HOW HYDRAULIC ENGINEERING UNDERDEVELOPED
SOUTHERN SRI LANKA

by

D.L.O. Mendis

Abstract

Walter Rodney documented how Europe underdeveloped Africa in his classic study under that catchy title. He described how various agencies based in Europe visited many African countries and exploited that great continent of some of its precious resources. In doing so they kept up a pretence that they were there in the cause of development, but actually set back the indigenous development potential wherever they went. This is what Walter Rodney described as the Underdevelopment of Africa.

This paper uses a similar idiom because, it is argued, a similar process of underdevelopment has been set in motion in southern Sri Lanka, and the villain of the piece in this case is identified as 'hydraulic engineering'.

It is well known that there are what are called water management problems in the two major projects in the south, Uda Walawe and Lunugamvehera. It may not be so well known that there have been problems related to land alienation, especially under Uda Walawe in the sixties and seventies. It may also not be so well known that large sums of money have been borrowed from international lending agencies and spent on rehabilitation works that commenced even before construction of the distributary channel system was completed. In Uda Walawe the amount spent in this fashion exceeds the cost of construction of the distributary system.

It is argued in this paper that engineers have adopted a hydraulic engineering perspective in trying to understand ancient irrigation systems. Water is treated as an inanimate but active agent, in this perception, exactly as in the study of hydraulics. An alternative approach is described as the irrigation ecosystems perspective in which water is seen as an animate but passive agent which is ceaselessly moving in the hydrological cycle through the biosphere consisting of the lithosphere, the hydrosphere and the atmosphere, in which are identified terrestrial, aquatic and atmospheric ecosystems. Irrigation is defined as an intervention by man in Nature’s hydrological cycle. Water is the main agent for irrigated agriculture, and irrigation systems are described as irrigation ecosystems. A hypothesis for the evolution and development of irrigation systems from prehistoric to early historic times has been used to identify 5 types of irrigation ecosystems still in use in irrigated agriculture in Sri Lanka today.

The two major projects in the south, Uda Walawe (including Chandrika Weva) and Lunugamvehera, were both designed and constructed using a hydraulic engineering approach. These two projects were superposed on the remains of ancient irrigation ecosystems, built in stages long ago. Those ancient irrigation ecosystems had fallen into disuse, but some of them had been restored in a piecemeal fashion in recent times. It is argued that the introduction of these hydraulic engineering projects is the root cause of underdevelopment in the south. It follows, if this analysis is correct, that permanent remedies can only be achieved by a redesign of the irrigation projects using an irrigation ecosystems perspective. It is further argued that a proposal described as the Southern Area Plan that was prepared in outline in the mid-sixties, could provide a permanent solution to the agro-ecological problems in the area, based on an irrigation ecosystems approach, creating sustainable man-made ecosystems. This is discussed in some detail.

Introduction

In ancient times Sri Lanka was divided into three kingdoms called Raja rata, Ruhunu rata and Maya rata as shown in Figure 1. The famous ancient hydraulic civilization of Sri Lanka was based on irrigation systems built in the dry zone which virtually encompassed the Raja rata and the Ruhunu rata, while the Maya rata occupied the wet zone and a

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small part of the southern dry zone as shown. The wet zone together with an intermediate zone (not shown) coincides with the central montane region of the country, while the dry zone coincides almost entirely with a plain which has occasional hill like rock knob protrusions that rise up a few hundred feet above the surrounding plain.

The dry zone is so described because it receives most rainfall from one monsoon, the northeast monsoon that blows from about October to March, while the wet zone receives much of its rainfall from the southwest monsoon that blows from about April to September, but also receives rain in the northeast monsoon season.

Brohier in a historic lecture to the Royal Asiatic Society (Ceylon Branch) in 1935 documented and drew attention to a complex system of inter-connected large reservoirs and channels in the ancient Raja-rata. Much of this system has now been restored piece-meal but without any understanding of its complex totality, in spite of the fact that it has been studied and further documented by historians. (Figures 2,3). Brohier had showed in this paper that each large storage reservoir contributed its 'drought-resisting capability' to numerous small tanks within its command area, each of which was the heart of a village settlement; but he himself was to be grossly misled, apparently by irrigation engineers, in later years, in regard to the purpose and function of the small tanks, and the evolution and development of the ancient irrigation works.

A very large number of these small village tanks appear to have been built in the southern area of Sri Lanka, part of the ancient Ruhunu rata, as a glance at the topographical map of the area will show (Figure 4). These small tanks are seen in cascades along the smaller tributaries of the Walawe Ganga, the Kirindi Oya and the Kumbukkan Oya in particular. What is most intriguing is that detailed engineering surveys have shown that these ‘cascades of small tanks’ in the Walawe basin were in fact a series of earthen diversion dams without incorporation of sluices. They had been used to divert water for irrigation of reddish brown earth soils in the valley sides and not for irrigation of the low humic gley soils in the valley bottoms (Figure 5). Much work remains to be done to reveal the exact nature of this system and to use it after restoration for a new system of crop diversification towards which so much effort has been put in, in recent times, by and large with disappointing results.

A historical archaeology project should be launched to discover the reasons for the construction of this intricate system of diversion bunds. A similar study launched by the University of Pennsylvania Museum of Archaeology / Anthropology, to study an ancient irrigation system for potato cultivation in Peru brought to light amazing facts about the productivity of that system (Annex 1). Similar unexpected discoveries may well be awaiting the archaeologist in this region.

Meanwhile recent field work done by the Irrigation department appears to confirm that a similar complex of inter-connected reservoirs and channels to that in the Rajarata had been built in the Walawe basin, but on a much smaller scale2. Presumably this system supplemented the system of small diversion dams just as the inter-connected system of large reservoirs and channels supplemented the small village tanks in the Rajarata.

In modern times, the Irrigation department which was set up in 1900 by hiring off the Irrigation branch of the Public Works department, was not particularly interested in the small tanks which came under the district administration of the Government Agents. However, in 1923, after very heavy rains in the North Central Province, a cascade of small tanks was breached, releasing a very big flood which washed away the railway line near Medawachchiya with much loss of life and damage to property. This tragedy led to a study of small tanks and diversion systems by the Irrigation department over the next ten years, after which J.S. Kennedy, then Deputy Director and later Director of Irrigation, presented a landmark paper titled ‘Evolution of Scientific Development of Village Irrigation Works’ to the Engineering Association of Ceylon3.

In this paper, Kennedy, referring to the vast number of small village tanks in the dry zone made a remark that was to have far reaching consequences. He said4.

The village tanks, like the village cattle, are far too numerous for efficiency.

This statement was to be (mis-) interpreted thereafter by irrigation engineers to mean that the small village tank was a stage in the evolution and development of irrigation systems in Sri Lanka, and therefore should be replaced by a large reservoir some day. This wrong interpretation of Kennedy’s statement was given unexpected support by R.L. Brohier in his Presidential Address to the Engineering Association of Ceylon in the 50th jubilee year in 1936. Brohier presented a hypothesis for the evolution and development of the ancient irrigation works in four stages which was later re-published by Joseph Needham F. R.S. in Volume 4, Part 3, of his classic Science and Civilization in China in 19715. (Figure 6)

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1 Brohier, 1937
2 Parramama, P A G (1992)
3 Kennedy, (1934)
4 Ibid, 134
5 Needham et al (1971), 369-369
Brohier's hypothesis for the evolution and development of the ancient irrigation systems in Sri Lanka in four stages, is as follows:

1. Small rainwater tanks from which water was baled out
2. Small village tanks
3. Large storage reservoirs each of which submerged a large number of small tanks.
4. A river diversion channel that augmented a large storage reservoir

On the basis of this erroneous interpretation the Irrigation department prepared a Plan described as the Water Resources Development Plan of Ceylon, published by the Survey department in 1957. This map shows a number of suitable sites for large reservoirs identified from the one mile to an inch topographical survey of the island which shows contours at 100 foot intervals. The reservoirs have been designed on the basis of a within basin or single basin of land and water resources in each major river basin. Yield of water has been balanced with the available area of land below the reservoir site (identified from the contour survey) to determine the storage capacity of the proposed reservoir. One major reservoir Moragahakanda has an excess of water which it was proposed to transfer to the north by means of a North Central Province canal or NCP canal.

This proposed channel runs on the central ridge that separates the eastern and western parts of the island. It has therefore been confidently asserted that if this proposal is implemented, the present north-south conflict will be augmented by a new east-west conflict over irrigation water flowing in this channel.

It has been repeatedly pointed out that the Water Resources Development Map set the clock back at least 1500 years in the field of water resources development planning in this country. Trans-basin diversion had been developed by the ancient engineers as long ago as the fifth century, if not earlier. The best known of the great ancient trans-basin diversion channels is the famous Jayaganga beginning at the right bank sluice of the Kalawewa, built in the fifth century by King Dhatusena, to augment the city tanks in the ancient capital Anuradhapura. (Figure 7). Brohier himself in that historic Lecture to the Royal Asiatic Society, (Ceylon Branch) referred to above had described the Jayaganga in the following words:

The Jayaganga, indeed an ingenious memorial of ancient irrigation which was undoubtedly designed to serve as a combined irrigation and water supply channel, was not entirely dependent on its feeder reservoir, Kalawewa, for the water it carried. The length of the bund between Kalawewa and Anuradhapura intercepted all the drainage from the high ground to the east which otherwise could have run to waste. Thus the Jayaganga adapted itself to a wide field of irrigation by feeding the little village tanks in the subsidiary valley which lay below its bund. Not infrequently it fed a chain of village tanks down these valleys - the tank lower down receiving the overflow from the tank higher up on each chain.

There is no better description of the interdependence of the small and large ancient irrigation systems in Sri Lanka than this authoritative statement.

Hydraulic Engineering

Brohier's hypothesis was no more than the expression of a view widely held among irrigation engineers at the time, that can best be described as a hydraulic engineering perspective of the ancient irrigation works in Sri Lanka. The Water Resources Development Plan was the ultimate expression of that perception in which emphasis is placed entirely on water as an inanimate but active agent, exactly as in the study of hydraulics. From this perspective, which has been given ample expression in discussions at the Institution of Engineers from time to time, a small village tank is said to be 'inefficient', for reasons such as the following:

Seepage and evaporation losses from a system of small tanks are both much larger than from a single equivalent large reservoir holding the same volume of water.

The area of potentially arable land submerged by a system of small tanks is much greater than the area submerged by an equivalent large reservoir.

It is possible to counter these criticisms with arguments such as the following, using a similar hydraulic engineering idiom:

There is re-use of irrigation and drainage water in a cascade of small tanks thereby improving water use efficiency.

In a small tank the irrigable area is closer to the tank so that conveyance losses are less than in a large distribution system such as exists in a large reservoir project.

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6 Mendis, D L O (1992) in the ENGINEER
7 Mendis, D L O (1988) etc
8 Mendis, D L O (1992)
9 Brohier, R L. (1937) 70
The problem of water disputes between head-end farmers and tail-end farmers is much less for the same reason.

However, it is preferable to abandon the hydraulic engineering perspective altogether, and discuss the problem from an irrigation ecosystems perspective.

**Irrigation ecosystems**

Ecology is essentially a study of interactions between organisms among themselves, and the relationship between organisms and their environment, viewed from a holistic perspective. An ecological system or ecosystem may be defined at any convenient scale to suit the needs of a particular study. For example planet earth is the largest ecosystem. The biosphere where all living things exist, is a smaller ecosystem, and so on down to a drop of water, which may be considered as a minute ecosystem sustaining forms of living organisms. Thus, by definition an ecosystem sustains life and must therefore be considered as animate.

Western scientists have come to recognize three broad types of ecosystems for study, namely terrestrial, aquatic and atmospheric ecosystems, corresponding to the lithosphere, the hydrosphere and the atmosphere, which together make up the biosphere, the region of the earth in which all organisms live and reproduce.

**In the case of humid tropical regions however, such a classification can be artificial. In the tropics irrigated agriculture is an important activity for people, and water is a vital ingredient in irrigated agriculture.** The Hydrological Cycle depicts water's natural behaviour, in its transition from land to water to air, the three domains in which it exists. Irrigation is seen as an intervention by man in Nature's hydrological cycle. Thus a concept of irrigation ecosystems is a natural one, depicting the activity of water in vital functions in irrigated agriculture and crop production. Defined in these terms, an **Irrigation ecosystem may have components of terrestrial, aquatic and atmospheric ecosystems.**

From an irrigation ecosystems perspective, then, both evaporation and seepage are parts of the hydrological cycle, and within certain limits should be considered as necessary features of a stable irrigated agriculture system. Seepage helps maintain the water table, and evaporation is only a part of evapo-transpiration. The small tank, like the large reservoir is an ecosystem, and is therefore by definition animate. Thus in the ecosystems approach, water is treated as an animate though passive agent, in contrast with the hydraulic engineering approach in which water is seen as an inanimate but active agent, as in the study of engineering hydraulics.

By analogy with Amory Lovins' concept of Hard Energy and Soft Energy paths, it is possible to describe the hydraulic engineering approach as a hard technology perspective and the irrigation ecosystems approach as a soft technology perspective. In trying to understand the ancient irrigation works in Sri Lanka the different perspectives will lead to totally different conclusions in regard to small tanks, large reservoirs, diversion systems and the relation between them. The hydraulic engineering perspective will lead to the hypothesis that Brohier published (Figure 6), while the irrigation ecosystems perspective will lead to a totally different hypothesis.

It has been shown that river diversion systems are very much older than storage systems, which can only be effective if they incorporate an irrigation sluice for control and issue of irrigation water. Invention of the sluice is therefore seen as a critical stage in the evolution and development of irrigation systems. River diversion represents water management in the dimension of space while storage represents water management in the dimension of time, the former being an earlier achievement in man's evolutionary progress. An alternative 7 stage hypothesis for the evolution and development of irrigation systems was therefore proposed, as follows:

1. Rain-fed agriculture
2. Seasonal or temporary river diversion and inundation irrigation
3. Permanent river diversion and channel irrigation systems
4. Development of weirs and spillways on diversion channels
5. Invention of the sluice
6. Construction of small, medium and large scale reservoirs
7. Damming a perennial river

From this hypothesis it was possible to recognize six different types of ecosystems that have evolved and developed in our country from very ancient times, and exist to the present day, of which all but the first one are irrigation ecosystems. These irrigation ecosystems should be studied and understood by engineers who design new irrigation projects in this country:

1. Slash and burn ecosystems or haen govitthan
2. Flood or inundation irrigation ecosystems
3. Channel irrigation ecosystems
4. A small village tank forming a micro irrigation ecosystem

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10 Lovins, Amory, (1978)
5. A large reservoir forming a macro irrigation ecosystem with one or more micro irrigation ecosystems of types 2, 3, or 4 in its command area.

6. A complex of macro irrigation ecosystems formed by a number of large reservoirs connected together by channels as in the ancient Rajarata.

With this understanding of the ancient irrigation systems as irrigation ecosystems, we may take a fresh look at the remains of the ancient irrigation works in Sri Lanka. To do this we have to use the earlier topographical survey sheets, because many of the ancient irrigation works have been omitted in the more recent reprints, for reasons unknown.

(In passing, the question may be asked whether these reprints are a diabolical attempt to erase the record of the ancient irrigation ecosystems and re-write history? We should also ask why the ancient irrigation works do not find a place in the much vaunted National Atlas of Sri Lanka published with much fanfare and publicity a few years ago?)

River diversion systems in Sri Lanka are called anicut systems, the word anicut having come into the English language from the Tamil language, and these give rise to irrigation ecosystems of types 2 and 3 above.

Recognition of a small village tank as a micro irrigation ecosystem of type 4 follows the description of a pond by the ecologist E.P Odum who has who has described it in the following terms:

> It is the whole drainage basin, not just the body of water, that must be considered as the minimum ecosystem, when it comes to man’s interests (Emphasis in original)

This description also applies equally well to a large storage reservoir but with the proviso that one or more smaller micro irrigation ecosystems should lie within its command area, so that such a reservoir, its irrigable command area and its upper catchment area together constitute a macro irrigation ecosystem.

We can also now better understand and appreciate the inter-relation of groups of large reservoirs and channels in the Rajarata that Brohier himself documented in his historic lecture to the Royal Asiatic Society, (Ceylon Branch) in 1935.

Together they form a complex of inter-connected macro irrigation ecosystems. (Figures 2, 3 and 7). It is a strange irony that Brohier who had documented this extra-ordinary complex and described it in such beautiful prose (quoted above), some twenty years later did a complete about turn in putting forward his four stage hypothesis for the alleged evolution and development of irrigation works in Sri Lanka, which was to have such far-reaching adverse consequences.

The so-called Water Resources Development Plan of Sri Lanka had the undoubted authority of Brohier who had done a great deal of research and published a 3 volume work which still remains the best reference book on the ancient irrigation works in Sri Lanka. In turn, that map has been used as ‘authority’ for location of the new major reservoirs in the south, Chandrika weva, Uda Walawe and Lunugamvehera. The latter two large reservoirs submerged a large number of small village tanks built in ancient times, lying abandoned or partially rehabilitated by local cultivators. Their locations thus conformed to the hypothesis that engineers believed, that a small village tank was a stage in the evolution of irrigation works and should some day be submerged by a large reservoir.

### Uda Walawe

When the Uda Walawe reservoir was under construction it was pointed out that it was being built in the wrong location - it should have been located at a site about 15 miles upstream of the present site (Figure 4).

When land alienation and blocking out of new lands was started in the downstream development area under the Walawe reservoir in the late sixties, there was resistance from the local people. A recent description of this is as follows:

> In fact the official land distribution never occurred. Once the land had been levelled and prepared, purana villagers, infuriated by the coming of outsiders, forcefully and disorderly occupied the land.

Here there is an assumption as to why the local villagers offered resistance to the ‘official land distribution’ namely that they were ‘infuriated by the coming of outsiders’, but no evidence is given to support this explanation which these two social scientists, a great distance away in time and space, appear to have imagined. Their reasoning however, is similar to arguments given in respect of what are now described around the world as ‘traditional Tamil homelands’ in the north and east of this country to which

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13 Mendis D L O (1992) a
14 Odum E P (1971) 16
15 Brohier, R L (1937)
16 Mendis D L O (1968). 135
17 Devroey and Shanmugaratnam, (1984) 85

225
'exclusive rights' are claimed by some writers. For example, Ponnambalam has said: 

The Sinhalese governments, by a policy of aggressive state-financed Sinhalese colonization and resettlement of the traditional Tamil areas, sought to end the Tamils' exclusive occupation of their homelands in the north and east.\(^{18}\) 

What then was the provocation for the resistance of the old villagers at Walawe? Even at the present time there is conflict between old cultivators and new settlers, over irrigation water issues, which remain largely unresolved. 

The reasons for this are tied up with arguments presented above for a proper understanding of the ancient irrigation works in Sri Lanka in terms of irrigation ecosystems. Some of the recent violence in the south may then be explained as a reaction to environmental degradation caused by hydraulic engineering.\(^{19}\) 

In fact the original plans for land development and settlement under Uda Walawe reservoir were never achieved because of an alleged shortage of water. A large extent of land in the left bank area was never developed for this reason. Even on the right bank further tracts have not been developed, due to water shortage. Complaints have been made virtually from the inception of the scheme that cultivators are wasting water. (The same thing has happened at Lunugamvehera - the originally suggested solution to this problem was to charge for the water). 

However, some studies have shown that seepage losses in the channel system are higher than expected, though that by itself does not account for the very high consumption of irrigation water. Farmers themselves in the lower reaches complain of shortage of water, especially at critical periods of crop production. In these circumstances, rehabilitation of the distributary channel system was undertaken with a loan from the Asian Development Bank, even before construction of the system was completed. Next, foreign expertise was sought and obtained to teach new water management techniques first to local staff and then to the farmers. 

Rehabilitation of the distributary system, and introduction of new water management techniques will be done and must achieve some results, but if these are considered to be the whole answer, one could well ask, with Amory Lovins:\(^{20}\) 

But, what was the question?

In other words, if when hydraulic engineering has created these problems, the solution is more of the same, (instead of an assessment to find out what the root causes of the problems are), leading questions like the following may be asked: 

Is environmental degradation a major cause of non-ethnic violence in the south? And: 

Is this environmental degradation due to the wrong location of the Uda Walawe and Lunugamvehera reservoirs? 

The desperate situation of lawlessness in the southern parts of the country some three or four years ago may now be only a distant memory for many engineers and administrators (especially those in Colombo). Many of them probably think that such a situation will never arise again. However, recent widespread rioting among the poor and under-privileged in USA should give pause to such hopeful thoughts. 

So long as the underlying causes for impoverishment of people are not tackled, the potential for such eruptions will always be present in any part of the world. 

Lunugamvehera 

The scandalous way in which the Lunugamvehera proposal was handled by the Ministry of Irrigation in the seventies has been documented previously\(^{21}\). That Ministry's bureaucrats and technocrats ignored directives given by the Prime Minister's Ministry of Planning to investigate an alternative site called the Hurithgamuwa site, before committing the country to this multi-million dollar project. It is hoped that some day yet some of those responsible for that high-handed defiance of directions will be exposed, at least as a precaution for the future. The Hurithgamuwa site fitted into the long term proposal called the Southern Area Plan (discussed below), while the Lunugamvehera site apart from its other shortcomings, did not. In fact Lunugamvehera gives rise to a host of other problems including a clash between wild life and humans (discussed below), all of which can be collectively described as problems of environmental degradation. 

After only one season of irrigation in new lands under this reservoir, soil salinity was reported which has prevented further cultivation on some of these lands, even if water is available. To those who understand the language there is really nothing surprising about this - Lunugamvehera 

\(^{18}\) Ponnambalam, 1983, 3  
\(^{19}\) Mendis D L O (1991)  
\(^{20}\) Lovins, Amory, (1978)  
\(^{21}\) For example, Mendis, D.L.O. (1990)
means salt-village-stupa. But there are other problems and perhaps more to come. In fields lower down, there is excess of water and hence new drainage problems, (and the possibility of salinity), apparently due to seepage water from the great reservoir upstream. Ironically enough, existing salterns still further down are said to be in danger of being leached out, and prawn fisheries which need brackish water are endangered due to this excess of drainage water. All these are problems of environmental degradation due to the location of this reservoir, which was described long ago as a Colossal Monument to Technocratic Folly.

**Environmental Degradation in the South**

Odum's description of a micro irrigation ecosystem quoted above sums up something that every purana villager knows, although obviously not in the same terms. Every small village tank is a stable irrigation ecosystem in which the tank itself, the catchment area above it and the fields below, together constitute the ecosystem.

Dry zone purana villagers have for long been accustomed to a traditional agricultural lifestyle in which the main feature is a comparatively low input low output crop production, together with a careful husbanding of the limiting resource, water. During drought years, much privation is suffered by the purana villagers. To alleviate this misery, the ancient cultural practice that had been evolved down the ages was to give equal access to water to all cultivators by the system known as bethma. The bethma system was practiced in times of drought, to equitably share the available water among all the cultivators, and this system is easily practiced below small tanks. Therefore purana villagers value the small tanks wherever such exist, and what they would have asked for had they been consulted before Uda Walawe and Lunugamvehera were designed and constructed, would have been a supplementary source of water for the small tank, the 'drought resisting capability' of the large reservoir, located upstream of the system of small tanks to ensure this (Figure 4).

Instead of this what happened during the so-called land distribution referred to above was the levelling off of their ancient system of cultural practices, and that was cause enough for 'injurition'. In the Walawe project as well as in many other so-called colonization schemes, the very layout of irrigation systems has virtually ensured that a privileged few are rich while the majority of settlers become impoverished. Pfaffenberger has documented and explained this recently;

*The supposed causal relationship between gravity flow irrigation and socioeconomic differentiation is, in the Sri Lanka case, illusory and deceptive. The appearance is created, and becomes convincing only to the extent that observers adopt a highly restricted definition of technology, a technology that includes only the hardware of irrigation (such as dams, pumps, and canals). As scholars in the history of technology frequently argue, a more useful definition of technology would certainly include cultural values and social behaviour, which are, after all, vital to the operation and maintenance of a technical system....*

The question this article addresses, therefore, is not why Sri Lanka's modern irrigation technology creates socioeconomic differentiation; on the contrary, the question is why the schemes' social design omitted the customs and behaviours that could have mitigated the differentiation process.

In raising the question of omission of (traditional) customs and behaviour that could have mitigated the process of social differentiation, Pfaffenberger has indeed hit the nail on the head. The schemes' social design is based on the hard technology hydraulic engineering perspective, which by definition 'includes only the hardware of irrigation' as he describes it, simply because the designers of these schemes have always been hard technologist irrigation engineers, who were ignorant of and unsympathetic to (their own) traditional customs and behaviour. Had they been less ignorant they would have adopted the soft technology approach and avoided the harsh consequences described by Pfaffenberger and others by recreating the ancient irrigation ecosystems that had once flourished in Sri Lanka.

**Southern Area Plan**

The original proposal described as the Southern Area Plan envisaged development of human settlements in the southeast dry zone to absorb surplus population from the southwest wet zone (Figure 8). At the time the plan was first proposed in the mid-sixties, the emphasis was on hydraulic engineering. It was envisaged that large reservoirs would be constructed in the southwest wet zone from which water would be diverted eastward to the southeast dry zone by means of two trans-basin diversion channels as shown. It will be seen that Chandrika wewa, Uda Walawe and Lunugamvehera do not fit into this larger long term plan for development of the southern area.

23 Leach, E.R. (1971)
24 Pfaffenberger, (1990), 364
When this plan was first presented the Uda Walawe reservoir was under construction. Lunugamvchera came much later and further set back the possibility of early implementation of the long term plan.

It should be noted here that Government has not so far explained how this project was constructed without ever investigating the alternative Huraghamuwa site which was proposed by engineers in the Prime Minister’s Ministry of Planning and Economic Affairs.

But there is even more to it than that, as can be seen from Figure 8 which presents the original Southern Area Plan prepared 25 years ago, as well as more recent developments in the area. After construction of Uda Walawe reservoir, the area above the reservoir was declared a national park. After construction of Lunugamvchera weva, the area above it was also declared a national park. Then the two parks were joined together by means of a further extension of both parks.

Thus a vast extent of potentially arable land that in fact had been under cultivation in ancient times under the system of small village tanks, has now been made into an extensive wildlife reservation. This is a major cause of conflict - between man and beast, and between man and man. Recently much publicity has been given in the press to the general problem of dwindling wild life and specially to the reduction in the numbers of elephants, considered to be one of our unique resources recognized as a common heritage of all mankind.

This perhaps gives new hope that remedial measures may be taken to alleviate underdevelopment in the southern area. The first such remedial measure should be construction of the Upper trans-basin channel from the Walawe Ganga crossing (or at least from the Weli Oya crossing) to Hambugamuwa Weva and beyond to meet the Kirindi Oya at its intersection with Kuda Oya near Huraghamuwa. Thereafter a new wildlife reservation should be demarcated above the Upper trans-basin channel and below the A 3 Highway from near Belihuloya towards Haldumulla and beyond. Wild-life from the Uda Walawe National park and Lunugamvchera National park reservations will be re-located here and some of the land in these reservations will then be released for cultivation based partly on restoration of a selected number of small tanks in this area. Eventually, new large reservoirs will be constructed at the Weli oya crossing and the Kuda oya-Kirindi oya crossing, and ultimately, a complex of macro-irrigation ecosystems will be created similar to the one that existed in ancient times in Rajarata.

If and when these two new reservoirs are built at the alternative upper sites in both river basins, at the sites of the intersections with the Upper trans-basin channel as described, they would replace the two gigantic reservoirs Uda Walawe and Lunugamvchera in their lower basins. Their beds would then be converted to human settlements based on the small tanks that have existed in the area for thousands of years, and now lie submerged under these reservoirs.

**Conclusion**

Underdevelopment in southern Sri Lanka can be explained and accounted for in terms of the hydraulic engineering approach adopted by irrigation engineers who were responsible for the (wrong) location, the design, and construction of first Chandrika Weva, and then Uda Walawe and finally Lunugamvchera reservoirs.

*In the last analysis, then, these colossal mistakes were committed by Sri Lanka engineers, because they were ignorant of their own heritage, which should also be rightly recognized as part of the common heritage of all mankind. By the same token, any effective remedial action to set right the mistakes already made can only be undertaken by engineers who are well-versed in a correct understanding of the ancient irrigation or water conservation works of our country. Surely such an understanding should be a minimum pre-requisite for designing any modern water conservation system in this country?*

In this context we should inquire why the National Atlas does not have any maps of the ancient irrigation systems, and the new topographical survey sheets have come to omit large numbers of the ancient irrigation works that were shown on earlier prints. Is this part of a diabolical attempt to re-write history, or another subtle attempt to try to justify the wrong location of Uda Walawe and Lunugamvchera reservoirs?

These facts may not even be known to engineers and scientists because sadly, many local engineers and scientists, fight shy of studying their own country's history, leaving that sort of intellectual work to the arts students, and perhaps to politicians. There seems to be a fear that any recognition of any scientific component in ancient systems would be ridiculed by more 'modern' scientists.

Worse still, some of these people who are quite ignorant of the ancient water conservation works, make derisory references to them with such epithets as the 'Mahavamsa syndrome'. Presumably they imagine that such an attitude will help them get fresh research grants from some foreign agencies which increasingly seem to be controlling such research activities in this country.

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26 Mendis, D.L.O. (1968)
Scientists of this ilk should take note of the attitude of Professor Joseph Needham F.R.S., who, referring to his rendering of the history of irrigation in Sri Lanka based on Brohier's discredited hypothesis, has readily accepted the fact that his 'treatment of the subject can be improved upon'. Perhaps, local decision-makers will be moved to take a fresh look at the misinterpretations of our own history only when a revised edition of Needham's Volume 4, part 3, Section 28 (f) is published. Even then, it may have to be brought to their attention through some foreign aid agency. Such is the depth of our underdevelopment.

References


Figure 2

(Source: A Concise History of Ceylon)
Diagram showing the inter-relation of irrigation works

Figure 3 (Source: A Concise History of Ceylon)
Figure 4

Valawe Basin Development

Ancient Dispersed Small-scale System vs.
Modern Centralised Large-scale System

Alternative upstream location
for Uda Walawe Reservoir
(Moudie, 1968, 133)

Uda Walawe Reservoir
Figure 5
Detailed Engineering Surveys - Walawe Left Bank area showing Earth embankments as deflection structures (2 ft. contours)
Brohier's Theory, quoted by Needham

The process of evolution which is thought to have occurred may be described as follows:

First the farmers made numerous small tanks in the hills and foot-hills, near their fields or terraces to catch the run-off water they baled out at leisure. The numbers of small dams, bunds (bemma) were built, often in series, on the upper reaches of tributaries of the greater rivers, thus retaining the annual or inundatory flow and discharging it as desired by small canals (ela) along the valley sides, as time went on larger dams were built submerging or rendering unnecessary the smaller ones. The next step was revolutionary: a weir (anicut, Tamil = tekkam) was built much higher up the main river (ganga, oya, Tamil = aru) to form the headworks for a long lateral water to join the annual monsoon supplies in the great reservoir. This method ambitious as well as scientific, had numerous advantages:

a. It harnessed a greater volume of water than any local catchment area could yield.
b. It put both monsoons as other rainfall to full use
c. It secured a resource in drought periods as well as an even supply in normal years, and

d. It lessened the silt accumulation problem because the feeder canals could be cleared periodically much more easily than the tanks (Needham et al, 1971, 368)
Figure 7 Macro Irrigation Ecosystems in Anuradhapura District
[Source: Brohier, 1937
(JRAS Ceylon Branch, Vol XXXIV No 90, p.72)]