

## **Damaged Rivers, Collapsing Fisheries: Impacts of Dams on riverine fisheries in India**

More than 10.86 Million Indians depend on rivers, wetlands, floodplains, estuaries, ponds and tanks for subsistence and market-based fisheries. Though the absolute contribution of riverine fisheries may not be huge in economic terms, it is a very crucial component in livelihood and nutritional security of the rural poor. With declining health of rivers, riverine fisheries are declining and collapsing rapidly. This is indeed worrisome and needs to be ameliorated. **SANDRP analysed the status of capture fisheries in rivers, floodplains, wetlands, estuaries, lakes and associated ecosystems in India and particularly looks at the devastating impacts of dams, barrages and hydrological modifications on this sector.** Fortunately, there exist a number of ways for mitigating impacts of existing infrastructure on fisheries and learning lessons from the past for our upcoming projects, as is being done the world over. Reviving riverine fisheries goes hand in hand with reviving rivers and this will lead to bettering lives of millions of Indians who depend on rivers in myriad ways.

The Report of the Working Group on Fisheries and Aquaculture of the 12<sup>th</sup> Five Year plan acknowledges, "Water abstraction for irrigation and power generation is perhaps the biggest reason (for problems of inland fisheries), causing reduced or no flow in the main channel to support fisheries and other riverine fauna and flora."



Above: River Satluj made dry by the Nathpa Jhakri Dam in the upstream. How can such such rivers support fisheries?  
Photo: SANDRP Partners

**Background** While mighty River like Brahmaputra supports more than 2 million fisher folk, smaller rivers like Wainaganga in Maharashtra support more than 4 lakh fishermen. The fisher folk in India can be termed as the poorest of the poor. Most of them live along riparian tracts and catchment areas, largely bereft of welfare schemes/programmes.<sup>1</sup> The importance of riverine fisheries in maintaining ecological balance and providing nutritional and livelihood security is much greater than gross national production figures suggest and higher as compared with other fisheries.<sup>2</sup> Most of the production is generated by small-scale activities, with very high levels of participation of men and women. In remote areas, riverine and associated fisheries are diffused, most of the produce is not commercialized and its huge socio economic importance is not properly reflected in national economic statistics.

Currently, India is the second biggest inland fish producer in the world. However, though blessed with one of the richest riverine fish gene pools and a network on hundreds of rivers, floodplains, ox bows and estuaries, the contribution of riverine and capture fisheries is declining sharply<sup>3</sup> and many have collapsed, despite having a great potential to grow. The current riverine fishery is below subsistence level with an average yield of 0.3 tonne per km, which is about 15% of their actual potential.<sup>4</sup> This is a matter of serious concern.

Riverine fisheries are a mirror of riverine health. Rivers in India are facing multiple problems of severe pollution, over extraction, encroachment, dams and barrages which cut off the connectivity of the river with its associated ecosystems, climate change, deforestation in catchment areas, etc. Particularly, the links between dams, hydrological changes and

<sup>1</sup> 12<sup>th</sup> Five Year Plan, Working Group on Development and Management of Aquaculture

<sup>2</sup> Allan and other, 2005

<sup>3</sup> 12<sup>th</sup> Five Year Plan, Working Group on Development and Management of Aquaculture

<sup>4</sup> 10<sup>th</sup> Five Year plan, Working Group in Fisheries

fisheries require urgent attention and more work. Local communities and increasing number of studies are highlighting that hydrological modification, absence of water in rivers, obstacle to migration, changes in salinity, changes in sediment, loss of riparian areas and floodplains brought about by dams are perhaps the most important reason behind the dismal scenario of riverine fisheries. According to Central Inland Fisheries Research Institute (CIFRI) “severe and drastic changes in the entire hydrological cycle of the river by dams and water abstractions has affected recruitment of most species, especially large carps, which like flowing water. Larger dams are major cause of degradation of aquatic environment and disruption of livelihood communities dependent upon the fishery along the rivers. **In India, natural flow of all major rivers have been regulated for fulfilling water demand of agriculture and power sector, without giving any attention to fisheries sector. As a result, rivers have lost their character and fisheries have suffered huge losses.**”<sup>5</sup>

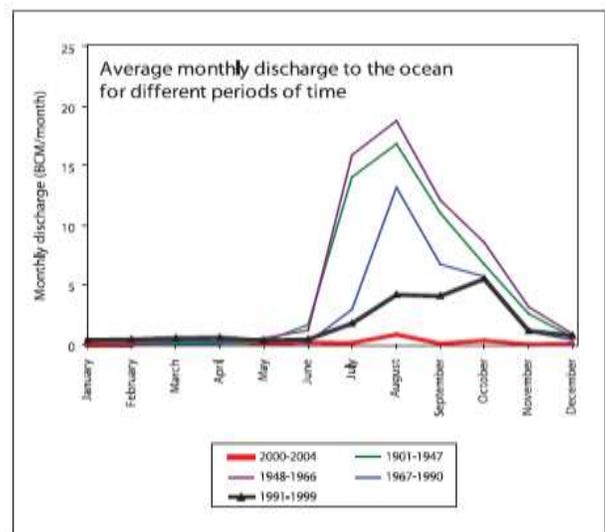
The tenth five year plan working group on Fisheries had said, “riverine fishery is already showing a declining trend. Millions of fishers and their families depend on rivers for their livelihood. These factors prompt an accent on development of riverine fisheries, which has rarely got the deserved emphasis of the planners. Therefore, it is the time, to take emergent steps to conserve our riverine fish biomass, to restore their habitat.”

Sadly, these words did not lead anywhere. Rivers and riverine fisheries continued to deteriorate in the past ten years. Of the Rs 6000 Crores outlay for the fisheries sector proposed by the working group in the current (12<sup>th</sup>) 5 Year Plan, most of the investment goes to Marine Fisheries and a whopping Rs 1000 Crores to National Fisheries Development Board, which does not even consider riverine fisheries as its thrust areas! Of the outlay of Rs 1200 Cr for Inland Fisheries and Aquaculture, riverine fisheries only get three schemes and majority of the rest is diverted to Aquaculture.

#### **Case study I Impacts of Dams on Fisheries in Krishna estuary**

CIFRI study between 2005 to 2007 across 80 kms from Srikakulam to Hamsala (sea face) indicates that dams constructed in the upstream and the Prakassam Barrage in Andhra Pradesh have diverted all the water away from the river for irrigation, industrial and urban uses. Upper part of the estuary is dry in summers and the estuary has now reached hyper saline conditions due to absence of freshwater. This has lead to near disappearance of oligohaline and freshwater species of carps, catfishes, murels, feather backs, etc. Low run off from the catchments, seawater intrusions due to absence of freshwater, increased salinity (20-35ppt) and drying up of one third of the estuary in non monsoon months leading to inadequate nutrient supply and **sub normal productivity of fisheries**. CIFRI has recommended that productivity of estuary may be improved by discharging at least 1300-1500 TMC water from Prakassam Barrage annually in seasonal cycles<sup>6</sup>.

In fact the Krishna Water Disputes Tribunal has ordered three riparian states of Maharashtra, Karnataka and Andhra Pradesh to release some water downstream for environmental purposes, but till now none of the states are releasing this. Releases from upper riparians will also help in sustaining many services of the river, including fisheries in the upper reaches as well. There are many ways for achieving this, including improving irrigation efficiency, demand side management, rainwater harvesting, etc. For instance, currently Maharashtra transfers 119.8 TMC water from the water deficit, closing Krishna Basin to the Konkan basin (which receives more than 2500 mm of rainfall), west of Sahyadri mountain ranges for electricity generation<sup>7</sup>. Securing this water back into the Krishna basin by technologies like pump back plants or reversible turbines will lead to a huge benefit to the communities and fisheries of the Krishna River.



India has 14 major and 44 medium rivers, innumerable tributaries, ox bow lakes, floodplains, riparian tracts, mangroves and estuaries. With a combined length of over 45000 km, the country’s riverine resources provide one of the richest fish germplasm of the world. There are around 1.2 million hectare (m ha) of floodplain lakes and wetlands

<sup>5</sup> Pathak et al, Riverine Ecology and Fisheries, vis a vis hydrodynamic alterations: Impacts and Remedial measures, CIFRI, 2010

<sup>6</sup> Krishna Estuary: Ecology and Fisheries, CIFRI, 2009

<sup>7</sup> Krishna Water Disputes Tribunal Award, 2010

where fish and fisheries remain a traditional economic activity with tremendous socio-economic impact in the rural sector. The cold-water fisheries resources at higher altitude comprise rivers, streams, lakes, reservoirs with a combined riverine length of 8 253 km and 41600 ha of lakes and reservoirs.

We have over 5100 large dams and more than 500 are in pipeline. The focus of this development has been increase in irrigated areas, urban and industrial water demands, flood control and, increasingly, hydropower. In this ongoing development, all other services provided by rivers like fisheries, climate regulation, natural flood control, biodiversity, non use values of rivers, groundwater recharge, etc., have been sidelined and this has deeply affected dependent human and natural communities. **The existing water infrastructure can be made more amenable to fisheries and other sectors through interventions like environmental flows, installing fish passes or ladders, protecting river sanctuaries, etc, but no attempts are being made in that direction.**

**Absence of Freshwater releases for downstream fisheries** Reallocation of water through dams has severely affected downstream ecosystems and fisheries. Outfalls of nearly all east flowing peninsular rivers is approaching zero without any freshwater releases in the downstream. Fisheries in Krishna, Godavari, Mahanadi, Pennar, Narmada,



Tapi, Sabarmati, Mahi and Cauvery estuary have collapsed or are rapidly collapsing or declining because of absence of freshwater in the estuaries all round the year and destruction of the mangrove forests. Salinity changes due to water abstractions are affecting mangrove forests of Bhitarkanika and Sunderbans, which are breeding and nursery grounds of several freshwater as well as marine fish. Riverine and estuarine fisheries in Narmada are already affected by the Sardar Sarovar, Narmada Sagar, Omkareshwar, Maheshwar, Tawa and Bargi Dams and reduced flows to the estuary. However, studies predict worse is in store for fisheries when the outfalls in the estuary will reduce severely.

Above: Desolate Fishermen across a dry Krishna in Andhra Pradesh. Photo: The Hindu

**Obstruction to Migration** Many species of peninsular and Himalayans rivers in India migrate short or long distances for spawning. Any obstruction in the spawning routes affects recruitment. Dams, without provisions for fish migration have a major impact on fisheries. This is an established global phenomenon and a number of countries are trying to mitigate this problem. United States has decommissioned more than 1000 dams in the past decade and many of these were decommissioned to reinstate migratory runs of fish like salmons and steelheads. There is a lot we can learn from the US experience. According to World Commission on Dams Report 2000, "Substantial losses to downstream fishery production have occurred as a result of dam construction around the world." **Hilsa** fisheries in Cauvery collapsed in the upstream after Mettur Dam. *Puntius* species also disappeared in Cauvery post dam, which formed 28% of the landings prior to dam construction.<sup>8</sup> **Mahseer**, once an abundant game and food fish in India is now on the list of endangered species, with extremely limited range<sup>9</sup> in rivers like Narmada, where it was abundantly found. Mahseer has been virtually wiped out from all Indian rivers due to dams and barrages and upcoming dams in North East and Himalayas will compound this problem. Tehri Dam on Bhagirathi has already impacted Mahseer migration to a great extent.<sup>10</sup>

<sup>8</sup> Sugunan, Reservoir Fisheries of India, FAO, 1995

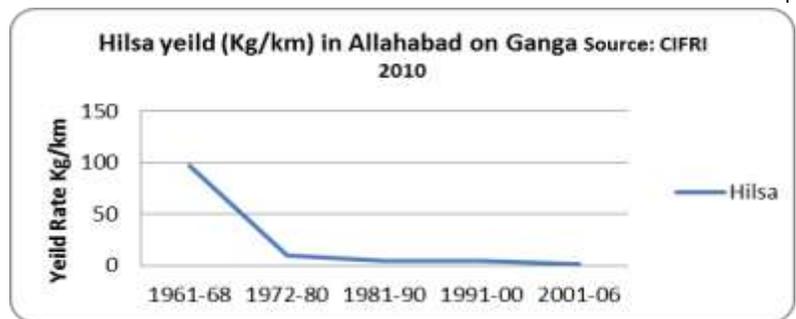
<sup>9</sup> Davendra S & Kamal Singh Negi, Mahseer Fish Bionomics and Population: Barrage Impact on Fish Biology

<sup>10</sup> Cumulative Impacts of Hydropower Dams on Alaknanda & Bhagirathi Rivers on Aquatic and Terrestrial Ecosystems, Wildlife Institute of India, 2012

**Change in sediment regime** Decreased river flows have tremendously affected the flushing property and increased sedimentation. This results in sharp decrease in fish population due to loss of breeding and nursery grounds ultimately affecting the breeding process. Decreased flows have aggravated siltation which raises river bed and further affects flow in return. According to CIFRI report, “In the period 1995-2000 the Ganga silt load increased upto 20 times at Allahabad and 30 times at Varanasi as compared to 1980-85. This also coincided with worst fishery period for the river.”<sup>11</sup>

### Case Study II

**Impact of dams on migration of Hilsa** Prior to commissioning Farrakka Barrage in 1975, the fish migrated from Bay of Bengal upto Allahabad. Post Farrakka, the yield of Hilsa dropped from 91 kg/km in 1960s to near zero in 2006 in Allahabad. The fish production is declining year by year and can now be afforded only by the very rich. How water flow volume affects fishery can be well illustrated by Hooghly estuary, where the quantum jump in water volume after commissioning Farrakka Barrage resulted in sharp increase in estuarine fishery from 9482 t (1966-75: pre Farrakka period) to 62000 t (1999-2000).<sup>12</sup>



**Growth of exotic species due to hydrological changes** According to CIFRI, “The reduction in catch associate with dams is also accompanied by change in species, where species favouring flowing water are replaced by species favouring still water, increase in exotics is attributed to decreased flows though dams. This seems to be the important reason for establishment of common carp and tilapia fishery in Ganga and Yamuna, the fishery of these exotic species could not develop in Ganga below Varanasi due to increased flow.” The graph below indicates the sudden jump in exotic fishes in Ganga in Allahabad, following increased sedimentation and low water levels. Reservoir fisheries and hatcheries set up by Fisheries Departments to compensate loss of fisheries due to dams also propagate exotic species. This further affects local, indigenous varieties. The studies in Ganga have found that exotics are not found below Varanasi, due to improved hydrological regime with fast current and improved water volume. “Proper flow and volume may help in elimination of exotics as well as help in augmenting the breeding and recruitment of dwindling Indian major carps”.<sup>13</sup>

### Case Study III: Changed sediment regimes affect fisheries in Godavari and Chilika

Dams also hold back silt, trapping it and leading to delta erosion like in the case of Godavari, where dam induced delta erosion is happening at a rate of 75 hectares/ year, with impacts on estuarine fisheries and fisher folk.<sup>14</sup> In case of Chilika Lagoon, major fishing and Ramsar site, freshwater balance was affected because of reduced freshwater releases from Mahanadi Basin Development projects like Naraj Barrage, Birupa barrage and Mahanadi barrage. This led to increased sedimentation and choking of the mouth of the lagoon, decreasing its salinity as sea water could not enter in the lagoon. This severely affected the fish catch<sup>15</sup>. Between 1985-98, fish catch dwindled from 8000 tonnes to 1500 tonnes. Many important estuarine and coastal fisheries are strongly linked to the ecological processes that occur in freshwater systems.

Period	Major Carps	Large catfishes	Hilsa	Exotics	others	Total
1961-68	424.91	201.35	97.17	null	211.96	935.39
1972-80	135.17	98.55	9.66	null	197.86	441.25
1981-90	155.73	99.40	4.31	null	247.59	507.03
1991-00	28.91	62.74	4.51	null	178.20	274.36
2001-06	38.58	40.56	1.20	64.27	223.41	368.01

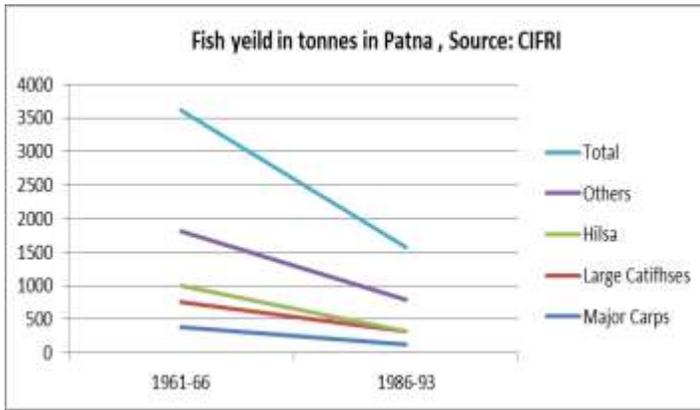
<sup>11</sup> Pathak et al, Riverine Ecology and Fisheries, vis a vis hydrodynamic alterations: Impacts and Remedial measures, CIFRI, 2010

<sup>12</sup> Pathak et al, Riverine Ecology and Fisheries, vis a vis hydrodynamic alterations: Impacts and Remedial measures, CIFRI, 2010

<sup>13</sup> Pathak et al, Riverine Ecology and Fisheries, vis a vis hydrodynamic alterations: Impacts and Remedial measures, CIFRI, 2010

<sup>14</sup> B Hema malini Coastal erosion and habitat loss along the Godavari delta front – a fallout of dam construction, Current Science, 2004

<sup>15</sup> B.P.Das, Impact of Mahanadi Basin Development on Ecohydrology of Chilika, 12 Lake Congress, 2008



**Fisheries in Ganga:** Lifeline of millions of informal, subsistence fisher folk in Uttarakhand, Uttar Pradesh, Bihar, Madhya Pradesh and West Bengal are on a steep decline due to obstacles, hydrological changes and various other changes associated with large scale water diversions through Upper Ganga, Middle Ganga and Lower Ganga Barrages and canals. Farraka Barrage has been the main

factor in destroying the thriving Hilsa fisheries along the river which once reached till Allahabad. Once supporting very rich fisheries, the yield started declining since 1970s, which also coincides with increased water abstractions through barrages, more dams and embankments on the tributaries. According to 10<sup>th</sup> Five Year Plan document, “The average yield of major carps in river Ganga has declined from 26.62 to 2.55 kg/ha/year during last four decades. The biologically and economically desirable fish species have started giving way to the low value species, exhibiting an alarming swing in the population structure.” At Allahabad, the yield came down from 935 Kg/km in sixties to 368 kg/k in 2001-06. In this 368 Kg/km, the contribution of major carps and large catfish (imp commercial species) is drastically low, exotics have increased sharply as they prefer lower and more stagnant water levels which cannot be tolerated by the carps. **The importance of water levels for fisheries is illustrated by the fact that fisheries improve considerably after Allahabad where a number of tributaries meet Ganga, bringing freshwater and sediments with them.** The major role played by hydrological changes is also highlighted by the fact that the productivity of the river is relatively good, yet fish catch is falling steeply. The accompanying table illustrates the decline in fisheries in Ganga down the decades.



Above: Dry Ganga downstream Maneri Dam in Uttarakhand. Photo: <http://www.peasantautonomy.org/>

**Upcoming Dams in Uttarakhand** It is documented that Tehri Dam on Bhagirathi in Uttarakhand has affected migration and populations of Mahseer fish. Uttarakhand is now embarking on a dam building spree. It has more than 330 dams (some estimate put the figure even higher, here dams include hydro projects of all sizes) in operation, under construction or planning stages. Only a few of these dams are in no fish zone, all the others will severely affect fish diversity. Nearly all riparian villages depend on Alaknanda and Bhagirathi rivers for subsistence fisheries. None of these dams will have fish passes or ladders, some will have hatcheries, but there has been no credible external monitoring of performance of hatcheries. Both Mahseer and Snow trouts are endangered, migratory species and these, with many other species will be very seriously impacted if the dams come up. Wildlife Institute of India, in its report on Cumulative Impact of dams on Alaknanda and Bhagirathi Rivers recommends that two rivers Balganga and Nayyar should be kept ‘dam free’ as river sanctuaries as they are important aquatic habitats supporting numerous fish species. Balganaga is one of the critically important habitats for mahseers and snow trouts which occurs in Tehri Dam and associated rivers. Many migratory species congregate along the rivers for breeding especially after the monsoon.<sup>16</sup> However, the fate of these rivers,

their fisheries and dependent communities hangs by a thin thread as the Government is refusing to take decisions based on socio ecological welfare.

<sup>16</sup> Cumulative Impact Assessment of hydro projects on terrestrial and aquatic biodiversity in Alakananda and Bhagirathi Basins, Wildlife institute of India, April 2012



Above: Ganga made completely dry at Haridwar by the Bhimgouda barrage Photo: SANDRP

*At the same time, there are some welcome initiatives. River Tirthan, a small tributary of Beas in Himachal Pradesh has been declared as a “No project” river, for its outstanding trout fisheries.*

**Impacts of Dams on Fisheries in Narmada** Narmada River system on the west coast experienced significant decline (68.24%) in Hilsa catch in 2004-05 (4866 t) as compared to 1993-94 (15319 t) and this decline was prominently recorded from 1998-99 onwards.<sup>17</sup> The construction of the Tawa Dam resulted in a reduction of water depths and loss of carp breeding grounds, spawning and feeding in the central 240 km stretch of the Narmada Basin. Flow reduction is the reason for reduced carp fisheries.<sup>18</sup> Hoshangabad, on the banks of Narmada in Madhya Pradesh enjoyed some of the best Mahseer landings in the country. After construction of Tawa and other projects, the Mahseer catches have already dropped drastically<sup>19</sup>. In the sixties, monthly catches of Mahseer at Hoshangabad alone ranged upto 2-3 tonnes<sup>20</sup>. The fish is nearly wiped out from the river after construction of Tawa Dam and Madhya Pradesh is now embarking on protecting the fish only through reservoir breeding and hatcheries program. Incidentally, like many other states, Madhya Pradesh has also declared Mahseer as its state fish. If targeted through ecosystems approach, there could be hope for reinstating Mahseer in Rivers of Madhya Pradesh, but there is no evidence that Madhya Pradesh is serious about this. At the Narmada estuary near Bharuch, the fish landings are reducing at an alarming rate. Even as fishermen blame low Hilsa runs and fish decline on the low water levels and non release of water from the Sardar Sarovar Dam in the upstream, the Sardar Sarovar Narmada Nigmal Limited (SSNNL) maintains that enough water has been released in the downstream. No data is available in the open domain to establish this claim of SSNNL.<sup>21</sup>

**Embankments affecting fisheries in Brahmaputra** Over the last three decades, approximately 4,000 km. of embankments have been constructed along the Brahmaputra and some of its major tributaries as a flood control measure. According to Dr. Sanchita Baruah and Dr. S.P. Biswas, “Embankments are responsible for the shrinkage of

<sup>17</sup> Milton, STATUS OF HILSA (*Tenualosa ilisha*) MANAGEMENT IN THE BAY OF BENGAL: AN ASSESSMENT OF POPULATION RISK AND DATA GAPS FOR MORE EFFECTIVE REGIONAL MANAGEMENT, Report to FAO Bay of Bengal Large Marine Ecosystem Project , 15 February 2010

<sup>18</sup> Nath, D.; Shrivastava, N.P. 1999. Decline of Carp fishery in Narmada in the context of construction of dam on the river and its tributaries. *Journal of Inland Fisheries Society (India)* 31(2): 25-27.

<sup>19</sup> Arya et al, Biodiversity and Fishery potential of Narmada Basin Western Zone with Special reference to fish conservation Arya et al. *Environment and Agriculture, ecological Society Nepal*, 2001

<sup>20</sup> Desai, 2003 Synopsis on the biological data of Tor Mahseer, FAO

<sup>21</sup> <http://www.indianexpress.com/news/as-rains-stay-away-hilsa-catch-drops-to-new-low/493332/>

feeding and spawning grounds of many prized fish species. The obstruction they cause has resulted in the disappearance of many of the state's spawn collection centres. A sharp decline in the catch of Indian major carps is a pointer to the loss of spawning grounds in the Brahmaputra system."<sup>22</sup> According to CIFRI, "landings at stations studied have decreased by 30% in the last two decades. Major cause of decline in fishery may be due to loss of wetlands which used to be ideal breeding and nursery grounds, due to embankments and encroachments."

The upstream Arunachal Pradesh is currently constructing and planning more than 135 dams on tributaries of Brahmaputra: Siang, Dibang, Subansiri, Kameng, Tawang and Lohit. The dams, apart from posing a huge migration block to trouts and mahseer will result in major fluctuations in water levels in the downstream. If immediate action is not taken by cancelling destructive dams, the fish diversity of the region will be severely jeopardized. Some of the rivers in the region also need to be declared as protected areas and no dams to be taken up on such rivers. We need such protected riverine zones in each ecological zone and each state.



Left: Dead fish on a dry stream bed made dry by a mini hydel project in Himachal Pradesh.  
Photo: Ramesh Ganeriwal

### **Conclusion**

The major role played by hydrological modifications and other changes in rivers caused by dams and barrages is undeniable. CIFRI claims that major hydrological alterations and changes brought about by dams are by far the most important cause for collapse of riverine fisheries, even more so than pollution and bad fishing practises<sup>23</sup>. Water quality is a crucial component in fisheries and release of untreated effluents and domestic sewage has been leading to fish kills several times a year in several rivers. Ganga, Yamuna, Krishna, Sutlej, Ravi, Beas, Narmada, Tapi, Mahi, Sabarmati, Pennar, Cauvery, Betwa, Gomti and all major rivers are severely affected by pollution and this issue needs to be tackled on priority. However, according to CIFRI, "Most of these impacts of pollution are confined to specific stretches and the rivers have overall shown a good potential energy resource, with no declines, except in the point discharge areas. **In spite of these favourable conditions, fisheries have been showing a decreasing trend and key factors for this are erratic flood pattern, regulation in flow, reduction in water volume. Dams, Hydropower projects, barrages, embankments and subsequent abstraction and regulation are the main reason for degradation of riverine environment and subsequently, degradation of fisheries.**"<sup>24</sup> In this situation, while reservoir fisheries have helped to an extent, they are entirely dependent on external inputs, not equitable due to contracts and do not encourage endemic species.

**The need of the hour is to explore and implement ways through which our existing water infrastructure becomes friendlier to fish and other aquatic species. Fortunately, many such options exist today which can be implemented if there is a strong political will, regulatory mechanism and community participation.**

### **Legal and Regulatory Framework for protecting Riverine Fisheries:**

- India does not have a unified Fisheries Policy or a policy for riverine fisheries. The Indian Fisheries Act is terse document dated 1897, which has serious limitations in addressing current problems.
- No Law for protecting the natural flow pattern or environmental flows in rivers

<sup>22</sup> Baruah, Biswas, Stemming the Flood, Killing Biodiversity, The Ecologist, 2003

<sup>23</sup> Proceedings, Second International Symposium on Management of Large Rivers for Fisheries

<sup>24</sup> Pathak et al, Riverine Ecology and Fisheries, vis a vis hydrodynamic alterations: Impacts and Remedial measures, CIFRI, 2010

- No specific laws to protect fisheries, apart from some provisions in the Indian Fisheries Act 1897, Water (Prevention and Control of) Pollution Act 1974 and The Wildlife Protection Act 1972, the Environment Protection Act 1986. None of them have been used effectively for protecting rivers or riverine fisheries.

#### Recommendation:

- **A strong National Policy for promoting conservation of fish, fisheries and dependant livelihoods in rivers and associated ecosystems** needs to be formulated at the country level, through local participation, especially from marginalised and poor sections. Participation of affected communities is the key to effectiveness of the Policy. States to promulgate individual policies in line with the national policy.
- Need for a strong law and amendment to existing Fisheries Law 1897/ Wildlife Protection Act/ Environment Protection which lays down clearly defined **rules for releasing and maintaining environmental flows and sediments from rivers** to the downstream. The amount and timing will be river specific, arrived at through local participation, in achieving compliance of such norms, local people must have an effective say.
- Need for a strong law/ amendment to existing Fisheries Law 1897 and Wildlife Protection Act/ Environment

*Fish Ladder at Lower Ganga Canal at Narora: **Lower Ganga Barrage or Narora Barrage** across Ganga*



Left: Fish Ladder at Narora Barrage. Source: SANDRP

*Lower Ganga Barrage has a fish ladder since 1967, from when the barrage became operational. When SANDRP colleagues visited this fish ladder Narora in Nov 2011, the fish ladder did pass water, but no fish seemed to be using it. However, it is supposed to be effective especially in monsoons when hundreds of fish are said to be using it daily. The functioning and efficacy of this ladder needs to be studied for a number of reasons. This is one of the very few fish ladders in India and also seems to be in a functioning situation. Interventions like these should be monitored, analysed and based on the results, similar/modified ladders can be prescribed for existing projects.*

Protection to **install fish ladders/ passes/ locks/ lifts in all existing dams less than 15 mts in height and study the efficacy of fish ladders for multiple species in high dams.** The Expert Appraisal Committee of the MoEF for River Valley projects is currently not recommending fish ladders to high dams, unilaterally assuming that these are ineffective. We contend that enough studies have not been undertaken about this crucial aspect. In many countries, fish ladders/ passes/ locks and lifts have been installed to dams as high as 130 meters. Fish ladder on the 60 mt high Bonneville dam on River Columbia is well known and effective. Brazil has a law that mandates that all dams should have structures to facilitate fish migration.

- **Environmental flows releases should be made from fish ladders or dedicated channels existing in riverbed or mimicking river bed conditions.** Channels releasing e-flows should not be fitted with turbines for hydropower generation as they are then useless to the fish and cause high mortality.
- It will help the Riverine Fisheries sector if the current National Water Policy being drafted has a strong section on the importance of riverine fisheries and the need to secure water for environmental purposes.
- The EIA Notification 2006 excludes dams built for drinking & industrial water from the ambit of EIA and hence public hearing and Environmental Management Plans. However, many dams built for these purposes affect fisheries and at times, the impacts may be greater than the benefits. Small hydropower dams, less than 25 MW are also excluded from EIA. In Karnataka this has wreaked a havoc with rich fish biodiversity. Hence, we request the MEF to amend the EIA notification to include all river valley projects in its ambit.
- The National Rehabilitation and Resettlement Bill which is before the Parliament should include norms for compensatory mechanisms for riverine fishermen impacted by projects like dams, ports, power plants, etc.

- Strong legal provision protecting community fish sanctuaries from pressures like dams, water abstractions and polluting industries. "Protecting Riverine Sanctuaries" is a line stated over and over again in all the past three Five year Plans, but nothing has been done on the field about this. Even the existing sanctuaries are not protected formally.
- Recommendations of reports commissioned by the MoEF like the Western Ghats Expert Ecology Panel Report and the Report on Cumulative Impact Assessment of Hydropower projects on Alaknanda and Bhagirathi by Wildlife Institute of India specific to fisheries and fish biodiversity should be supported and implemented.
- Sections 29 (for sanctuaries) and 35(6) (for National Parks) of the Wildlife protection Act 1972 should be strictly implemented. "**No person shall destroy, exploit or remove any wild life including forest produce from a sanctuary or destroy or damage or divert the habitat of any wild animal by any act whatsoever or divert, stop or enhance the flow of water into or outside the sanctuary, except under and in accordance with a permit granted by the Chief Wild Life Warden, and no such permit shall be granted unless the State Government being satisfied in consultation with the board that such removal of wild life from the sanctuary or the change in the flow of water into or outside the sanctuary is necessary for the improvement and better management of wild life therein, authorises the issue of such permit...**" (Emphasis added, for full act see: [http://www.karnatakaforest.gov.in/english/Acts\\_Rules/acts/Wildlife\\_Protection\\_Act\\_1972.pdf](http://www.karnatakaforest.gov.in/english/Acts_Rules/acts/Wildlife_Protection_Act_1972.pdf)). Nothing is happening for its implementation today.



Above: Nakur Gaya Fish Sanctuary on Kumaradhara river in Dakshin Kannada Photo: SANDRP

**Institutional Mechanisms and Information Database** Though there are over 18 Centrally funded institutions working on fisheries in India (apart from state institutions and universities) basic information like status of riverine fisheries in India, population of dependant fishermen, their status, the problems that they face, the impact of dam on fisheries and livelihoods, etc., are yet not documented. In a country which has millions of rural poor depending on fisheries, the thrust areas of National Fisheries Development Board do not even mention riverine fisheries, but are focussed only on reservoir fisheries and aquaculture.

#### Recommendations:

- The existing institutions should also focus on riverine fisheries, fish biodiversity and contribution of riverine fisheries to food and nutritional security
- Reports from government funded research institutions like CIFRI should be put in the open domain immediately and in a reader friendly way. A number of conclusive reports, which hold potential of changing the current water management practices, are locked away in CIFRI offices.

These studies should be made online and widely publicised.

#### Major Research Gaps to be addressed

- A consolidated white paper on the impact of dams on fisheries and livelihoods should be published, with multidisciplinary participation.
- Research about mitigating impacts of dams on downstream and upstream fisheries to be urgently undertaken.
- Research about installing fish passes/ladders/ locks/ lifts for a variety of species in tropical and temperate rivers to be undertaken for small as well as high dams.
- A Status report on impact of hatcheries installed by Fisheries Departments and Dam developers in states like Himachal, Jammu and Kashmir and the North East to be undertaken. Dams even on rivers and stream identified for in situ fish conservation are sanctioned by Fisheries Departments in states like Himachal Pradesh after accepting compensatory payments from Dam proponents. This is supposedly used to set up hatcheries and breeding pools, but there is no evidence to show this is happening. However, dams should not be allowed in these conservation zones
- There is an urgent need to ascertain the functioning and impacts of hatcheries on wild and edible fish populations.

## Procedural Recommendations

- New dams affecting outstanding wild and edible fisheries where a large population depends on fisheries either for subsistence or livelihood should not be sanctioned in the absence of proper mitigative measures.
- Cumulative impacts of large dams coming up in North East, Uttarakhand, Himachal Pradesh, Jammu & Kashmir, Karnataka, Maharashtra, etc., should address cumulative impacts of these interventions on fisheries.
- Cost benefit analysis of large dams should include current benefits of riverine fisheries to communities and benefits of aquatic biodiversity and other services that the river provides.
- **Environmental flows** recommendation should be river specific and fish should be an important consideration while calculating e-flows
- **MoEF should set up project specific monitoring mechanisms to ensure** the compliance of clearance conditions regarding fisheries given by the EAC to dam proponents: about environmental flows, hatcheries, fish ladders, fish breeding, etc. The local affected communities should have effective say in this monitoring mechanism.
- **Environment Impact Assessment of Dams to include downstream impact** of hydrological modifications on wild and edible fisheries and associated livelihoods.
- Dams which have outlived their lifespan and dams with extensive impact on fisheries and livelihoods should be **considered for decommissioning to reinstate fisheries.**
- No more embankment projects should be cleared, looking at their impacts on a number of sectors, including dramatic impacts on fisheries, without impact assessment, management plans, and public consultations. EIA notification needs to be appropriately modified.
- In case of projects like ports and thermal plants on estuarine coasts (like in the case of Konkan in Maharashtra), fishing communities should be a part of impact assessments, public hearings and monitoring and compliance mechanisms. If the projects receive clearances, compensation to be given to fishing communities



- Rivers with high number of endemic and endangered species, religious fish sanctuaries, etc. should be protected in their free flowing condition. At least one river in each ecological zone and one in each state should be urgently identified for such protection.

*Riverine Fisheries are an indicator of the health of the river itself. Reviving Riverine Fisheries by restoring rivers and their flows will help not only the poorer riverine fishermen, it will help a number of other communities and livelihoods dependant on rivers. The inherent resilience of riverine ecosystems*

*will ensure that socio ecological impacts of restoration work will be evident in a short to moderate time span and will benefit millions of fisher folk and ecosystems.*

**Parineeta Dandekar**