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Water Resources And Environment: Search For Sustainable Supply And Equity Wit Special Reference To Kangpokpi District, Manipur

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Abstract The world faces a wide range of ecological and human health crises related to inadequate access to, or inappropriate management of, clean fresh water. As human populations continue to grow, regional conflicts over water, ecological degradation, and human illness and death are becoming more frequent and serious. Water scarcity threatens us all — menacing our well-being, jeopardizing our livelihoods, and sometimes endangering our lives. In more prosperous countries, water shortages curtail economic growth and diminish the quality of life. In poorer countries — especially among poor people — the scarcity of good water in adequate quantities already counts as a deadly affliction. As we approach the turn of the century, new approaches to long-term water planning and management that in-corporate principles of sustainability and equity are required. Among these principles are guaranteed access to a minimum amount of water necessary to maintain human health and to sustain ecosystems.

Keywords: Jhum Cultivation, water resource management, environment, sectoral planning, institutional challenges

Introduction

Water is a finite resource that is fundamental to human well-being and only renewable if well managed. Smart water management is a pre-condition of sustainable development. Managed efficiently, water plays a vital role in strengthening the resilience of social, economic and environmental systems in the face of rapid and unpredictable changes. Water resources are a key element in policies to combat poverty, but are sometimes themselves threatened by development. Under the backdrop of the financial and economic dimensions affecting the use of water resources be it water extraction, pollution or allocation sustainable water resources management, the scientific assessment of the multiple connections between water resources and the economy is crucial. Water resource management is the cornerstone for sustainable development. According to the United Nations world water development report, one-fifth of the world's population lives in areas characterized by physical water scarcity. The increase of water demand concomitantly with water scarcity is a common threat for humanity; it is expected to be worse in the future. Thus, potential water resources need to be monitored with care for strategic management. Population growth and economic development cause significant increase in agricultural and industrial demand for water. Coming to our case study area, the Kangpokpi district in Manipur where mostly tribal population as per 2011 is still seen as being isolated and difficult area with little prospect for management of natural resources particularly water resources and sustainable economic development. As the Study district is located in Hill District, local water resources are very limited because of its geographical setting and physical environment. The availability of basic minimum services is very poor. Continuous central assistance in revenue and capital expenditure has not solved the problem of physical infrastructure and availability of market water resources except traditional water resources. The quality and quantity of available fresh water has been greatly affected by unsustainable development and governance failure.

The world faces a wide range of ecological and human health crises related to inadequate access to, or inappropriate management of, clean fresh water. As human populations continue to grow, regional conflicts over water, ecological degradation, and human illness and death are becoming more frequent and serious. Water scarcity threatens us all — menacing our well-being, jeopardizing our livelihoods, and sometimes endangering our lives. In more prosperous countries, water shortages curtail economic growth and diminish the quality of life. In poorer countries — especially among poor people — the scarcity of good water in adequate quantities already counts as a deadly affliction. It breeds sickness, blocks development, deepens inequalities of income and opportunity, and undermines the survival of entire societies. The natural environment is everywhere imperiled by these scarcities, and by misguided attempts to overcome them. When water scarcity occurs at the boundaries of ethnicity or privilege, or at international borders, or between urban and rural communities, it can intensify the risk of conflict (Brooks B. David 2002).

As we approach the turn of the century, new approaches to long-term water planning and management that in-corporate principles of sustainability and equity are required. Among these principles are guaranteed access to a minimum amount of water necessary to maintain human health and to sustain ecosystems.

It is fair to answer that water scarcities are hardly new to the human condition. But present and future scarcities matter more than ever before, and to more of us. Population growth, industrialization, and urbanization are depleting and polluting lakes, rivers, and aquifers irreversibly. New technologies empower us to extract water supplies faster than the rate of replenishment. Catastrophic human-made environmental damage is done on a global scale never before possible. And with the integrating forces of globalization, we are all now implicated in the troubles of others, no matter how distant.

Enter climate change. Climate change dramatically complicates the existing complexity and uncertainty that planners and managers have faced over the years. Climate change and climate variability render the entire situation more uncertain and difficult to manage. Better planning and management can enhance resilience to uncertainties in water quality and availability (this is sometimes referred to as “anticipatory adaptation”). However, there is a growing consensus that climate change will entail significant variations in the amount and timing of precipitation, changes that are potentially dramatic or even catastrophic. Unfortunately, there remains significant uncertainty about the precise parameters of the location, timing and quantification regarding such changes at the regional, national and local levels. In some regions, the baseline data are so sparse that the climate change scenarios, let alone the precise implications of those scenarios, remain skeletal. Moreover, increasing temperatures are expected to increase water demand, for example for agriculture.

Despite the complexity and uncertainty inherent in water management, including as a result of climate change, there are immediate and pressing needs that must be met that require managers to make important decisions now. People need water for drinking, to grow food, for industrial and commercial purposes, and for recreation; delaying decisions on the use and allocation of water until comprehensive studies are conducted would allow for continued unsustainable development and uses for years, further prejudicing the range of options. Similarly, it is not feasible to have a full understanding of the potential impacts of climate change before determining how best to adapt to those impacts. Indeed, considering the nonlinear and complex nature of the hydrologic cycle and the socio-economic factors affecting water use, such studies would never be able to predict accurately the long-term water needs, availability of water resources, or the specific legal and institutional responses that would be appropriate. Even if it were possible to understand and model perfectly the science of the different non-linear physical, biological and socio-economic factors affecting water availability and use – not to mention the interplay among those factors – their sensitivity to initial conditions makes long-term predictions problematic.

These are the hard facts. As reported in 2001 by the United Nations Population Fund (UNFPA), the global population has tripled in 70 years while water use has grown six-fold. Within the next 25 years, fully one-third of the world's population will experience severe water scarcity. Right now, more than 1 billion people lack access to safe drinking water; 3 billion people (half of everyone on Earth) lack access to basic sewage systems. More than 90 percent of all the sewage produced in the developing countries returns to the land and water untreated. For many millions of people, freshwater scarcity is defined as much by poor quality as by insufficient quantity.

Water-scarce countries are customarily defined as those with less than 1000 cubic metre of fresh water available per person per year — not enough to provide adequate food or support economic development, and a potential cause of severe environmental difficulty. Countries with 1000 to 1700 cubic metre per person per year are said to be water-stressed. UNFPA calculates that 508 million people lived in 31 water-stressed or water-scarce countries in 2000; by 2025 those numbers will likely rise to 3 billion people in 48 countries. The number of people suffering water scarcity will double in 25 years, and the total living with water stress will be six times higher by then. All of this will happen even though global water consumption has recently begun to level off, growing now only at about the same rate as global population.

According to the report of the World Commission on Water for the 21st Century (World Water Commission, 2000), renewable blue water flows will be insufficient to meet all industrial, domestic and agricultural needs by 2020, primarily due to growing water pollution, population growth, urbanization and inappropriate management practices. Many countries are already facing water crises, particularly those in arid and semi-arid regions. A new generation of water managers is needed, with new mindsets that can develop and implement innovative policies and practices. In brief, water management in the 21st century must change: business as usual is no longer a viable option. The current trends indicate that water scarcity is likely to threaten up to 50 per cent of the world population within the next generation, and continued mismanagement of water will result in significant local and regional water quality deteriorations. Many governments, international institutions and experts have started to address the urgent need to establish a new development agenda in the field of water management. Awareness of water crisis is well underway now, but mental switch has yet to happen.

Since independence, India has witnessed an unprecedented increase in population. With an increasing number of mouths to feed, there has been an additional pressure on agriculture resulting in an increase in net sown area from 119 million hectares in 1951 to 142 million hectares in 1997; high cropping intensity has also resulted in an increased demand for water resources. Domestic water need in the urban areas has also grown notably with the current urban population at 4.5 times the population level in 1950s (UNEP 1998). The water requirement of the manufacturing sector has increased in proportion to the increase in the sector's share in GDP from about 12% in 1950s to 20% in 1990s. By the year 2050, the population is expected to reach around 160 crores, the per capita availability will be drastically reduced and our country shall be water stressed in many river basins.

Further, there is substantial variance in the different user sectors—agriculture, domestic and industry, vis-à-vis, their share of water demand, resource pricing structure and usage efficiencies, which creates inter-sector competitions and conflicts. The agriculture sector, for instance, accounts for about 95% of the total water demand with the subsidized and free regime of supply of power and water resulting in the over-exploitation and inefficient usage of water. The high resource cost for industries, on the other hand, cross-subsidizes the water consumed by the other sectors. The demand for fresh water has been identified, as the quantity of water required to be supplied for specific use and includes consumptive as well as necessary non-consumptive water requirements for the user sector. The total water withdrawal/utilization for all uses in 1990 was about 518 BCM or 609m3/capita/year. Estimates for total national level water requirements, through an iterative and building block approach, have been made for the year 2010, 2025, and 2050 based on a 4.5% growth in expenditure and median variant population projections of the United Nations. The country's total water requirement by the year 2050 will become 1,422 BCM, which will be much in excess of the total utilizable average water resources of 1,086 BCM. At the national level, it would be a very difficult task to increase the availability of water for use from the 1990 level of approximately 520 BCM to the desired level of 1,422 BCM by the year 2050 as most of the underdeveloped utilizable water resources are concentrated in a few river basins such as the Brahmaputra, Ganga, Godavari, and Mahanadi.

It has been estimated by the National Commission that the annual 'usable' water resources of the country are 690 km^3 of surface water and 396 km^3 of groundwater, making a total of 1,086 km^3. The present quantum of use is put at around 600 km^3. It follows that in national terms the position is not uncomfortable at the moment. However, this will obviously change with the growth of population and the processes of urbanization and 'development'. The National Commission has made various assumptions in regard to these matters (high, medium and low rates of change), and come to the conclusion that by the year 2050 the total water requirement of the country will be 973 to 1,180 km^3 under 'low' and 'high' demand projections, which means that supply will barely match demand. It is the Commission's view that there will be a difficult situation but no crisis, provided that a number of measures on both the demand side and the supply-side are taken in time. (The precarious balance between supply and demand can of course tip over into a crisis if the actual developments fail to conform to the assumptions. Moreover, apart from demand putting pressure on the available supplies, the supplies themselves may also be seriously affected by the growing incidence of pollution and contamination of water sources.). A word regarding the concept of 'water stress' may not be out of place here. Malin Falkenmark, the leading Swedish expert, has calculated the 'water stress' situation of different countries with reference to 'Annual Water Resources per capita' (AWR). An AWR of 1,700 m^3 means that only occasional and local stress may be experienced; an AWR of less than 1,000 m^3 indicates a condition of stress; and one of 500 m^3 or less means a serious constraint and a threat to life. Under this categorization, India is somewhere between categories (i) and (ii). In other words India is not among the most water-stressed countries of the world. But this situation will change with the growth of population, and India may join the ranks of 'water-stressed' countries in the future if counter measures are not taken.

Moreover, there are wide variations, both temporal and spatial, in the availability of water in the country. Much of the rainfall occurs within a period of a few months during the year, and even during that period the intensity is concentrated within a few weeks. Spatially, there is a wide range in precipitation - from 100 mm in Rajasthan to 11,000 mm in Cherrapunji. (Incidentally, it must be noted that despite the very heavy precipitation, Cherrapunji, known as among the wettest places on earth, suffers from an acute shortage of water in the dry months, because all the rain that falls quickly runs off the area). Sixty per cent of the water resources of India are to be found in the Ganga, Brahmaputra and Meghna river systems which account for 33 per cent of the geographical area of the country; 11 per cent in the west-flowing rivers south of Tapi covering 3 per cent of the area; and the balance 29 per cent in the remaining river systems spread over 64 per cent of the land area. Broadly speaking, the Himalayan rivers are snow-fed and perennial, whereas the peninsular rivers are dependent on the monsoons and therefore seasonal; and again broadly speaking the north and east are well endowed with water whereas the west and south are water-short. Apart from the desert areas of Rajasthan, there are arid or drought-prone areas in parts of Gujarat, Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu; and of course the eastern parts of the country experience devastating floods from time to time

Coming to the institutional challenges with regards to water resource management, all state and national level institutions that are directly dealing with water are centralized institutions. They use “centralized” and “top-down” approaches for data collection, compilation and management, water development planning, implementation and finally water management. First, centralized planning processes do not involve local communities at any stage of data collection, issue identification and water development planning. Official agencies identify the issues on the basis of macro-level data they gather. Such processes are grossly inadequate to capture the local resource availability, conditions and problems. The involvement of local communities in data collection is essential in view of the fact that they are aware of the condition of the resources in their locality. On the other hand, involvement of local user groups in planning could lead to development of plans that are implementable as they are aware of the range of factors that determine the type of interventions that are physically and socially viable. “Centralized” and “top-down” planning processes create doubts and fear in the minds of local people and often leads to conflicts and opposition to the project implementation. Secondly, by and large, the centralized systems do not encourage effective participation of the user groups in water management, due to the reason that they are often too large for the local communities to handle. Water management being a social activity, the involvement of user groups is critical to achieve the desired water management objectives. Mechanisms and avenues for user groups involvement in management are also lacking. In sum, most often, planning of water resource systems was supply driven. The existing institutions are never able to respond to the local water management needs.

Water laws are essential for efficient management of water resources. Given the bearing water has on social and economic development, preservation of natural ecosystems, water laws have to be based on environmental, ecological conservation and social and economic consideration. But, water laws in India are heavily fragmented and water related legislations use piecemeal approaches and far less than comprehensive (Bhatt 1986).

The approach to water sector in India is sectoral (World Bank 1998). Institutions were created to cater to the needs of different sectors such as rural drinking, urban water supplies, irrigation, recreation, fisheries etc. Often, the dynamics of interaction between various socio-economic systems influencing water use in different sectors is poorly understood. New water projects often alter the allocation among existing uses. For example, adverse impact of structural interventions in the natural flows on in stream uses has always been ignored.

The water supply strategies adopted within a sector are not often holistic and integrated, but rather narrow and disjointed. Sectoral planning lack long term perspectives. The overall demand and supplies within the basin and the future trends in both are not considered in planning a new water project in river basins. In river basins where flows are heavily diverted and intensively used, new storage and diversion projects only alter the allocation rather than adding to the aggregate freshwater supplies. This can lead to conflicts between and within sectors.

With the resources increasingly becoming scarce new water development projects hardly add to the aggregate supplies and only allocates the available supplies among alternative uses. Thus, the priorities of these institutions are changing from managing supplies to conservation and demand and allocation management.

Human interactions with the environment and their impacts depend heavily on the property rights systems or the institutional regimes that are embedded in the social, cultural, economic and political setting. In developing countries, including India, there is very little understanding of the role of institutional regimes in determining the way in which natural resources are used. Given the institutional vacuum, in which communities exercise control and access water resources, the property rights issues in water are self-evident. The lack of a well-defined property right system creates uncertainty about the impact of the resource use on environment and therefore creates incentives for overuse. But, the governments increasingly tend to use “command and control” approach to restrict the use of water. Improving the institutional framework can help find sustainable solutions to water management problems. Water has always been at the centre of political agenda in independent India. They use it as a tool for creating vote banks. Therefore, policies, laws, regulations and legislation and institutions that would restrict or redefine the rights of communities in accessing water is bound to become a politically sensitive issue.

Manipur is a small state located in a hilly terrain with a small portion of valley. It has a complex geology, terrain, geomorphology, and lithology. Imphal valley is a palaeo-lake basin. Most of the lakes in the basin had now vanished in the course of time. Many natural groundwater recharging structures like ponds, tanks and swampy areas are greatly reduced due to urbanization and change in land-use pattern (Sherjit and Mohon, 2014). Rivers are greatly polluted in many parts of the state .But demand of water is increasing day by day due to rapid increase in population. So Manipur is facing water problem. Urbanization and changing climate change enhances the problem.

Manipur has 15 major rivers having 166.77 sq. km. of total area i.e. about 0.75 % of the total geographical area of the state and 90% of the total population used surface water whereas remaining 10% used underground water from hand pump, tube well, etc (aquifer water) as domestic purposes (ENVIS, 2015). Manipur, falls under high intensity of rainfall area of the North East India during monsoon season and eventually surplus water too. However, the state faces acute shortage of water particularly during dry / lean season i.e. January - May every year. All the river systems of the state remain dry except Barak River, Manipur River and her tributaries. Every year, the state is facing sever flood during rainy season (June -October) and drought like situation, particularly in the months of February - May, due to depletion of raw water at source and drying up of all the water bodies like Ponds, Lakes, Moats, etc. The problem is further aggravated due to the climate variability and erratic monsoon for the past few years resulting to shortage of water supply every year.

The ever-increasing human population and their unlimited needs, the human impact on natural environment is one of the most drastic issues. People living in the hill areas of Manipur are largely depending on land and forests for their livelihood through agriculture, food gathering and hunting. "Jhum cultivation" or "shifting cultivation or slash and burn" or simply jhumming or "jooming" has been practiced as a way of life within the tribal communities and hill people from time immemorial. Initially, Jhumming worked well, as Jhum cycle was ranging from 20 to 30 years, but with increase in human population and increased demands on lands, this Jhum cycle has got reduced to 2-5 years. This adversely effect eco-restoration, ecological process of forests and geomorphology. Indiscriminate destruction of forests, as a result of shifting cultivation, coupled with high rainfall lead to various problems such as ecological imbalance, acceleration of soil erosion, loss of nutrients etc.

According to ecologists and environmentalists, jhum or shifting cultivation is economically unviable and ecologically unsustainable. Forests performed different functions of regulating water supply, slow the flow of rainwater, controlling soil erosion, feeding springs, streams gradually, balancing our ecosystem and so on. Forest in the River Basins of Manipur has been regularly affected because of deforestation for shifting cultivation or slash and burn agriculture. Even though, the state received high rainfall, she still suffer from water scarcity due to improper water management as the forest catchment areas are destroyed, water is drained quickly after rainfall. Rain water is drained and disappeared just after rainfall, as there is no forest and rainwater harvesting facilities to checked the run-off water.

Coming to the case study area of Kangpokpi district of manipur, the district is endowed with perennial sources of water in the form of streams and springs in the western part of the district. But in recent years, growth of population and rampant deforestation has significantly reduced the availability of water in the district and scarcity of water during dry season has become common phenomena. The majority of the population is still dependent on surface water. As the district is mainly hilly, biological contamination of drinking water supply combined with scanty quantity has been a major cause of most of the ill health. People used the available surface water for drinking and domestic purposes from any source due to shortages of safe drinking water. Ground water augmented through springs and streams are used for drinking and irrigation purpose only in the district. As there is no sources of ground water supply in the district, ground water utilization for the same may be considered as negligible. The development of ground water in the district negligible (Central Ground Water Board, North Eastern Region, Ministry of Water Resources 2013).

Evaluation of management of water resorces

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