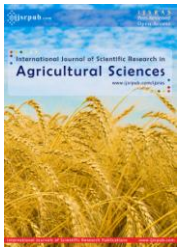
International Journal of Scientific Research in Agricultural Sciences, 1(3), pp. 32-42, 2014
Available online at http://www.ijsrpub.com/ijsras
ISSN: 2345-6795; ©2014 IJSRPUB
http://dx.doi.org/10.12983/ijsras-2014-p0032-0042



Editorial Publication

Do We Need Some More Dams?
Past, Present and Future of Freshwater Bodies in Karnataka State – A Perspective

Narayan Ramappa Birasal

Associate Professor, Zoology Department, KLE Society's Gudleppa Hallikeri College,
Haveri – 581 110, Karnataka state, India
Phone: +91 94491 22732. E-mail: nrbirasal@gmail.com

Received 06 May 2014; Accepted 07 June 2014

Abstract. Forest cover has come down from about 46% in 1947 to less than 23%. An honest commitment to protect the forests has become critical. As per the National Forest Policy objectives, every State has to endeavor to have at least 33% of its geographical area under vegetation cover. For a developing country like India, it is important to pursue a path of sustainable development, regulating the use of forest land for the developmental needs of the state / people and the nation at large. Forest Conservation Act 1980 is a unique piece of legislation and a regulatory mechanism which reflects the collective will of the nation to protect its rich biodiversity and natural heritage and that permits only unavoidable use of forest land for various developmental purposes. To achieve this, it is necessary to protect and consolidate the existing forest areas apart from bringing new areas under afforestation programmes. This editorial paper is the report of rivers of Karnataka State, dams built details, causes for development, effects of developmental activities and the need for protecting the existing forest cover.

Keywords: Dams, Water resources, Check dams, Western Ghats, Fresh water bodies.

1. INTRODUCTION

Most of the primary civilization of the world emerged in or near river valleys. The construction of dams is one of the oldest branches of engineering. The earliest dams were probably built for the purposes of irrigation, flood control and water supply. Later, water was impounded that its subsequent controlled release could provide a source of energy. Modern reservoirs are designed to impound the water in periods of higher flows so that it may be released gradually during the periods of lower flows (Baxter 1977). Dams are constructed across the rivers to stock water for generating electric power, irrigating the land, providing water for domestic and industrial uses, fish culture and for taming the rivers in spate. It has been realized that dams and reservoirs do cause environmental hazards (Baxter, 1985). Time has come now to understand that the construction of dams should be undertaken only after an accurate prediction is made about its impact on the environment and socio-economy. Dams interrupt stream flow and generate hydrological changes along the integrated continuum of river ecosystems (Gerd, 2001).

2. SCENARIO

2.1. Global

The earth, two-thirds of which is covered by water, looks like a blue planet - the planet of water - from space. The world's lakes and rivers are probably the planet's most important freshwater resources. But the amount of fresh water covers only 2.53% of the earth's water. On the earth's surface, fresh water is the habitat for a large number of species.

2.2. India

India is blessed with numerous rivers and streams. Major river systems in the north are Ganga, Yamuna, and Brahmaputra (perennial rivers from the Himalayas) and in the south, Krishna, Godavari, and Cauvery (not perennial, as they are mainly rain-fed). The central part of India has the Narmada and the Tapti. The Indo - Gangetic floodplain is the largest wetland regime of India. Most of the natural wetlands of India are connected with the river systems. The lofty Himalayan mountain ranges in northern India accommodate several well-known lakes. Apart from

this, there exist a number of man-made wetlands for various multipurpose projects.

2.3. Karnataka

Karnataka is situated between 11° 31' and 18° 45' N latitude and 74° 12' and 78° 40' E longitude, and endowed with numerous rivers, lakes, and streams. Natural inland wetlands mainly include lakes and ponds whereas man-made inland wetlands include reservoirs and tanks. Wetlands cover about 2.72 million hectares, of which inland wetlands cover 2.54 million hectares.

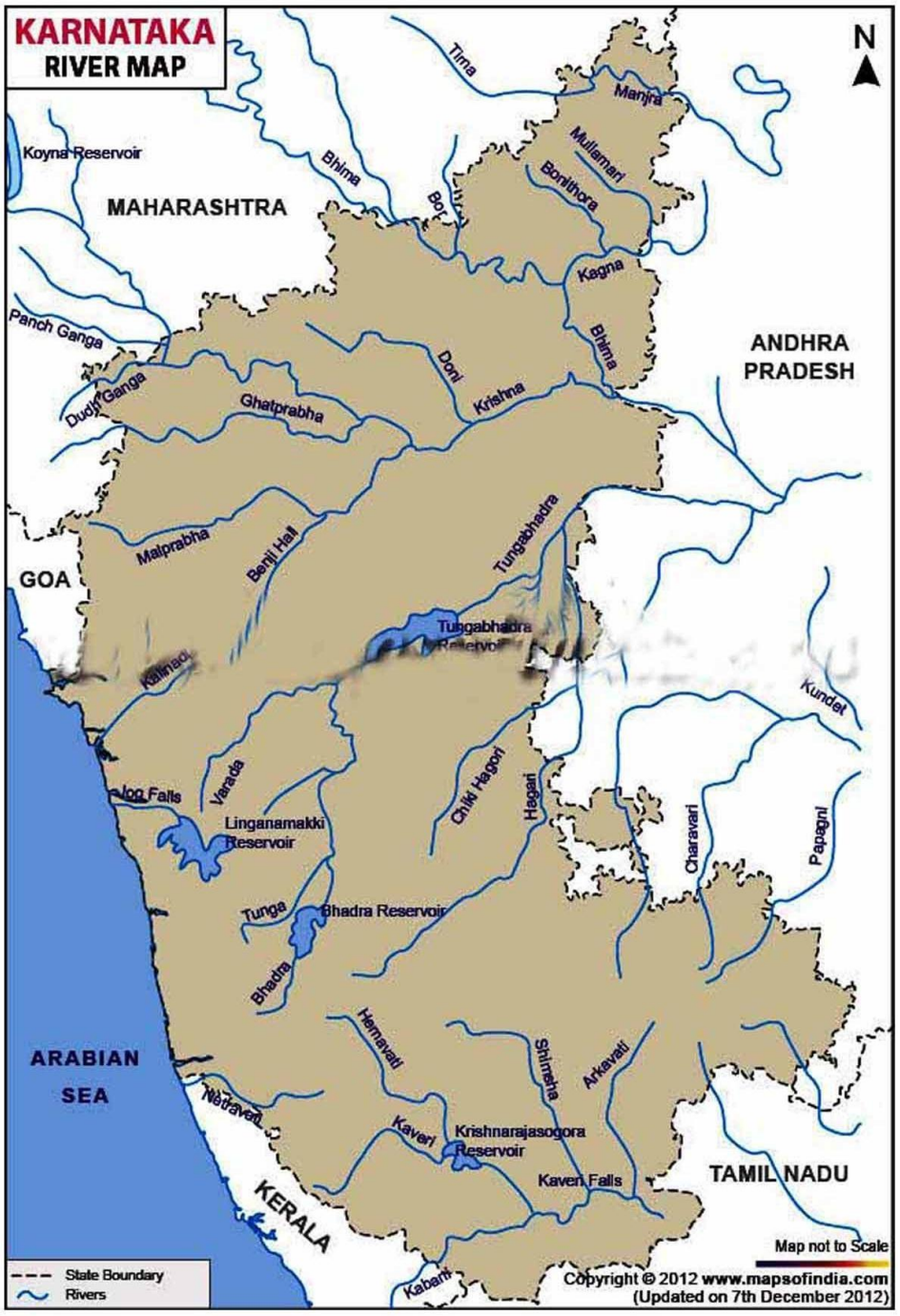


Fig. 1: Karnataka map showing the important rivers flowing across the state

3. ECONOMIC GROWTH

Having realized the importance of infrastructure to achieve faster rate of economic growth, the Government of India and State Governments have ventured into making heavy investment in agricultural infrastructure especially from the First Five-Year Plan onwards (Shah, 1993; Venkatachalam, 2003). The

major focus of infrastructural investment has been on irrigation and electric power and this has contributed significantly to the agricultural growth. Fresh water is emerging as the most critical resource issue facing humanity. While the supply of fresh water is limited, both the world's population and demand for the resource continues to expand rapidly. World Bank has warned that lack of water is likely to be the major factor limiting economic development in the decades to come (Serageldin, 1995). Aquatic ecosystems have been subjected to various levels of stresses in India due to unplanned developmental activities in the last century leading to serious environmental degradation. Thus, aquatic ecosystems are exposed to all local disturbances regardless of where they occur.

4. IMPORTANT RIVERS OF KARNATAKA

Karnataka is blessed with abundant water resources in the form of rivers and streams (Figure 1). The Western Ghats stretching north-south give rise to west flowing and east flowing river systems. The rivers of the coastal belt are west flowing. Important west flowing rivers are Nethravathi, Sharavathi, Aghnashini, Gangavali and the Kali. They have their source in the Western Ghats and flow into the Arabian Sea. The North Karnataka region has Krishna River and South Karnataka region has Cauvery River.

Cauvery is the largest river in the state and originates from the district of Kodagu (Coorg). It is often called as Dakshina Ganga (the Ganges of the South) and considered as one of the sacred rivers of India. The tributaries of Cauvery are Harangi, Hemavathi, Lakshmanatirtha, Kabini, Shimsha, Arkavati, Suvarnavathi, Bhavani, Lokapavani, Noyyal, and Amaravati. Krishna is the second largest river in peninsular India. It originates in Maharashtra and passes through Karnataka. The principal tributaries of the Krishna River in Karnataka are Ghataprabha, Malaprabha, Bhima and Tungabhadra.

4.1. Dams built so far

India ranks third in the world in terms of number of dams. The country has about 4762 completed large dams till February 2012. According to National Register of Large Dams, 229 dams are built in Karnataka state (Senagupta, 2009). No doubt, Dams have helped immensely in attaining self-sufficiency in food-grain production besides flood control, power generation and drought mitigation etc. With less than 50 rivers running across the state, Karnataka government has already built 229 dams. Salient features of some important dams of Karnataka are given in Table 1 & 2.

Figure 1 clearly indicates that from 1900 to 1990, in 90 years, 186 dams were built in Karnataka and many of them are for irrigation purpose (Figure 2) and the graph was on rise till 1990. From 1991 and onwards, in 23 years, the graph is in reverse trend and the dams built are only 43. Now it appears that, none of the rivers are without dams or the engineering wing of irrigation / water resources department of Government of Karnataka is not finding sufficient catchment area in a river basin to build a new dam.

5. HOW OUR DAMS ARE PERFORMING?

It is stressed that the only sustainable and true development is environmentally sound development. The planning of the development process with this perspective is a great scientific and technological challenge that must be taken up (Gadgil, 1979). The Supa reservoir was constructed for the specific purpose of ensuring a plentiful store of water for generating electric power (Malgonkar, 2000; Anon, 2010a**)**. Supa dam in 28 years of its existence has reached its full level of 564m only twice i.e in 1994 and 2006 (Kerakar, 2014). Since 100 years, Vani Vilas Sagar dam is awaiting for better days! (Rozinder, 2010). According to Central Water Commission, which is monitoring storage status of important reservoirs spread all over the county, out of 84, only 37 have hydro-power benefit with capacity of more than 60MW. The total live storage in all 84 reservoirs is 48% of the storage capacity at FRL (Anon 2013).

6. CHECK DAMS - ALTERNATIVE FOR SUMMER IRRIGATION

Temporary check-dams overcome water scarcity faced by farmers during the summer irrigation season and thereby play a crucial role in farming (Govindasamy and Hsu, 2008). It is also proved that cost-benefit ratio of a check dam is higher than that of a large dam across a river. The most important advantage of a small structure like the check dam is that it does not have issues of submergence of forest, villages in the backwaters and rehabilitation of evacuees. These dams are managed by traditional communities and in some localities by local panchayats.

This traditional water harvesting and conservation system suits the local geographic conditions and needs to be sustained and promoted (Balooni et al., 2008). Bidar Zilla Panchayat has built 1,225 check-dams across the five taluks under various programmes and according to officials, these new-generation check-dams have recharged groundwater, rejuvenated streams and helped farmers take up multiple crop

cycles (Anon, 2010b). This success has inspired Karnataka government to replicate the Bidar Model across the state. However, construction of check dams is also studded with political interventions. Recently, Member of Parliament from Pollachi constituency and leader of All India Anna Dravida Munnetra Kazhagam (AIADMK) party K Sugumar urged the union government to direct the Karnataka Government to drop its proposal to construct a check dam across Thenpennai River which if not done, would affect irrigation and drinking water supply in five districts of Tamil Nadu state (Balaji, 2012).

7. OPINION / STATUS ABOUT PROPOSED DAMS / PROJECTS

On several counts, social, environmental, economic, legal, and developmental policy grounds, the new dams does not make sense and needs to be scrapped (Anon, 2007). Following are the seven much debated projects of Karnataka state.

7.1. Dandeli Dam in Seismic Prone Area?

Demand made by Murdeshwar Power Corporation Limited (MPCL), a private company in January 2002 and in February 2004 to take up a mini-hydel project at Maulingi was rejected by the government in view of ecologically sensitive forest. The reasons given were (i) it would lead to the submergence of valuable flora and fauna (ii) against the Union Ministry of Environment and Forests' (MoEF) stipulation, imposed in May 1987 in the context of the Kodisalli power project, that "no further projects involving diversion of forest land would be undertaken on Kali river or its tributaries"; that it could be a frightening proposition from the seismic point of view since the area had several major reservoirs and Kaiga atomic thermal power plant in a radius of less than 20 km. After two unsuccessful attempts, MPCL again submitted its revised proposal for the generation of 18 megawatt (MW) of power (Anon, 2006; Sharma, 2006). It is yet to be decided by the government of Karnataka.

7.2. Controversial Bedti Project

KPCL planned to build a 111 metre high dam across the Bedti River to generate power, as early as in 1978-79 near Magod in Yellapur taluka. Continuous agitation by environmentalists, followed by a seminar on the Bedti, its valley and its ecological assessment, forced the then Chief Minister, Gundu Rao (1980-83) to stay the implementation of the project (Reddy, 2012). In 1992, KPCL revived its earlier proposal to build the dam. The Union Ministry for Environment and Forests withdrew its approval to build the project in October 1992. In 1995-96, the KPCL again suggested a run-of-the river scheme with 16 mini-dams proposed across the Bedti at different points. The Government signed a memorandum of understanding with private companies to build six mini dams, but environmentalists opposed the project again pointing out that it would also cause ecological imbalance in the valley (Habbu, 2000). Huge rallies, protests forced the government to cancel the MoU with private companies on October 24, 1997. KPCL has not given up the Bedti Project and it has now proposed to augment the Kali Hydel project by diverting the waters from the Bedti to the Tattihalla Reservoir by building a dam across the Bedti at Kirvatti village. It means the project is still alive.

7.3. Dams on Six Dudhsagar Feeders

Karnataka had initially decided to build dams on the Katla and Palna tributaries of the Dudhsagar waterfalls in 1988, but they were not constructed. Now, besides the plan of constructing eleven dams on the various feeders of the Mhadei River along with diversion channels and canals, Karnataka has a plan to dam and divert the main feeders providing water to the Dudhsagar waterfalls. According to Sreeramaiah, technical consultant to water resources department, these diversion schemes are necessary for Karnataka to meet the requirement of drinking water and will be undertaken to divert water into the reservoir of the Supa dam. But these projects cause grave losses to the biodiversity as well as ecology of Mollem national park and the Mahavir wildlife sanctuary of Dharbandora in Goa state along with the Anshi-Dandeli tiger reserve of Karnataka (Kerkar, 2014).

7.4. Dams Mean Disaster for Agriculture?

Much debate has been going on in Coorg district about the building of dams. According to the members of SAI Sanctuary Trust, once the dams are built, annual replenishment of nutrients will cease and soil fertility will drop. Hence, no matter what types of dams are built, the dams themselves will mean ‘disaster’ for agriculture for several reasons. Trustees expressed their concern about building of dams in the Kodagu, and more specifically at several sites on the Barapolay River located inside the Oorti and Kerti reserve forests, which form part of the core area of the Brahmagiri Wildlife Sanctuary of the Western Ghats / Nilgiri Mountains. All types of wildlife in the areas of the dams will be catastrophically affected for a number of reasons (Malhotra, 2008).

7.5. Gundiya Project

Western Ghats Ecology Expert Panel (WGEEP) has reported that Gundia power project in Karnataka should not be permitted as its execution can cause significant environmental impact and biodiversity loss. The Karnataka Power Corporation Limited (KPCL) proposed to implement the project in the Gundia river basin in Hassan and Dakshina Kannada districts to generate 200 MW (Sudhi, 2012; Paliwal and Aghor, 2012).

Table 1: Salient features of few important Dams constructed in Karnataka State (From 1900 to 1982)

Sl. No	Name of the dam	Built across the river	Purpose	Built in	Length (m)	Height (m)	District
1	Vani Vilas Sagar	Vedavathy	Irrigation	1907	405.4	43.28	Chitradurga
2	Krishna Raja Sagara (KRS)	Cauvery	Drinking water	1924	2620.36	39.86	Mysore
3	Maralvadi	Arkavathy	Irrigation	1938	480	16.5	Ramanagar
4	Tungabhadra	Tungabhadra	Irrigation, Hydel power, flood control	1953	2449	49.5	Bellary
5	Neerasagara	Bedtinala	Water storage	1955	1158.25	24.6	Dharwad
6	Nugu Dam	Nugu	Irrigation & Hydel power	1957	637.65	43.58	Mysore
7	Linganamakki	Sharavathi	Hydel power	1964	2400	58.82	Shimoga
8	Bhadra	Bhadra	Irrigation & Hydel power	1965	1708	76.81	Chikkamagalur
9	Malaprabha	Malaprabha	Drinking water	1972	40.23	154.53	Belgaum
10	Chandrampalli	Bhima	Irrigation	1973	926.54	28.65	Gulbarga
11	Kabini	Kabini	Irrigation & Drinking water	1974	696	58	Mysore
12	Kanakanala	Kanakanala	Irrigation	1975	975.65	20.12	Raichur
13	Hidkal	Ghataprabha	Irrigation & Hydel power	1977	10183	62.48	Belgaum
14	Hemavathy	Hemavathy	Irrigation & Drinking water	1979	4692	58.5	Hassan
15	Tattihalla	Tattihalla	Diversion dam	1979	1225	42.4	Uttara Kannada
16	Bommanahalli Pick-up	Kali	Hydel power (diversion dam)	1979	1024.8	30.45	Uttara Kannada
17	Gundal	Gundal	Irrigation	1980	1219	31.55	Mysore
18	Narihalla	Narihalla	Irrigation	1981	295	32.92	Bellary
19	Harangi	Harangi	Irrigation & Hydel power	1982	845.8	53	Kodagu
20	Basava Sagar Dam or Narayanpur	Krishna	Irrigation	1982	10637.52	29.72	Yadgir

7.6. Diverting Water from Mahadayi

Karnataka High Court has put a stay on the ongoing construction of dams by the state government for diverting water from the west-flowing Mahadayi and its tributaries to the east-flowing river Malaprabha in the eco-sensitive Western Ghats region bordering Karnataka and Goa. The court ordered that all construction work should be stopped till the Karnataka government gets mandatory forest clearance (Suchitra, 2013).

7.7. Dandavati, Kalloddu & Malathi Projects

Rehabilitation and payment of compensation to the people displaced by the projects that had been implemented in the past are yet to be resolved; hence it is inevitable to oppose several proposed controversial projects like Dandavati Irrigation Project in Sorab taluk, Kalloddu and Malathi (Anon, 2009).

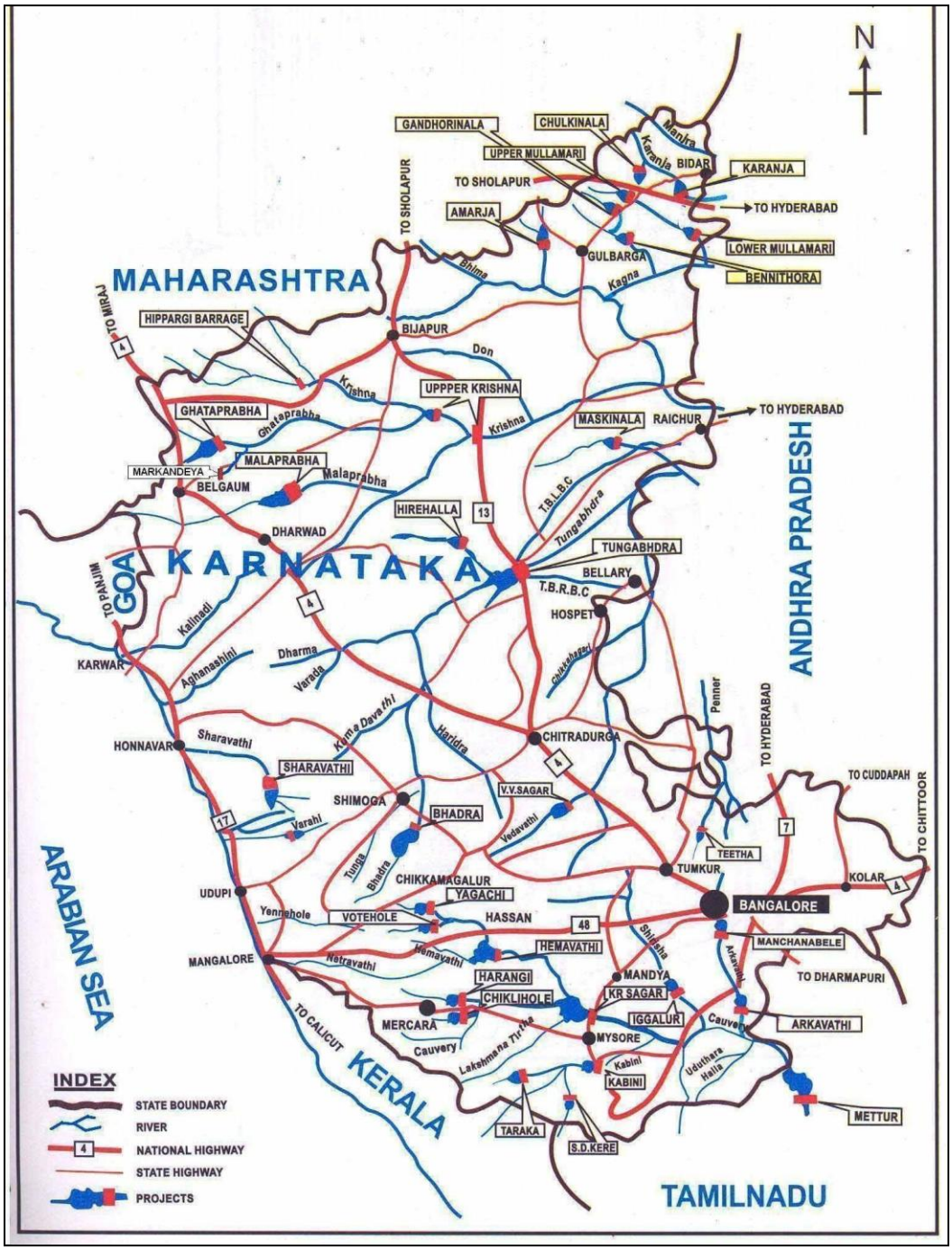


Fig. 2: Irrigation projects of Karnataka State

8. DAMS FOR DEVELOPMENT OR DAMNING OF KARNATAKA ENVIRONMENT

The entire environmental governance related to dams, Sanctioning of Projects, Mitigation Measures, Compliances, and Monitoring is riddled with serious problems making dams a huge challenge before India's biodiversity (Parineeta, 2012). All the governments and political parties in the country have given first preference to human beings than environment till the early years of 21st century (Anon, 2014). Nature based conflicts lie at the heart of the Indian environment debate (Gadgil and Guha, 2007). Rivers face existential threats due to dams. Most of India's major, medium and minor rivers have been dammed at several places, thus affecting the freshwater flows downstream from such dams, particularly in the non-monsoon months, and also affecting the character of floods in the monsoon (Philippe et al., 2012).

Table 2: Salient features of a few important Dams constructed in Karnataka in the last 30 years (1983 to 2014)

Sl. No	Name of the dam	Built across the river	Purpose	Built in	Length (m)	Height (m)	District
21	Votehole	Votehole	Irrigation	1984	900	44.48	Hassan
22	Suvarnavathi	Suvarnavathi	Irrigation	1984	1170.4	25.9	Chamarajnagar
23	Taraka	Taraka	Irrigation	1984	1272.5	37.49	Mysore
24	Upper Mullamari	Mullamari	Irrigation	1984	810	28.4	Bidar
25	Chiklihole	Chiklihole	Irrigation	1985	464.8	25.3	Kodagu
26	Supa	Kali	Hydel power	1985	332	101	Uttara Kannada
27	Chakra ((to feed water into Linganamakki reservoir)	Chakra	balancing reservoir	1985	570	84	Shimoga
28	Upper Kaneri	Kaneri	Diversion dam	1986	163	27	Uttara Kannada
29	Theetha	Jayamangali	Irrigation	1986	1017	22	Tumkur
30	Mani	Varahi	Hydel power	1988	580	59	Shimoga
31	Karanja	Karanja	Irrigation	1989	3480	28.1	Bidar
32	Aheri-Jumbagi	Aheri-Jumbagi	Irrigation	1989	1018	10.59	Bijapur
33	Lakya (to prevent contamination	Bhadra	Irrigation	1994	1048	108	Chikkamagalur
34	Kadra	Kali	Hydel power	1997	2313	40.5	Uttara Kannada
35	Amarja	Amarja	Irrigation & Drinking water	1998	960	31.85	Gulbarga
36	Kodasalli	Kali	Hydel power	2000	534	52.1	Uttara Kannada
37	Bennithora	Bennithora	Irrigation & Drinking	2001	2340	31.39	Gulbarga
38	Yagachi	Yagachi	Irrigation & Drinking	2001	1280	26.237	Hassan
39	Gandorinala	Gandorinala	Irrigation	2002	1813.5	24.27	Gulbarga
40	Arkavathi	Arkavathi	Irrigation	2004	720	29.68	Ramanagar
41	Almatti	Krishna	Irrigation	2005	1565.15	52.25	Bijapur

9. LOSS OF FERTILE RIVER VALLEYS

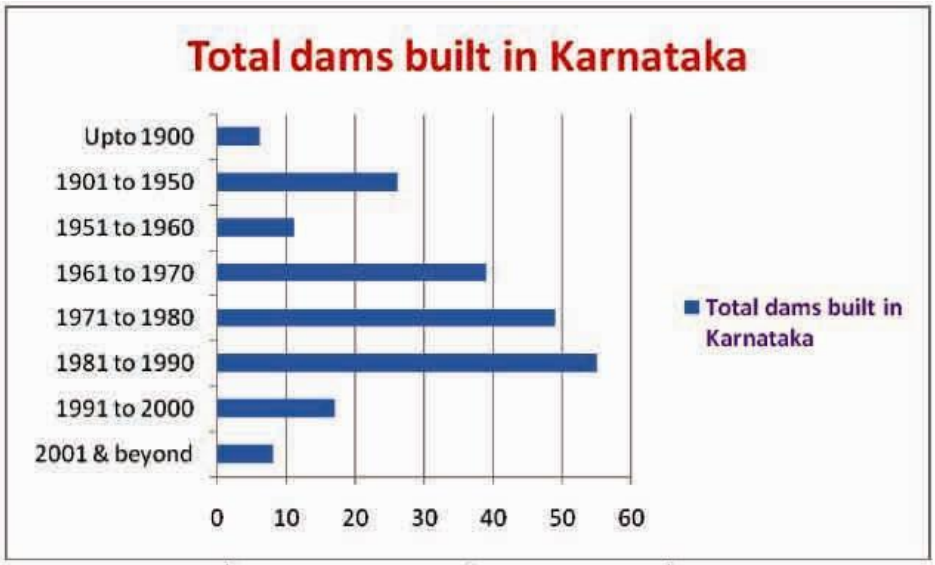
With annual precipitation of 4000 to 5000 mm in the Ghats, the hilly terrain of Uttara Kannada and neighbouring disticts afforded opportunities for the utilization of hydroelectric power. A number of such projects were taken up. Given the dominance of the urban-industrial sector at the national policy making level, it is natural that little attention has been paid to the loss of fertile valleys under these projects. Compensation for the land submerged has been inadequate. Lack of consideration for preservation of vegetation in the catchments has resulted in rapid siltation of reservoirs, floods and other problems. These problems went unnoticed in early years of independence. By 1980's, they began to draw attention and assessment of the environmental impact of dams was made mandatory (Prasad et al., 1985).

10. LOSS OF FOREST FOR THE CONSTRUCTION OF DAMS

Rivers, lakes, and wetland ecosystems support a disproportionately large part of global biodiversity. Construction of dams causes widespread flooding of surrounding areas causing destruction of species that inhabit the area. They also affect the flow of riverine species like fishes and disrupt their normal habitats. Large tracts of forest land in Karnataka state have been cleaned up for monoculture plantations like teak, coffee and rubber. This has led to the destruction of species that were dependent on the forest. An example is loss of special habitats in Karnataka such as Myristica swamps and high altitude grasslands. In the dry zone, they have adversely affected several species dependent on large tracts of scrub such as the wolf and the Great Indian Bustard.

10.1. Classic Example of Kali Nadi Hydroelectric Project (Khep)

A total of 15,797 hectares of forest land along the Kali River and its tributaries and in the deep gorges of Western Ghats has been totally demolished due to submergence under the major reservoirs. Supa reservoir affected 47 villages of which 26 villages were fully submerged and 21 partially affected. The total population affected is 15,000 of about 3000 families. 302 hectares of forest is cleared at Ramanagar to rehabilitate the affected people. The luxuriant growth of evergreen species developed and observed by our ancestors in the Kali river valley is now undergoing a vast change in its ecosystem along the river course and its tributaries (Homji MVM 1980, Birasal, 2001,).



Year of construction	Total dams built in Karnataka
2001 & beyond	8
1991 to 2000	17
1981 to 1990	55
1971 to 1980	49
1961 to 1970	39
1951 to 1960	11
1901 to 1950	26
Upto 1900	6

Fig. 3: Total dams built in Karnataka State since 1900

11. CONCLUSION

In 1954, while inaugurating the Bhakra Nangal dam, the then Prime Minister Jawaharlal Nehru christened it as the 'temple of modern India'. Man's attempts to intensify the use of natural resources can often result in the exhaustion of the resource or deterioration of other interacting resources. In the last 60 years, Cost-Benefit analysis, Environmental Impact Assessment (EIA) studies have proved that some projects are not yielding fruitful results. Forest is removed due to submergence of dams but siltation process followed affecting the storage level. Deforestation has resulted in inadequate and erratic rainfall every year. According to historians, the 145 foot tall Vani Vilas Sagar dam built in 1907 with a storage capacity of 30 tmc.ft was full to the brim only once (in 1933). Siltation is a major problem with old dams and also

preventing natural regeneration of forests. Vast forest area has already been destroyed to accomplish these massive engineering marvels. Majority of these projects have threatened our rich endemic wildlife. Against this backdrop, it is the time for our experts, officials and elected representatives to rethink of their single-minded pursuit of the development of the water resources of the rivers, failing which we will be forced to live without a healthy environment.

REFERENCES

Anon (2006). Kali river dam proposal resurfaces dubiously. India Together Report in issue of 23 August, 2006

Anon (2007). Kali Bachao Andolan. Report published by Environment Support Group (ESG) trust dated February 25, 2007

Anon (2009). Agitation against Dandavati project spreads to Sagar. A report published in The Hindu January 21, 2009

Anon (2010a). The thirsty dams of Uttara Kannada. The New Indian Express. August 28, report

Anon (2010b). Check-dams: Bidar model to be adopted Statewide. A report published in The Hindu. September 20, 2010

Anon (2013). Storage status of important reservoirs in the country as on 31.01.2013. 5 pages report. http://www.cwc.gov.in/bulletin

Anon, (2014). Human or environment : What should be given preference? A report appeared as India Opines. Honest news, Views and Editorials Blog January 16, 2014

Balaji J (2012). Stop Karnataka from constructing check dam. A report published in The Hindu, May 22,2012

Balooni Kulbhushan, Kalro AH, Ambili G Kamalamma (2008). Community initiatives in building and managing temporary check-dams across seasonal streams for water harvesting in South India. Agricultural Water Management, 95(12): 1314-1322

Baxter RM (1977). Environmental effects of dams and impoundments. Ann. Rev. Ecol. Syst., 8: 255-283

Baxter RM (1985). Environmental effects of reservoirs. In Microbial processes in reservoirs (Ed. D Gunnison). PP 1-26.

Birasal NR (2001) Some studies on the changes in the freshwater ecosystem during the impoundment of the Kali river (Karnataka state, India). Intern. Archives Sci. Technol., 1(1): 1-5

Gadgil M (1979). Hills, dams and forests. Some field observations from the Western Ghats. Proceedings of the Indian Academy of Sciences, 2(3): 291-301

Gadgil M, Guha R (2007). Ecological conflicts and the environmental movement in India. In Environmental Issues in India: A Reader. Edited by Mahesh Rangarajan, PP 385 – 429

Gerd M (2001). Dams, fish and fisheries: Opportunities, challenges and conflict resolution. FAO Fisheries Technical paper 419. PP 166

Govindasamy Agoramoorthy and Hsu Minna J (2008). Small size, Big Potential: Check dams For Sustainable Development**.** Environment: Science and Policy for Sustainable Development. 50(4): 22-35

Habbu RS (2000). Environmentalists opposed to Bedti Project. A report published in The Hindu. November 13, 2000

Homji Meher VM (1980). Repercussions of deforestation on precipitation in Western Karnataka, India. Archiv für Meteorologie, Geophysik und Bioklimatologie, Serie B. 28(4): 385-400

Kerkar Rajendra P (2014). Karnataka to build dams on six Dudhsagar feeders. A report published in The Times of India March 25, 2014

Malgonkar M (2000). Rivers for sale. A report published in Spectrum, The Tribune. June 11, 2000

Malhotra AK (2008). Dams for Coorg or Damning of Coorg? Archives of SAI Sanctuary Trust, http://www.saisanctuary.com/envir_dams.htm.

Prasad Narendra S, Hegde MS, Madhav Gadgil and Hegde KM (1985). An experiment in Eco-development in Uttara Kannada district of Karnataka. South Asian Anthropologist, 6(1): 73-83

Paliwal A, Aghor A (2012). Experts' panel red flags power, mining projects in Western Ghats. March 7, 2012. Down to Earth Magazine.

Parineeta D (2012). Damned Biodiversity : Impacts of Dams on Biodiversity: Need for Urgent Collaborative Action. Paper presented as part of plenary session in Second Indian Biodiversity Congress held at IIS, Bangalore from 9-12 December 2012.

Philippe C, Suhas P, Himanshu T, Vani MS, Joy KJ, Ramesh MK (2012). Water conflicts in India: Towards a New Legal and Institutional Framework. Forum for Policy Dialogue on Water Conflicts in India, Pune. PP 1-118 http://conflicts.indiawaterportal.org

Prasad Narendra S, Hegde MS, Gadgil M, Hegde KM (1985). An experiment in Eco-development in Uttara Kannada district of Karnataka. South Asian Anthropologist, 6(1): 73-83

Reddy Maheswara Y (2012). Bedthi hydro-electric plant languishing for 30 years. A report

published Bangalore, Agency : DNA on 9 October 2012

Rozindar F (2010). Vani Vilas Sagar Dam waits for better days. A report published in The Hindu dated October 26, 2010

Sengupta SK (2009). National register of large dams. Chief Engineer (DSO), Central Water Commission published a 224 pages register

Serageldin I (1995). Water Resources Management: A New Policy for a Sustainable Future. Water International, 20(1): 15-21

Shah RB (1993). Role of major dams in the Indian economy. International Journal of Water Resources Development, 9(3): 319-336

Sharma Ravi (2006). Another dam, another row. Frontline, 23(9): 06-19

Suchitra M (2013) High Court stays Karnataka's efforts to divert water from Mahadayi. A report published in Down to Earth on March 4, 2013

Sudhi KS (2012). Gundia power project will result in bio-diversity loss, says experts panel. A report published in The Hindu on January 1, 2012

Venkatachalam L (2003) Infrastructure and agricultural development in Karnataka state. IX/ADRT/92.

Narayan Ramappa Birasal earned his doctorate in Zoology in 1989 from Karnatak University Dharwad. The title of Ph.D thesis is some studies on the changes in the freshwater ecosystem during the impoundment of the Kali River (Karnataka state, India). He has worked as Research Fellow in a project sponsored by Department of Environment, wildlife and forests, Government of India (Western Ghats Research Project No. 9/122/84. En.2) for three years (1984 to 1987). He is currently Associate Professor in Zoology at KLE Society's G H College Haveri. He is now working as Principal investigator in an MRP entitled a survey of birds found in and around Haveri district financially supported by UGC.