Assessment of Krishna River Basin Closure:
Contribution of Maharashtra

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Abstract

In recent years, to satisfy societal demands of day to day life, water is extracted from all available sources. River basins are mined limitless at various locations. After a certain point a time comes when no more utilizable flow is left in the basin i.e. when the basin is said to be closed. Basin closure means scarcity and more frequent water crisis, many of which are artificially created by over committing water resources. In spite of this, in many cases of closed river basins, over allocations, exploitation continues and the water depletion exceeds the utilizable flow, which leads to a potentially unsustainable situation. Krishna River basin is an example of a closed river basin in peninsular India where Basin Closure has happened not only at river mouth but also at sub basin level. Trends in water uses in Maharashtra infers that water use in Bhima sub basin has crossed the optimal point by irrigation, domestic, industrial sectors due to over use of water, which is critical socially and environmentally. Since hydrological cycles, water users, aquatic and terrestrial ecosystems are interconnected; it is difficult to administrate river basins. Presently in sub basins of Krishna, instead of giving scope to the development of the water, it is important to give more emphasis to the water management. Well defined water policies, water rights, management and governance are required to deal with these closed or closing sub basins.

Key Words: societal demands, closed river basin, water use, ecosystem, water management, governance

1.0 Introduction

In the phase of growing human pressure and in the course of time, the supply of natural resources reaches capacity. Most of the water resources are committed of depleted with very few remaining untapped. Hence if we come to a postulation of concept of River basin closure, it can be said that when water consumption from a basin to fulfil needs of societies as well as environment is beyond optimal point of availability of water.

In order to fulfil demands of population increase, uncertain weather, etc. obvious response of the governing

bodies is to tap whatever water available without using it carefully. For bridging gaps between demands and supply, unsustainable practices towards water management are established. Because of these practices long term, irreversible environmental losses have begun to emerge. The challenge is to manage the water resources over the time and space sustainably without compromising environmental water needs.

Today the struggle for scarce water resources in many places is unavoidable. Many river basins are unable to fulfil all the demands of water even for their rivers to reach the sea. Further extraction of water for human use is not possible because limits have been reached and in many cases breached. Basins are effectively "closed," with no possibility of using more water. The lack of water is thus a cause of worry to produce food for hundreds of millions of people.

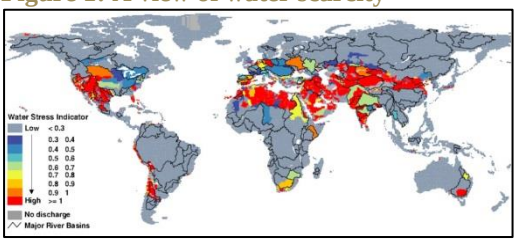
Humans are not the only ones who are using available water for themselves. Aquatic, terrestrial ecosystems are also dependant on fresh water. Ecosystem services are fragile and are vanishing by the way we grow food. The climate is changing, affecting every aspect of neighbourhoods, economies and ecological systems. The trend lines shout out that we are not doing the right things. Inequity in the benefits of water use will grow between haves and have-nots to the detriment of food production. The pollution and depletion of rivers and groundwater will continue. Enough food grown at the aggregate global level does not mean enough food for everyone.

The Comprehensive Assessment of Water Management in Agriculture by more than 700 scientists and practitioners from around the world for more than five years leave their strong and urgent message: problems will intensify unless they are addressed and now.

2.0 Explaining the Basin Closure

According to the research done by (Molle F., 2006), some of the examples of overcommitted basins are the Colorado River, Indus, and Murray Darling river basin. Great concern according to (Falenmark M, Molden D., 2008) over the last 50 years is that, many river basins supporting important economies, many of the world's economy generating areas have reached the closed limit.

Figure 1: A view of water scarcity

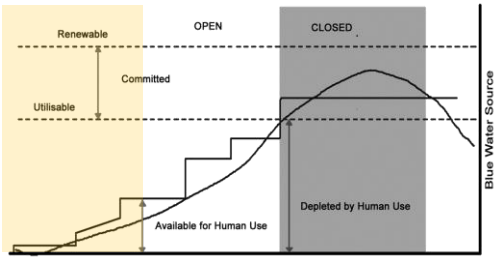


Source: (Smakhtin V), Water for food water for life (Red areas show closed basins)

Fifty years ago there was less population in the world than today, fewer calories were consumed, had less meat, and thus less water was required to produce food. There was less pressure imposed on the environment and hence water consumption was also less.

Literature on Basin closure provides us phases of water development like development, utilisation, and allocation.

Figure 2: A view of water scarcity



Source: Malin Falenmark, David Molden, (November 2008): Wake Up to Realities of River Basin Closure, International Journal of Water Resource Development

In the phase of development, water use is limited. Dams are constructed in the most convenient locations and used for irrigation, producing energy and domestic supplies. Demand supply gaps are minimal and conflicts rarely arise.

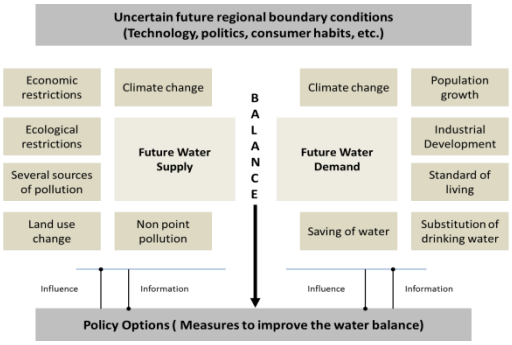
In phase of utilisation, water shortages start to appear in the dry seasons. As a safeguard, more large scale water storing capacity dams are added in the basin and ground water is pumped out of deep aquifers. Water resources I the basin achieves full development. Management, improving water infrastructure, saving water, water pollution become critical issues. As basin is near closure, need of sectoral allocation is felt. Allocations are diverted to economically valuable sectors. New institutions are established to manage river basins.

Third phase starts when basin is fully closed. Societal demands and environmental demands cannot be fulfilled by the basin. New alternatives like water transfers are opted for augmentation of water. Scarcity is experienced during and beyond dry periods of year.

Water scarcity is either lack of enough water (quantity) or lack of access to safe water (quality). It involves water stress, water shortages, and water crisis. Stress is the difficulty in

obtaining sources of fresh water for use also called as economic water scarcity and crisis is lack of sufficient potable water than demand also called as physical water scarcity.

Figure 3: Driving forces of water supply and demand



Source: (Mall R. K., 2006)

The driving forces of water scarcity (being the "imbalance between water supply and water demand") comprises of mainly population growth, migration, land use changes, climate change and changes in economic activities and thereby changes in societal needs. These are significant drivers, which exert stress directly by altering water availability (rainfall, evaporation, evapotranspiration, etc.) or indirectly by upgrading production patterns, changing consumption patterns on water resources and ultimately on the aquatic environment. (Strosser P., et.al., 2012)

Land use change in the agricultural sector is one of the foremost key drivers in water deficit areas. Its share can reach up to 85% of water use as a result of the high dependence on irrigation. Due to research and development in the sector of irrigation techniques, effective fertilisers and insecticides, improved seed varieties etc., development of irrigated areas increased extensively. This expansion in irrigated areas is the reason for series of adverse environmental impacts, viz. over-pumping of fragile aquifers, water logging and increased soil salinity.

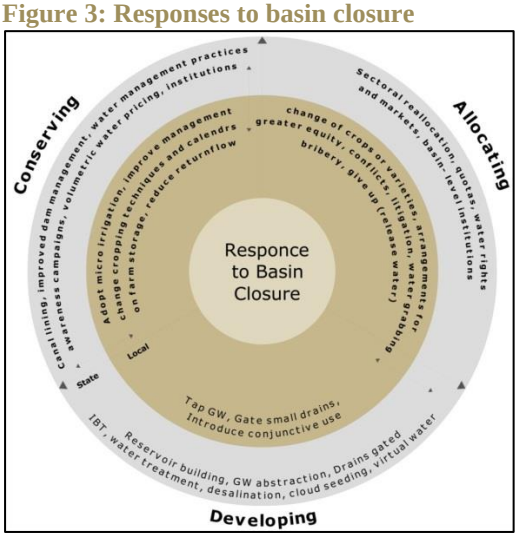
Indeed, a WWF and SEO/Birldlife (2010) study highlighted that the level of subsidies allocated to the agricultural sector in a region was inversely correlated to its environmental situation (in terms of overexploitation of aquifers or nitrate and phosphate pollution originating from agricultural practices), as innovation, motivation and subsidies are given to farmers to use fertilisers and pesticides to increase agricultural produce that imposes higher pressures on the environment. (Strosser P., et.al., 2012)

Along with these, people expect more water for their daily needs like drinking, food production, recreation

and aesthetics. There are political as well as other pressures with societal demands, and hydraulic development is at the prime importance of the political agenda. (Falenmark M, Molden D., 2008)

Societal responses to water scarcity comprise of several strategies at individual, community and state levels. Some of the common responses can be explained as below.

Figure 3: Responses to basin closure



Source: (Wester H, Molle, 2007), (Molle F., 2006)

Developing responses:

These consist of problem solving options by tapping available resources. Usually this is accomplished by constructing new dams, reservoirs, digging more wells for ground water, artificial water seeding, etc.

Water is tapped from shallow or deep aquifers, local ponds, drains, streams, irrigation canals etc.

Conservation responses:

This refers to using existing resources efficiently without increasing supply. This includes minimizing losses by controlling leakages, treating and reusing waste water at community level. At local level, adopting alternative techniques for farming, choosing water intensive cropping patterns, reducing return flows of waste water from industries and domestic areas. At state level, policies that stimulate water savings like water pricing, quotas, incentives to water savers, etc.

Allocation responses:

This response is of reallocating water in water consuming sectors. Reallocation is done to release tension by favouring uses which could increase food security, equity, reduce conflicts. Reallocation distributes stress in all the sectors instead of one sector bearing. Inter sectoral transfers is generally economic. Usually domestic and industrial sectors get water before agriculture. Generally, water for environmental services is the neglected

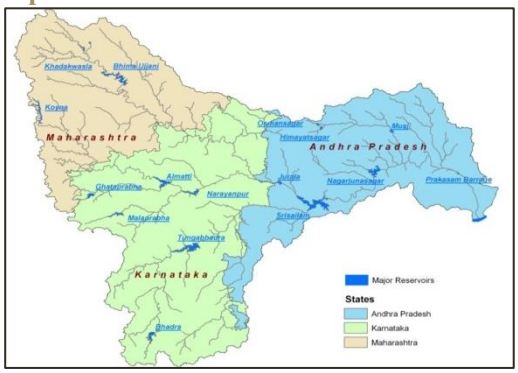
sector and doesn't get water allocated for it. Because of which huge socio-environmental concerns arise.

The present literature about basin closure, concepts and methods are not defined for the systematic analysis of basin closure as a phenomenon that can appear at various locations and moments in a basin. Hence impact of influence of environmental and human induced factors on a basin's runoff often remains unclear, and the contributions of different sub basins to the closure of an entire river basin are generally not addressed separately.

3.0 Krishna River: Introduction of the study area

Krishna River originates from Mahabaleshwar in Western Ghats at height of approx. 1337 above mean sea level and flows 1400km eastwards to meet Bay of Bengal in Andhra Pradesh. Geographically and according to administrative boundaries, basin lies in the states of Maharashtra, Karnataka, and Andhra Pradesh. (Venot, Hugh, 2007), (Venot,et.al., 2008) (National Rain fed area authority, 2011) has ranked Krishna River Basin as India's fifth largest river basin which covers around 8% of total area of country which is 2, 58,948 km2 in peninsular India. Krishna River flows to east and the river basin is second largest interstate basin in the peninsular part.

Figure 1: The Krishna River Basin in Riparian States

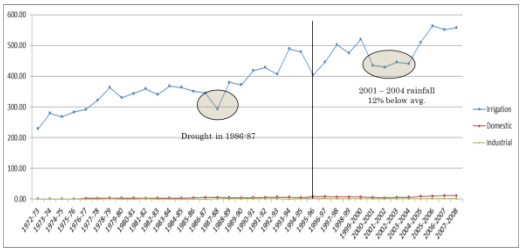


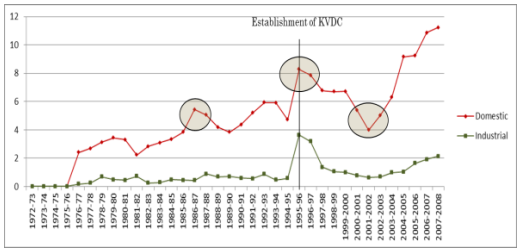
Source: IWMI

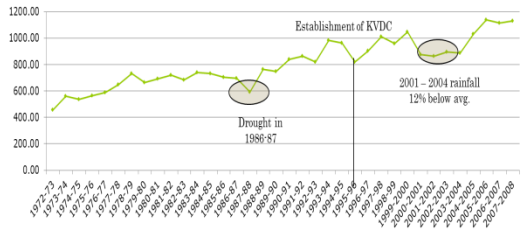
4.0 Water uses

As we have compared both the figures of the years 1955-65 and 1990-2000, importance of irrigation in water use is growing year by year.

As said by (Biggs T.,Gaur A., 2007) Depletion in rain fed agriculture was the main user of water, due to the large area coverage of rain fed crops, notably in the dry areas of the Deccan Plateau.







According to negotiations in KWDT award, Maharashtra can use 585TMC of Krishna water which comprises of surface water to the tune of 560 TMC and 25 TMC from regeneration within Maharashtra area. On Andhra Pradesh taking up Pollawaram project for diversion of Godavari water into Krishna basin an additional quantum of 14 TMC water use is allowed by the Tribunal to Maharashtra State. With this, total water use allocation to the State goes to 599 TMC. (MKVDC, 2010-2011)

KWDT award also keeps an account of how much Krishna water has been used by Maharashtra government for different purposes.

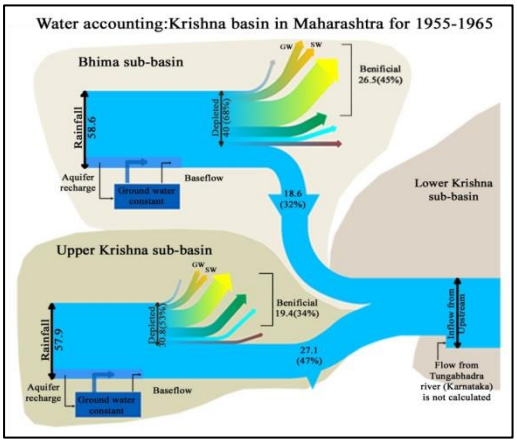
If we observe trends in total water use from 1972-73 to 2006-07, it is very clear that water use is increased from 228 TMC to 571 TMC.

Sudden drop in the water use during 1986-87 can be explained by drought suffered in Maharashtra at that time. In 1996, due to establishment of MKVDC, water use by irrigation sector could have been controlled and domestic and industrial uses promoted. Again during 2001-04 because of below average rainfall by 12%, water use could have been controlled.

If environmental flow is considered to be 2% of total utilizable flow (allowed by KWDT) approximately 12 TMC should be kept aside. In this case, total water use including environmental flow can be calculated to 583 TMC.

Though Maharashtra has maximum amount of dams in the country, water scarce regions are increasing day by day. This can be because of the works carried out in the catchment area. This has shifted water flow from agriculture to other works and nearby towns.

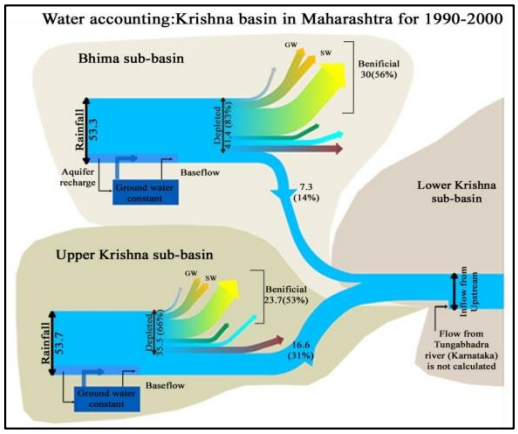
Figure 2: Water use scenario from 1955-1965



Source: (Vennot, 2008)

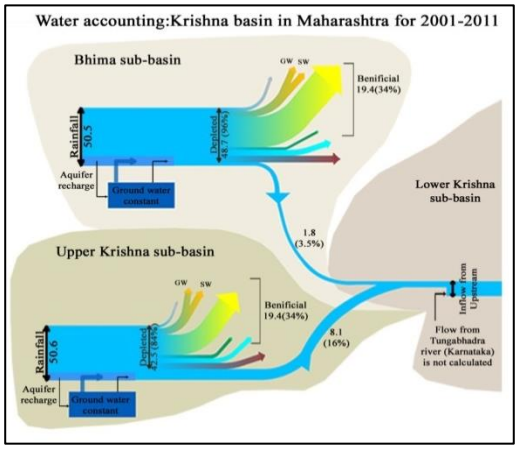
In 1990-2000, beneficial depletion from rain fed agriculture and low beneficial depletion from natural vegetation accounted, is more than it was in years of 1955-65. These figures clearly illustrate that sustainable and equitable water management (rain fed agriculture is the main livelihood for the poorest communities) can only be achieved through an increase in the productivity of agriculture in semi-arid rain fed areas (Venot, Philippe J., 2008).

Figure 3: Water accounting scenario for 1990-2000



Source: (Venot, Philippe J., 2008)

Figure 4: Water accounting scenario for 2001-2011



Source: prepared with the help of available information

But when we observe water accounting scenario of years 2001-2011, it can be inferred immediately that water use in Bhima sub basin has crossed the optimal point due to over use of water till the last drop of available fresh water and in upper Krishna sub basin, water use is leaping towards its closure point. Hence the Krishna basin is not only closed at its mouth but also at its sub basin levels, which is critical socially and environmentally.

5.0 Conclusion

At present, instead of making new policies and governing bodies, collaboration and synchronised working of existing bodies is important. Grass root level actions in individual sub basins and water sheds, should lead to basin level priorities. Some of the water sector reforms are discussed below.

State water Policy was formed by GoM in 2003 and was revised in 2011. The policy describes the water scenario, challenges and perspectives. Policy framework emphasises on Integrated Water Resource Management (IWRM) along with need for watershed management, ground water management, and aquifer management. The revised policy gives second priority to irrigation after drinking water. (Patil, 2012) Water for environmental purposes is still at fifth place. Policy mentions that dams should allow minimum water flow as environmental flow in the rivers but the minimum water flow is not defined. Water rights are not clearly mentioned. Political economy operates water market in Maharashtra. If water policy is rightly drafted and followed then some of the answers to water scarcity and droughts in Maharashtra can be fetched.

Maharashtra gets credit for establishing MWRRA in 2005 to finalize water tariff for irrigation and non-irrigational water uses with appropriate incentives and penalties. It is also responsible for monitoring and regulating water resources within the state, trading, allocation and utilisation to maximise efficiency of water use.

(SANDRP, 2013) blames GoM, for making wrong decisions about building impracticable and unwanted dams, cropping patterns, unacceptable water management system, diversion of water for non-priority uses leading to reduction in per capita water.

According to (SANDRP, 2012), during the drought, MWRRA was arranging meetings for revising water tariffs and not on the main issue. In Bhima sub basin, MWRRA is facing opposition from downstream users because of very poor quality of Ujjani reservoir because of untreated sewage from Pune and sub urban areas. As upstream area is sugarcane lobby, downstream cities in Solapur are suffering from scarcity. The dams upstream have huge amount of dead storages. According to (SANDRP, 2012), senior official of

MWRRA have argued that these storages can be used for drinking water supply. But the fact is that there is no mechanism or policy to achieve that.

Agriculture is largest sector consuming water resource as a person consumes more food a day than he drinks water. And hence agriculture has more opportunities for water saving through proper irrigation methods and water intensive cropping pattern.

Krishna basin is one of the important sugarcane growing areas in the state. Drought prone and drought affected districts are major sugar producing districts. 45000 cu.m per a hectare water is needed for cultivating sugarcane or 2068litres of water for producing 1Kg of sugar, which is huge. There has been no serious attempt at controlling area under sugarcane or controlling unauthorised sugarcane cultivation around Ujjani backwaters. 'In affidavit in high court, Maharashtra government said on March 28th 2013, that MWRRA effectively does not exist'. (SANDRP, 2013)

It is said that benchmarking irrigation projects will help government officials and planners in policy formulation for development as well as management. It will help irrigation sector to be transparent along with many benefits such as equitable distribution, improvement in irrigation efficiency, increased per unit of water etc. (Water Resources Department, 2003-04). During the survey by SANDRP, few hotel managers denied that there is water scarcity in Solapur. Poor are suffering from water scarcity and wealthy and powerful continue to get water whenever they want regardless the quantity. Pune ESR shows that 146 MCM water is diverted to clubhouses and hotels in urban and sub urban areas of Pune which is equal to domestic water requirement of the entire city.

Water accounting and auditing is extremely important in order to save water by reducing water losses in undesirable sectors and for transparency and accountability within the system.

Presently, the water account of irrigation is first checked at Circle level and then scrutinized the water account of each project to find out differences. Water auditing of each irrigation management division is carried out annually as well as midterm, if needed.

Since from the scenario it is clear that, government officials are unsuccessful in water auditing and accounting, they can include BSc students, students of environmental sciences etc. in to these processes as their internships so that processes will be accurately executed within lesser time.

The Assessment done by a huge number of researchers around the world give urgent message that, closure and scarcity problems will intensify unless they are addressed now.

Store the water of the precipitation, soak the water into the earth, these are activities all of us have to do seriously because 'water is Life', otherwise Water would be the cause of third world war.

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