

SUSTAINABLE DEVELOPMENT OF JAFFNA PENINSULA WITH SPECIAL FOCUS ON GROUND WATER

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There are certain environmental features peculiar to Jaffna that need to be taken into account if development is to be sustainable. The violence and destruction on account of the conflict has brought ruin and misery to the population. But already, in the decades prior to the outbreak of violent conflict, Jaffna was drifting towards a major environmental crisis. While we are addressing the problems of resettlement and rehabilitation, we need to ensure that the lessons of the past are learnt and the mistakes are not repeated. In fact the near total breakdown of economic activity and the dispersal of the population has provided an opportunity that may not have been seen earlier and that may not recur in the future, to re-think, holistically and from a long term perspective, the strategy for the sustainable development of the peninsula and the future of her population. If we wisely use this limited ephemeral space in time that the conflict and destruction has created in the development process, this crisis that has caused enormous suffering may also yield very substantial benefits, particularly to future generations.

The climate, geography and geology of Jaffna are such that the people are solely dependent on rain falling on the peninsula for their fresh water requirements. Most of this rain falls within the brief North East Monsoon period (October to December). Since the temperature is high and the land is flat, much of the rain water is quickly evaporated or drained into the sea. A minor fraction (estimated to be less than a third) of the rain water seeps underground and is absorbed into the layers of miocene limestone and the spaces in between layers. In turn the water from the limestone infiltrates into the dug wells of which there is one in almost every household and farmland in the peninsula. In some areas sea water too seeps into limestone so that there is a precarious balance between fresh water and saline water contained by the limestone. Since salt content increases the density of water, as a general rule, in these areas, salinity increases with depth. As increasing quantities of water are pumped out of wells, the water level drops and the water quality turns saline; the increase in salinity is not easily reversed since the soil could get impregnated with salt and prevent a return to the original condition.

The land area of the peninsula is about 100,000 sq.km. The combined surface area of Vadamarachchi and Upparu lagoons is about 10,000 sq.km. These two water bodies are so shaped that no part of the land is more than a few kilometres from the sea or either of these lagoons. These and the other internal lagoon (Elephant Pass), the surrounding sea, and the scattering of over 1000 ponds and several minor tanks are not only distinctive characteristics of the landscape but also critical elements in the ecology of the peninsula. Barrages have been constructed at Thondaimannar and Ariyalai designed to exclude sea water from Vadamarachchi and Upparu

lagoons respectively, and at Araly to exclude sea water from Valukkai aru, which is a seasonal natural stream draining flood water into the sea. These barrages are damaged and some sea water does enter these water bodies. The water in Elephant Pass lagoon, which is seasonally open to the Bay of Bengal near Chundikulam, is far more saline than that in any of the other internal water bodies. There is a plan to convert Elephant Pass lagoon also into a fresh water body over a period of many years.

Jaffna's only sources of fresh water are its dug wells, ponds and minor tanks. The distinction between ponds and minor tanks is that it is only the water in the latter that is used for irrigation. The ponds and minor tanks help to reduce run-off of rain water into the sea and to increase infiltration into the limestone and onto the wells. The lagoons have brackish water and the ponds and minor tanks have fresh water sustained by rain; in turn, the water from the ponds, minor tanks and lagoons seep into the wells. The wells and ponds provide fresh water for domestic, human and animal use, for home gardens and for many other purposes. The minor tanks serve these as well as agricultural purposes.

The brackish waters in parts of the lagoon favour the proliferation of prawns. At one time there had been tension in some areas between those who were dependant on prawn fishing, who wanted the lagoons to continue to have brackish water, and farmers and the others in the neighbourhood who wanted to have the lagoons gradually transformed into fresh water lakes. However, there can be no doubt that the benefits to Jaffna of converting the internal lagoons into fresh water bodies far outweigh the benefits of retaining their salinity. Some of those now dependent on fishing in the internal lagoons may need some help to relocate their fishing activity. There is some potential for fresh water fishing in the lagoon.

A related urgent issue is the control of the use of fresh water from wells and minor tanks in the peninsula. Long before the crisis caused by the conflict, there was massive spread of lift irrigation and overuse of ground water, resulting in a steady and seemingly inexorable and irreversible increase in water and soil salinity. It will not be easy but we need to find some way to limit the extraction of ground water in Jaffna. Hitherto, the pattern of agriculture in Jaffna appears to be based on the assumption that fresh ground water is a free resource and the only costs are those of extraction.

This is what Game Theorists describe as a "Prisoner's Dilemma" situation, and some economists describe as the "Problem of the Commons", in which there is net loss to the community on account of over-extraction, but since every person extracting the water obtains the full benefits of the extraction but bears only a negligible part of the costs (lowering of the water table and increase of salinity)

each individual extracting the water may be motivated to continue to extract more of it, leading, eventually, to widespread ruin. The problem lies not in any lack of knowledge, since almost everyone understands very well the social consequences of their actions, but in the failure to develop viable institutional mechanisms to internalise the externalities, i.e., to impose on each significant user of ground water the equivalent of the real costs borne on that account by the community.

Closely linked to the problem of over-extraction of water is that of the over-extraction of limestone. Indeed any mining of even a small quantity of limestone, permanently reduces the fresh water storage capacity of the peninsula. Thus, here again, we are in a "Prisoner's Dilemma"/"Problem of the Commons" situation. Those extracting the limestone may only need to bear the immediate costs of extraction such as that of the labour involved and, perhaps, a modest payment to the owner of the land. The permanent and, perhaps, the most substantial costs of the mining of the limestone (reduction in fresh ground water storage capacity and intrusion of sea water) are borne by the community rather than those who profit from the extraction (the cement industry, those engaged in road construction, the building industry, etc) All these parties understand the ill-consequences of their activity, but they profit from it and it is not in their interest to desist.

Again, we may need to address the daunting task of limiting, if not prohibiting, the extraction of miocene limestone in the Peninsula. It appears that we need to avoid the rehabilitation of the cement industry and also find alternatives to miocene limestone in construction work (probably metal brought in from the mainland). If the mining of limestone on a commercial scale is resumed, irreversible and disastrous ill-effects will follow. Preventing such extraction could reduce employment opportunities in Jaffna and also increase construction costs, but there will be long term benefits which may justify short term sacrifices in respect of employment and the availability of cheap construction material.

If the extraction of ground water is to be restricted, the pattern and scale of agriculture in Jaffna will have to change. In any event, developments in the South, such as bringing large extents of lands for cultivation under (inexpensive) gravity irrigation, are undermining the comparative advantage once enjoyed by the farmers of Jaffna in respect of several water intensive crops such as onion and chillie. But profitability is not the only consideration; the future of Jaffna and her population are at stake.

The cultivation of these crops is not only water intensive but also agro-chemical intensive. Among the ill-effects of such cultivation is the pollution of the ground water. Unlike in other regions, where much of the chemical pollutants seep underground to be lost deep down or run off into rivers to be diluted and carried into the sea, in Jaffna nearly all of it enters the limestone and gets drawn up with the water for agriculture or animal or human use. Since the toxicity of these chemicals survives several cycles and generations, ultimately much of these will be consumed directly or indirectly by human beings.

We need to rethink and redirect agriculture in Jaffna. We may need to opt for a pattern of agriculture that uses less ground water and less of the more harmful agro-chemicals. We may need to devise disincentives to excessive use of water and agro-chemicals, and incentives to resort to other crops. Organic farming, once a distinctive feature of farming in Jaffna, may need to be repopularised in the peninsula, although lack of road access to the mainland may impose limitations on the availability of organic manure. Perhaps there is also a greater role for horticulture, including the commercial cultivation of tree crops such as mango, jak and cashew and, possibly, of high value crops such as grapes.

While some of the impending environmental disasters referred to above have gained a temporary reprieve on account of the breakdown of the economy, the large scale destruction of trees, especially palmyrah, and other green cover is a direct ill-consequence of the conflict. Traditionally the people of Jaffna have looked after their trees and, as far as possible, maintained a green cover over most of the peninsula. Much of the destruction of the green cover in the last few years has been for security reasons or for lack of alternative construction materials, or for lack of inexpensive fuel. The maintenance of a green cover is, of course, closely tied up with other environmental issues including the availability of ground water.

The cooperation of all concerned, including the armed forces, is necessary to protect what remains of the trees and green cover and to embark on an extensive, vigorous programme of replanting. GTZ has experimented with producing low cost construction material involving reduced use of threatened natural resources such as timber and miocene limestone. More work needs to be done in this direction. More work also needs to be done to popularise environment friendly forms of energy such as solar power. Environmental conservation demands focussed application of science and technology.

The fragility of Jaffna's environment and, in particular, the susceptibility of the peninsula's ground water to contamination dictate the requirement that special attention be paid to sewage disposal, the production of bio-gas and compost, waste disposal economy in resource use, and some of the new innovations in organic farming. Research studies and other investments are needed in this field.

The immediate impact of the changes suggested may be higher costs, less employment and, perhaps, less total income in the peninsula. Perhaps a population of one million is too large for the peninsula to carry, but these changes can eventually be comfortably accommodated with a smaller population, say not exceeding 700,000. Such a population size may permit the people to enjoy a quality of life superior to what was enjoyed before the out-break of the conflict. In any case, it does not appear that the population of Jaffna will exceed 600,000 in the near future. Resettlement needs to proceed well beyond the current population level of 470,000 but 100% resettlement is neither feasible nor desirable. Surely the people of Jaffna would not wish to maximise population and income in the short term through measures that will doom future generations.