

A Systemic Understanding of Environmental Degradation of the River Ganga

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This paper explains the pollution of the River Ganga as arising out of three reasons:

- 1. ‘Energy’ as the source of improvement of the Ganga basin;**
- 2. Lack of communication among different worldviews about the Ganga;**
- 3. Lack of regulation to the fast pace of ‘improvement’ brought about by ‘energy’.**

Then this paper indicates one instance of improved waste water management, one instance of improved fresh water management and a case study of improved cleanliness in a factory which was earlier a polluter of the Ganga.

1. Introduction

“The Ganga is the most important river system in India with almost one-tenth of the world’s population living within its basin. It is also one of the most polluted rivers in the country” (Markendya & Murty, 2000). The Ganga Action Plan (GAP) started in 1985, aimed to clean the river. It involved among others, cleaning the sewage discharge and treatment of the industrial affluent before these are released into the river and construction of electric crematorium for burning of dead bodies. The result of 13 years of pollution control is shown in Table 1.

This shows that the handling of the affairs of pollution control of the Ganga has produced mixed results. This brings us to first develop a generic understanding of how we have handled our affairs of environmental management.

2. Two approaches to environmental management

It has been argued that human affairs display the interaction of two processes – the goal seeking process and the process of generation of multiple and often conflicting standards for appreciating and regulating ongoing relationships (Vickers, 1970: 202). On these lines, this paper argues that the approach to environmental management can be looked in two ways. The dominant one is based on the Western rational-scientific ethos. The other approach can be called a social approach which aims at appreciating different and constantly changing worldviews. Here actions emanate from an understanding of the different worldviews. In trying to understand the present threat to the River Ganga, let us begin with the goal seeking process of the world.

S.No	Location	1986 (summer)		1999 (summer)	
		DO(mg/lit)	BOD(mg/lit)	DO(mg/lit)	BOD(mg/lit)
1.	Haridwar	8.1	1.8	8.6	1.2
2.	Allahabad	6.6	15.5	7.9	3.2
3.	Patna	8.1	2.2	7.8	2.4
4.	Calcutta at Uluberia	6.9	2.1	6.6	2.2

Table 1: The level of pollutants in Ganga with respect to pollution parameters (Source: <http://haridwar.nic.in/gap.htm>).

Note:

DO: Dissolved Oxygen. The desired standards fixed by the Central Pollution Control Board of Ganga is 5 mg/lit (minimum).

BOD: Bio-chemical Oxygen Demand. The desired standards fixed by the Central Pollution Control Board of Ganga is 3 mg/lit (maximum).

2.1 Social systems as goal seeking

The understanding of human behaviour as goal seeking gave rise to the problem solving approach to the issues of the mankind. This affected our response to many issues facing the world including that of environmental management. Before the industrial age, 'protestant ethics' – the foundation of Western civilisation believed in expending energy (by being industrious) and then relaxing. In contrast, the Indians are said to believe in *aram* culture. '*Aram* means rest and relaxation without being preceded by hard work' (Sinha, 1995: 101). It is not surprising that since the advent of industrial age, technology – which again is energy driven - has been the most accepted means of bringing about improvement much in line with the problem solving approach. However there is an inherent flaw in accepting improvement in life as energy driven: The second law of thermodynamics says that entropy – a measure of wasteful heat in a system - keeps on increasing if we try to change the system. This means the more we change a system the more its entropy increases. This results in an increase in the percentage of unusable heat in the system. The present problem of global warming can be understood from this basic argument. Further, one can argue based on the principles of thermodynamics that because of the innate irreversibility in any change process, the more we try to improve a system the worse it could become. This is congruent with the traditional Indian philosophy which is systemic in nature (Kumar & Sankaran, 2006) and the ideas of the systems school by system dynamics. From this point of view, our eco-system has to perforce move away from where it was say a hundred years ago to a more disordered eco-system thanks to the 'progress' we have made in this period. Thus what was once a natural system called the 'Ganga basin' became a manmade system of 'water utilization in the Ganga basin'.

Returning back to energy as the prime mover of improvement, this mindset affected the way of tackling the environmental issues. Therefore, sewage treatment was conceived in a manner which needed electricity which however is not available in the entire Ganga basin for almost half a day throughout the year. It needs

proper maintenance of the sewage treatment plant for which the cash strapped state government had made no provisions. Thus sewage treatment became a costly affair – it costs about Rs 5 million to treat a million litres per day of sewage before it is discharged into the Ganga (Dasgupta, 2005). Do we see the second law of thermodynamics asserting itself in these downstream ‘disorders’?

2.2 Social systems as appreciating systems

If the Ganga is polluted today, besides the goal seeking, energy driven approach to improvement, another reason that could be attributed is our inability to appreciate and reconcile different worldviews about the Ganga and a lack of communication among these different ‘worldviews’. What are the different worldviews about the Ganga? – Is it a large open drain in which to discharge the pollutants of a factory or a flow of sacred water brought from Heaven in which one must bathe so as to cleanse one of all his/her sins or a major river in an irrigation system or a open pipe line to transport sweet drinking water from the Himalayas to the plains of India, or a river whose annual flooding bring rich alluvial soil or is it a river whose beautiful *ghats* (banks) can be used to attract tourists?

These worldviews show the problem of pollution of the Ganga through the second process of generation of multiple and often conflicting standards for appreciating the world. To paraphrase Vickers (1970, p.203) our fears and aspirations about the Ganga have generated standards so exacting and so conflicting as to pose insoluble problems of multi-valued choice.

3. The problem of rate of change

However, a larger problem that continues (Vickers, 1970: 203) is the rate of change both in the course of events and in the categories and standards of our appreciation. In the process we have created a system which is neither stable nor regulable (Vickers, 1970: 19). Today, we are facing the problem of lack of ecological, political and economic regulation partly because we are not able to set widely acceptable and internally self-consistent standards with which we can interpret our experiences. This has resulted in three threats: the environmental threat – the water, the air – the threat to the Ganga falls in this category; the institutional threat – political, economic and social institution do not know how to adapt themselves to the energy driven ‘improvements’, and the appreciative threat – the need to revise and revalue, more rapidly than time permits the way we understand the events of the world which is the most serious threat (Vickers, 1970: 20).

This understanding tells us to shift our attention from the more physical and therefore the more compelling ‘failure to keep the Ganga clean’ to the failure to develop institutions and the failure to modify appreciation which could keep pace with the ‘improvements’.

So there are three systemic issues with respect to the pollution of the Ganga:

1. ‘Energy’ as the source of improvement of Ganga basin;
2. Lack of communication among different worldviews of the Ganga;
3. Lack of regulation to the fast pace of ‘improvement’ brought about by ‘energy’.

4. Alternate approach to environment management

However, there are examples of environmental rejuvenation in pockets of India which are not based on energy and in which there are ample communication between different worldviews about pollution. This paper quotes two of them and then discusses a case study which aimed at in-depth penetration of each others mind-set and communication among participant's worldviews through action science.

(i) Spread over an area of 3500 hectares, the wetland on the eastern fringe of Calcutta has been using the wastewater of Calcutta not as a pollutant but as a resource for breeding of fish (Ghosh, 1998). Using the natural eastward slope for the flow of wastewater from Calcutta, the fishermen have used their traditional knowledge of the ecosystem called '*bheries*' (wetland) to clean the wastewater. Ghosh (1998) adds:

“Retention of wastewater in the ponds, before the initial stocking of fish, allowed bacteria to act upon the organic matter in the sewage and decompose the organic waste. The growth of these beneficial bacteria was supported by the algae that thrived in these shallow ponds under the ample sunshine. The algae also provided food for the fish. This ecosystem provides a natural kidney for the city's organic wastewater. So a double boon was taking place: The organic sewage was being treated by the natural ecosystem, and was producing rich quantities of fish food on which the local varieties thrive.”

This is an example of approaching water-treatment in terms of resource recovery (in contrast to energy expending), 'regulation' of water quality in place of improving water quality and community participation instead of lack of communication.

(ii) In the semiarid state of Rajasthan, Latoria village was described as barren with highly saline landscape where 40% of population would migrate to adjoining districts in summer. Further, the government policies removed the community ownership of forests and water resources and therefore their responsibilities for these resources. The environment deteriorated, and water became scarce. (Sen, 2002). After a local initiative, Latoria turned into an oasis and its water table rose from 60 feet in 1991 to 15 feet in 2002. This was achieved by integrating the natural system of water cycle into the human social system. Religion was used to 'regulate' the use of water and conserve it. Earlier, holding values such as respect for natural resources was a way of life. But such basic respect for environment along with the need to share and conserve it took a back seat as the population exploded. Laxman who spearheaded the effort to conserve water combined the forgotten customs and rituals of the region with traditional methods of water conservation said, "I therefore placed all natural resources on a pedestal in the form of deities to preserve the sanctity of the environment" (Sen, 2002).

Both examples described above show instances of communication between multiple worldviews. However, it does not show them in detail. The case study nar-

rated next shows how difficult it is to establish communication between different worldviews and then arrive at a consensual action. The case study is available in detail in Kumar and Sankaran (2005).

4.1 Environment management through and action science

The organisation where the study was done is a large manufacturing entity in the Indian public sector engaged in the manufacturing of internal combustion engines. It is located in Banaras city where the Ganga Action Plan was launched in 1986.

The manifest problem in the organisation was that there was no organized method of collection or disposal of the packing material which were received with goods that arrived at the warehouse. They were treated as waste and thrown here and there around the work place.

The initial problem for the improvement in work practice was thus defined as: *How to have an organized system for disposal of waste and cleanliness in the factory?*

The first initiative looked at the issue from mode 1 of soft systems methodology which is pictorially shown in Figure 1. A participatory approach where everyone was encouraged to give his/her point of view was adopted in the soft system methodology so that different worldviews can be understood.

However, after some months there were reports of packing waste lying in the warehouse for days. They were not being dumped in the bins earmarked for them. Sweeping of the warehouse was reported to have become irregular. If not checked, the system ran the risk of getting reverted to the old state.

Reassessing the same situation from the point of view of action science showed that there were differences between the ‘espoused theory’ and ‘theory-in-use’ of the employees because of the culture of India which considers cleaning a menial activity.

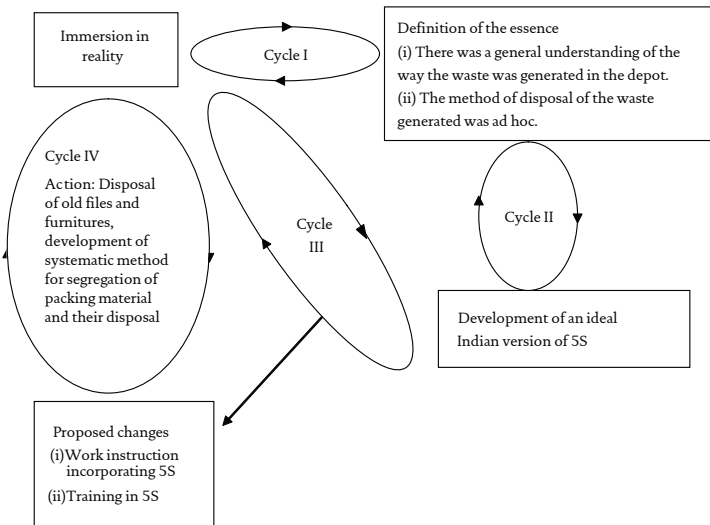


Figure 1 Summary of different cycles in terms of SSM (Source: Based on Tay, 2003)

It was clear to the action research team that any effort for effective implementation of cleanliness was required to address and tackle this mind-set against cleaning. The strategies till now contributed only to the existing norms of interaction – it could be called a rational approach to housekeeping. It made no attempt to discover, much less change, the underlying values which governed the behaviour of the workshop managers and staff. It was akin to what Argyris, *et al.* (1985: 281) have called a ‘culture of protectionism’- strategies that contribute to norms of interaction that inhibit learning.

Reflecting further on the situation, it gradually became clear that the intervention has to go beyond the conventional methodologies of SSM or action science. Edmondson says that Schein offers an approach for assessing organisation specific cultural patterns (Edmondson, 1996: 591). The insight provided by action science about employees’ defensive behaviour inhibiting change was combined with Schein’s idea of culture being sum of shared tacit assumptions and with Indian’s propensity of being guided by social pressure (Derne, 1992). The revised action strategy was based on these three theoretical moorings. The revised action is shown in Figure 2.

Figure 2 shows that the earlier governing values-in-use of the group become nested in the more fundamental governing values of dignity of labour, hierarchy and power distance. When the dormant value of dignity of labour was invoked there was an imbalance in the relative magnitude of different governing values nested in each other. This disturbed the existing appercart of hierarchy which went against the power distance value of the group as a whole. Thus to bring back the values of these three governing values to the earlier level (which was the normal level), the revised behaviour of following the dictums of cleaning became necessary for everyone. This therefore triggered the revised action strategy shown in Figure 2. It is to be noted here that the feedback loop was not used to change the action strategy. It was instead used to change the governing value.

5. Discussion

The human predicament is produced by the interaction of two streams of processes (Vickers 1970: 202) discussed in this paper. The case studies show how enduring improvement in environment is possible which need not be energy driven and where developing a common apparatus for interpreting the incoming communication of the world around and also the world within was a crucial enabler. Therefore, if our earlier ecosystem was a better ecosystem, one way to induce minimal change in it is to think beyond considering energy as the prime mover of improvement. This calls for a radically different approach to environmental management than what has hitherto been attempted in the Ganga Action Plan. We modified our earlier ecosystem because - thanks to the domination of protestant thinking – we felt that we could control the environment to our ‘preferred’ standard. ‘The great emancipation which the power of technology brought soon resulted in wastage of resources, pollution of the environment and multiplication of populations so as to defeat even their own productivity’ (Vickers, 1970). ‘As God disappeared from the Western world, there was nothing to stop us from befouling our own nest..... Our belief in progress orin general our future orientation made us challenge the

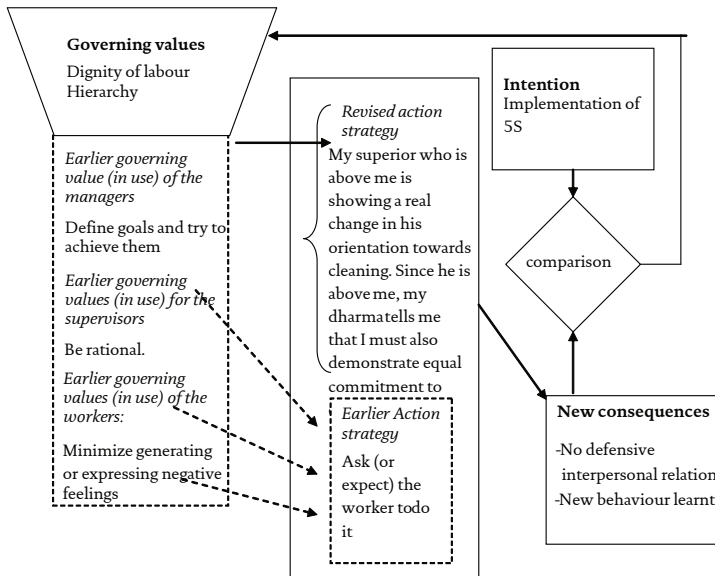


Figure 2 Nesting of earlier governing values in more fundamental governing values and resulting action strategy and consequence of the action strategy (Source: developed for this work. Note: dashed boxes show earlier governing values and action strategies.)

present situation, the social environment as much as the physical one...As they say, the rest is history' (Loy, 1993). This is the trap we are in (Vickers, 1970). The source of this trap is the energy driven model of improvement. Market economy – as the economic institution, parliamentary democracy – as the political institution and scientific temper or rationalism – as the social institution were supposed to provide stability to the output of the energy driven world. But what about mechanisms to regulate this energy driven world? None. The aspect of regulation cannot come when you are constantly trying to 'improve'. Homeostasis will then be dismissed as a throwback to an earlier state.

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