CHAPTER 3

Water: A Key Resource for Sustainable Development – Recognizing and Valuing the Many Faces of Water

“Water is a finite natural resource for sustenance of life and ecological systems and a key resource for social and economic development.” (UN Economic and Social Council. 2001:2) From being an infinite and renewable natural resource, water has become not only finite, but also a highly vulnerable natural resource. In fact, the entire 21st century echoes the story of a growing and alarming water crisis. The pressures of burgeoning population and economic development have not been commensurately mapped against the almost dramatic and critical stress of water shortage, which is uniform across the many parts of the world. Just as there has been an increase in the per capita need for water, so also the per capita water stress has escalated. Given the extremely critical nature of water – the elixir of life – for socio-economic development and human well-being, it is imperative to understand and analyze the nature and intensity of this looming global water crisis, the multilevel anthropocentric pressures affecting it directly or indirectly along with the multifunctional utility value of water in order to plan for and achieve a ‘water secured world.’

Is this crisis natural or man made? The answer to this question varies due to the different perceptions about the many aspects of water crisis, such as the role and concepts of water among the different stakeholders, the linkages of poverty, water-ecosystem and economic growth, the concepts of equity and sustainability and their operationalization, and the role of the public sector in water resource management to name a
few areas. However, those who are not fully aware about the nature and the scale of this crisis have attributed it to government failure in striking a balance between the socio-economic needs and the ecological constraints. The basic issue is how should the water crisis be viewed and fitted into an overall scenario of problem solving and conflict resolution in managing sustainable development. As pointed out by the Commission for Sustainable Development in 2002: “Poverty reduction, changing unsustainable patterns of production and consumption and protecting and managing the natural resource base for economic and social development are overcharging objectives of, and essential requirements for sustainable development.” (UN and WWAP. 2003. Executive Summary: 4) Thus, water crisis management should be viewed as a part of the sustainable development strategy and fitted in the economic growth model accordingly. And, therefore, the World Water Development Reports (UN and WWAP. 2003 and 2006) have insisted on recognizing and valuing the many faces of water (UN and WWAP. 2003: Chapter 13), governing it wisely for sustainable development (UN and WWAP. 2003: Chapter 15) and viewing water crisis and its management as a “shared responsibility” of the developed and developing countries as well as the international agencies. (UN and WWAP. 2006)

In this chapter, section I briefly highlights the key role of water resource in realizing the objective of sustainable development. Section II deals with the various perceptions and/or concepts of water and their policy implications for planning and programming sustainable growth, especially in the context of the specific characteristics of water as a natural resource – free good – and water as an economic good – private property. Valuing natural resources in general and valuing water in particular has remained a complex as well as a difficult exercise. Section III attempts to analyze the issues related to valuing water:
conceptual premises, theoretical foundations and putting economic principles into practice, while section IV provides the concluding observations.

Section I: Water: A Key Resource for Sustainable Development

The first World Summit: UN Conference on the Human Environment, Stockholm 1972 was primarily concerned with the challenges to Life and Human Well-Being. The management of water resource crisis is also a fundamental challenge to life and well-being of mankind and, therefore, ‘the later part of the twentieth century up to the present has been the era of large conferences on sustainable human well-being, not the least on water and sequence will continue...’ (UN and WWAP. 2003. Executive Summary: 5-6 and UN and WWAP. 2003. Chapter 2: Milestones) Appendix I – Milestones of Global Concern for Water – provides the information about the ‘large’ conferences as well as the global meets on water resource management for sustainable economic development: From Stockholm (1972) to Mal del Plata (1977) to Dublin (1992) to The Hague (2000) to Bonn (2001) to Mexico City (2006). This shows the critical role of water security in human well-being oriented sustainable economic growth. Therefore, the Bonn International Conference (2000) on Fresh Water views water as a “key to sustainable development” and the Fourth World Water Forum at Mexico City (2006) calls for initiating “local action for global water crisis”. A survey of literature on the role of water in socio-economic development and sustainable human well-being provides various approaches to appreciate the role of water in real life; but, by and large, they are of a descriptive nature.

The UNDP (HDR. 2006) and UN and WWAP (2003 and 2006) have broadly divided the role of water in two groups: (1) Water for Life and (2) Water for Livelihoods and have shown how water can play a key role in realizing the dream of sustainable development. Both the roles
are of complementary nature and for sustainable human well-being both
the functions of water are equally important. The water for life role
emphasizes the existence aspect of human being and the water for
livelihoods role recognizes the significance of water in socio-economic
development of the society, which, in turn, enhances human capabilities
and the freedom of choice. And, therefore, to enhance the role of water
in sustainable development by effective management of water crisis, the
UN plans to face the eleven water crisis related challenges squarely.
Of these, seven have been identified by the 2nd WWF at The Hague and
four have been identified and added by the UN and WWAP 2003
WWDR. These challenges highlight the role of water in managing crisis
related to life and well-being: (1) Challenge related to basic human
need and the right to health, (2) Challenge of protecting ecosystems for
people and planet, (3) Challenge of water management for urbanized
world, (4) Challenge of securing food for growing population,
(5) Challenge of promoting cleaner industry for everyone’s benefit,
(6) Challenge of developing energy to meet the development need,
(7) Challenge of mitigating risk and coping with uncertainty related to
droughts, floods and other such calamities like landslides and water
related diseases, and (8) Challenge of sharing water: defining common
interest. The remaining three challenges are related to the effective
management of water resources for sustainable development:
(9) Challenge of recognizing and valuing the many faces of water,
(10) Challenge of ensuring knowledge base for shared responsibility,
and (11) Challenge of governing water wisely for sustainable
development. (UN and WWAP. 2003. WWDR: Chapters 5 through 15
and UN and WWAP. 2006. WWDR 2: Chapter 2)

The Government of Andhra Pradesh, while preparing its water vision:
for the State, explored the importance of water in terms of its demand
from various sectors: (1) Demand for water by the society (basic need
and health...), (2) Demand for water by the economy, (agriculture, industry and energy...) and (3) Demand for water by nature (forests, wetlands, biodiversity...) (Irrigation Department. 2003: 43-56) Here, on the basis of these approaches/guidelines, an attempt is made to highlight the role of water as a key natural resource to sustainable development.

(A) Water for Life

A healthy long life depends on two factors: (a) Assured adequate supply and good quality of basic necessities of life and (b) Security of life from natural and man-made disasters and/or calamities and social harmony. In this context, the three critical roles related to water are highlighted as under:

(1) Basic Human Need and Human Right

Conventionally speaking, food, clothing and shelter are considered as the basic needs in economics. However, next to air, water is the fundamental basic need of mankind. And, therefore, now provision of adequate and safe drinking water is considered as a human right and the MDGs aim at halving the number of those people who do not have access to safe drinking water by 2015. Health, hygiene and development of human capital are critically dependent on the availability of safe and adequate water. At the time of the launch of the International Decade of Action: Water for Life 2005-2015, two publications of WHO and UNICEF effectively brought out the importance of water for life.

The WHO and UNICEF studies, on the one hand, show the incidence of unsafe and inadequate water supply and lack of proper sanitation services for human beings including children and, on the other, highlight the socio-economic benefits of reaching the MDGs of water and sanitation: “Today 1.1 billion people do not have access to improved drinking water and 2.6 billion people live in families with no
proper means of sanitation. Lack of water supply and sanitation services kills about 4500 children a day...Even if the MDG of sanitation target is achieved, there will be 1.8 billion people having to cope with unhygienic sanitation facilities by 2015...Halving the portion of people who lack satisfactory water supply and sanitation services by 2015 would avert 470 thousand deaths a year and result in an extra 320 million productive working days annually...Depending on the region of the world, economic benefits of achieving the MDG of drinking water and sanitation targets have been estimated to range from US$ 3 to US$ 34 for each dollar invested.” (WHO. 2004 and WHO and UNICEF. 2005: 4th Tile Page)

Life supporting services, needed for the ecosystems as well as other socio-economic benefits, critically depend on water. Therefore, in estimating the demand for water, environmental needs for water, especially for sustaining the biodiversity and biomass, are taken into account. As ecosystems are a powerful natural resource base, (Chapter II. Section II) their role is discussed in the following section (B): Water for Livelihoods.

(2) Mitigating Risk and Coping with Uncertainty related to Natural Calamities

A secured and healthy life is equally important for enhancing capabilities and freedom of choice. But over time risk and uncertainty about secured and healthy life is found to be increasingly affected by water related disasters.

The anthropocentric pressures are responsible for climate change. And climate change is responsible for speeding up the hydrological cycle, which, in turn, results in more frequent and extreme storms, floods and droughts. The WWDR 2003 observes: “The number of hydro-meteorological disasters – floods and droughts – has more than doubled since 1996...Between 1991 and 2000, the number of people affected by natural disasters rose from 147 million per year to 211
million per year. In the same period, more than 665,000 people died in 2,557 natural disasters, of which 90 percent were water-related... Recorded economic losses from natural catastrophes have grown from US$ 30 billion in 1990 to US$ 70 billion in 1999... These figures understate the true scale of loss, which is believed to be double or more than the recorded figures... While the figures indicate the economic impact of disasters today, they understate the impact on future social cost, e.g. loss of livelihoods, etc. .... Natural disasters affect low-income countries disproportionately... some 97 percent of all natural disaster deaths occurred in developing countries like Asia and Africa.” (UN and WWAP. 2003. Executive Summary: 23-24) Now mitigating risk and coping with uncertainty related to natural disasters are considered as a part of water resource management. Risk reduction and management — assessing the risks, implementing both structural and non-structural measures to reduce risks, sharing risk via insurance programs and other risk transfer mechanisms — were so far not considered as an integral part of water resource management. However, now effective disaster preparedness and mitigation methods do take care of this aspect. (UN and WWAP. 2003. Executive Summary: 24) Thus, a secured and healthy life depends on water and its effective management.

(3) Security through Avoidance of Water Conflicts and Water Wars

Water is a finite and vulnerable natural resource, and a scarce input for life and economy. It is going to become even more scarce because of the dramatically increasing demand for water over time. In water scarce countries, water conflicts are becoming endemic at all levels of uses (Agriculture, Industry, Energy sector, Environment...) and/or users (Farmers, Firms, Regions having common river basins and aquifers).

The water conflicts or water wars are equally catastrophic like natural disasters. (Renner Michael. 2002) “There are presently 261
international river basins and 145 nations have territory in shared basins...Over last fifty years 500 conflicts over trans-boundary water sharing, no formal wars, have taken place.” (UN and WWAP. 2003. Executive Summary: 25) It is feared that the next world war might be because of water! On the basis of the understanding related to ‘common interest’ and through proper institutional arrangement – treaties, protocols – in sharing trans-boundary water, there can be social harmony and peace-oriented security for mankind against the disastrous resource conflicts and/or wars. So for a peaceful and secured life at all levels, local to global, a water secured world is necessary. And, in this respect, water is life – secured, safe and peaceful life. And, therefore, the HDR 2006: Beyond Scarcity: Power, Poverty and the Global Water Crisis emphasizes: “Water security is an integral part of the broader conception of human security.” (UNDP. 2006 HDR 2006:3)

(B) Water for Livelihoods

Water is critically needed for socio-economic sustainable development, as well.

(I) Water, Poverty and the Millennium Development Goals

Sustainable development, in the medium term, focuses on alleviating poverty through the effective management of the natural capital base and the environmental quality. “The MDGs provide a context within which wider issues linking water, sustainable development and poverty reduction can be understood” in a proper perspective. (UN and WWAP. 2003: 9) Besides, the MDGs are provisional indices and/or indicators that help to measure the progress towards reduction in “human poverty” along with the reduction in “income poverty” and the march towards sustainable development in a medium term. It is because access to safe water and availability of health services are two of the five key indicators of “human poverty index”, the most important variables that influence the quality of lives of the poor. It is a common knowledge that
the poor, both urban and rural, are most vulnerable to water-related issues and the incidence of the water-related problems is high on women and children. In this context, water resource management becomes crucial for reducing poverty and achieving the MDGs. Here the two research works – *Vision 21: Water for People: A Shared Vision for Hygiene, Sanitation and Water Supply and A Framework for Action* (WSSCC: Water Supply and Sanitation Collaborative Council. 2000) and *Poverty and Water Security* (Soussan J. G. 2002) – effectively work out the linkages between water, poverty and the MDGs. They are summarized in Table 1. It shows how water can effectively ‘contribute to the overall reduction of poverty and in the sustainable development of the people and nations.’ (UN and WWAP. 2003: 9)

The UN Economic and Social Council observes that for combating poverty, both rural and urban poverty and promoting sustainable development of urban human settlement, it is inevitable to rely on the IWRM. (UN Economic and Social Council. 2001: 6) This shows how water resource can contribute to the socio-economic development of a country, in general, and in alleviation of poverty, in particular.

(2) **Water for Protecting the Ecosystems**

The ecosystems protect lives, sustain biodiversity and promote livelihoods by supporting the important sectors like agriculture, industry and energy through the provision of goods and services/environmental throughputs required by these sectors. It is an indisputable fact that water is an essential part of any ecosystem; both in quantitative and qualitative terms and reduced water quality and quantity have serious negative impacts on the ecosystems. The environment has a natural absorptive, self-cleaning and deleterious capacity, but human activities – the growth of population and consumption, interventions through infrastructure development (large dams, irrigation canals, roads etc.), over harvesting and exploitation of
water and other natural resources, introduction of exotic species like genetically modified plants/crops etc. – are now exerting pressure on the environment beyond its resilience potential and thereby risking the functions of the ecosystems and the lives on the planet. (UN and WWAP. 2003. Executive Summary: 13-14) Fresh water is not only essential for life, but also for livelihoods to enhance the capabilities and freedom of choice of the people.

(3) Water for Agriculture, Industry, Energy and the Urban Sector

With the growth in population and consumption, the burden on agriculture, industries, energy and the urban sector is increasing at a higher rate than the rate of increase in population. This has, on the one hand, increased the demand for water and, on the other, increased the vulnerability of water, further aggravating the issue of water scarcity. Besides, the management of water in cross-sectoral context is more complex and relatively difficult to handle because water needs of these sectors are not only increasing, but also competing. At present, irrigation accounts for 70 percent of all water withdrawals. This requirement cannot be curtailed given the need for food security for the ballooning population. In addition, water is a vital need for the sustainable urban development which is a large consumer of water. (UN and WWAP. 2003. Chapters 6 and 8, and UN Economic and Social Council. 2001: 6) 'Cities often take water from outside their administrative boundaries and discharge their waste downstream, thereby affecting other users.' (UN and WWAP. 2003. Chapter: 7) Due to this, most of the rivers, especially in the developing countries, are converted into polluted river stretches and/or toxic drains and city’s outskirts are converted into landfills for solid and hazardous bio-non-degradable wastes. All these, in turn, have degraded soil and placed agricultural sustainability at stake, as well as polluted the water to the extent of further aggravating the water scarcity issue. Again, for the
agricultural sector, wastewater is an important source of irrigation requirement and in such a situation, effective urban water disposal management mechanism may prove a blessing in disguise. Agriculture, industry and the domestic sector are competing water users. For industries, good quality of water is an important raw material and industrial use of water increases with the acceleration in GDP growth rate and so does the untreated polluted water. It has been estimated that during the process of transformation of a country from low and middle-income to high-income, water use may increase from 10 percent to 59 percent. (UN and WWAP. 2003. Executive Summary: 19) So promoting cleaner industry for everyone's benefit, without compromising the growth of other sectors, is a top priority water resource management issue. (UN and WWAP. 2003. Chapter: 9) Electricity/power can significantly influence the socio-economic development of a country and contribute to poverty alleviation in many ways. (UN and WWAP. 2003. Chapter: 10) “Some 2 billion people have no electricity at all, 1 billion people use uneconomic electricity supplies (dry cell batteries) or candles or kerosene, and 2.5 billion people in developing countries have little access to commercial electricity services...Yet electricity contributes to poverty alleviation in many ways. It is essential for livelihoods that involve small-scale enterprises, for improving medical services, including powering equipment and the refrigeration of vaccines and medicines. It can extend the length of the working day, providing lighting for study and business activities. It provides power pump water for domestic, agriculture and small industrial functions. It substitutes for solid fuels used for cooking and eating (currently 80 percent of all household fuel consumption in developing countries is from bio-mass), making for a cleaner, healthier, domestic environment.” (UN and WWAP. 2003. Executive Summary: 21-22) For thermal power generation and for the provision of hydropower water is needed, and water extraction, distribution and purification treatment is not possible without energy. Managing the water-energy nexus is regarded as an important aspect of

Thus, water is not only life, but it also contributes to alleviation of poverty and provides respectable and sustainable livelihoods by supporting the increasing scale of economic activities and consumption for the present as well as the future generations.

Section II: Various Perceptions / Concepts of Water and their Policy Implications

Many Faces of Water

The WDR 2003 observes: “Solving water crisis in its many aspects is but one of the several challenges facing humankind as we confront life in this third millennium and it has to be seen in that context. We have to fit water into an overall scenario of problem-solving and conflict resolution, aiming at the realization of the objective of sustainable development.” (UN and WWAP. 2003. Executive Summary: 4 and UN and WWAP. 2003, Chapter. 23. The World Water Crisis: Fitting the Pieces Together) Water is one of the most important ecosystem on which other ecosystems are critically dependent. (Vladimir Smakhtin et al. 2004) Besides, in rendering this valuable service, water plays other important roles in sustaining economic growth and human well-being (water for livelihoods, as discussed earlier) Given this frame of reference, effective and efficient water resource management requires proper understanding of the multiple aspects of water crisis. And that depends more on how one perceives the concept of water, its role and what value and/or values that one would like to attribute to water. Thus, the complexity of managing the present water crisis can be
attributed to the lack of an understanding on the part of all the stakeholders including the planners and policy makers as well as the international agencies about the concept and the role of water. (Hanemann W. M. 2005: 2)

The following examples amply illustrate this point: (1) “Agenda 21 and the Dublin Principles put the concept of water as an economic good on the global agenda, and they received wide acceptance by the world’s water professionals. However, there is substantial confusion about the exact meaning of some of the articulated principles. In particular, it is not clear to many non-economists what is implied by the statement that water is an economic good or an economic and social good.” (ICWE. 1992, United Nations. 1992, Perry C. J., Michael Rock and D. Seckler. 1997, Rogers Peter, Ramesh Bhatia and Annette Huber. 1997: 4 and Solanes Miguel et al. 1999) (2) “The Fourth Guiding Principle of the Dublin Statement, that ‘water has an economic value in all its competing uses and should be recognized as an economic good’, is immediately followed by an important qualifier: ‘it is vital to recognize the basic right of all human beings to have access to clean water and sanitation at an affordable price.’ So the question is when is water to be considered as a pure public good (free good or a public service or a social good) and when to treat it as an economic good? Or is it both a social good as well as an economic good at the same time? (Briscoe John. 1996, 1997 and 1997a, Rogers Peter, Ramesh Bhatia and Annette Huber. 1997, Mann P. C. 1981, Doss Mervat and Grant Milne. 2001 and Mann Howard. 2003) (3) The WWDR 2003 notes that “water has many faces”. (UN and WWAP. 2003: Chapter 13) It is because of this characteristic of water that water is perceived by different people (or by the same people in different contexts) in different ways (Iyer Ramaswamy R. 2003: 77) Water is regarded as a tool for realizing human development (IDS. 2006), regional development (Biswa Asit K. et al eds. 2004) and sustainable development (Kataoka Yatsuka. 2002), a tool for reducing hunger and poverty and achieving
environmental sustainability (SIWI et al. 2006 and UNDP. HDR 2006), a key resource for environmental protection (Vladimir Smakhtin et al. 2004) and sustainable development (UN Economic and Social Council. 2001) and economic development (Nicol Alan et al. 2006, Rogers P. 1986 and 1992, Serageldin Ismail. 1995, and Winpenny J. 1994), wealth for the poor (WRI et al. 2005) and so on...Water is known as Blue Gold for multinational corporations and a cause of water wars for its privatization, profit and pollution. (Barlow M and Clarke T. 2002 and Shiva V. 2002) Water is also considered as a catalyst for peace. (UNESCO et al.) So the issue is: What truly is the economic conception of water that matters in designing a water policy for the efficient and sustainable use of water? (Hamlin C. 2000 and Hanemann W. M. 2005) Perhaps this has compelled some experts to think about ‘the economics of water, irrigation and development’ or ‘the economics of water resources’ separately as against ‘the economics of natural resources’! (Young R. A. and Haveman R. H. 1985 and Schoengold Karina and David Zilberman. 2005)

**Economic Conception of Water**

In economics, generally, goods and services or commodities are classified on the basis of their value: value in *use* and value in *exchange*. The value in exchange exists in case of that good which is scarce in terms of its relative demand and so value in exchange is, by and large, the market price. There is a qualitative difference between the market price and the true value of a commodity. Hanemann observes: “Market price reflects the fluctuating circumstances in daily life, the vagaries of supply (sudden scarcity, monopoly, etc.) or demand (temporary needs, change in tastes, fads and fashions), while the true value is something more basic, enduring and stable. Just what this true value is has been seen differently at different times.” (Hanemann W. M. 2005: 4) Due to this reason, in the context of socio-economic objectives, welfare considerations and operational difficulties, there is a practice of classifying a good or service as free good / pure public good/
public utility, merit good and/or private good and global common (ozone layer) or local common (village pond or tank).

Water now is not an infinite and renewable resource, but a finite and a vulnerable natural resource. The looming water crisis and its socio-economic implications for the present and the future generations ask for conservation, augmentation and development of this most valued natural capital base. Enhancing water use efficiency and water productivity, as well as, optimal allocation of water resources among different competing uses and equitable distribution of water through appropriate water sector reforms and wise governance are now the top priority policy issues at the national and international level. So now water cannot be treated as a free good. It is an economic good. But economic goods are classified in a number of ways as well as their provision and governance is case specific: pure public goods like defense and law and order are almost like free goods and provided-governed by the public sector; primary education and health are merit goods as well as pure private goods and their provision may be public as well as private; water and transport services are, by and large, public utilities in developing countries and are provided by the local bodies.

The question that arises is what is then the status of water? The answer to this question depends, because “the answer is contested ground between economists and their critics.” (Hanemann W. M. 2005: 10)

In this context, the various contesting concepts of water are briefly discussed here:

**Water as a Basic Need and Human Right**

In 1948, the United Nations General Assembly approved the Universal Declaration of Human Rights (UDHR). Article 25 of UDHR reads: “Everyone has right to standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing…” (UN General Assembly. 1948) According to this resolution, the right to water is an implicit part of the right to food, health, human
well-being and life. (Gleick Peter. 1999, UN CESCR. 2002 and UNDP. HDR 2006) There is also a practice of regarding water as a “sacred resource or divinity” because water supports life, and is also a part of the natural environment, sustaining it and, in turn, being sustained by it. (Iyer Ramaswamy R. 2003: 81-82) To substantiate this belief, Hanemann quotes Barlow and Clark (2002): ‘It is a universal and indivisible truth that the Earth’s fresh water belongs to the Earth and all species, and, therefore, it must not be treated as a private commodity to be bought, sold, and treated for profit...the global fresh water is a shared legacy, a public trust, and a fundamental human right, and, therefore, a collective responsibility.’ (Hanemann W. M. 2005: 10)

So, commodification of water is inhuman and uncultured and as water is a free gift of God and basic human need, it should enjoy the status of a free good. Vandana Shiva (2002) sees the process of commodification of water as a clash between two cultures: “a culture that sees water as sacred and treats its provision as a duty for the preservation of life and another that sees water as a commodity, and its ownership and trade as fundamental corporate rights. The culture of commodification is at war with diverse cultures of sharing, or receiving, and giving water as a free gift.” (Hanemann W. M. 2005: 10-11) When millions are deprived of easy access to safe and adequate water, especially in the third world countries, and when the MDGs of water and sanitation aims at minimizing the incidence of water poverty by 2015 at any cost, the concept of water as a free good is, no doubt, very appealing. However, because of the looming water crisis, water cannot be treated as a free good and perhaps this compulsion has promoted the idea to treat water as “a social and economic good” – the status of water somewhere between 100 percent free good and 100 percent pure private good or may be like a merit good.

Economic good has an ownership right and market and its utilization, management and sale or exchange is owner’s prerogative. In the case of economic good, exclusion is possible and there exists rivalry in its
consumption. When water is a social good as well as an economic good, what about its ownership and management? Is it like pure public good whose provision and management is with the public sector? Or water as a basic need and human right is a social good and water used for other purposes is an economic good? In case of water as an economic good can the principles of economics be applied as applied in case of other goods? A number of such issues deserve attention while designing the water sector strategy and reforms. Perhaps to avoid such operational issues, civil societies have promoted the idea of “commons.”

**Water as Commons**

Commons range from local commons to global commons. Traditionally, a tank/pond/small lake or a pasture/forest/fishery in a village used as Common Pool Resource (CPR) is known as ‘local commons.’ Here there is absence of private ownership or individual right and the CPRs belong to the entire community or civil society. Normally it is the community that manages the commons. The climate and/or the environment, the ozone shield and the fishing in sea, all are the illustrations of global commons. These commons are for the common good and are to be shared and protected through global cooperation and partnership.

Hardin Garrett has effectively highlighted the “tragedy of commons.” (Hardin Garrett. 1968 and 1974) The lack of private ownership and community management had resulted in the commons suffering at all places and all levels. The Riparian rights – rights to the water of a flowing river inherent in, or claimed by, different users located alongside the river or in the vicinity of the river – have given rise to conflicts between the upstream and downstream users. There are 251 international river basins that are shared by 145 nations. Here the issues related to sharing of water and managing common river basins give rise to a different set of water policy issues. Again, there is a difficulty in classifying common pool resources like water as a pure public good or
pure market good. According to Paul A. Samuelson (1954), pure public goods are those goods that all enjoy in common and they have the two key properties: *non-rivalry in consumption* and *non-excludability*. In case of water as a common pool resource, there can be rivalry in consumption, but exclusion is perhaps very difficult. So water as commons is neither a pure public good nor a pure private good! Water resource management is, therefore, qualitatively different in the case of water as a basic need and water as commons.

**Water as a Commodity**

Apart from water as a basic human need, water has multiple uses and in those cases water can be easily considered as a commodity. For example: (1) the use of water for irrigation in commercial agriculture, (2) the use of water for industrial processes, (3) luxury use by the affluent class in swimming pools and gardening, and (4) five stars hotels lavishly using water etc. In all these cases, exclusion is possible and there can be rivalry in consumption of water. So in such cases, water is a commodity or almost like a pure private good.

However, considering water as a commodity or as an economic good is not an end in itself or a permanent solution to the looming water crisis! In this context, there are some methodological and related issues that deserve careful consideration. They are: (1) If water is an economic good then should it be treated at par with other commodities like food, shelter, clothes and medicines etc. which are treated as pure private good in economics? Or is water qualitatively different and so it should be treated as an economic and social good? (Rogers Peter, Ramesh Bhatia and Annette Huber. 1999) (2) Is water a heterogeneous commodity? Is water really an economic commodity? Can the economic issues related to water be analyzed using the same conceptual framework of economics that is applied to other commodities? Or is water different from other commodities? (Hanemann W. M. 2005: 10-21) (3) If water is to be treated as an economic good, then what
about its property rights, especially in the context of common property like village tanks and transboundary water resources? (4) What about valuing the water? How to calculate the cost of provision of water? What about pricing of water? (This issue is discussed in Section III.) The failure of understanding these issues in their proper perspective and managing them with appropriate water sector reforms and good governance may prove a remedy worst than the disease.

These considerations have led experts like Perry C J et al. associated with the International Irrigation Management Institute, Colombo, Sri Lanka to raise the issue: Water as an Economic Good: A Solution or a Problem? (Perry C. J., Michael Rock and D Seckler. 1997)

**Water is a Different Commodity**

Water is qualitatively different from other commodities like food, clothes, shelter, etc. The framework of analysis, thus, applied to other commodities in economics, may not be directly useful in handling issues of water resource management. In an ode to water, Kenneth Boulding has, in a very stylized manner, attempted to show that water is a different commodity. (Appendix II) Besides, this distinction also provides guidelines in designing appropriate water sector reforms and water resource policy. In this regard, the arguments put forward by Hanemann W M, John Briscoe, the World Bank expert, and others – references especially given in this section are briefly summarized here:

(1) Water is inevitably an *essential* commodity as well as an input. "The concept of essentialness can be applied either to something that is an input to production or to something that is directly enjoyed by people as a consumption commodity. In the case of an input, if an item has the property that *no* production is possible when the input is lacking, the item is said to be an essential input. In the case of a final good, if it has the property that *no* amount of any other final good can compensate for having a zero level of consumption of this commodity, then it is said to be an essential commodity. Water obviously fits the definition of an
essential final good: human life is not possible without access to 5 to 10 L/day of water per person. Water also fits the definition of an essential input in agriculture and in several manufacturing industries (e.g. food and beverages, petroleum refining, lumber and wood products, paper, chemicals, and electronic equipment) that cannot function without some input of water.” (Hanemann W. M. 2005: 17-18) In other words, water is for life and livelihoods. (2) Water is neither a pure public good nor a pure private good, but it is both as well as a social good. However, at times, it can be a pure private good, say water in a private tube well and a pure public good too, say water in situ, e.g. water for navigation in the river and seawater for fishing. Water, as a basic human need, is obviously a social good because safe freshwater, though essential, is scarce. (3) Because of the multiple uses of water, it cannot be treated as a single homogeneous commodity, but can be considered as a heterogeneous commodity. “Water has many dimensions besides just quality. These include: (a) location, (b) timing, (c) quality, and (d) variability or uncertainty. To a user, one liter of water is not necessarily the same as another liter of water, if it is available at a different location, at a different point in time, with different quality, or with a different probability of occurrence.” (Hanemann W. M. 2005: 20) (4) As compared to other inputs/commodities – like land/food – water has mobility and the opportunity for sequential use and re-use and that makes it relatively a distinct commodity. “These properties of water have important economic, legal and social implications. Keeping track of water flow is costly and sometimes difficult. Consequently, it is often hard or impractical to enforce excludability or to establish property rights to return flow. In this respect, water is different as an asset from land, which is relatively easy to divide and fence. The common solution is to resort to some form of collective right of access: in effect, this internalizes the externality associated with the mobility of return flows. A classic example of this is the Riparian water rights in English and the American common law...The riparian right to use of water is not a right to a fixed quantity, and it is a co-relative right
shared with all other riparian along the same stream.” (Hanemann W. M. 2005: 12-13) (5) The variability of water – the variability of supply in terms of space, time, and often quality – also makes it qualitatively a different commodity. “Because this variability, the major challenge for most large water systems is the spatial and temporal matching of supply with demand. Storage is typically the key to controlling the temporal variability in supply, while inter-basin transfers are used to overcome the spatial mismatch between supply and demand. But the variability of supply has affected not just the engineering of water resource systems, but also the legal and institutional arrangements for the use of water. The variability of supply is yet one more point of divergence between water and land and it explains why the property rights regimes are different: It would surely be difficult to apply the ownership rights in land to so variable a resource as water.” Normally the nature of demand for water is found to be intermittent. It varies periodically in agriculture and in urban sector, with the pressure of demand for water being very high in summer. This is an added dimension which needs to be addressed while planning for sustainable use of water overtime.

The foregoing discussion amply justifies that water, as a commodity and as an input, should not be treated at par with other commodities or inputs dealt with in economics. The perceptions and/or concepts of water are case or situation specific. And, therefore, they are partial perceptions and they all are valid only in a given situation. (Iyer Ramaswamy. 2003: 77) However, this makes water resource management qualitatively different as compared to managing other natural resources. On the basis of the foregoing discussion, based on the survey of literature on management of water resource as an economic good, an attempt is made here to evolve an economic perspective on water resource management.

**Water Resource Management: An Economic Perspective**

To have an effective and enriching feel of the economic perspective on water resource management or policy implications of the many faces of water, a few but relevant findings from the important research works are reproduced here:

(1) “There clearly are some distinctive emotive and symbolic features of water that make the demand for water different, there are also some distinctive physical and economic features which make the supply of water different and more complex than that of most other goods. This fact has often been overlooked by economists and non-economists alike.” (Hanemann W. M. 2005: 27)

(2) “It is commonly said that the problem of water is not one of economics but politics, not one of physical shortage but governance. This is partly correct, but not entirely. The generic problem of water is one of matching demand with supply, of ensuring that there is water of a suitable quality at the right location and the right time, and at a cost that people can afford and are willing to pay.” (Hanemann W. M. 2005: 26)
(3) “There is wide interest in, and support for, the idea of treating water as an economic good. However, the role of water – as a basic need, a merit good, and a social, economic, financial, and environmental resource – makes the selection of an appropriate set of prices exceptionally difficult. Further, the application of price-based instruments, once an appropriate value system has been agreed, is particularly difficult in the case for water. This is so because the flow of water through a basin is complex, and provides wide scope for externalities, market failure, and high transaction costs. While judiciously applied market tools can be expected to have benefits, in many cases the necessary and sufficient conditions, especially defined and enforced water rights, are not yet in place. Priority attention to these essentials is likely to have high returns; pursuit of economic approaches in absence of such preconditions may have unpredictable and possible negative effects.” (Perry C.J., Michael Rock and D. Seckler. 1997. Summary: v)

(4) John Briscoe, Senior Water Advisor to the World Bank, in his keynote paper to: The International Committee on Irrigation and Drainage Conference on Water as an Economic Good provides a tentative set of “Rules for Would-be Reformers”, considering water as an economic good. He suggests that successful management of water as an economic good necessarily asks for appropriate reforms in the water sector and that too with utmost care and skill. The rules are: (a) Initiate change only when there is powerful and articulated need for reform. (b) Have a clear strategy for involving all the interested parties in the discussions of reforms. (c) Pay attention to general principles, but be sensitive and innovative in adapting these in different institutional and environmental context. (d) Do not advertise water markets as a silver bullet or a panacea, but ensure that they are a part of an effective water resource management system. (e) Start with the relatively easy problems to get experience and build momentum for reform. (f) Acknowledge that there are no perfect solutions, and don’t let the
best become the enemy of the good. (g) Pay close attention to prescribing institutional arrangements, which will address legitimate third-party issues, but which will simultaneously minimize transaction costs. (Briscoe John. 1997. Abstract: 2 and World Bank’s Report on India’s Water Economy. 2005. Chapter 4. Principled Pragmatism and “Rules for Reforms”: 73-82)

A Diversion: Concept of Virtual Water

The concept of virtual water is, as such, a useful economic tool in water policy making and, therefore, it cannot fit in the conventional economic classification of goods and services. However, it is one of the important water resource management related concept and hence this diversion is preferred. The amount of water consumed in the production process of a product is called the virtual water contained in the product. (World Water Council. 2004: 3) The concept of virtual water is like the concept of factor intensity that has been used in the Heckcher-Ohlin Theorem. “Water scarce regions can achieve high global water use efficiency by importing products that have high virtual water content embedded in and exporting products that have low water content.” (M. Dinesh Kumar and O. P. Singh. 2005: 2) The concept of virtual water and the tool of virtual water trade was developed by Allan A. J. in early 1990 and it is believed that it provides a solution to water shortage, enhances the global water use efficiency and eliminates the water conflicts/wars. (Allan J. A. 1998 and 2003, Hoekstra A Y ed. 2003, World Water Council. 2004, Sigh O P et al. 2004 and M. Dinesh Kumar and O. P. Singh. 2005)

The World Water Forum views the concept of virtual water in a wider context. The two reports published at the time of The 3rd World Water Forum 2003 at Kyoto: (1) Virtual Water Forum – Final Report and (2) Water Voice Project Report consider the concept of virtual water as an approach to develop water resource management strategy following

The discussion in this section can be briefly summarized as under:

Water is a gift of nature and so it can be considered divine, a basic human need, human right, social good and an economic good. Thus, water has many facets – different perceptions and correspondingly various concepts. But now water is considered both a social good as well as an economic good, and so management of water resources becomes more complex as compared to other natural resources. In this context, planning and programming socially optimal rate of water utilization for present and the future generations is a skillful assignment. The assignment is both a science and art as it involves resilience and rigidity in handling the dynamic issues.

**Section III: Valuing the Water: Conceptual Premises, Theoretical Foundations and Putting Principles into Practice**

Some of the issues related to water resource management are – the provision of adequate safe water as a basic human need and its equitable distribution at a reasonable price and/ or tariff; financing investment for the needed infrastructure and funding of its governance, mechanism for water provision as a basic human need and as a critical input for agriculture, industry and power sectors; optimal water allocation among various uses and users; and demand management for sustainable use of water over time. Also, they are related to “the functions of economic valuation of water.” (UN and WWAP. 2003: 333-338) And, therefore, water valuation is an inevitable and integral component of water resource management. (UN and WWAP. 2003: 328 and UNDESA. 1998) The multidisciplinary approach to sustainable economic growth for the realization of the socio-economic objectives, especially because of the emergence of branches like environmental economics, ecological economics, natural resource economics,
economics of environmental policy and economics of natural resource policy, has taught the economists how to manage sustainable economic growth and has resulted in a paradigm shift in model-building for a sustainable economic development.

Now, economists have learnt, as Abramovitz J. N. puts: "...most of the value in world economy does not come from putting things out of nature – it comes from the normal functioning of healthy rivers, forests, and fields." (Abramovitz Janet N. 1998: 10) And, therefore, water is an integral part of eco-systems and its conservation and development through optimal utilization should be planned in an environment friendly manner. This implies that water is not a free service of nature or priceless and its carefree management can adversely affect the existence and well-being of mankind forever through the irreversible damage to the life-supporting ecosystems. As water is a social and economic good, valuing water is not only inevitable and inescapable, but also an important element in the integrated water resources management.

**Water Value: A Multidimensional Concept**

In microeconomics, there are basically two concepts of value: value in *use* and value in *exchange* (price). However, as seen in the previous section, water can be perceived by people at different places, at different times, differently, which makes it a resource with "multidimensional concept". And water has been attributed a range of values! Because of this reason, "the subject of valuing water is controversial and people get very emotional when they talk about" water rights, the governance of water resource management, privatization of water, public-private partnership, its valuation and pricing etc. (UN and WWAP. 2003: 325) The Ministerial Declaration of the Hague Conference on Water Security in the 21st Century has recognized *valuing water* as one of the seven key challenges for the global community, proclaiming that people have to 'manage water in a
way that reflects its economic, social, environmental, and cultural values for all uses, and move towards pricing water services to reflect the cost of their provision. This approach should take into account the need for equity and the basic needs of the poor and vulnerable and so ‘any discussion of value (of water) must, therefore, take into account people’s perception of the world and their cultural and social traditions, as well as economic considerations and notions of full cost recovery.’ (Council of Ministers. Second World Water Forum. 2000 and UN and WWAP. 2003: 325)

Range of Water Values

According a value – economic and non-economic or non-financial – to natural resources, especially for water resources, though an inevitable assignment, is not easy for there are various considerations as well as approaches to handle this assignment. (Desvouges W. H. and V. Kerry Smith. 1983, Winpenny J. 1994, Rogers Peter. 1997, Bharadwaj V P et al. 1997. Pushpangadan P., K. Ravi and V. Santosh. 1997 and Abramovitz Janet N. 1998) This is because water is, by and large, a non-market good with many facets. Besides, water is now considered a finite but renewable natural resource and is also the most vulnerable resource due to climate change as well as the negative externalities of various economic activities. The WWDR 2003 observes: “Much progress had been made in the last decade in understanding that water has not only an economic value, but social, religious, cultural and environmental values as well, and that these values are often interdependent...For example, the social value of water for ‘health’ has economic return because a population in good health is more productive. Similarly, the environmental value of water has obvious economic and social implications.” (UN and WWAP. 2003, Executive Summary: 27 and UN and WWAP. 2003: 332) For these reasons, there are a range of values that can be listed through the survey of the literature related to water valuation: (1) Life-giving Value of Water,
(2) Social Value of Water, (3) Value to Eco-systems, (4) Economic Value of Water, (5) Religious / Cultural Value of Water, and (6) Essential Value of Water associated with equity and justice in water provision etc. All these concepts of water values are based on partial view related to water, but are complementary and useful in shaping the institutional and governance systems for socially optimal utilization rate of water and building up a water secured world in the 21st century.

Total Economic Value of Water

The concern for conserving the biodiversity among experts from various disciplines led to a methodology being framed for estimating the total economic value of the services provided by the biodiversity and a plan for its conservation. (Desvouges W. H. and V. Kerry Smith. 1983, Pearce D. 1990, Akerele O et al eds. 1991, and Pearce D and D. Moran eds. 1994) In general, for estimation of the total economic value of a natural good and/or its service, the following method is employed. (Pearce D. 1990, Bharadwaj V P et al. 1997 and Pushpangadan P., K. Ravi and V. Santosh. 1997) Chart I depicts the various components of total economic value of natural resource/input. The Total Economic Value (TEV) can be briefly described as under:

\[
\text{TEV} = \text{UV} + \text{NUV} = (\text{DUV} + \text{IUV} + \text{OUV} + \text{BUV}) + \text{NUV}
\]

Here,

\begin{align*}
\text{TEV} &= \text{Total Economic Value} / \text{UV} = \text{Use Value} / \text{NUV} = \text{Non-Use Value which is Existence Value associated with the preservation,} \\
&\text{conservation, enhancement and/or development of the natural resource} / \\
\text{DUV} &= \text{Direct Use Value} / \text{IUV} = \text{Indirect Use Value} / \text{OUV} = \text{Option Use Value} / \text{BUV} = \text{Bequest Use Value}. 
\end{align*}

Desvouges and Smith have in the context of water resource use tried to show the types of values associated with water (Desvouges W. H. and V. Kerry Smith. 1983) and that have been shown in Chart II. It shows that the total economic
value of water is a sum total of *Current User Values* associated with direct use and indirect use of water from the stream and groundwater withdrawal and *Intrinsic Use Values* associated with optional value due to potential use of water existence value associated with the future use of water.

**Value, Cost and Price of Water as Economic Tools**

The WWDR 2003 has underscored two points to ensure socially, economically and environmentally efficient use of water. (Chapter 13. Recognizing and Valuing the Many Faces of Water: 333-344): (1) The water resource planners and managers have to carefully determine (a) the value of the water — benefit to beneficiaries, (b) the cost of supplying water — capital and operating costs of water delivery systems, and (c) the price of water — charges to consumers/users. (2) The water resource planners and managers have to handle the water valuation work carefully for a number of technical reasons and operational difficulties which may, in turn, increase complications in handling the problem rather than enhancing the ease to manage it: (a) economic tools cannot accurately estimate social/religious values, (b) economic tools cannot meticulously estimate economic and environmental externalities or intrinsic economic value of water, (c) most current valuation methods are too complex and there is little operational application of valuation methods, and (d) even today water is more a divinity or a free gift of nature than a social good or an economic good and so even today, water services are heavily subsidized in the developed countries and most of the countries in the third world have neither water, infrastructure, finance and satisfactory institutional arrangement to provide adequate and safe water in a near term to millions of the poor in the rural and urban areas without discounting the interest in food security!

A keynote paper on water valuation, prepared by Peter Rogers (1997) for the United Nations Development of Economic and Social Affairs
Expert Group Meeting at Harare in 1998, is now accepted and used as a framework for water valuation. His framework and methodology of valuing water has two distinct advantages and for these reasons, his work has been widely accepted for developing operational principles for managing optimal and/or sustainable utilization of water resources over time:

(1) At present, water markets are not so developed even in the developed countries and the methods available for estimating water values have operational difficulties and due to this with relatively little utility potential, one cannot try the general equilibrium approach to the problem of efficient water allocation over time. Rogers’ framework enhances the scope for trying partial equilibrium approach to water resource management problem. He observes: “It may be pointed out that the value in alternative uses and opportunity costs are determined simultaneously when water supplies match water demands for user sub-sectors over time and space. Water markets, if functioning, will perform these functions of matching water demands (both for quantity and quality) with supplies if appropriate policies (regulatory and economic incentives) are used to take care of the externalities. In absence of such well-functioning water markets, efficient allocation (and resulting values and costs) can be obtained by using multi-period, multi-location systems analysis models. (Sinha, Bhatia, and Lahiri. 1986, Anandalingam, Bhatia and Cestti. 1992, and Harshadeep. 1995) With the advent of high-speed computers and efficient software, it is possible to obtain empirical estimates of values and costs using a system analysis model on a personal computer...However, where such systems analysis models are not available for the practical purposes of estimating values, costs and tariffs, a partial equilibrium approach should be followed. This requires estimating the opportunity cost of water when used in sub-sector in order to reflect the cost of developing other sectors of the use of this water. For example, while evaluating the full economic cost of water used in the industrial sector,
it becomes necessary to estimate the value in the best alternative foregone, which may be urban households or agriculture. Similarly, estimating the economic costs of water used in irrigation requires the estimation of the value of water used in industrial and urban sectors.” (Rogers Peter. 1997 and Rogers Peter, Ramesh Bhatia and Annette Huber. 1997: 5-6)

(2) “The sustainable use of water requires that the values and the costs should balance each other: full cost must equal the sustainable value in use.” (Rogers Peter, Ramesh Bhatia and Annette Huber. 1997: 5) Rogers’ framework also provides a methodology to estimate the full cost of provision of water as well as the total sustainable value of water in use. This helps the water managers to practice economic tools/principles to treat water as a social good and as an economic good.

Estimation of Full Cost of Water

The methodology provided by Peter Rogers is relatively simple to estimate the full cost of water provision. Chart III shows the various components of water costs that add up to make the full cost of water provision.

The full cost of water provision is a sum total of (1) Full Supply Cost which includes Capital Charges and Operation and Maintenance Cost. (2) Full Economic Cost is the sum of Full Supply Cost plus Opportunity cost of water use in a particular sector plus Economic Externalities related to water provision. Now the Total Full Cost of Water can be worked out as: Full Cost of Water Provision = Full Economic Cost + Environmental Externalities. The opportunity cost of water can be zero only when there is no shortage of water for all possible alternative uses of water forever and that is not true. Ignoring the opportunity cost of water by another user and/or incorrect estimation of water’s opportunity cost may undervalue water and cause serious misallocation of water between the users and investment failure in water sector and welfare
loss to the community as a whole. So utmost care is needed to approximate water’s opportunity cost. Water, normally surface water in river basin, is a fugitive resource and so it has a very high potential to generate “pervasive externalities”. “The most common externalities are those associated with the impact of an upstream diversion of water or with the release of pollution on downstream users. There are also externalities due to over-extraction from, or contamination of, common pool resources such as lakes and underground water…” (Rogers Peter, Ramesh Bhatia and Annette Huber. 1997: 8) The standard economic approach to externalities is to try to internalize the cost of such externalities. As distinct from economic externalities, there are environmental externalities such as public health hazards and biodiversity losses due to water pollution or inadequate water supply to people and/or the ecosystems. Here also, one has to be careful in estimating the costs of such environmental externalities.

**Estimation of Value of Water through Value in Use**

Economic criterion suggests that for maximization of social welfare, the value of water, which is estimated from the Value in Use, should be just equal to the full cost of water. But it has been observed that in case of water, social and economic goals override the economic criteria and that has aggravated the water crisis. In this context, it is necessary to estimate the value of water carefully and evolve an effective water governance mechanism for socially optimal utilization of water overtime.

“The value of water depends both upon the user and to the use to which it is put.” (Rogers Peter, Ramesh Bhatia and Annette Huber. 1997: 10) Chart IV shows schematically the components of the Value in Use of Water, which is the sum of the Economic and Intrinsic Values.
The Full Value of Water = Economic Value of Water + Intrinsic Value of Water. The Total Economic Value of Water is a sum total of (a) Value to Users of Water, (b) Net Benefits from Return Flows, (c) Net Benefits from Indirect Uses, and (d) Adjustment for Societal Objectives. The value to users of water is as such the willingness to pay for the water by the domestic users and the marginal value product of water used by the farmers or industrial/commercial units. Water is also a fugitive resource and so it generates benefits – water diversion through canals may recharge the groundwater table in the region – and result into loss of water due to evaporation and pollutants. So, the Net Benefit from Return Flow is a positive difference between the gains and losses due to flow of water. ‘Irrigation scheme provides water for domestic use – drinking and personal hygiene – and live stock purposes, which can result in improved health and/or higher incomes for the rural poor...Irrigation is also known for some adverse consequences include, *inter alia*, water logging and salinization of soils...’ (Rogers Peter, Ramesh Bhatia and Annette Huber. 1997: 11-12) These benefits and costs are accounted in Net Benefits from Indirect Uses. Poverty alleviation, employment and food security are societal objectives which some times compel to adjust the value of water in an arbitrary manner. So, while estimating the value of water use, extreme care must be taken in the use of such societal considerations. ‘The concept of economic value, it should be noted, does not assign any value to concerns such as stewardship, bequest values, and pure existence values. While these are difficult to measure, they are, nevertheless, valid concepts and do reflect the value associated with water use (or non-use)’. (Rogers Peter, Ramesh Bhatia and Annette Huber. 1997: 14) Intrinsic Value cares for such unassigned values to water use. However, it is very difficult to measure and hence some have attempted to approximate it through ‘Hedonic Price Indices.’ (Rogers Peter, Ramesh Bhatia and Annette Huber. 1997: 14)
Other Issues to be Considered

Peter Rogers et al. also emphasize that while estimating the cost and value of water, the following two points must be taken into consideration: (1) The effects of reliability of water supply on cost and value. (2) Water quality concerns in cost and value. (Rogers Peter, Ramesh Bhatia and Annette Huber. 1997: 14-16) It is because adequate and safe assured water supply i.e. water security ultimately promotes sustainable economic growth and enhances human well being.

Operational Principles for Water as a Social/Economic Good

A framework for operationalizing the concept of water, as a social and as an economic good, developed by Peter Rogers et al. derives the following four principal conclusions/guiding principles:

“First, it is important to estimate the Full Cost of water used in a particular sector and this should include the Opportunity Cost of water as well as the Environmental Externalities. The full cost should present the context for setting water prices, effluent charges and the incentives for pollution control.

Second, in estimating the value of water, it is critical to reflect the societal objectives of poverty alleviation and food security and incorporate the net benefits from return flows and non-irrigation uses of water.

Third, the above considerations should be taken into account while setting water tariffs for domestic users and for irrigation.

Finally, raising water tariffs, levying effluent charges and encouraging water markets can play significant role in improving the economic efficiency and environmental sustainability of water use.” (Rogers Peter, Ramesh Bhatia and Annette Huber. 1997: 31)
Water Pricing: Tradition vs. Compulsions

Prices reflect the relative scarcity of goods and services. So, if markets are near perfect and are working efficiently, prices can become a powerful economic tool which can help in rationing the use of a scarce commodity, in increasing the relative efficiency and productivity of input/natural resource use and in optimal allocation of the resources between different uses. It can be productively employed in demand management of the critical natural resources. Water is a scarce and vulnerable natural input. Its relative scarcity is only going to escalate due to the non-commensurate inflation in its demand vis-à-vis growth in the population and economic activities. There is, hence, a strong compulsion to consider water as an economic good.

The commodification of water, as against water as an economic good for the purpose of optimal utilization of the critical natural resource for sustainable human well-being, are two different things. But lack of such an understanding has made water-pricing issue more debatable. (Shiva V. 2002, Barlow M and Clarke T. 2002 and Mann Howard. 2003) Mann Howard’s cry against water’s privatization was reflected in his research work: “Who Owns Your Water? – Reclaiming Water as a Public Good under International Trade and Investment Law.” (Mann Howard. 2003) Water security cannot be achieved unless it has been made everybody’s business (Cosgrove William, Risberman F. R. and World Water Council. 2000 and World Water Council et al. 2000) and as there is a fear of excluding the stakeholders by privatizing water, it is prudent to keep it as a pure public good.

Difficult Task of Water Pricing

Managing water, as an economic good, is a package deal and it requires many critical aspects to be evolved: appropriate legal framework for water rights, development of workable water markets,
canalizing private initiatives and investment for creating the needed infrastructure for water harvesting and storage, mechanism to manage common pool resources, efficient participatory governance machinery for water resource management and so on... Over and above, societal considerations – poverty alleviation, employment generation and food security – require the public sector to play a pivotal role in effective water resource management. So, water pricing is, on the one hand, a debatable issue and, on the other, a complex issue to deal with unless a suitable network and congenial environment are created.

The WWDR 2003’s observation pertaining to the issues of water valuation and water pricing aptly highlights the complexity of the problems related to water pricing:

“Problems in the pricing of water reflect those encountered in valuing water..., in addition to the fact that: the different economic sectors of water use (food, cities, industry, etc.) may all be valued differently; the tradition of paying for water is not well established everywhere; it is not always practicable or economically feasible to measure actual consumption, making pricing approximate; and the polluter pays principle often cannot be applied because of uncontrollable (legal or illegal) water pollution.” (UN and WWAP. 2003. Executive Summary: 28) Besides, the water pricing issue is more country/case specific, and so here it is not possible to deal with it elaborately.

**Section IV: Concluding Observations**

Water is a key resource for sustainable economic growth and, therefore, instrumental in realizing the socio-economic objectives resulting into the enhancement of human well-being forever. Water is now finite and the most vulnerable natural resource and hence the concept of water, as an economic good, is on the global agenda. Besides, as it is a basic human need, it has also been considered as a human right.
Keeping these aspects in view, the task of recognizing the many faces of water and its valuation and pricing is inevitable for designing a comprehensive natural resource policy in general and Integrated Water Resource Management (IWRM) component of this policy in particular. But the task is not so easy since the image of water, as a public good/common resource rather than an economic good, still persists. This, as such, further aggravates the various issues of water resources management at all levels – the local, regional, national and global.
## Table 1
**Water, Poverty and the Millennium Development Goals**

<table>
<thead>
<tr>
<th>Millennium Goals</th>
<th>How water management contributes to achieving goals</th>
<th>Directly contributes</th>
<th>Indirectly contributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poverty</td>
<td>to halve by 2015 the proportion of the world’s people whose income is less than $1/day</td>
<td>○ Water as a factor of production in agriculture, industry and other types of economic activity</td>
<td>○ Reduced vulnerability to water-related hazards reduces risks in investments and production</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ Investments in water infrastructure and services act as a catalyst for local and regional development</td>
<td>○ Reduced ecosystems degradation boosts local-level sustainable development</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ Improved health from better quality water increases productive capacities</td>
<td>○ Water as a factor of production in agriculture, industry and other types of economic activity</td>
</tr>
<tr>
<td>Hunger</td>
<td>to halve by 2015 the proportion of the world’s people who suffer from hunger</td>
<td>○ Water as a direct input into irrigation including supplementary irrigation, for expanded grain production</td>
<td>○ Improved nutrition and food security reduces susceptibility to diseases</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ Reliable water for subsistence agriculture, home gardens livestock, tree crops</td>
<td>○ Improved health and nutrition reduce susceptibility to anemia and other medical conditions that affect maternal mortality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ Sustainable production of fish, tree crops and other foods gathered in common property resources</td>
<td>○ Improved health and nutrition reduce susceptibility to anemia and other medical conditions that affect maternal mortality</td>
</tr>
<tr>
<td>Universal primary education</td>
<td>to ensure that, by 2015 children everywhere will be able to complete a full course of primary schooling</td>
<td>○ Improved quantities and quality of domestic water and sanitation reduce mass morbidity and mortality and mortality factor for young children</td>
<td>○ Improved health and nutrition reduce susceptibility to anemia and other medical conditions that affect maternal mortality</td>
</tr>
<tr>
<td>Gender</td>
<td>progress towards gender equality and the empowerment of women</td>
<td>○ Improved health and reduced labour burdens from water portage reduce mortality risks</td>
<td>○ Improved health and nutrition reduce susceptibility to anemia and other medical conditions that affect maternal mortality</td>
</tr>
<tr>
<td>Equality</td>
<td>and the empowerment of women should be demonstrated by ensuring that girls and boys have equal access to primary and secondary education</td>
<td>○ Improved health and nutrition reduce susceptibility to anemia and other medical conditions that affect maternal mortality</td>
<td>○ Improved health and nutrition reduce susceptibility to anemia and other medical conditions that affect maternal mortality</td>
</tr>
<tr>
<td>Child Mortality</td>
<td>to reduce by two thirds between 1990 to 2015, the death rate for children under the age of five years</td>
<td>○ Better water management reduces mosquito habitats and malaria incidence</td>
<td>○ Improved health and nutrition reduce susceptibility to anemia and other medical conditions that affect maternal mortality</td>
</tr>
<tr>
<td></td>
<td></td>
<td>○ Reduced incidence of range of diseases where poor water management is a vector</td>
<td>○ Improved health and nutrition reduce susceptibility to anemia and other medical conditions that affect maternal mortality</td>
</tr>
<tr>
<td>Maternal Mortality</td>
<td>to reduce by three quarters, between 1990 and 2015, the rate of maternal mortality</td>
<td>○ Improved health and reduced labour burdens from water portage reduce mortality risks</td>
<td>○ Improved health and nutrition reduce susceptibility to anemia and other medical conditions that affect maternal mortality</td>
</tr>
<tr>
<td>Major diseases</td>
<td>to halve, by 2015, heart and cancer; to reverse the spread of HIV/AIDS; to stop the scourge of malaria, the scourge of other major diseases that affect humanity</td>
<td>○ Better water management reduces mosquito habitats and malaria incidence</td>
<td>○ Improved health and nutrition reduce susceptibility to anemia and other medical conditions that affect maternal mortality</td>
</tr>
<tr>
<td>Environment sustainability</td>
<td>to stop the unsustainable exploitation of natural resources and to halve, by 2015 the proportion of people who are unable to reach or to afford safe drinking water</td>
<td>○ Improved water management, including pollution control and sustainable levels of abstraction are key factors in managing ecosystems integrity</td>
<td>○ Development of integrated management within river basins creates conditions where sustainable ecosystems management is possible and upstream-downstream impacts are mitigated</td>
</tr>
</tbody>
</table>

This table shows that improving water management can make a significant contribution to achieving all of the Millennium Development Goals established by the UN General Assembly Millennium meeting in 2000.

**Source:** UN and WWAP 2003 9
Chart 1
Economic Values attributed to Environmental Assets

Total economic value

- Use values
  - Direct use values
    - Output that can be consumed directly
      - * Food
      - * Biomass
      - * Recreation
      - * Health
  - Indirect use value
    - Functional benefits
      - * Ecological functions
        - * Flood control
        - * Storm protection
  - Option values
    - Future direct and indirect use values
      - * Biodiversity
        - * Conserved habitats
  - Nonuse values
    - Existence value
      - Value from knowledge of continued existence, based on, for example, moral conviction
      - * Habitats
      - * Endangered species
    - Other non use values

*Decreasing “tangibility” of value to individuals*

CHART II
Types of Values Associated with Water

CURRENT USER VALUES

Direct Use
Indirect Use → Near Stream

Withdrawal

In Stream

→ Navigation
→ Recreational
→ Commercial
→ Hydropower

→ Municipal
→ Agriculture
→ Industrial/Commercial

→ Recreational
→ Relaxation
→ Aesthetic

→ Potential Use → Option Value

INUINSIC VALUES

→ Near term Potential Use
→ Long term Potential Use

→ No Use → Existence Value

→ Stewardship
→ Vicarious Consumption
→ Pure Existence Value
→ Bequest Value

Chart III
General Principles for Cost of Water

Source: Peter Rogers et al. 1997: 7
Chart IV
General Principles for Value in Use

Intrinsic Value

Adjustment for Societal Objectives

Net Benefits from Indirect Uses

Net Benefits from Return Flows

Value to Users of Water

FULL VALUE

ECONOMIC VALUE

Source: Peter Rogers et al. 1998: 13
Appendix I
Global Concern for Water – Milestones

1972: UN Conference on the Human Environment, Stockholm / Theme: *Prevention and Enhancement of the Human Environment for Sustainable Human Well Being* / Conference was at root in originating the idea and visualizing the role of *Sustainable Development* in human well-being.

1977: UN Conference on Water, *Mar del Plata Conference*. It was the first serious global meet exclusively on water issue / focused on “water for people” rather than “water for the environment” / this conference actually initiated a series of global initiatives/activities related to the Global Water Crisis.


1990: Global Consultation on Safe Water and Sanitation for 1990’s, New Delhi.


1992: *The International Conference on Water and the Environment*, Dublin / Four Dublin’s Principles / Recognized water as an economic good / these principles also helped to form the idea of Integrated Water Resource Management – IWRM.


1996: WWC (*World Water Council*) was established out of the increasing concern for water issue / international think-tank about global water issue / decided to arrange for WWF (World Water Forum) every three year.


2000: UNs Millennium Assembly Declaration of *Millennium Development Goals for 2015* / One of the goals is: to halve the portion of people without access to safe drinking water and basic sanitation.

2000: *The 2nd WWF*, The Hague, Netherlands / “*World Water Vision*” was presented and deliberations on “*From Vision to Action*” / *World Water Assessment Program* was announced / Parallel to this Forum, there was a Ministerial Conference.


2000: ESCAP Ministerial Conference on Environment and Development in Asia and the Pacific (MCDE) / Conservation and Integrated Management of Freshwater was considered priority issue for the region.

2001: *The High Level Regional Meeting* for the World Summit on Sustainable Development, Phnom Penh considered freshwater issue / Freshwater is considered a key resource to sustainable development.

2001: *International Conference on Freshwater*, Bonn (Dublin +10) / Theme was: "Water - A Key to Sustainable Development / Recommended priority actions in three areas: Governance, Mobilizing Financial Resources, Capacity Building and Sharing Knowledge.

2002: *World Summit on Sustainable Development*, Johannesburg (Rio +10) / UN Secretary General Kofi Annan identified "WEHAB" (Water and Sanitation, Energy, Health, Agriculture, Biodiversity) as integral to a coherent international approach to sustainable development.

2003: *International Year of Freshwater*.

2003: *The 3rd WWF*, Kyoto, Japan / translation of water vision into concrete action / two Projects: A Virtual Water Forum and Water Voices Project Parallel to this Forum, there was a Ministerial Conference / Presentation of First World Water Development Report.


2006: UN’s *Second WWDR 2: Water A Shared Responsibility*.

2006: *The 4th WWF*, Mexico City / Theme "Local Actions for a Global Challenge".


(2) Kataoka Yatsuka. 2002. (3) UNDP 2006 HDR 2006
Appendix II

**Water Is Different – An Ode to Water**

Water is far from a simple commodity
Water's a sociological oddity
Water's a pasture for science to forage in
Water's a mark of our dubious origin
Water's a link with a distant futurity
Water's a symbol of ritual purity
Water is politics, water's religion
Water is just about anyone's pigeon
Water if frightening, water's endearing
Water's a lot more than mere engineering
Water is tragical, water is comical
Water is far from the Pure Economical.