, is likely to supply water to industries only at the cost of the livelihoods of local farmers.

In this study I am trying to inquire whether or not privatisation of water resources is taking place and if privatisation of water resources is taking place then to what extent is such activity taking place while introducing the case of new industrial barrages in construction on the Mahanadi in Chhattisgarh. While enquiring into this question I am looking into the conflicts arising out of the construction of the barrages on the Mahanadi and its impact on

[1] Cost includes social cost to a consumer as well as economic cost which he would bear in order to fulfil basic needs.

the livelihoods of the people throughout the region. This case study was researched and written for an internship project of two months, as a part completion of my academic requirement for post-graduation. The case study is field based research which has used interviews of various stakeholders and an analysis of project documents and news articles as primary methods. The first part of the study deals with the meaning of water resource privatisation, second part is a brief profile of new barrages. Third part of study is with a brief socio economic profile of the region in which these barrages are being built. The fourth part of the study analyses the conflict which may arise or is arising in the region due to these barrages and the nature of conflicts which is going on in the area. The fifth and final part of study suggests a way to mitigate existing conflicts in the region and to avoid conflicts in future.

Meaning of Water Resource Privatisation

Goods are classified mainly under four categories, public, private, toll and common property resources on the basis of two attributes excludability and subtractability (Pacific Coast Environmental Metrics, 2009). Excludability includes both cost to exclude consumers and cost of excluding consumers while subtractability means how much good will left after consumption by a consumer (Pacific Coast Environmental Metrics, 2009).

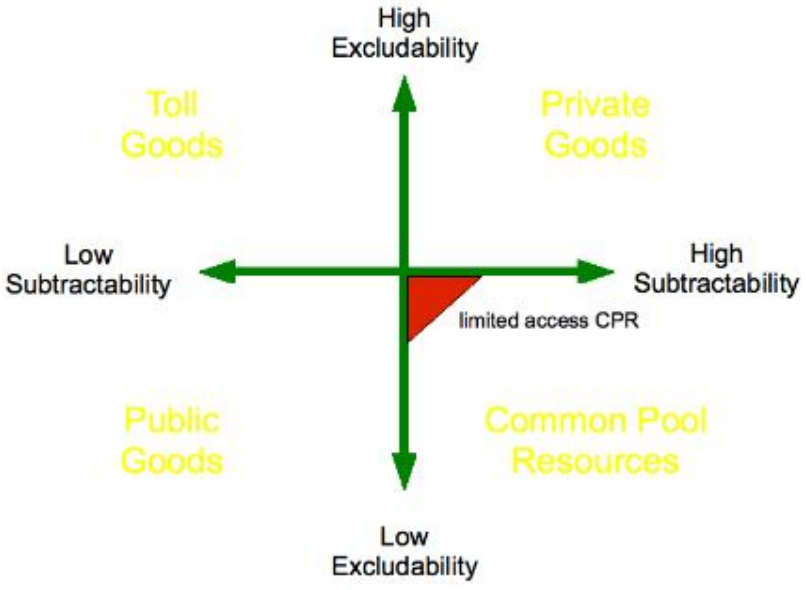

Figure 1: Classification of goods on the basis of excludability and substractability (Ostrom, 2005)

Water resources for instance are a common pool resource as they are high in subtractability and low in excludability because if anyone uses a drop of water that cannot be used by anyone else and cost of excluding consumer is very high as water is basic necessity of life. These water resources then become private if private parties succeed in excluding certain consumers from accessing it.

New Barrages on Mahanadi: A Profile

The Chhattisgarh Government has signed 61 MOUs with various companies to establish power generation capacity of 50,000MW electricity with an investment of 25,000 crores (George, 2010). The state government has attracted huge investment in power generation from private players. There are 37 new power projects has been proposed in the Janjgir Champa district alone. These power plants are coal based thermal power plants which need continuous supply of huge amount of water for cooling and other purposes (Technical Study: Best Practices in water Usage in Coal Based Thermal Power Plants, 2013).It is for such power plants, that the State government has begun constructing barrages to satisfy most crucially their need for water in the summer months.

Of the total, 7 new barrages are being built on the Mahanadi and one on the Hasdeo River, at an estimated cost of 1,572 crores (Deshbandhu, 2011). It was expected that these barrages will generate 628 crores for the state exchequer through annual water charges (price of water per Cubic Meter)(Deshbandhu, 2011). These barrages will supply water to more than 45 power plants in three districts of Chhattisgarh(Navbharat, 2011).

The construction is taking place in three districts Raipur, Janjgir-Champa and Raigarh. There are four barrages in Janjgir- Champa, two in Raigarh and one is in Raipur district. One more barrage has been proposed in Raipur district, which is not in construction phase. Though the water stored in these barrages will ostensibly be fully reserved for industries, (Navbharat, 2011) the State government adds that these barrages would not only provide water for industry, but will also lift the water table up in the surrounding areas which will be better for people living there (Deshbandhu, 2011). The project proposal too states that the second objective of these barrages is to lift the water table in the areas they are being built, ignoring the fact that flow will reduce in downstream especially in summers when the river has a very lean flow. The increased water table it states that it will help farmers by

increasing availability of water for irrigating their crops and will therefore increase the crop yield in these areas.

These barrages are all being built on the basis of a similar financial model by the Department of Water Resources, Government of Chhattisgarh. The department has in turn outsourced the construction to private companies through a closed bidding process. The construction company will also operate and maintain the barrage for two years after completion of construction. After this period the department will operate and maintain the barrages by itself. The ownership of barrage will remain with the government.

The money for the building of barrages has been contributed by the private companies which will take water from the barrage. In the case where there are multiple companies which will take water from one barrage they will invest money in proportion to their respective water usage. The government will not pay any interest on the money given by companies for building the barrage. This money has been paid as advanced water charges by the companies for their future water consumption. The Department of Water Resources will adjust this advance money in the annual water bill of companies. The state government is currently charging Rs 2/m^3 for the water withdrawn by companies directly from river for construction purposes, the water prices will be hiked to three times once the construction of barrage will complete (S L, Yadav, Executive Engineer, Department of water Resources, Janjgir-Champa, Personal Communication, June 19th, 2014). These barrages will supply water to companies in the summers, in other seasons companies will withdraw water directly from the river (S L, Yadav, Executive Engineer, Department of water Resources, Janjgir-Champa, Personal Communication, June 19th, 2014). The details of these barrages are in the table below.

Table 1: Details of Barrages on Mahanadi

S. No.	Name of Barrage	River	Location	Cost (In Crores)	Reservoir Capacity (MCM)	Total Allocated Water as per Jaldhara[2] (MCM)	Land Submerged	Name of Power Plant	Amount of Water Allotted as per statement in Vidhan Sabha[3] (MCM)	
									Annual	Summer
1	Saradih Barrage	Mahanadi	Saradih, Raigarh	399.03	54.24	127.83	-	IND Bharat Ltd (600 MW)	20.00	4.50
								Visa Power Ltd (1200 MW)	35.00	7.87
								BEC Power Ltd (505MW)	14.50	3.26
								SKS Ispat Ltd. (600+600 MW)	35.00	7.87
								RKM Jain Power Pvt. Ltd. (1400 MW)	44.83	10.09
								DB Power Ltd.	--	1.66
								NTPC Lara	45.00	15.18
								SKS Ispat & SKS Power Generation Ltd	38.00	3.81
								Total	232.33	54.24

[2] The amount mentioned in Jaldhara, a report published by DOWR in 2013.
[3] The amount of water allocated various companies from new industrial barrages, as per Vidhansabha proceedings of question hour in 2014.

S. No.	Name of Barrage	River	Location	Cost (In Crores)	Reservoir Capacity (MCM)	Total Allocated Water as per Jaldhara[2] (MCM)	Land Submerged	Name of Power Plant	Amount of Water Allotted as per statement in Vidhan Sabha[3] (MCM)	
									Annual	Summer
2.	Shivarinarayan Barrage	Mahanadi	Shivarinarayan, Janjgir-Champa	122.61	37.00	54.00		Jindal Steel & power Ltd. (3.2 MTPA steel plant + 600 MW Power Plant)	--	9.45
								Karnataka Power Ltd. (1600 MW)	52.00	17.55
								M/S KSK Mahanadi Power Co. Ltd. (3600 MW)	--	10.00
								Total	52.00	37.00
3	Basantpur Barrage	Mahanadi	Basantpur, Janjgir-Champa	233.54	50.62	286.00	62.322	Sona Power Ltd.	20.00	4.50
								Jindal India Ltd.	36.00	8.00
								M/S KSK Mahanadi Power Ltd	100.00	12.51
								Adhunik Thermal energy Ltd.	32.00	7.20
								NTPC Lara	35.00	10.81
								Jindal Steel & power Ltd	--	0.50
								Moserbear Power Ltd	36.00	7.10
								Total	259	50.62

S. No.	Name of Barrage	River	Location	Cost (In Crores)	Reservoir Capacity (MCM)	Total Allocated Water as per Jaldhara[2] (MCM)	Land Submerged	Name of Power Plant	Amount of Water Allotted as per statement in Vidhan Sabha[3] (MCM)	
									Annual	Summer
4	Mirouni Barrage	Mahanadi	Mirouni, Janjgir-Champa	348.37	52.65	165.00	64.00	Athena CG Ltd (A)	15.00	3.38
								Athena CG Ltd (B)	20.00	4.50
								NTPC Lara	-	9.00
								Top worth Ltd	13.00	4.70
								DB Power Ltd	20.00	7.25
								Jindal Steel & Power Ltd	--	17.07
								Nalawa Steel & Power Ltd	20.00	6.75
								Total	88.00	52.65
5	Kudari Barrage	Hasdeo	Kudari, Janjgir-Champa	118.81	15.60	60.00		CG State Power Generation Co	60.00	12.04
								CG Steel & power Ltd.	1.50	0.38
								Prakash Industries Ltd.	15.25	1.02
								Total	76.75	13.44

S. No.	Name of Barrage	River	Location	Cost (In Crores)	Reservoir Capacity (MCM)	Total Allocated Water as per Jaldhara[2] (MCM)	Land Submerged	Name of Power Plant	Amount of Water Allotted as per statement in Vidhan Sabha[3] (MCM)	
									Annual	Summer
6	Kalma Barrage	Mahanadi	Kalma, Raigarh	182.03	50.39	251.83		Monnet Ispat Ltd	9.96	2.24
								JSW Ltd	35.00	7.88
								TopWorth Ltd.	23.00	5.18
								Jindal Power Ltd.	70.00	15.75
								DB Power Ltd (A)	20.00	4.50
								DB Power Ltd(B)	20.00	2.84
								Korba West Power Ltd. (A)	20.00	4.50
								Korba West Power Ltd. (B)	15.00	5.06
								Mahavir Global Ltd	9.75	2.19
								Mahavir Energy Ltd	1.12	--
								Surya Chakra Power Ltd	9.50	--
								Jindal India Ltd	36.00	--

S. No.	Name of Barrage	River	Location	Cost (In Crores)	Reservoir Capacity (MCM)	Total Allocated Water as per Jaldhara[2] (MCM)	Land Submerged	Name of Power Plant	Amount of Water Allotted as per statement in Vidhan Sabha[3] (MCM)	
									Annual	Summer
								Chambal Infrastructures Ltd.	35.00	--
								Jindal Steel & Power Ltd	42.00	--
								Cosmos Sponge & power Ltd	20.00	--
								Nalwa Steel & power Ltd	20.00	--
								Jindal Steel & Power Ltd.	88.00	--
								Total	473	50.14
7	Samoda Barrage	Mahanadi	Samoda, Raipur	159.02	27.00	36.00		GMR Energy Ltd (1370 MW)	36.00	--
8	Chichpol Barrage	Mahanadi	Chichcpol	127.62	--	8.08		Adhunik Power & Natural Resources Ltd, (1000 MW)	8.08	--
9	Kudurmal Anicut	Hasdeo	Kudurmal, Korba		8.862	38.00		Lanco Power	38.00	--

Source: (Department of Water Resources, 2013), (Department of water Resources, 2014)

Socio- Economic profile of Affected Population

This region is primarily agricultural and known as the Rice Bowl of Chhattisgarh. The land of Janjgir Champa is being irrigated by Hasdeo-Bango Project while Raipur, Baloda bazar and Raigarh are being irrigated by either the Mahanadi or its tributaries. The people primarily affected by the barrages belong to the OBC category, while some of the tribes in ST category will also be affected. These barrages will submerge around 1000 hectares of agricultural land along the bank of the river. There will however be no displacement of any human settlement.

The riverbed of Mahanadi is being cultivated currently by landless Kevat tribes in summers. These tribes will not able to cultivate on the river bed any more. This will result in the loss of livelihood of approximately 175,000 Kevats along Mahanadi (Mishra, 2014).

Conflict from Barrages

These barrages are currently generating conflict on the subject of land acquisition and the relevant compensation for the land which will be submerged but they will also generate many other conflicts after completion. These barrages will submerge land along the banks of the Mahanadi and land along the banks of water channels merging with the Mahanadi. The state government however is giving compensation only for land submergence on the banks of Mahanadi. It is not considering the fact that when water level in river will rise after completion of barrages, the water level in channels merging in Mahanadi will also rise, which will submerge land on the banks of these water channels. State government is not giving any compensation for this land (Gowda, 2014). Secondly, Department of Water Resources has acquired land in some villages (Kharod, Devraha, Basantpur, Chicholi etc.) without conducting public hearings or announcing compensation in these villages. In the villages wherever public hearings have been held and public compensation has been announced, the amount has not been disbursed. The manner in which public hearings have been held is also called into question, hearings have been chaired by local collectors and sub divisional officers which is against established norms. The farmers are also not happy with the compensation amount announced in some villages; they state that the department is giving compensation on the basis of government land records which shows older market prices. The current prices for agricultural land are very high in comparison written in

government records. For example, in the case of Basantpur Barrage about 62.32 hectares of land in ten villages will be submerged, but the public hearing has been conducted only in four villages Chicholi, Talegaon, Belmudi and Devraha. The construction work has already started without the completion of public hearings in all affected villages and in the absence of any decision on compensation in all the villages. The conflict around land acquisition and compensation are the major issues of concern as of now with all eight barrages under construction. The below table shows completion dates of barrages as told by government:

Table 2: Timeline of barrages

S. No	Name of barrage	Name of Contractor	Completion Date (Targeted)
1	Saradih	Rithwik Project Ltd, Hyderabad	31-07-2015
2	Sheorinarayan	SEW Infrastructure Ltd, Hyderabad	28-07-2015
3	Basantpur[4]	SEW Infrastructure Ltd, Hyderabad	09-02-2016
4	Mirouni	SEW Infrastructure Ltd, Hyderabad	28-07-2015
5	Kudari	Rithwik Project Ltd, Hyderabad	INA*
6	Kalma	Rithwik Project Ltd, Hyderabad	16-02-2015
7	Samoda	SEW Infrastructure Ltd, Hyderabad	26-02-2015
8	Chichpol	NA	Under process
9	Kudarmal Anicut	INA	June, 2015

* Information not available

These barrages are likely to generate other conflicts once they become operational. The first and foremost conflict with these barrages will be the indirect privatization of common pool resource like a river and the denial of domestic water requirements. The state government has declared these barrages industrial and will cater industrial water needs. The barrages are being built with the private money of companies which will get water from these barrages.

The companies have signed MOU with Chhattisgarh State Industrial Development Corporation (CSIDC), in which state government has guaranteed water supply for their power plants. The state government is therefore liable to supply water for these power plants, which makes these resources as private property of companies till water charges does not get adjusted in the amount paid by companies as advanced water tax. The below

[4] This is listed on the website of both companies SEW Infrastructure Ltd. And Rithwik Project Ltd., Project officer has confirmed that it is being built by SEW Infrastructure.

table shows an estimate of the time needed to adjust the advanced water charges paid by these companies.

Table 3: Expected Repayment Schedule on the basis of Annual water Allocation and Water prices[5]

S. No.	Name of Barrage	Annual Allocation (MCM)	Water Rate After Completion (Rs/M^3)	Annual Revenue (in Crores)	Total Cost of Barrage (in Crores)	Time for Repayment (in Years)
1	Saradih Barrage	232.33	6	139.39	399.03	2 years,10 months
2	Shivarinarayan Barrage	52.00	6	31.2	122.61	3 Years, 11 month
3	Basantpur Barrage	259.00	6	155.4	233.54	1 year,6 months
4	Mirouni Barrage	88	6	52.8	348.37	6 years, 7 Months
5	Kudari Barrage	76.75	6	46.05	118.81	2 years, 6 Months
6	Kalma Barrage	473	6	283.8	182.03	8 Months
7	Samoda Barrage	36.00	6	21.6	159.02	7 Years, 4 months
8	Chichpol Barrage[6]	8.08	6	4.848	127.62	26 years, 3 months
9	Kudurmal Anicut	38.00	6	22.8		

The table above shows that government is liable to supply water to these industries on an average of 4 years. The Department of water resource has allotted water equivalent to maximum capacity of barrage to the companies in summers; it means there would be no water in these barrages for domestic and other livelihood purposes. The annual allocation[7] from these barrages is four to five times their capacity. This exclusion of every consumer other than these companies will change nature of these water resources. They will now be high on excludability as well as subtractability, which are characteristics of private property as explained above. This will impact the livelihoods of people residing in the area and will

[5] The figures in the table are based on calculation on the basis of data available in table 1 and table 2.

[6] Chichpol Barrage is in earlier stages, so no information is available on total capacity of barrage and how many companies will get water from it. The current calculation is based upon agreement with a single company; there are chances of fluctuation in repayment time.

[7] The data for annual allocation is different in Jaldhara (2013) published by DOWR and question answered in Vidhan Sabha (2014), DOWR.

pose difficulties to fulfil domestic water needs. This may replicate the tragedy of the privatization of the River Seonath where people living at banks were not allowed to take water even for domestic use. Although, there is a provision for reserving 20% water for domestic needs and 15% for environmental flows (S. L Yadav, Executive Engineer, Department of water Resources, Janjgir-Champa, Personal Communication, June 19th, 2014), but the summer allocation shows that there will be no water in barrages for purposes other than industrial use.

The second conflict which would arise due to building of the barrages is the loss of livelihood of a specific community in the area. The Mahanadi belt is home to around 175,000members of the Kevat tribe. Most of these tribal men and women are landless and depend on the Mahanadi for their livelihoods. They usually fish in the monsoon season and farm in the summers. In summers, the flow of Mahanadi becomes very lean in comparison to the monsoons. This leaves most of riverbed dry, the tribe cultivates on this dry riverbed. It does not require any irrigation as water table in the riverbed remains very high. They usually farm vegetables, fruits like watermelon, cucumber etc. This is the only source of livelihood for the Kevat during summers. The building of barrages will lead to complete submergence of the riverbed permanently preventing them from cultivating on the riverbed and causing them to lose their only source of livelihood in the summer. The loss of livelihood will not only lead to conflict between industries, government and this tribe, but also force them to relocate their homes. It shows that, these barrages may not cause displacement directly, but will force many to be displaced indirectly because of loss of livelihoods. The government said it is planning a scheme to provide livelihood for this tribe (S L, Yadav, Executive Engineer, Department of water Resources, Janjgir- Champa, Personal Communication, June 19th, 2014), but no further details have been given.

The third impact is that these barrages will increase the chances of flooding in the surrounding areas. These areas usually experience flooding in monsoons due to heavy rainfall in the upstream areas. Local people fear that these barrages will be obstacle in the ways of water even when their gates are fully opened (Shukla, 2014). Subosh Shukla, President Pani Panchayat[8], Kharaid has said that the Sheorinarayan barrage will increase the

[8] Pani Panchayats are water user bodies established by Chhattisgarh Farmer's Participation in Irrigation Management Act, 2006

chances of flooding in monsoons because of the obstacles created by its construction which will lead to submergence of the Kharif crop in the area. He added that the Government will not give any compensation for their losses due to the flooding.

The chances of flooding will further increase due to siltation. The Mahanadi carries a lot of sand and other particles which causes siltation of reservoirs. Hirakud Reservoir has lost 24% of its capacity since its construction in 1957 due to siltation (Mukharjee, Veer, Tyagi, & Sharma, 2007). This means it has lost on average 0.48% of its initial capacity annually. The situation gravitates when a small reservoir handles silt of a larger area, and in this case the rate of siltation would be much faster than in big reservoirs like Hirakud (Singhdeo, 2014). Fears abound that these barrages are small in comparison to Hirakud and the process of siltation will be much faster because they have to handle silt of a very large area within a combined capacity of only around 300 MCM (Singhdeo, 2014). In this case these barrages will become a catastrophe and, as feared by Dr. Ramchandra Singhdeo, tombs of an industrial civilisation which was in a hurry. This siltation will invite massive floods in the area which would be difficult to avoid given the current status of engineering expertise and the experience of Bhakra Nangal and Hirakud shows that rate of siltation in reservoirs remains higher than what was expected at the time of construction (Singhdeo, 2014).

The fifth conflict will be an interstate conflict between Odisha and Chhattisgarh. The capacity of Hirakud Reservoir is decreasing due to siltation. It has been reduced by 24% since its construction (Mukharjee, Veer, Tyagi, & Sharma, 2007). On the other hand the water demand is increasing in Odisha due to industrialisation as in Chhattisgarh too(Das, 2010). In the monsoon, the Hirakud can store less water than it used to; this means there are higher chances of floods downstream of Hirakud and there would be less water in reservoir to supply in summers. Odisha wants Chhattisgarh to store extra water in monsoons to stop the floods in Odisha (S L Yadav, Executive Engineer, Department of water Resources, Janjgir-Champa, Personal Communication, June 19th, 2014).The industrial demand for water is rising in Odisha because of new industrial plants which have come up in the last 10 years (Panda, 2010). Considering the above facts, continuous reduction in the live capacity of Hirakud reservoir and rising water demands by new industries, Odisha wants Chhattisgarh to stop water in monsoons but release it in summers. It is in reverse to the interest of government of Chhattisgarh. Chhattisgarh cannot store water in monsoon;

otherwise chances of floods will increase Chhattisgarh, while in summers it will stop water to meet up its own industrial water demands. Chhattisgarh will serve its interest by building these barrages which will create conflict between the two states by serving the interest of only one state. These interstate water conflicts will induce other political conflicts further in other areas.

The other conflicts will be with nature. The barrages are on average within 20-30 km(Except Samoda) from each other(Google Map Engine, 2014). This means the back water of one barrage will almost touch the other barrage (S L, Yadav, Executive Engineer, Department of water Resources, Janjgir- Champa, Personal Communication, June 19th, 2014). In this case river will not be flowing at all during summers. This will lead to destruction of the river ecosystem, loss of river fauna and biodiversity. The hydrological connectivity of river will also be lost. The planning agencies have completely ignored environmental needs of rivers. Though, in the project report 15% of the total capacity of reservoir is reserved for environmental needs, if we look at summer allocation of water to industry, they have not left a single drop of water from reservoir for environmental flow needs. The other effects to be considered are those of industry on agricultural yield and annual production. The state government is saying that agricultural productivity will rise due to the increase in ground water level. Farmers counter this claim saying that the barrages are being built for industry and will not provide any benefit to farmers. The agricultural yield will not increase by these barrages but it will reduce due to pollution of power plants(Gowda, 2014). The percolation of water from ash dams of these power plants is likely to destroy agricultural land in the area as it happened in Sipat due to NTPC's coal based thermal power plant in Bilaspur district (Srivastava, 2014).

Currently the conflict is between farmers loosing land due to submergence and state government for compensation. They are mainly being represented through the Gram Sabha and Pani Panchayats. There were some organised protests taking place, but the people are certainly suspicious of registering their opposition in public hearings. The Chhattisgarh Kisan Sabha is organising villagers to become one voice and put their case across strongly. The Sabha has organised protests in July 2013 at district headquarter of Janjgir- Champa before construction of Basantpur and Mirouni barrage started. They were promised that the administration will carry out public hearings in each village before construction, but these

promises were not kept and construction was started without conducting public hearings. The farmers again protested against land acquisition for Kudari barrage in December when contractors has destroyed crops in fields to carry our construction work. The isolation of villages affected by one barrage and villages affected by another barrage is one of the main concerns, as they were not able to unite their voice against state government. The Department of Water Resources has used dirty tricks by promising undue benefits to powerful individuals in villages to disrupt the movement and it has had some success in that (Gowda, 2014). Another concern exists regarding the Kevats, since there is no formal or informal organisation to represent their interests, the protests so far have been mainly regarding compensation for agriculture land but no protest has happened for the livelihood issues of this tribe.

The main parties involved in movement against these barrages are Pani Panchayats, Chhattisgarh Kisan Sabh at all barrage sites. Although, individuals like Subodh Shukla, President, Pani Panchayat, Kharod at Sheorinarayan, Brijesh Gowda in Janjgir, Arun Rana, Diwaka Rana, Aklatara and local Journalist Keshao Murti Singh and Anand Mishra, local politician.

The below table is a snapshot of different perspective of government and people who will get affected by these barrages on conflicts which are existing in the region or that may arise in the future due to these barrages.

Table 4: Different perspective of Government and other Stakeholders

S. No.	Type of Issue	Comment of Beneficiaries & Government	Comment of Affected Parties
1	Ground Water	Water table will rise near the barrage(S L Yadav, Executive Engineer, Department of water Resources, Janjgir-Champa, Personal Communication, June 19th, 2014)	Water flows will reduce downstream which are already lean in summers.
2	Livelihood	More jobs will be created in power plants.	People who are doing faming on river bed will lose their livelihood.
3	Privatization of water	Government owns and will operate the barrages (Deshbandhu, 2011).	The companies are financing the barrages and government is liable to supply water to these companies.
4	Ecological and environmental	The water which is getting wasted by flowing to the sea	This will disrupt the hydrology of the river and will destroy the river

	demands	would be utilised for industrial and economic development (Singh, 2009).	ecology. The power plants in the area will cause water and air pollution which will reduce agricultural yield in the area.
5	Compensation	Fair compensation has been given to all affected farmers as per policy(S L, Yadav, Executive Engineer, Department of water Resources, Janjgir-Champa, Personal Communication, June 19th, 2014).	The land has been taken from farmers without disbursing compensation (in most cases) and without declaring the compensatory amount in some cases. The farmers are not happy with the amount given as it is not as per market rates. The second issue is that no compensation has been given for landless living in area and for the land submergence in areas along adjoining water channels.
6	Interstate conflict	Odisha want Chhattisgarh to store water but this will lead to floods in Chhattisgarh in the monsoons (Panda, 2010)	Odisha want Chhattisgarh to store water in monsoon but Chhattisgarh will do reverse and store water in the summers for its own needs.

A Way Forward

As shown above these barrages are generating conflict related to land acquisition and compensation and would generate other conflicts in future. In this case, State needs to use strategies to mitigate the conflict which has emerged already and use strategies to avoid conflicts which can emerge in future. I am suggesting following steps to mitigate conflicts around land acquisition and compensation and to avoid other conflicts in future.

- The State government should carry out a detailed and transparent Social and Environment Impact Assessment before formulating the project plan for a particular area. It will make government more capable to avoid any conflict which may arise and to prepare a mitigation plan in case it arises.
- The state government should conduct free and fair public hearings before starting construction and should take the majority of villagers in confidence. The due procedure should be followed in public hearings and these meetings should be chaired by local person of reputation instead of state officials It should also declare compensation before starting construction. The land survey should be carried out in detail and each inch of the land which will submerge should get the compensation not just land submerging

along the main river bank. It should also make arrangement for training and skill development of farmers who will lose their land so that they can find another livelihood.

- The government should provide compensation to the landless and consider the fact that they depend on the river for their livelihood. It should allow the Kevats to fish in the barrages without any charges. After completion of these barrages they can fish the whole year as the river will have stored water even in summers. It will give them another livelihood immediately after losing one. It will also reduce the pressure of migration upon them from this area.
- Government can look for the chances of ecotourism especially near Seorinarayan. It is a religious shrine which used to attract many devotees. It will give livelihood for local people especially landless.
- The government should give clearance to power plants only if they use environment friendly technologies which require less water to produce electricity. In India, typically a 200 MW coal based thermal power plant needs $5M^3$ water to generate 1 MW power (Technical Study: Best Practices in water Usage in Coal Based Thermal Power Plants, 2013). This demand of water in coal based thermal power plants can be reduced by using alternate technologies without changing much in design. The power companies should not allow use of water intensive technologies while setting up power plants. It will leave some amount of water in the barrages, which can be given for domestic, environment and livelihood purposes in summers.
- The Government should ensure in its plan that new construction does not increase chances of flooding in upstream or downstream. It should mitigate this risk with proper planning and engineering. In any of the case of flood, it should give compensation to those who get affected.
- These barrages are industrial barrages which are expected to give revenue of 628 crores annually (Deshbandhu, 2011). The funds should use for local development and welfare of people.
- The industries which are taking water from these barrages should offer employment to those who are losing their livelihood. If any training is required to work in these power plants they should make arrangements through their CSR funds.

- The government should ensure that water and air pollution by these power plants does not go beyond permissible limits set by it. The companies should use mix the low calorific coal with higher calorific coal so that production of pollutants like fly ash and Sulphur Dioxide can be reduced. Power companies in the USA have reduced amount of SO_2 in 1970s after the Clean Air Act got implemented. Indian companies can learn from them. At last, it should ensure that no adverse effect befall agricultural productivity and health due to pollutants like Sulphur Dioxide (SO_2), particulate matter in air and percolation of polluted water from ash dams.
- The State should check the rate of siltation every year, so that any chances of flooding or other adverse effect can be mitigated.
- The government should ensure that local communities do not get excluded from water resources. They should be allowed to take water for their domestic needs from these barrages. These measures can mitigate the present conflicts and will build confidence between people living in the area. Other measures will help avoid conflicts which may occur in the future because of industrial barrages in the region without harming interest of either industry or agriculture or landless people. The government should take all these measures in the interest of all stakeholders involved in the region.

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