Sustainable Water Resources Development: Some Personal Thoughts[1]

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ABSTRACT *Sustainable development has now become a popular term, but it often means different things to different people. Operationalization of this concept is still not possible. This paper examines some of the major issues associated with sustainability. The opportunities and constraints of the current environmental assessment approaches for water development are objectively discussed.*

Introduction

Contrary to popular belief, the concept of sustainable development is not new. The general philosophy behind the concept was expounded centuries, if not millennia, earlier. For example, William Shakespeare said in *Hamlet*:

> Suit action to the word, the word to the action; with this special observance, that you overstep not the modesty of nature.

Similar thoughts on living in harmony with nature can be found in Hindu religious texts such as *Veda* and *Rig-Veda*.

Looking back, the term 'sustainable development' became fashionable around 1980. However, there is very little difference between this and other concepts of 'ecodevelopment' and 'basic human needs—outer limits' that were prevalent in the early 1970s.

Sustainability is unquestionably a popular concept at present, but it means different things to different people. One is reminded of the popular support for the Conservative Movement of the United States in the early part of the present century, when President Teddy Roosevelt exasperatedly exclaimed: "Everyone is for conservation—no matter what it means!" The situation does not appear to be much different at present for sustainable development!

Sustainability—What is it?

Before sustainable development became fashionable, the term 'sustainability' was technically used for harvesting reproducible natural resources, e.g., maximum sustainable yield for fisheries. This concept was extended in the late 1970s by a group of environmental scientists meeting in Nairobi under the aegis of the United Nations Environment Programme. The broadened concept of sustainable

development was expected to be a 'new' idea for assessing and managing human impacts on the environment and natural resources.

The term was later popularized by the Brundtland Commission report *Our Common Future,* which was published in 1987. The Commission defined it in a somewhat amorphous way as "development that meets the needs of the present without compromising the ability of the future generations to meet their own needs". Not surprisingly with such a vague, simplistic, internally inconsistent and static definition, the Commission was unable to specify what was to be sustained. The Report made continual references to sustainability, but was totally unable to say how the concept could be operationalized. Sustainability was expected to be achieved in an unspecified and undetermined way. Nor did definition include the realization of a reasonable and equitably distributed level of economic well-being, without which no development can be sustainable over the long term. This aspect is especially important for developing countries.

Once the concept became popular, dozens of new definitions were offered. Currently one can easily identify more than one hundred definitions of sustainable development without much difficulty. Even an organization like the United Nations does not have a uniform and acceptable definition for use by its various component organs. Thus, the definitions used by UNEP, FAO or ILO differ in some significant ways.

Major Sustainability Issues

In spite of the present rhetoric, it has to be admitted that operationally it has not yet been possible to identify a development process which can be planned and then implemented and which would be inherently sustainable, however this may be defined. It would be true to say that we have had more success in identifying certain aspects of development which are unsustainable—then taking appropriate remedial steps to reduce or even eliminate those undesirable effects—than in devising a holistic process that is intrinsically sustainable right from the very beginning (Biswas, 1991).

For example, if sustainable water resources development is considered, it has been known for decades that irrigation without drainage would contribute to waterlogging and salinity, which in turn would reduce the yields of the irrigated area over a period of time. Since the main purpose of any irrigation project is to increase the total agricultural production, clearly any system that does not fulfil this objective over a long-term period cannot be considered to be sustainable. Similarly, if extensive use of fertilizers by the farmers increases the nitrate content of groundwater so that its use for drinking purposes is impaired, then this practice has to be considered unsustainable (Biswas, 1993a).

While there are many issues that are important for sustainable water resources development, from a policy point of view the following three factors are worth noting.

Short- versus Long-term Considerations

The concept of sustainable development automatically assumes that the process selected would be visible over the long term, even though the issue of what constitutes 'long term' has neither been clarified nor featured much in current discussions. The time factor, either inadvertently or because of its complexity,

has basically been left fuzzy: no attempt has been made to define or even discuss what is meant by long term. For example, does sustainability cover 50 years, or 100, 500, 1000 or even more? Some have spoken vaguely of 'several' generations.

Even if one considers the lowest figure of 50 years, there is a fundamental dichotomy as to its use in the real world. For example, if we consider irrigated agriculture, generally the economic planning horizon of farmers extends to one cropping season or at most two. The overriding philosophy of nearly all farmers anywhere in the world has been to maximize economic returns from their agricultural activities within this time frame. Thus, the mind-set is inherently based on maximizing profits over a continual series of short-term periods. Though the short-term benefits could have long-term costs, even to themselves (e.g. in terms of soil erosion, salinity development, etc.), generally short-term considerations have won over the long-term implications. While in some cases this outlook of 'short-termism' could be due to the lack of knowledge or understanding of the potential long-term impacts of their activities, it has to be admitted that, for financial reasons, small farmers in developing countries, who are generally poor, are mostly forced to consider only the short-term economic implications for their own survival.

Accordingly, even if the societal and/or governmental goal is to achieve long-term sustainable development, in reality the main objective of a vast majority of farmers often extends to short-term benefits or even survival. Thus, any plan for sustainable irrigation development, which does not specifically consider this fundamental conflict and then attempt to identify realistic alternatives to overcome the problem, is doomed to fail. Such plans are most likely to gather dust on Ministry shelves.

Externalities

Externalities occur when private costs or benefits do not equal social costs or benefits. People operate primarily on the basis of their own private costs and benefits. If they perceive opportunities which could reduce their costs and/or increase potential benefits, they often take actions which could be beneficial to them but are unlikely to serve the common good. Commonplace examples include use of excessive irrigation water by the farmers in the headreaches of canals, which means that tailenders have an insufficient and/or unreliable water supply. This, in turn, could decrease the agricultural yields and thus incomes of the tailenders substantially. Similarly, wastes from municipalities could be discharged to canals and rivers, which could impair existing water uses downstream.

Such costs could be internalized, at least conceptually, through taxes, subsidies and regulations. But in reality, even in developed countries, it has not been easy to internalize the externalities for four important reasons. First, methodologically, calculation of the precise value of externalities has been a very difficult task. Second, frequently there are politically powerful individuals and organizations who vociferously defend their own considerable private advantages against a large number of unorganized and disadvantaged individuals who may be experiencing additional costs somewhat indirectly. Third, externalities could develop steadily over time, and thus there could be a time gap before those affected realize the real costs. Finally, regulations to control such externalities in

nearly all developing countries have proved to be somewhat ineffective and expensive.

Risks and Uncertainties

A major issue confronting sustainable water resources development is risks and uncertainties that are inherently associated with such complex systems. For example, with the increasing population base of the Asian developing countries, there is no question that resources such as land and water have to be used intensively in order to maximize agricultural production. The fundamental question, for which there is no real clear-cut answer at the present state of knowledge, is: up to what level can an agricultural production system be intensified, without sacrificing sustainability? What early warnings could indicate the beginning of a transition process from sustainable to unsustainable? What are the parameters that need to be monitored to indicate that such a transition is about to occur or, indeed, is occurring? Clearly, our present knowledge is inadequate even to identify the parameters that could indicate the passage from one stage to the other. Thus, currently we really cannot accurately detect, much less predict, the transition of any such sustainable system to an unsustainable one. In addition, water resources systems are variable by nature. Their fluctuations could be so great that statistically significant data could be very expensive or even impossible to obtain in order to state categorically that such variations are natural or are signs of unsustainability. If, on already complex issues, additional factors such as potential climatic changes are superimposed, the degree of uncertainty in terms of detecting or predicting the transition process increases greatly (Abu-Zeid & Biswas, 1992). One is then confronted with the difficult issue of even identifying the direction of any change, let alone the degree of change.

These types of fundamental issue need to be resolved successfully, before the concepts of sustainable water resources development can be holistically conceived and then implemented. Unfortunately, while much lip-service is given to sustainable water development at present, most of the published works on this subject are either somewhat general or a continuation of earlier 'business as usual' undertakings that have only been given the latest trendy label of 'sustainable development'. If sustainable water development is to become a reality, national and international organizations will have to address many real and complex questions, which they have not done so far in any measurable and meaningful fashion. If not, and unless the current rhetoric can be translated effectively into operational reality, sustainable development will remain a trendy catchphrase for a few years, and then gradually fade away like the earlier concept of ecodevelopment.

Environmental Assessment

For all practical purposes, methodologies used for environmental impact assessment (EIA) have changed only in some minor ways during the past two decades (Biswas, 1992a). While such methodologies were acceptable and even laudable in the 1970s, they are certainly out of date two decades later. Significant changes and modifications to our current environmental assessment frameworks are essential if they are to meet the complex needs and challenges of the 1990s and

beyond. Yet, most unfortunately, water and environment professionals are continuing to use such limited analytical frameworks without asking any serious questions about their overall effectiveness. It appears that we have generally accepted them as the only possible approach. Regrettably, we are not even asking the right questions and hence, not surprisingly, the real long-term solution is currently nowhere in sight.

There are three fundamental problems with the techniques used at present for environmental impact assessment. First, at the macro level, the linkages between EIA and social and economic aspects of water development are not clear. They are fuzzy at best. Second, while considerable expertise has been developed on the application of the present EIA methodologies at the project level, commensurate progress at policy and programme levels simply has not been made. It has to be admitted that we just do not know how effectively to carry out environmental assessments of policy and programmes, except in a very general fashion.

Third, it is indeed a curious irony that we have spent the last two decades discussing and promoting *what is not* sustainable water development rather than *what is*. We have concentrated almost totally on those aspects which cannot be sustained. By trying to define sustainable water development in terms of *only* those factors that could contribute to unsustainability, clearly we have focused our entire attention on one part of the equation, and have completely ignored the other, which could possibly be as important as the negative aspects, if not more so. Sustainable water development, as it is analysed at present, focuses *only on what it is not*, and then attempts to ameliorate the potential negative effects. This issue is not approached holistically; consideration should first be given to what *is* sustainable water development, and then move on to what is *un*sustainable. Instead we are hung up exclusively on 'how' to reduce the negative impacts. I must admit that as a scientist I find it very difficult to accept the present somewhat skewed approach to environmental impact assessment.

It is worth noting that, even though it is axiomatic that any significant development project would have many environmental impacts, the word 'impact' in the context of EIA has developed primarily and almost exclusively, negative connotations. While any large water development project, irrespective of its nature, will have both positive (otherwise why construct it?) and negative impacts, all current analyses of environmental and social impacts generally consider *only* adverse impacts and their potential amelioration.

To a certain extent this overwhelming emphasis on the negative aspect of all major water development projects can be explained rationally. During the 1970s and earlier, project analyses primarily consisted of technical and economic considerations: environmental and social issues were mostly not seriously analysed. Because of this general neglect, and some very visible but adverse impacts of certain development projects on the society and the environment, a movement gradually developed in the West for environmental conservation. Within a very short period, environmental protection became an important item on the political agenda in the late 1960s and early 1970s in some developed countries, primarily through the activities of environmental pressure groups and non-governmental organizations.

Not surprisingly, this attitude and perception of environmental protection was reflected in the United Nations Conference on the Human Environment held in Stockholm in June 1972. A retrospective analysis of the Stockholm Action Plan,

as approved by all the UN member countries, clearly indicates its negative approach to environmental management: stop all pollution stemming from any development activity, stop exhausting non-renewable resources, and stop using renewable resources faster than their generation. The emphasis thus was primarily on adverse impacts of development: positive aspects did not receive much attention (Biswas and Biswas, 1982).

Accordingly, environmental impact analysis, which was developed and made mandatory in many developed countries during this era, was exclusively concerned with the identification and amelioration of negative impacts only; positive impacts were mostly ignored. Because of this inauspicious and incorrect beginning, the term 'impact' has continued to have almost exclusively negative connotations. Sadly, this unfortunate situation has not changed over the past two decades.

Specifically, in the area of large-scale water development, another factor of this early environmental period has had a major and continuing impact on our general thinking. This was the publication of a series of articles in the popular media by the well-known journalist, Claire Sterling, on the adverse social and environment impacts of the Aswan Dam. Her well-written but somewhat unreliable commentaries caught the imagination of the general public, especially in the North, including many scientists, most of whom were no experts either on water or the environment, and had even less knowledge of Egypt. This dam suited the times of a 'small is beautiful' era very well for three important reasons:

(i) It was a large dam whose completion in 1968 coincided with the newly emerging environmental movement, which had started to flex its muscles.
(ii) For political reasons, well-documented elsewhere, the West declined to assist Egypt in constructing this dam. It was finally built with the assistance of the 'Evil Empire', the Soviet Union, and thus became an immediate and easy target for western criticisms. Khruschev's personal interest in the dam, including his presence during its opening, contributed to additional adverse 'public image' problems for this project.
(iii) In the then prevailing climate, it was much easier to severely criticize a new dam in a far country than one's own country.

Sterling's high-profile concentration on the negative environmental impacts of the Aswan Dam found a very receptive audience in the West, who were already convinced that all large development projects were disasters. Her writings reinforced the prevailing biases, and helped to make the Aswan Dam a *cause célèbre* among environmentalists as a shining example of a bad development project. The perception that the environmental and social costs of the Aswan Dam significantly outweighed its benefits did not change because Egyptian scientists, as well as the Government, generally did not produce objective and comprehensive analyses of its total environmental impacts, both positive and negative. To the extent that the Government did so, the general reaction outside Egypt was "what else would one expect from the Government that built it?". In contrast, its so-called adverse environmental impacts were well publicized through a series of non-authoritative writings.

Thus, the Aswan Dam rapidly became a 'symbol' of everything that is wrong with major water development projects. Unfortunately, to date, this view is still widely held, and most international publications available on the subject still do not provide a reliable and objective discussion of the real benefits and costs of

this much-maligned dam. Our recent reviews of the various research work done on the environmental impacts of the Aswan Dam over the past two decades indicate clearly that this dam is now surrounded by many 'myths', which are now generally accepted as 'facts', even though *ex post* environmental monitoring indicates otherwise (Biswas, 1992b, 1993b). This is because these myths have been repeated so many times that they are now accepted as truths! In reality, however, the Aswan has been a remarkably successful dam, without which Egypt would undoubtedly have been in dire economic straits. It has certainly contributed to some adverse environmental impacts. However, the real question is no longer whether the dam should have been built, since without it Egypt would now be facing a continuing catastrophe, but rather what steps should have been taken to maximize the positive environmental impacts and minimize the negative ones.

In retrospect, such an unsatisfactory state of affairs had one major beneficial impact. It was made clear to the engineering profession, which dominates the water development field, that there are other important issues in water management, in addition to the techno-economic analyses, which must be considered to maximize human welfare. Accordingly, environmental impact assessment, which was neglected prior to this period, has increasingly become acceptable as an established procedure.

Conclusion

For developing countries of the South, which are all located in tropical and semi-tropical climates, water is likely to become one of the most critical resource issues within a decade. Like oil some two decades ago, the day when water could be considered to be a cheap and plentiful resource is now virtually over.

It is my firm belief that, so far as water resources development is concerned, from the perspective of developing countries it is absolutely essential that the development process must not be impeded, but that the environment must be protected simultaneously. It will not be an easy task because of the complex technical, economic, social and political factors involved, but we really have no other choice. Equally, in terms of environmental management, it is essential that we move beyond the current negative-reactive approach to a proactive-creative one. For the sake of a better quality of life for the millions of people in developing countries, we need to graduate from a pessimistic approach to a more optimistic one.

For those of us who are working globally, it is clear that our profession is now facing a critical problem in terms of efficient water management, the magnitude and complexity of which no earlier generation has ever had to face. In the run-up to the 21st century, the water management profession really has two stark choices: to carry on as before with a 'business as usual' attitude with only some marginally incremental changes, and thus endow our future generations with a legacy of sub-optimal water development projects and management practices, or to continue in earnest an accelerated effort to plan and manage water resources efficiently and sustainably in arid and semi-arid countries. We no longer have any soft options left: only hard choices. To quote George Bernard Shaw:

> You see what is and ask, 'Why?'
> I see what could be and ask 'Why not?'

Note

1. This paper is based on the Key Note Lecture given at the International Conference on Environmentally Sound Water Resources Utilization, Bangkok, Thailand, 8–11 November, 1993.

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