

## VALUING THE RIVER

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**ABSTRACT :** In the history and traditions of India, the river plays an overwhelming role – shaping her economy and the culture. All old civilisations were cradled in river valleys. But the importance of a river in a tropical country with a nine-month dry period led to the symbolism of river as the life-giver, the concept of *Ganga* – the mother and provider. Lately, modern industrialism, population expansion and over-exploitation have caused serious degradation to the country's river systems. Whereas development has brought in benefits, it has also imposed environmental costs, normally not entered in the books of cost-benefit.

The river for the Indian society has been extremely *valuable*; it remains so and will remain more so in the future, for development and sustainability of the civilisation. River provides both *use values and non-use values*. The use value is derived out of *direct uses* like in irrigation, drinking water usage or power generation. The *indirect uses* are from maintenance of ground water, deposition of silts during flooding and maintaining the fertility of the soil, moderation of the microclimate etc. The *non-use value* is derived in form of its scenic significance and the religious and cultural importance to the Indian civilisation.

The intention in this paper is to provide a theoretical and methodological foundation to valuing the river in all its tangibles and intangibles. This is likely to help in evaluating projects as well as in decision making about social investments in their preservation, conservation and wherever necessary, in re-generation of the river systems.

### INTRODUCTION

River is valuable. Human civilisation emerged in river valleys. Majority of cities, whether ancient or modern, developed on banks of rivers. Rivers shaped the landscape, created fertile valleys and deltas; they provided sweet water to drink and irrigate the fields of the farmer; provided fish as a vital food; provided a place to live in the densely populated deltas; Yang-tze; in ancient times, they were the highways of transportation and commerce – no less now, – in nut-shell, rivers have been invaluable to human society, its culture, civilisation and economy. It is inconceivable

to think of civilisation without the central role that the river played in it. In tropical countries like India, China, or Egypt (the Old World civilisations), rivers are even more relevant. It is not far to see why the people assigned divinity to river in India – the eternal mother and the giver of life.

Societies assigned value to rivers both by intuitive reasoning as well as through empirical reasoning. Intuition provided the aesthetic and spiritual values (the intangibles), empirical, the mundane economic and other beneficial values. It is also to be appreciated that with the beginning of the industrial era,

the rivers are no more the rivers they were – no more the pristine ambience nor the sweet-scented water that quenched thirst of millions and billions of humans and other life-forms on earth, for ages. Acute pollution of rivers through out the world, is a question for survival of man and his civilisation. There is excess drawal of water for a variety of uses, their channels dammed time and again for power and irrigation, their banks constricted by embankments, the water is poisoned and has turned toxic – no more the fish and fowl frolic on their blue expanses. This has not ended. Man's needs are unending. Every now and then new project comes up. It is there, that the cost-benefits of the project has to take account of the tangible and intangible values of the river in their cost calculus -- if the goal is preservation of a sustainable river system for ourselves and for the posterity.

Rivers are valuable because of their *intrinsic worth* as a moving fresh-water body that promotes life as containing various ecosystems within, as well as supporting life outside – humans, plants and other animals. It could also prove destructive and inimical to life on occasions. On the other hand, human culture and civilisation also assign values or *create values* to the river – a stretch of river that is assigned a scenic significance or religious or other beneficial significance to the society. The same cannot be ascribed to other life forms. Thus, there is the intrinsic value of river as an environmental entity as well as created value due to anthropogenic processes. However, it may be difficult to value the river in this light – it is the economic valuation principles that are useful from a practical point of view.

### **VALUING ECONOMIC BENEFITS AND COSTS**

Rivers are of many benefits and these benefits

theoretically can be assigned economic value. However, in practice it is not as easy. Environmental economics provides certain valuation methods and techniques for valuing environmental resources. The river is one. Benefits of river can be in terms of both *use values* and *non-use values*. Use value of the river could be further divided into *direct use value* and *indirect use value*. Direct use value can arise in the form of estimable financial flows of benefits, say from a hydroelectric project or an irrigation project where the society (consumers) purchase the benefits by way of direct financial transactions.<sup>1</sup> The same may apply to fishing in the river that the riparian villagers may use the river as a common property resource or the state may impose a royalty on such rights on the users. Similarly, the state could impose a cess or royalty on use of the river for transportation.<sup>2</sup>

The indirect use value of the river arises out of benefits that accrue that are valuable to the society but cannot be accessed through direct financial means, either by a user charge or a fiscal method. For example, the flooding of the river brings in benefits by way of deposition of silts on the flood plain and enhances fertility of the croplands. The farmer gets a better harvest. However, it is difficult for the state to impose a cess or a tax on such silts or to estimate the incremental benefits of flooding and silt deposits on the flood plains. Riparian villagers and townsmen draw water from the river for drinking and domestic use that hardly could be taxed, except for large-scale users, like industries or water purification systems that supply to big cities and receive user charges – that come under the category of direct use value.

The non-use value of a river may be in terms of its *option value* or *existence values*. The

river as a resource may not have a use value to day because of its difficult location and current difficulties in harnessing it for whatever economic or non-economic reasons. However, it may hold a potential option value in the future. There also could be trade-offs between the present uses and the future uses. On the other hand, the river may contain some biological diversity whose full benefits are not known today but, could be valuable in future – that construe another form of option value. The river may have an existence value – that the society assigns significance to the sheer presence of the river, say Ganga. The Society is also ready to expend money to keep the river flowing and in good condition for its cultural or religious significance or for posterity unless the river dies or changes course wholly outside the realm of efforts of the society. These are intangibles. The river has its scenic and leisure potentials that have both use value as well as existence value.<sup>3</sup>

The river creates some negative values by way of damages it might cause principally due to flooding its banks, damage to crops, livestock, residences and lives of people, and wildlife etc. These arise out of purely natural causes and also due to anthropogenic reasons. The anthropogenic costs could be by way of habitations and embankments on the levee that block the natural flooding; the pollution of river water by industries and agriculture - the waste water flowing into the river system that causes health costs on the users, loss of fish and biotic life etc. It is difficult to see that man can anyway blame nature and put a cost on such damages. However, man can change in the way it interacts with nature and therefore reduce damages arising out of anthropogenic costs. Some of the damages caused by the river can be mitigated by human action and that has a cost – *damage mitigation costs*.

These could be brought into the overall cost calculus of the river.

In general, therefore, the balance of the benefits and costs of the river, in principle gives some idea about the value of the river. Thus, if the value of the river is V, then :

$$V = V_b - V_c \dots\dots\dots (1)$$

Whereas V is the value of the river, V<sub>b</sub> is the benefits of the river and V<sub>c</sub> is the costs of the river that is imposed on the society. Further, V<sub>b</sub> in the sum total of all use and non-use values :

$$V_b = V_{bu} + V_{bnu} \dots\dots\dots (2)$$

Whereas V<sub>bu</sub> is the use value benefits (direct + indirect) and V<sub>bnu</sub> is non-use value benefits (option + existence values).

Similarly, the costs of the river (including the damage mitigation costs) could be in terms of the direct costs of damage, V<sub>cd</sub> + indirect costs, V<sub>cnd</sub> (of mitigation costs, V<sub>cm</sub> + shadow costs or opportunity costs, V<sub>co</sub>). Thus,

$$V_c = V_{cd} + V_{cm} + V_{co} \dots\dots\dots (3)$$

Therefore, V can be re-written,

$$V = V_{bu} + V_{bnu} - (V_{cd} + V_{cm} + V_{co}) \dots\dots (4)$$

**METHODOLOGY OF ESTIMATION**

The theoretical propositions made, need to be seen in light of the methodologies available for estimation of the value. However, there is no single methodology available for the estimation process as a whole. The direct benefits and costs are relatively easy to estimate, say the hydro-power potential of the river, the irrigation potential and the incremental benefits of irrigation on crop productivity, or for that matter the drinking water or industrial uses where water is an essential input. Similarly, the direct costs due

to flood damages to property, crops, livestock and lives of people could also be theoretically estimated in a given watershed (by averages over a period of time). However, it is the indirect benefits and hidden costs that raise real problems of estimation.

The indirect benefits, like, say the silt deposits during flooding, perhaps, could be estimated by the differential yield, i.e., between without silt deposit yields and with silt deposit yields. So also, in estimating the transportation benefits. But, the conditions of estimating the *option value* or *existence value* are much more complex. For example, what is the value of the river *Gharial* in Sundarbans, or the value of the Ganga Dolphin (at Allahabad)? They construe both future value as bio-diversity whose preservation for future is thought necessary (even if, not fully ascertained) and an existence value, that their sheer presence in the river is desirable. The first could be approached by the preservation cost method.<sup>4</sup> The second, by the Willingness to Pay (WTP) methodology<sup>5</sup>, i.e., some people from far and near are ready to pay for seeing the Sundarban *Gharial* or the Ganga Dolphin – their existence has a value, at least for a section of the (informed) society. In the same way, Ganga has a religious connotation for the Hindus, and many visit Ganga to take a holy dip in the river coming from within the country and abroad – that cost them by way of transportation, stay etc. Thus, the *travel cost method* could be an appropriate methodology for estimating such existence values of the river. The same may apply to the scenic significance of the river or stretches of the river that has or can be utilised for tourism or other leisure purposes like the white-water rafting (sports).

## CONCLUSION

Why value the river? – Have not we always valued it? The matter here is putting an economic value to the river. This may at once look mechanical, somewhat unorthodox, or even a prosaic interpretation of the value to an environmental resource that societies intuitively assigned great significance both for temporal and spiritual reasons. This methodology can help us in conserving this vital heritage and resource and also to use it in a more effective and judicious manner in many areas of its application.

First, for purposes of conservation of the river systems appropriate valuation is vital – both in terms of the benefits and the costs that are caused. For any conservation programme like the Ganga Action Plan, it is necessary to know the costs of damages and the costs of abatement of damages.<sup>6</sup> It is to be appreciated that it is not practicable to think that the river can be left full to its pure natural state. It is also utopian to think that a conservation programme can restore the river to its original state – about which we know little or even so, the costs may be prohibitive and unacceptable (to the society). The acceptable state, in which the river can be used, yet conserved is in between a state of total damage or the pure natural state of the river.

Fig. 1 shows the decision support that valuation of damage costs of the river and damage mitigation costs can provide. Left to its own devices, human action can lead to immense damage to the river system at an incremental rate on the scale of use (on the X axis), in terms of increasing health costs to people due to polluted rivers, flooding due to the catchment deforestation, decreased fish yield and loss of livelihood of the fishermen, and so on. These could be mitigated by incurring costs in conservation that would be initially

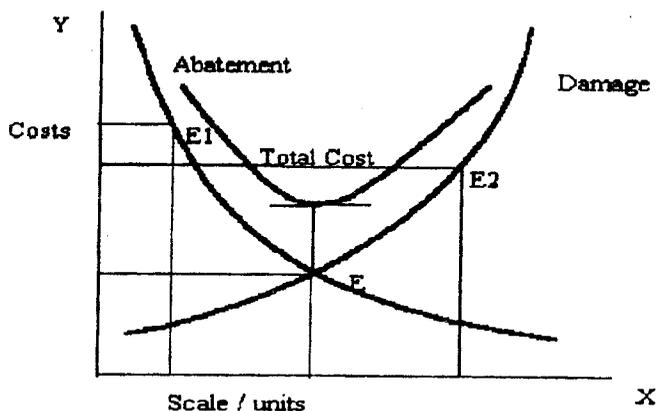


Fig. 1 : Environmental Costs and Social Choice

more beneficial per unit of cost but would decline over additional units, a negative function (abatement cost function). E is the intersection of the two functions that provides a possible choice, i.e., a trade-off between an acceptable damage profile as well as some conservation measures in restoring the river to a state of repair, a social acceptable state incurring a socially acceptable economic costs of abatement.

Second, the valuation techniques help in providing resolution of river disputes both internationally as well as nationally. If rivers can be valued, then riparian countries or states

can exchange usage of river benefits by trading in rights on their usage.<sup>7</sup> Not far away is the imbroglio of Cauvery, between the states of Tamil Nadu, Karnataka, Kerala and Ut of Pondicherry.

Third, the valuation can help in effectively analysing specific development projects, be they of power generation, irrigation, and leisure or of drinking water. It may be noted that water itself in such project analysis is treated as a free gift – that in a general sense is true, but looking at increasing scarcity and competing uses, it would be foolhardy to continue with this methodology.

#### END NOTES :

1. It may be noted that in project analysis of both hydro-electric type or irrigation type, the cost of water is treated as zero, a free commodity of nature. As a result the (long term) project costs are either too low or the prices charged are cost plus basis. This is not a sound methodology under the situation that the water is getting scarce and appropriate pricing may be necessary for the optimal use of the resource. One example is the river water disputes between riparian states (say, the Cauvery dispute). If cost of water as a gift of nature is assigned an economic value (accruing to the riparian states) it is possible that such rights can be traded between countries and / or states and the option will be open whether a particular country or state wishes to utilise the water or wishes to sell it to a downstream country or state. The result would be much more rewarding and disputes fewer.
2. However, the amount of cess or royalty may not provide a true picture of its value for transportation. This could be estimated by the differential of transport cost with the alternative transportation that is the least cost under the situation.

3. A question may arise about the distinction between the potential benefits and those realised. It could be noted that it is not the intention here to go into this distinction. All realised and potential benefits of the present and future need to be accounted in the framework under discussion.
4. For example, how much would it cost to undertake a preservation programme on the endangered riverine fauna inclusive on educating people, actual conservation programmes and preventive programmes etc.
5. See, Anil Markandya, *The Political Economy of Environment*, Manuscript (Unpublished : 1997).
6. Here the environmental damage cost is confined to anthropogenic costs alone, whereas the abatement costs relate to the mitigation costs that society is to bear to abate or prevent the damage.
7. An interesting parallel is the recently concluded Global Convention on Climate Change (UNFCCC and under Intergovernmental Panel on Climate Change, IPCC), Kyoto, Japan (December, 1997) in which, negotiating countries discussed but could not agree on trade in pollution rights distributed among countries, thus encouraging on paying for countries that are less polluting (the atmosphere).

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