



Water and economic development

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THE TOTALITY OF human endeavour is directed to securing the highest possible level of welfare and comfort for man. Every advancement of science and technology has this for its ultimate aim. The process of applying technical knowledge to the art of living is generally described by the term "development".

This presentation has for its objective the re-orientation of the approach of the water engineer to the subject of water engineering as an applied science, and the introduction of the concept of his participation in total economic development. The inter-relationship of the disciplines of economics and economic development, philosophy, psychology, physiology, sociology and the behavioural sciences become self-apparent.

Man, like all other living organisms, is intimately linked with and influenced by the environment which surrounds him, and his life and functions are controlled by the suitability or otherwise of the environment.

The environment

The concept of preventive medicine has changed considerably in recent times, and is now being directed more and more towards the study of the relationship between man and his environment. The elimination of diseases caused by an unfavourable environment can only be secured by an adjustment between man and the environment. This adjustment can be achieved in two ways, - either by man altering his way of living to suit the environment, or by the modification of the environment to suit man's way of life. The final answer will, no doubt, lie in a combination of these two approaches.

The conditions under which diseases of an unfavourable environment cannot survive can be brought about only by coordinated progress in the economic, cultural and social spheres, leading to a better pattern of living. Since this process is of an evolutionary nature, leading to a better pattern of living, it must be watched and guided if the final result is to an integrated whole.

Physical environment and in particular, "sanitary" environment, has for a long time been recognized as having a profound influence on health. However, it is only comparatively recently that the importance of the social environment in regard to health has received recognition.

Water and health

Dr. Candau, one-time director General of the World Health Organization, in his address to the International Conference on Water for Peace, held in the U.S.A. in 1967,

stated: "Man can live without clothes, without shelter, and for some time, without food; without water, however, he soon perishes. It is not surprising, therefore, that for the early periods of mans' history, his dwelling places have been closely associated with lakes, rivers, springs and wells. Civilization and cultures were nurtured in the valleys of the great rivers - the Nile, the Indus, the Ganges and the Yangtse".

Dr. William H. Stewart, Surgeon General, USPHS, addressing the same conference said: "No resource is more basic to health progress than water - water that is safe to drink and cook with, water that is easily accessible in sufficient quantities. It is true that man cannot live without water; but it is also true that in much of the world, the water upon which he is dependant is itself a threat to life. In the developing nations, insanitary water is still a carrier of diseases like cholera and typhoid fever and other parasitic infections that drain energy and hope from millions of people. Unclean water is the source of diarrhoeal diseases that claim the lives of over five million infants an year, before their first birthday".

The physiology and psychology of entrepreneurship

Several social scientists and economists have expressed the view that people in developing countries, particularly the Asians, have low productivity because they are 'naturally' lazy and undisciplined, and possibly have a lower IQ than their Western counterparts. This view was extended to mean that most of the developing countries could not be expected to reach the level of development or intellectual attainment of Western countries.

This canard has already been disproved by the performance of people from developing countries in the Western environment, as also by the intellectual, academic, professional and industrial attainments of a section of the people in these backward countries.

There is no gainsaying the fact, however, that the majority of the population in the developing countries have very low productivity and lack the initiative, enthusiasm and drive to improve themselves. Their philosophy seems to be: "Sufficient unto the day is the evil thereof". The reasons for the apparent sluggish economy lies elsewhere.

Most of the developing countries are still 85% rural, with an agriculture-based economy. The rural population do not own land, and are either tenant farmers or seek employment in agriculture. These people have a low

basic health level, and are virtually at “Survival” level. The majority of the rural population suffers from water and filth borne diseases, many of them from multiple infections. The continued low level of basic health in these areas, attributable to diseases transmitted through contaminated water or soil, is perpetuated by the lack of safe and adequate water and basic sanitation.

Water-borne diseases and soil transmitted diseases (particularly the helminths *Ascaris* and *Ankylostoma*), sap the energy and zest for life, and generate a distaste for any avoidable exertion. It drains all ambition, drive, initiative and the desire to strive for self-improvement.

A high level of energy in the individual is a prerequisite for the ambition and drive that leads to self-improvement. The urge for self-improvement is the seed that germinates and grows into the spreading tree of diverse achievement. Taken collectively, it leads to economic development. The rate of development in a rural community which is marginally above the “survival” level, is inescapably linked to the basic health level of the community.

Human welfare has been divided into five levels of concern. These are:

- Survival
- Protection from disease
- Performance
- Enjoyment
- Creativity

The sluggish economic improvement that is evident in a rural community with a low basic health level, can reach the “take-off” point in self-motivated economic development, only when the stage of “Protection from disease” has been passed.

Water, while supporting life itself, is perhaps the greatest destroyer of life. Water provided for domestic use, should be viewed not from the hydraulic aspects alone, but from the public health aspect as well. Economic development can only ride on the back of a sound basic health level of the community, and the basic health level is tied up with the water the community drinks and washes with. Domestic-use water, it must be remembered, has to be both safe and adequate to support a high level of personal hygiene.

If domestic-use water is to be provided to the rural population which is scattered in small groups, and if it is the intention of the local authority that the system must be operated and maintained by the beneficiaries, it must necessarily be through a system which is relatively inexpensive to construct, and simple to operate and maintain.

The logic for “AFFORDABILITY” is self-evident.

Man - the primary resource

Man is the primary resource in economic development. The mental attitude of improvement, motivation, ambition, drive and perseverance are essential to economic development.

Several economists have described economics and economic activity as consisting of the constant struggle on the part of man to subdue nature to satisfy his needs. This theory defines two categories of resources - the human agent, with all his powers of brain and brawn, emotions and skills; and the external physical world which he tames to his own purpose. The interaction between man and his physical environment is the area of economic activity.

If man has a fundamental role in economic development, and freedom from diseases of the environment is essential to his having the mental attitude or motivation for development, then without doubt, the water engineer has a key role in producing the climate for economic growth.

Economic development and health

Water engineers are well aware of the strong influence safe water has on human health. W.H.O. has defined health as a “state of complete physical, mental and social well-being, and not merely the absence of disease or infirmity”. For practical purposes health can be appraised by ‘the extent to which the human body is capable of fulfilling its physical and mental functions, producing effective work and of enjoying life in given conditions - genetic and environmental’.

Ben Abbot made a clear analysis of the influence of mans’ health on his mental and physical outlook. “Poor health”, he stated, “cause adverse conditions in varying degree, such as the following:

- a) the mind is not clear and alert;
- b) he cannot think logically. The thinking process is slow. Reasoning power and judgement are affected;
- c) the mind is more apt to give in to pessimistic. discouraging moods, with greater emphasis on CAN’T than on CAN
- d) it is more difficult to concentrate, make decisions and persevere in undertakings to successful conclusions;
- e) initiative is crippled. The habit of taking action is undermined;
- f) production and efficiency are materially reduced;
- g) resistance to fears and bad habits is lowered;
- h) emotions are harder to control and one is more apt to be timid and diffident;
- i) time is seldom used to best advantage;
- j) interest and enthusiasm are lessened;
- k) it becomes much harder to overcome difficulties and start action after mistakes;
- l) nervous disorders and illnesses are more prevalent;
- m) self-respect is diminished and it is harder to work with and influence others”.

Time and again, Member Countries of WHO have clearly cited unsafe water and water shortage for the continuing low social and economic development in their communities. In 1959 the World Health Assembly, “recognising that safe and adequate measure for the protec-

tion and improvement of health, and are indispensable for economic and social development”, launched a global water supply programme.

Engineering technology and economics

Economics is part and parcel of the science of engineering. Broadly speaking, engineering is a science which can produce a given result, at highest efficiency, at the lowest cost. All water engineers should therefore be concerned with the principles of economics, and society places on them the obligation to conceive and construct schemes which are economical and which will produce the highest benefits in relation to money spent. Each individual scheme should be subjected to the tests commonly applied in economics, so that the best alternative is selected to serve the purpose in mind. In such an evaluation, the sophistication of the scheme should be tailored to the social and economic status of the community to be served; it should be affordable and sustainable by the community. It has to be borne in mind that to serve the health objectives, a high level of sophistication in project concept is not necessarily called for. This does not mean that a simple project does not call for sophisticated technology. A good case in point is the technology required in location and drilling deep wells in fissured hard rock areas. Affordability dictates that deep wells, furnished with hand pumps, will be the most appropriate solution to providing safe water in a given community. These rural people had traditionally to walk several kilometres to polluted ponds, to fetch their minimum domestic water requirements. Drilled wells drawing water from deep fissures in the rock providing safe and plentiful water at their doorstep, were a sustainable and adequate solution. Haphazard location of deep, drilled wells in hard rock areas, with a view to intersecting the water-bearing fissures at a depth adequate to provide a perennial supply, could turn out to be a grossly prohibitive venture, thus negating the purpose of affordability. The technology for locating water in the fissured rock, at a depth which would provide perennial water; pin-pointing the exact intersection at ground level, and drilling to depths of 30 to 70 metres, involved Resistivity and Seismic Refraction technology, with computer linked data interpretation, plus skill in the operation and maintenance of DTH-hammer rigs. The end result was a simple drilled well and hand pump, which was well within the affordability and sustainability of the rural population.

Engineers are prone to be grandiose in their conceptualization, and it is in the nature of their training and skill to prefer sophisticated and elaborate solutions, even where the community finances cannot support them. This tendency is evident in the field of water supply, because water engineers propose elaborate and expensive schemes to serve simple needs, at once putting such a programme outside the financial resources of the community and the country.

The pragmatic approach

In developing countries which are largely agricultural and 85% rural, and where the ability of the community to pay for services is low, there is a strong need for low-cost water. The water engineer in a developing country is therefore faced with the challenge of devising simple, inexpensive methods of providing rural communities with their basic safe water requirements. This will require that engineers come to grips with reality, “because a modest programme that can be executed is to be greatly preferred to an elaborate one that never gets off the paper”. Water engineers must resist the temptation to associate in their minds, the science of water engineering only with developed urban communities and sophisticated schemes; for in countries where 85% of the population is rural, this will in itself constitute an unrealistic attitude.

Social and economic development

Spangler, in his comments on John Mills’ expose on Economic Development, states:

“... economic progress depended, as did the augmentation of human welfare, upon two sorts of improvement - the extension of man’s knowledge of the laws of nature and his capacity to remove barriers imposed by an unbeneficent nature; and upon the removal of barriers imposed by men on themselves (in the form of beliefs, customs, opinions and habits of thought), together with the sustenance of forces that made man strive to improve and elevate human nature and life”. The study between cultural patterns and physical conditions is of the greatest importance for “an understanding of human society, but it cannot be undertaken in terms of simple geographical controls alleged to be identifiable on sight”.

The magnitude and urgency of the problem

The World Health Assembly, by a resolution in 1980, set in motion a programme with the objective of providing safe water for everyone by the year 1990. While some momentum was created, achievement fell far short of the target. The “Water Decade” was extended to the year 2000, and time is rapidly running out. Some studies reveal that the annual population coverage falls short, even of the annual population increase in those countries. This also takes into account systems which fall into disuse due to lack of maintenance or sustainability. Granted that the human attitude for self-improvement can be generated only when a basic health level is achieved, water engineers may have to review their approach to providing ‘safe water’ as a step-wise process, achieving the health objectives at an affordable cost in the first instance, and upgrading the system as the affordability and expectations of the community rises. The challenge to water engineers lies in using sophisticated knowledge and tech-

nology to find simple solutions to safe and adequate water supplies, within the affordability of the community being served.

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