Negombo was one of the areas that developed facilities faster from Dutch colonial times and the old canal built under the supervision of their hydraulic engineers, which linked up streams, lakes and lagoons that traversed this region, contributed in no small measure to the prosperity of these districts. Boats were the usual mode of transport and the "padda boat", which became a part of this scene, was introduced by them, maintains R. L. Brohier in his book on "Dutch Ceylon". Pictured here are sections of the old Dutch Canal through Negombo. The top illustration also shows the type of barge (provided with a thatched roof) which the Dutch introduced to Ceylon for use on their Canals. It is called locally: "padda boat" and was towed using a towpath on the bank or poled or sailed.

INLAND WATERWAYS

The Colombo–Puttalam and other canals

An overview of the heyday and the recent Committee proposals

A significant legacy left to Sri Lanka by the Dutch was a network of waterways most of which were conceived, designed and built under supervision of their colonial engineers. Though the Hamilton canal came later in the British period, and the main system started earlier under Portuguese and Sri Lanka patronage, the substantaial engineering was Dutch planned. It has been observed that few Dutch engineering projects in this country contributed in larger measure to the prosperity of the districts they governed than the canal-cuts commissioned by their hydraulic engineers to link up streams, lakes and lagoons. The most noted among these of course was the 82 mile long Colombo-Puttalam waterway which continued to be in regular use upto the early 1950s. In February, 1949, the D. R. Rutnam Transport Commission reporting on "Transport Conditions in Ceylon" posed a very relevant issue, in this regard, thus: "the present generation should examine the problem of appropriate future use of these waterways from the standpoint of whether there are public advantages in the maintenance of this system in a reasonable state of efficiency. If there are, we are able to preserve to posterity some advantages from this free legacy from the past. It is not a question altogether of whether or not, if we had a free choice, we would now dig such a canal system: but rather *should we keep the system going, and if so on what a scale*".

This same issue, is even more relevant today, and has been investigated in great detail over recent years. Several committees have examined this question since 1970 (see box on page 9). and one consequence was that as far back as 1975 a separate Canal Development Division was set up to undertake the rehabilitation and maintenance of the canal system. This Division has since its inception expended nearly Rs. 20 million, up to the end of June, 1981, for its work on the Colombo-Puttalam canal and has plans for even greater expenses. Meanwhile, a local expert Canal Study Committee is now finalising its report on the current feasibility of the canal development plans under consideration; while, two transport economists from the Netherlands Economic Institute, invited to assess the transport economic feasibility of rehabilitation of the Colombo-Puttalam canal, reported in June this year that all efforts at making use of this canal for transport purposes should be abandoned forthwith.

In many parts of the world canals and waterways have been recognised as an economical and convenient means of transport and as an integral part of development, from early times. In certain countries, particularly where the terrain has been below sea-level, or subject to flooding, hydraulic engineering, with particular reference to canals, has been developed to a high degree. A good example in this respect is the Netherlands In Britain, France, Germany, Belgium, Finland, USSR, USA, Canada and China major rivers and man-made canals linking them, have been utilised extensively as inland waterways.

During the 17th and 18th centuries particularly, a number of canals have been cut linking waterways to accelerate the process of industrialisation in these countries. Subsequently the development of railways and

Spread of the Canal Network

Canals and waterways in Sri Lanka are closely associated with the Dutch. While the Dutch, (themselves natives of a country situated below the sea-level and nurtured in hydraulic skills and systems) were substantially responsible for the system of waterways that had emerged in colonial Sri Lanka, yet waterways as a means of transport was not unknown in pre-colonial times in this country. Siddharama-Ratnávaliya records that rivers were an easy mode of transport with the use of rafts. Tradition also has it that the Arab or Moor peddlars used rivers as a means of access into the interior of Sri Lanka, and this explains partly why most Moor settlement villages in the interior of the country are along rivers and streams. There is also evidence that the Portuguese had taken the first initiative to introduce manmade waterways or canals for purpose of transport. They started a network of canals in the Colombo area leading towards Hendala in the North, and linking the Bolgoda Lake in the South to the Kotte Lake. The Dutch Governor Van Imhoff in his memoirs refers to "an old Portuguese water-way which flows from the lake of Nedimala to .... the river or stream of Kotte". R. L. Brohier an authority on the Dutch period of rule in Sri Lanka also mentions that even the canal to the north of Colombo from the Kelani Ganga to the Pamunugama Lagoon was started by the Portuguese, though completed by the Dutch.

Some scholars assert that Sinhala kings initiated the first navigation cuts in the Kotte and Raigama areas, but although earlier Sinhala engineers developed the technology of trans-basin canals for irrigation purposes it is not known as whether these skills came down to the Kotte era. Unfortunately evidence of waterways in the times of the Sinhala kings is less systematic and meticulous than in the time of the Portuguese and Dutch.

Thus, while the evidence suggests that water-ways were existent in Sri Lanka prior to the coming of the Dutch, it also recognized that it was the Dutch who developed the system of water-ways as a significant means of internal transport. In this endeavour, according to Brohier, the zeal and personal endeavour of Governor Van Imhoff (1736—1740) was considerable. His memoirs indicate the number of water-ways he had planned for the Western Maritime Districts of Sri Lanka and a good many of which he ensured were implemented.

These water-ways which the Dutch planned and developed, along with a few innovations by the British are shown in the map on the inside cover. The first canal credited to the Dutch was in the north of Colombo from the Kelani Ganga. This was the one commenced by the Portuguese. The Dutch completed it and by 1706 it was extended to connect with the Maha Oya. Within the next two decades they had taken it upto Puttalam and thence via the Puttalam lagoon etc. to Kalpitiya, a further 15 miles away. Possibly within that decade cuts had been made linking rivers, backwaters and lagoons which established a 120 mile network between Colombo and Puttalam. In the south of Colombo once again the Portuguese are credited with a canal from Kotte, via Kirillapone to Nedimala and then to Bolgoda Lake. This was restored and improved by the Dutch Governor van Imhoff who also planned a short and direct water-way from Kotte to Nedimala via Gangodawila, and commenced work on it, but it was never completed. Further South Van Imhoff planned and commenced building a water-way to link Moran Ela in Pasdun Korale to the Port at Barberyn (Beruwala). This too, however, was not completed. An alternate link of the Kaluganga to Bentota Ganga was also commenced and abandoned by the Dutch. Inspite of these few incompleted projects, it lies to the credit of the Dutch that they had developed a continuous internal water-way system stretching from Kalpitiya in the north to Kalutara in the south. This water-way had access to the interior, via the rivers it intersected — viz. Deduru Oya, Maha Oya, Kelani Ganga and Kalu Ganga and some of their tributaries (e.g. Gin Oya and Lunu Oya of Maha Oya).

Similar water-ways, as in the Western maritime districts, were credited to the Dutch in the South and East of Sri Lanka. In Galle District the Kapu Ela (literally meaning in Sinhalese the "cut water-ways") takes off from Gin Ganga and provide passage over twenty miles with many outlets into the sea. Minuwangoda Ela is part of this system of canals in the Galle District. In Matara a canal linked Polatumodera Ganga at Weligama to the Nilwala Ganga at Matara. On the Eastern coast, the Batticaioa lagoon which stretched over a number of miles was made use of by the Dutch by a series of canal links to provide a water-way from Samanthurai, 31 miles south of Batticaloa to Vanderloos Bay 26 miles north of Batticaloa. It was linked to the two ports in this region in Dutch times — Batticaloa and Kalkudah

The British realised the importance of water-ways for transport in the 19th century as well as for flood protection and continued to maintain them and also make additions and innovations. The Hamilton Canal linking the Kelani Ganga to Pamunugama Lagoon; and Anstruther canal linking Bolgoda Lake to the Kalu Ganga are innovations or alternative links, built under the aegis of the British. Layards folly, linking the Kotte-Kirillapone-Nedimala Canal to the sea at Wellawatte was intended to be a flood outlet of the Kelani Ganga. It earned the name Layards Folly, (after C. P. Layard, G.A., Western Province at that time, who conceived it) because though built to drain away flood water, the canal bed was much higher than the flooded area. This was subsequently deepened and has performed the useful function of flood protection and draining away of rain water.

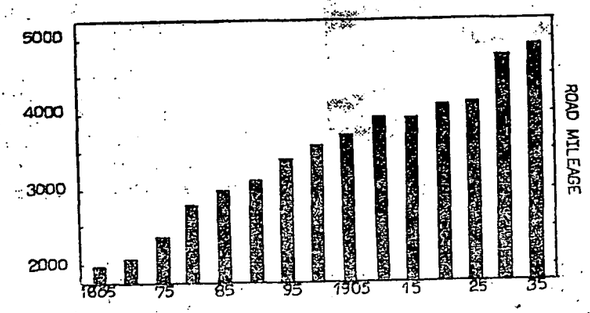
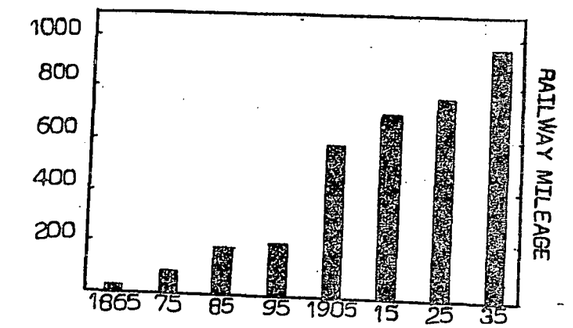


FIGURE I ROAD CONSTRUCTION 1865 - 1935

Source: University of Ceylon: History of Ceylon. Vol. 3, page 312



FIGUER 2. RAILWAY CONSTRUCTION 1865 - 1935

Source: *University of Ceylon, History of Ceylon. Vol. 3, Page 312*

In the British period, particularly the 19th century, the water-ways provided a useful transport system for the growing import-export economy that was developing with the gradual emergence of a capitalist economy in Sri Lanka. Coffee plantations (and later tea and rubber) and Graphite mining produce from the central hill country was generally transported by cart, until the advent of the railways in the latter half of the 19th century. But wherever water-way transport was possible it was preferred to cart transport. This entry by the AGA, Kegalle on 2nd May, 1871 inquirying into some dispute provides evidence that graphite was transported by padda boats or barges right down from the Ruwanwella via the tributaries of the Kelani Ganga to the Kelani Ganga and thence to Colombo.

"Arnold Pieris claims a padda boat of plumbago lying at Gurugoda Oya at Ruwanwella weighing 8 tons, purchased by Peiris from Juwaris de Mel. Juwaris de Mel cut it from Pushena in Erabanduwella".

A miners folk song also records how graphite extracted at the Dumbara Mines, near Ingiriya, was transported by barges down Kalu Ganga and via the canals to Colombo.

බැසලා බඹ ගණනක් වල නැවැත්තූ වා
කඩලා මිනිරන් අරගෙන ගොඩ කෙරූ වා
ඇදලා ඇල්ල ගාවට පාරුවේ පට වා
පැදලා ගහෙ ගෙන ගොස් කොළඹට බෑ වා

We worked the mine a few fathoms deep
We extracted graphite and piled them up
We then took them to Ellagawa and loaded them on to barges
And floated them down the river to Colombo.

Even after the advent of the railway from 1865 and the rapid growth of roadways too, from about the same date (see Fig. 1 and 2,) canals continued to be in use. They supplemented the rail and roads systems that were developing, to meet the increased demand for goods transport, with the new economic activities ushered in by British colonialism; and as Wickremaratne, in the University of Ceylon, History of Ceylon Vol. 3 observes: ".... inspite of Tennent's prediction that canals would pass into obsolescence with the emergence of the "metalled highways", they were of no small importance in the over-all pattern of transportation particularly from the point of view of the indigenous producers. Indeed in the second half of the 19th century, despite rapid extension of railways and road facilities, the Public Works Department was annually spending a considerable sum of money on inland navigation. By 1880 as much as 167 miles of canals were in use especially in the Western and North Western Provinces."

It was only with the advent of motor lorry transportation in the 1920's, that canals as a means of transport began declining in importance. By 1930 there were over 2,960 lorries constituting a major challenge even to the railway. Since then a characteristic of transportation in Sri Lanka was the battle between the Railway and Motor Road transport. The strong lobbying position of the motor transport sector in the political economy of Sri Lanka has given them an edge over the Railway even though the latter was itself a Government run concern. The rapid emergence of motor transport and the acute competition between Rail and Road led to the waterways ceasing to be of importance.

The neglect of the canal system was rationalized by the P.W.D. officials in the late 1940's as follows:—

"Wartime experience has shown that inland water transport is not more economical than road and rail transport. Further, the canals in their present condition are most unsuitable for use by power driven boats. The extensive improvements that would be required to afford protection to their natural earth slopes and render them suitable for use by power driven boats would not only be prohibitive in cost, but would also extend over a very long period of time. This department will not be in a position to undertake the work until its present programme of improvements to roadways, and bridges has been executed".

It appears that if the canals then were to compete as a form of transport with road and rail they had to match the latter in technology by using motor driven barges. This was not feasible without certain structural alterations to the canal embankments at considerable cost and time.

highways and the progress of the industrial revolution resulted in much of the traffic being taken off the canals. The canal systems with time continued to play a proportionately less important role in some of these countries.

In Sri Lanka this mode of transport became popular at the time that the Dutch occupied the maritime provinces of the country. They devoted waterways and canals mainly for transporting produce, from points of origin along navigable water courses, to the ships in ports from where it was exported; and it was here that the Colombo-Puttalam canal had its origins. (See Box). The Dutch wooden barges and pontoons, which they moved with the aid of tow-ropes, were extensively used for this purpose. With the coming of the British and the departure of the Dutch this waterway came to be gradually used more for drainage purposes than for transport. The result was that over a period of nearly one and a half centuries of British rule the waterways finally fell into disuse and became badly silted and neglected.

Under the influence of competition from a new railway line and later from a parallel road, the transport function of the canal gradually diminished and around 1950 had come to a complete stop. Since then transport equipment (barges) and the operating skills gradually disappeared.

The reasons for the collapse of the canal system are hardly different whether applied to Britain or Sri Lanka. Thus Britain's Inland Waterways Association reported in 1974 that successive governments have ner-

petuated myths and broadcast misconceptions about inland water transport which has militated against its development. For instance the Association was of the view that:

"There is a continuing allusion to Britain's narrow canals and the era of narrow boats and refusal to acknowledge the extent of our wider waterways and the tonnage they actually carry — in essence an implication that inland water transport is old fashioned. Yet, many countries notably the most economically advanced, are building big new waterways now..... It is said that inland water transport is too slow to compete with other forms of surface transport. If it was, would countries like Germany, France, Holland, Belgium, Russia and the United States, none notable for economic backwardness, intensively use and further expand it today?"

The reasons for the neglect of waterways are far more deep rooted, as the box below will illustrate.

The possibilities of restoring and developing this mode of transport in Sri Lanka were again actively persued at the beginning of 1970 and has been the subject of discussion from time to time over the past 10 years.

In 1970 the State Engineering Corporation's Research and Development Division undertook a feasibility study on the development of canals for transport purposes in this country. There was a firmly held view that developing and cleaning the inland waterways extending from Colombo could prove advantageous economically, both in relation to short term profits from cargo transport and to the longer term benefits which could result from the development of marshy areas and neglected lands adjacent to the canals. It was therefore proposed to develop the Colombo-Puttalam canal, as a first step, because this waterway had the biggest cargo potential as compared to any other canal. It was evident that large quantities of cement, coconut produce, salt, foodstuffs and other cargo needed to be transported between the canal catchment area and Colombo. It was argued that if the real economic potential of this waterway could be realised, from its profits other canals could also be rehabilitated in an order of priority (the potential of the Colombo-Oruwala Canal was also being investigated at this time and a feasibility, report was prepared see box on page 7) until the entire network of canals in the Western sector of the country was developed. The first feasibility report on the development of canals, prepared by the R & D Division of the State Engineering Corporation in December, 1970, maintained this view.

This report pointed out that there was a total of 78 miles from Colombo to Palavi along the waterway — the actual length of canal and canalised river being about 61 miles, the balance 17 miles being made up of estuaries, uncanalised rivers, lagoons and lakes. The Committee recommended various measures for improvement and development of the canal including (1) dredging; (2) a fleet of boats and barges; (3) an additional length of canal to be cut to the Puttalam Cement Factory site; (4) existing streams to be cleared and widened to the Government Food stores at Wellsara; (5) strengthening of canal banks; (6) widening and raising the bridges; (7) constructing stations and loading points along the canal and larger capacity go-downs at certain key points. These seven items were estimated to cost a total of Rs. 32.4 million at that time. No definite estimates of the volume of cargo to be carried were worked out at that stage. It was therefore not possible to work out the likely return from this investment, though it was vaguely stated that the return "will be directly dependent on the quantity of material that will be carried".

The Committee recommended a crash programme for dredging the canal, manufacturing concrete boats and barges, and constructing extensions to the Cement Factory at Puttalam and the Government Food Stores at Wellsara.

As in the case of many future reports too the indirect benefits were emphasised, though hardly quantified. The savings due to canal transport as compared with road and rail transport were said to be greater on depreciation and maintenance and also on fuel costs. The foreign exchang

Why have canals been neglected

J. Diandas

(SOURCE: A Paper read at a Seminar in 1975)

Their economics seem bad by the accounting that has been done for them particularly in UK where little canal traffic still flows. For example, C. D. Foster, one of the foremost British University Transport Economists, mentions "canal" only twice in his book "The Transport Problem". UK has only 260 miles of canals still in use.

Yet Inland waterways account for around 15% of all inland freight in USA and 5% in USSR. Also, of course France, Holland etc.

Highways are all-purpose tracks, which carry four principal traffics, namely:

(a) Goods in lorries and carts
(b) Persons in buses
(c) Persons in private vehicles
(d) Persons on foot and bicycles.

Except for the last, these categories have been wooed by salesmen of the oil, auto, tyre and ancilliary industries all of which in the world are multinational giants. Their propaganda has been intense, effective and unobtrusive.

The third group, those who travel on highways in cars are rather insignificant volume-wise, yet are the decision-makers. Many an economic feasibility report that pushes a road-widening, a new road, a new highway flyover or even the filling of a pothole, is readily appreciated and passed for action because the problem is known, seen and felt to be urgent by those who make or influence the decision.

But what about money for canals, whether for maintenance or for improvement? Which decision-maker sees the canals or knows where they are?

A highway improvement justified by cargo needs will make for better car running too. But canal improvement is strictly for goods. Nobody appears to get visible spin-off benefits.

Donald Rutnam's findings in 1949

A clear example of neglect was the Colombo-Puttalam canal. The Donald Rutnam Transport Commission reported in February 1949 as follows: "Generally speaking, the canal system is suffering from considerable neglect. Between Chilaw and Topu Bridge I understand that practically nothing has been spent on the tow-path in the last ten years. **The Executive Engineer cannot inspect the canal easily as the engine of his launch has not been repaired or replaced.** In many places the tow path is completely non existent, where a little bit of expenditure on clearing the bushes and other undergrowth by the side of the canal would give the padda boat men considerable assistance in their pursuance of a most arduous calling".

This stretch of waterway had fallen into considerable neglect during the war years. The Donald Rutnam Commission quoted the official PWD view in 1949 that practically nothing had been done towards maintenance of the canal system in this area. The PWD's engineer could not inspect the canal easily as the engine of his launch had not been repaired or replaced. It was not surprising therefore that the canal system had been so neglected.

Looking back it is clear that if a comparatively little money and trouble had been spent at that time, as recommended by Donald Rutnam 32 years ago, we would not need so much money and effort to restore the canals now. As Diandas, drawing on the situation highlighted by Rutnam; commented cryptically at a seminar in 1975, "In 1949 it seems the Executive Engineer could not inspect the canal because his boat engine had conked. I believe then as now the roads under his jurisdiction would not have lacked inspection in similar circumstances. Because both then and now if his car engine conked, the repair would be done in an hour or so."

COLOMBO — ORUWELA CANAL

SOURCE: Feasibility Report on the Development of Canals in Ceylon for Transport Purposes. Preliminary Stage I-Colombo-Oruwala Canal. Research and Development Division of the State Engineering Corporation—December. 1970

Developing the ancient San Sebastian Canal (which serves as an important link between the Colombo Harbour and the Kelani Ganga) and the Kelani Ganga for navigation during the dry season up to Bomiriya (near Kaduwela) and the Pallewella Oya into a new canal from Bimiriya to Oruwela, would prove economical from the point of view of the Steel Corporation. Their present annual expenditure on transport between the Colombo Harbour and the Steel Factory site would be drastically reduced when this canal is developed into a satisfactory mode of transport.

Investments

There is a total investment of about Rs. 8,000,000/- which should be invested in full, since this is a comparatively small investment and the fact that the canal is developed for the use of the Steel Corporation only.

Investgating the economics of a water transport system for the transport of raw material from the Colombo Harbour to the Steel Factory at Oruwela — the major items to be considered are steel billets, scrap iron, iron ore, wood charcoal or coal, limestone and fuel oil.

At present annually 60,000 tons of steel billets are imported and transported from the harbour to the factory by road on a tonnage charge. This could easily be handled by the proposed Kelani-Pallewella canal system using locally manufactured barges and tugs as outlined later on in the report.

Method of Operation

It is proposed that the imported raw materials be unloaded from the ship directly into barges. Sufficient barges are made available wherever possible, so that an entire ship load of 10,000 tons is transferred from ship to barges without any delays, double handling or payment of excessive harbour dues for storage. The barges are towed off immediately after loading and unloading at the factory making optimum use of tugs and barges. If necessary the billets received in barges may be stored in the Kelani or Beira which would be very much cheaper than storage within the harbour where high storage rates have to be paid.

Depending on the demand at the factory, the barges are towed off, 2 at a time, along the Kelani to Bomiriya (just beyond Kaduwela) and then along the proposed new canal along Maha Ela and Pallewella Oya to the Steel Factory at Oruwela. It may be necessary to construct locks at Bomiriya and higher up the Pallewella Oya in order to obtain an adequate draft throughout the year.

Due to constrictions along the route to Oruwela, specially at San Sebastian lock which is 16 ft. wide, 50-ton barges are recommended for immediate use. Subsequently, with the development of the overall canal transport system this lock would be widened, but for the present 46 ft. long x 12 ft. wide x 3 ft. 6 ins. deep draft barges would suffice. Using these sizes, 16 barges and 7 tugs will be required so that a shipload of 10,000 tons is unloaded without any delays or double handling at the harbour and the optimum practical number of convoys arrive at Colombo.

The operational time for a complete cycle of a convoy is assumed as 5 hours to load into the barges at the harbour, 9 hours for passage through locks and along Kelani to Oruwela, 3 hours for unloading at Oruwela and 9 hours for the return journey, making a total of 24 hours.

The current (1969) expenditure by the Steel Corporation on transporting 60,000 tons from Harbour to Factory is Rs. 1,000,000/-. In addition a heavy storage bill is also paid from the Steel Corporation to C.P.C. on account of delays in transport. With the commissioning of the canal transport system, the expected return on investment on the above basis is Rs. 700,000 (i.e. deducting a running cost of Rs. 300,000/-) not allowing for the expenditure on demurrage payment. This amounts to a nett return of 11 percent on the capital invested in the canal system and barge fleet. However by making optimum use of the transport fleet, the spare capacity could be developed to bring an additional return of 60 percent on the capital invested.

With the development of Phase II of the Steel Factory the total cargo from Colombo will increase from 60,000 tons per year to 251,000 tons per year (consisting of iron ore, coal, limestone and scrap). This increase could be handled with more barges which require a comparatively small capital investment. It would also be possible for barges, on their return journey to Colombo, to bring back pay loads of bricks, sand and ohter products of that area, thereby improving the return on investment. Further, during the slack periods, barges could be hired out to private users.

component and expenditure involved in the respective transport methods also showed that canal transport was cheaper. Other possibilities such as a reduction in the price of consumer articles as a result of cheap transport provided on the water-way; cutting down costs further in export items by making use of barges themselves as temporary stores within the harbour; relieving the road passenger transport services of part of their load; facilities for tourist traffic and business associated with it; an increase of land values in areas bordering the canals; and reclaiming marshy land in these areas for housing and other commercial purposes were also listed in this report. There was also the potential for large scale labour employment during the period of development of the canal. An estimated 2,100 workers were directly required for this work and a further 800 indirectly were to be employed on basic materials production units.

Over three years later (in April, 1974) the Government approved in principle a proposal for the development of the Colombo-Puttalam canal and other canals; and decided to appoint an inter-ministerial committee to carry out investigations and report on this subject. This committee recommended, in August 1974, a preliminary stage of development of the Colombo-Puttalam canal for transport. The extent of the work envisaged included deepening the canal upto a depth of 4 feet from Wattala to Puttalam; while reverting the bank and repairing existing damage to structures where necessary. Also, the desilting of the St. Sebastian canal from Kelaniya to St. Sebastian lock; renovation to St. Sebastian lock and deepening the area of the Beira Lake. At this time the preliminary stage of development was estimated to cost Rs. 25 million of which Rs. 15 million was to be spent on manual dredging and disposal of soil.

In 1975 a separate Canal Development Division was set up to undertake this project. A third draft report prepared by a Committee of this Division in August, 1975 worked out details for re-development of this canal for transport and envisaged a total investment of Rs. 50 million. The report dealt with the other benefits from this investment and considered taking up the development of the Colombo-Puttalam Canal in three stages, to a depth of 4.0 ft. They were:

Stage I	—	Re-development of the existing Colombo-Puttalam Canal from Colombo to Kochchikade.
Stage II	—	Re-development of the existing canal from Kochchikade to Bangadeniya.
Stage III	--	Re-development of the Canal from Bangadeniya up to Puttalam.

THE KAPU ELA

(Cut Waterway)

G. K. K. S. De Silva

The waterway which links the Bolgoda Lake to the Kalu Ganga and provided communication to Kalutara is even today called the Kapu Ela (literally — "Cut Waterway"). This waterway was constructed at the time the foreign powers ruled the Maritime provinces, but there is no definite evidence to indicate whether the Portuguese or the Dutch were responsible for its construction. In later years however, the British appreciably reduced the distance from the Bolgoda Lake to Kalutara along the Kapu Ela by a more direct cut. (This was called Anstruther Canal, named after Phillip Anstruther who was Collector of Colombo in 1829).

The history of the canal abounts with folk-lore and stories of romance, adventure and even the woes and worries of the people in the area. This waterway in its broadest uses can be considered to link the Kelani Ganga with the Kalu Ganga. It extends over a distance of about 30 kilometres. However, the canal had been cut only at various points linking the natural water spans. Hence from Kalutara cutting of the canal had been continued up to a point where it meets the Bolgoda Lake. Even up to date without much maintenance and repair the canal is in a satisfactory state for transport and navigation. From Bolgoda Lake the connecting canal which joins the Beira Lake is the most neglected and the most impassable. At points the canal has been filled up in the recent times and even permanet structures built over this canal, thus obstructing a renewed use of this waterway for economic purpose.

Waterways were a fairly dominant mode of transport during the Dutch times and undoubtedly Kapu Ela would have had its economic uses. Historical records dating back to the early Dutch period indicate that transport of trading commodities and even movement of forces were facilitated by these canals.

However, the economic use of waterways in recent times has been subject to a more critical assessment as the other modes of transport have developed with various comparative and competitive advantages.

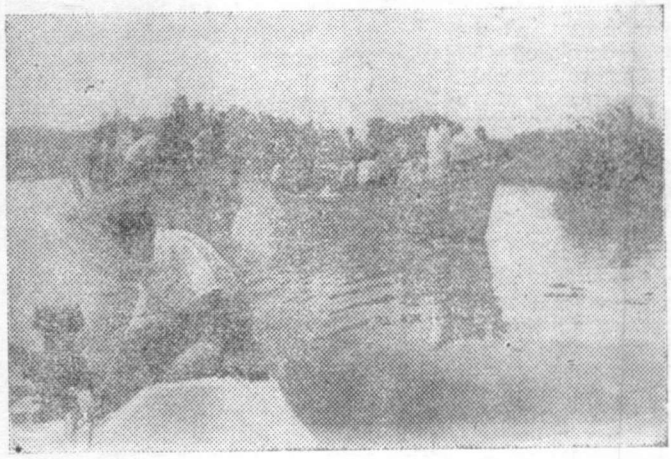
Canal development in Third World countries, particularly a canal like Kapu Ela, should not be based entirely on the western oriented economic feasibility studies. It must be emphatically said that inland waterways should be developed for their own sake, irrespective of whether it efficiently performs the economic functions of an alternative or a substitute mode of transport. This is because there are numerous other benefits on which the restoration and the development of a canal like Kapu Ela can be justified. The most elementary are (1) Drainage, (2) Flood control, (3) Irrigation, (4) Aesthetic value, (5) Tourism, and (6) Transport.

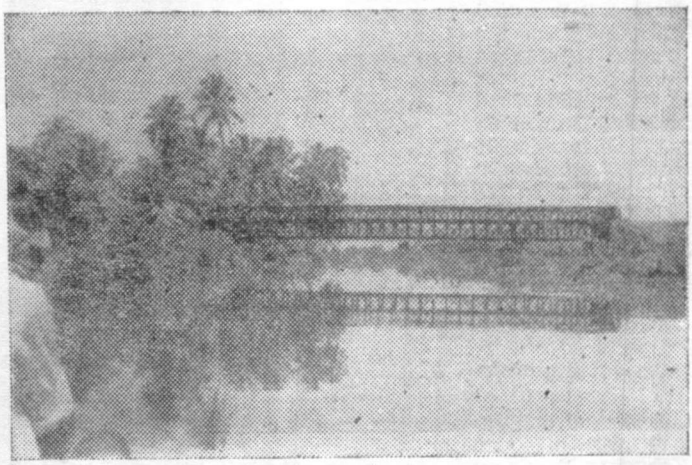
In addition to all these a perhaps more important reason for development of Kapu Ela lies in the fact that it could contribute in no small measure to the desalination of a large span of water close to the Moratuwa region. The informal information available indicates that the levels of salinity in this area are rather high and practically the water is of little need for human utilisation. If Kapu Ela can be developed to effect the desalination process of the canal at certain points, this span of water would be of immense use in agriculture particularly the home gardens which are located on either side of the canal in this heavily populated area.

Development of Kapu Ela also can perform more important functions of bulk transport where quick delivery is no consideration. Particularly, if developed, it can be put to use for transport of various non-trading commodities, including machinery and equipment, which could be moved on up to Kalutara, from warehouses in Colombo. Although it no longer has the same historical function it can serve as a useful substitute to the road system from Colombo to Kalutara which has to take a heavy wearing and is overflowing with traffic at present.

This Committee decided to confine its examination to the first stage only, on the basis of the proposals of the Canal Development Division, for the transport of building materials, food cargo and coconut produce between Kochchikade and Colombo.

In September, 1975, a Committee consisting of the Director, Canal Development of the Ministry of Housing and Construction; Deputy Food Commissioner (Supplies); and Deputy Director, Ministry of Planning and Economic Affairs was appointed to make detailed recommendations for the redevelopment of the section of the Colombo-Puttalam canal upto Kochchikade. Working on the basis, at that time, that the cost of manually





Two views of the Kapu Ela. The transport potential is evident, as seen in the top picture, where boats ply this water way with passengers. Picture at bottom, is a closer view of this river at Kalutara where it finally leads up to the sea.

propelled canal transport was about 25 cents per ton mile they regarded operating costs of canal transport to be low when compared to other costs of transport. They recommended that it would be profitable for the national economy to employ such transport for whatever cargo that could be taken. They argued that the commercial cost of transporting by canal was 25 cts. whereas by road it was Rs. 1 per ton mile, for building materials; therefore a saving of 75 cts. could be affected by shifting from road haulage to canal haulage. This benefit could be transferred to consumers by helping in the reduction of the price of building materials they argued. The foreign exchange savings per diverted ton was estimated at 30 cents on the assumption that the break even level of cargo was estimated at 875,000 ton miles per annum.

This Committee also listed other benefits that could accrue from the dredging of the canal. They suggested that there could be a beneficial impact on the hinterland of the canal enabling land development and reclamation, resettlement, agricultural production, development of the fishing industry and promotion of recreational activities in the area. The Committee made a case for proceeding with Stage I Phase A (upto Wattala) of the project, which was then estimated to cost Rs. 6.5 million, with half of this sum to be spent in 1976.

The Canal Development Division thus started with the execution of Stage I, Phase A, comprising reconstruction between Kochchikade and Wattala. The Government approved an expenditure of Rs. 6.5 million on this section, for infra-structural works and barge construction.

Meanwhile, a team from the Netherlands arrived in the island in March 1976, to report on possibilities of technical co-operation on the rehabilitation of the Colombo-Puttalam canal. The team submitted two reports; the first on Phase I in July, 1976, and the second on Phase II in September, 1977. tThese reports dealt mainly with the engineering and technical aspects of transportation on this water-way; canal bank protection; barge design and construction; and the management and organisational aspects, including the setting up of a Canal Development and Transport Authority.

Further, at the beginning of 1977, the Canal Development Division commissioned one of the members of the original 1970 Committee to carry out a transport and marketing study on Phase A Stage I (Hendala to Kochchikade) of the Colombo-Puttalam Canal. His report made several recommendations regarding the cargo to be transported along this canal and also on providing of facilities to do so.

Once again in June, 1978 a seven member official Committee was appointed by the Secretary to the Ministry of Local Government, Housing and Construction, to undertake an economic feasibility study of the Colombo-Puttalam Canal Development Project. They recorded that about Rs. 7.3 million had been spent by the Canal Development Division, since its inception in 1975. (From then upto date a further Rs. 12.5 million approx. has been spent on this project). This Committee recommended that the originally estimated costs for Stage I Phase A, of Rs 6.5 million, had to be revised to Rs 23.1 million. This was mainly due to inflation and the extra cost of canal bank protection amounting to Rs 400,000 provid-

A CHRONOLOGY OF COMMITTEES AND EXPERTS FINDINGS

In December, 1970 a feasibility report on the development of the canals in Ceylon for transport purposes was prepared by the Research and Development Division of the State Engineering Corporation. This investigation studied for development purposes only the Colombo Puttalam Canal, since this length of waterway had the highest cargo potential as compared to the other waterways in the country.

In September, 1972, the same Committee from the R & D Division of the State Engineering Corporation reported on the preliminary Stage I of the Colombo — Oruwala Canal, having investigated the economy of raw materials transport to the Steel Corporation from the Colombo harbour.

In October 1974 a Committee of representatives of various Ministries submitted an interim report on the development of the Colombo Puttalam Canal and other canals.

In September 1975, at a meeting chaired by the Secretary to the Ministry of Planning and Economic Affairs, to discuss the implementation of the Canal Development Programme it was decided to appoint a Committee consisting of the Director, Canal Development Division, Ministry of Housing and Construction and representatives of the Food Department and the Ministry of Planning to work out the details of the redevelopment of the sections of the Colombo Puttalam Canal upto Kochchikade. The Committee submitted its report in February, 1976.

In March, 1976, a team of four experts from the Netherlands carried out a study for the 1st phase of the Technical Co-operation on the re-development of the Colombo Puttalam Canal in Sri Lanka. A report "Technical Co-operation Phase I" was submitted in July 1976 to the government.

In January/February 1977 a Transport and Marketing Study on Phase I Stage I of the Colombo Puttalam Canal (Hendala — Kochchikade) was prepared by a Consulting Engineer, Hemal Peiris.

In September 1977 a team of consulting Engineers from the Netherlands submitted their second report on rehabilitation of the Colombo Puttalam Canal for Phase II Stage I of the Technical Co-operation.

Early in 1978, the Secretary to the Ministry of Local Government Housing and Construction appointed a six member committee under the Chairmanship of the Director Canal Development Division of the Ministry and representatives of the Ministry of Irrigation, Power and Highways, the Ministry of Plan Implementation, the Ministry of Transport, the Ministry of Finance and Planning and the Ministry of Local Government, Housing and Construction. This Committee which undertook an economic feasibility study of the Colombo Puttalam Canal Development Project reported in June 1978 that Stage I Phase A of the Colombo Puttalam Canal project (Hekkita to Pamunugama) should be completed according to its recommendations. Also studies on the potential for development of Stage I Phase B (Wattala to Colombo Harbour) Stage II (Kochchikade to Bangadeniya) and Stage III (Bangadeniya to Puttalam) of the Colombo Puttalam Canal Project should be carried out as early as possible.

In 1980 another Committee was appointed to report on the current feasibility of implementing this project.

In 1980 the Ministry of Local Government, Housing and Construction through its Canal Development Division requested the Directorate General of International Co-operation (DGIC) of the Netherlands Ministry of Foreign Affairs to provide transport economic advice with regard to the envisaged rehabilitation of the Colombo Puttalam Canal.

Two transport economists from the Netherlands Economic Institute therefore visited Sri Lanka for a period of about two weeks in mid May and submitted to the Canal Development Study Committee (which is continuing its sittings) its report in early June. These two consultants were firmly of the view that "from a national economic point of view, the re-development of the Colombo Puttalam Canal must be considered wholly unfeasible i.e. contrary to Sri Lanka's economic interest". Their view was that for transport economic reasons it would not be justifiable to rehabilitate the Colombo Puttalam Canal.

The Canal Feasibility Study Committee is in the meantime finalising its report and it is believed that the report of this Study Committee is not as pessimistic as that of the Dutch economists.

FOLK SONGS OF THE WATERWAYS

Sunil Sarath Perera

Down the ages, waterways have been in use for transportation in Sri Lanka. No doubt with the changes that occured in economic activities following the advent of the European colonizers, this mode of transportation gained even greater importance. But it appears, as folk and religious tradition would have it, that even before the arrival of the European colonial powers in this country, man-made waterways had been used to extend river transport. This tradition claims that 'Alagakkonara' (circa 1312 AD) built a canal connecting Kalu Ganga and the Panadura lagoon for the purpose of transportation, and also had a canal cut near a cemetery called Gorakane Bahinatota along the Panadura river.

Nevertheless it was the Dutch who developed and made maximum use of waterways or canals for transportation. When the British took over from the Dutch in 1796 there were hardly any trunk roads and most transportation were by waterway.

Sri Lanka has a rich store house of folk songs, and a good many are work songs and hence have acquired a definite occupational character and association. Among the more traditional of these are 'Nelum Kavi' (folk songs sung by groups of women while transplanting paddy) and 'Kamath Gee' (sung by men while threshing paddy). Many occupational folk songs in Sri Lanka were sung to relieve the monotony of toil. The peasant in his field watch-hut (Pala) sang folk songs and philosophising on life kept himself awake in the process; a graphite miner sang of his labours as he endlessly kept on turning the dabare (windlass) to manually hoist up from the pits, the bucket of extracted graphite etc. and the boatman sang to his mistress and maidens fair on his river journeys as he punted his barges or paru.

ඔ ගේ මම සියලී අස්තොත් සිතු ලෙසින
නුගේ ලඟ නාන තොටුපොල වෙත පැමිණ
ඇගේ රූ වරුණ මෙතෙකැයි නැත පමණ
නගේ නුඹ සිටින් මම එනකල් ඔතන

Oh you who stand bathing by the Nuga tree,
I cannot describe your beauty in words,
If you will listen I will tell you all about me,
So maiden, wait for me until I return.

සු ර ඔ කෙලෙන සුරගඟ තුල් තරඟ යෙනී
ක ළ ඔ නැගී යන සිද්ධවිද්දරන් මෙනී
කොළඹ විසල් වන්තල් පුත්තුරු වෙනී
න ර ඔ යනෙන වෙළඳුන් ඔරු පාර වෙනී

Behold the merchants travel to and fro
In their barges and boats at Wattala, Patturuwa and Colombo.
Like the Siddhas and Vidhadhares* who travel.
On the cloud-like waves made by the divine nymphs play in the rivers of the heavens.
(*Mythical characters).

This folk poem, which tradition dates to the Kotte era, suggests that the area covering Colombo, Wattala and Putturuwa (which may be the present Mattakuliya) were areas with heavy traffic in paruwas or boats.

In the waterways transportation technology "pahura" or barge was an important element. The word 'pahura' (the raft —(පහර) referred to a vessel used to transport loads of logs along the river) while the word 'paruwa' denotes a comparativsly larger vessel also used for journeys down the rivers. The origin of the word 'paruwa' can be traced back to the word 'pakuru' (පාකුරු) which in the Sinhala language, means 'floating. Over a period of time the word 'pakuru' changed to 'paruwa'. In the Sinhala literary work 'Hansa Sandeshaya' we come across the word 'paruwa' for the first time.

The 'paruwa' which contains a lot of space is built with safety in mind and provision to carry a large quantity of goods. Although it has a slow movement and was used in journeys that lasted a number of days, it carried a variety of goods such as tea, rubber, copra, graphite, arecanut, timber and other items that were to be brought to the Port of Colombo. It took back goods such as salt, bricks, tiles, pottery etc. that were needed in the villages. The journey down the river, that took long spells of time, required the 'paruwas' to be equipped with a roof or a canopy generally made out of cadjan to safeguard its occupants from the hot sun or the torrential rains. The preparation of food for the journey was done on the vessel itself, facilitated by a hearth set on it. Even today one could find elders in our villagers, who would fondly remember the tasty food like the rice and coconut sambol curry that was prepared on these 'paruwas' on their long journey down the river. There are several traditions that were associated with these meals, one such being that it was specially sought after by expectant mothers.

These journeys down the rivers on these vessels was mostly embarked upon during the nights. The barge men or paru-men had stop-overs at 'Ambalamas' (traditional rest-places) along their way. This folk song of the barge-men or Paru-kavi as they are customarily known gives evidence of this feature of the journeys.

හඳපානේ බඳ පානේ ගමන් යලී
ර වුණු කැනේ අම්බලමේ වාඩි වෙලී
අව පනමක පැණි අරගෙන බෙදු කලී
යාළු ඉනින් ඔරු පැද පැද ඉලන් කලී

Lets travel by moonlight
Lets stop over at an ambalama.
Lets share the eight pence worth of treacle
And then punt the barge chewing betel.

Social anthropologists consider traditional folk poems and songs as invaluable to understanding social attitudes of various societies and cultures. The paru kavi, which comprise a part of our traditional folk-song reportoire has much liveliness and meaning even to day because of some of its unique characteristics. Although these folk songs evolved in the context of a particular occupation, mobility of the boatmen and their not being restricted to a specific place or a geographical area (as in the case of 'pal-kavi') has given them very definite characteristics. For instance a wider variety can be noticed not only in the language used but also in the experiences related in these songs.

We observed earlier that barges or paruwas travelled mostly at night. While, the boatmen's folk songs, like the folk songs of the field watchmen (පැල්රකින්නා), may have helped them to keep awake, it also appears to have been functional by way of making known their movements to other barges and so avoid collisions in the dark.

Even though there appear to be occasions when the folk songs of the barge men reflect a sense of solitude; or work wearines, and had also been a mode of entertainment — these folk songs have also served the purpose of information media, during the hey day of waterway transportation.

For the mobility of the barges, meant also the facility to disseminate news over the terrain they traversed via the waterways. This folk song perhaps illustrates this.

ම ලේ මලේ තැඹිලිය වැන්න පොල්ම ලේ
ර ලේ රලේ මීදෙන් දමන දිය රලේ
බ ලේ බලේ රාසි දෙවියන්ගෙ බලේ
ග ලේ කොටුව බැන්දයි කිරිකුණා මලේ

Like the thambili from the thambili trees flower
Like the waves from the ocean
From the power of King Rajasinghe
Emerges a fortress at Trincomalee.

In the context of this role of paru kavi, it is perhaps appropriate to refer to the Kavi-Kolaya (traditional verse leaflet), an interesting element in Sinhala society and culture from the time that printing came to be known in Sri Lanka until the advent of the mass circulation newspaper. Once again it also performed some functions of information media. While 'Kavi Kola' had been composed about barges and waterways as they grew increasingly in importance, some of the may have had their origins as folk songs of the bargemen and vice versa. While it is not necessary to go into symbiotic relationships the two traditions may have had we reproduce a Kavi Kola which interestingly reflects social attitudes of the times on the social changes

that were occurring when the annonymous folk poet describes his journey on a barge from Colombo to Madampe.

ස කල සිරින් පිරි පතල කොළොම්පුර
නාගලගම් පාලමේ සිරින්
යැ දල පඩුරු සන්නානම් මව් හට
වික්ටෝරියා පාලමේ යවින්
යැ දල ඒ සිව් දෙන හබල් හතර ගෙන
කැළණි ගඟේ සැඩ පහර තදින්
හැ දල නැමැති ගමෙ දළුත් ඇලට වීත්
ලාදුරුවත්තට තුදුරු තැනින්

We start from the Nagalam bridge
Having made offerings to St. Anne
we pass under Victoria Bridge
Using four oars we row down Kelani Ganga

To enter the new canal at Laduruwatte.

දුරා අනිචු දන වසනා පියසකි
කම්මල් දෙගොඩ සූරා බොරින්
රසාදුරු නසිනම්බමෙන් පොල් අරගෙන
මඟුරු වලලන් බොරලැස්සට වන්
ගිතුරුවෙය දුන්ගාල් බලාගෙන
දුම්මලදෙනි වෙන්නප්පු ගමෙන්
සොදුරු ඒ ලුතුවිල එද රට බත් කෑ බුදියාවෙන්

We pass blacksmiths on both banks and see men taking liquor
Collecting coconuts at Nainamadama we come to Borelessa fair at Maguruwela.
Passing Dummaladeniya and Wennappuwa.
We stop at Lunuwila for the night.

උතු න් එරෝපය රටයිට ඇවිදින්
සුදු මහතුන් නැග යතර උදන්
කප න් නෙ කොහුපොල් පිරන යන්තරෙ
ලුතුවිල දෙගොඩේ තනා තිබෙන්
නිර න් තරේ පයිගන්ඩ දිවා රෑ
එගන්තුලේ තරුණියො පැටියොත්
බලන් ඩ හැකිවෙයි නෙත හැර කාටත්
සුදු දරුවෝ ටික කලක් ගියොත්

The White men from Europe work day and night
In the factories on the banks,
combing out fibre from coconut husks.
Young women work with them day and night to earn a wage
We will all be seeing white babies before long.

වෙහෙස වෙමින් කඹ ඇද ගොස් පාරුව
රේන්ද පොල දැන් මුදල් දෙමින්
කොස් අතු ඔයෙන් එන සැඩ පහරට
වෙහෙස වෙලා ඇද ඒගොඩට වන්
ඉස්සර සිව් පරසිදු වෙළඳම් පොළ
නාත්තන්ඩියත් බලා තුවින්
පිස්තර නෙක රටවල අඟනෝ වීත්
ඉරු දිනයේදී නෙක වෙළ දන්

We are tired pulling the barge up by rope and we pay the toll tax at the toll.
Struggling with the strong current from Koswatta Oya
We pass the famous bazaar at Nattandiya
Where women from many places sell their wares.

ආදන් කුල පව් පලදනී අපහට
මේ දුක් විඳිනට සුරිදු න්නේ
ඖදම් සේ කටුපිටි ඔය දැකලා
මව් දුන් රන්කිරි මතක් උනේ

ඔඟම් සිරිලා එන සැඩ පහරට
හෙන ඔඩ මෙන් ගුගු රන්නේ
මෑදම් සේ පාලමේ දෙගොඩ ඔරු
පාරු අඟලු බැඳලා තිබුනේ

Oh God, we suffer all this for the sin of Adam
When we pass the Katupitiya Oya at Madampe we think of the golden milk we had at our mother's breast.
And now as strong currents approach gurgling with the sound of thunder
The boats and barges are tied up on the banks of the Madampe bridge.

Most of the Sinhala folk songs that are known today are of four metres and indeed the Sinhala term for folk song — seupada literally means this. In Sandesa Kavis that were composed during the Kotte period this method of composition has mainly been in use. It was during the same period that paruwas as a means of transport increased in importance and paru kavi may have been influenced by this tradition. The four metre folk songs are sung in a variety of rhythms. Often the Paru Kavi were sung in a slow rhythm reflecting the gentle movement of the vessel on the waterways. Barges or paru are not totally associated with tiresome journeys transporting cargo. They also appear to have been used for pilgrimages and even for social events like weddings. There is for instance within living memory of some persons in Balapitiya, a wedding ceremony that had taken place on a barge or paru floating down Maduganga (මාඋගඟ) from Godagedara to Dickduwa. It can be dated possibly to the 1940's.. The journey had comprised about 10 barges including a Bangala Angula (බංගලා අඟල) This Bangala Angula was the barge on which the married couple travelled and it was colourfully decorated with beautiful workings of the traditional Magul-Maduwa style. The couple and some immediate relatives and a few other females have been made to sit on this barge in a circle of chairs.

In this marriage procession, the music party who provided musical entertainment travelled in a special paruwa. This music troupe had been providing entertainment with songs and music befitting the occasion along the entire journey. They have been singing the "gramaphone songs", of the period, accompanied by instruments like the tabla and serphina. The informants recollected this song among the many that were sung.

The relatives of the two parties have travelled on other 'Angulas' loaded with boxes and baskets full of sweetmeats.

The 'paruwa' has served the Sinhalese in their numerous journeys of pilgrimages. Even on these pilgrimages they never forgot the "Thunsarana Kavipotha", a book of taraditional religious poems or songs. It is possible that their experiences of taking pilgrims and listening to religious poetry had some influence on the paru kavi or bargemen's folk songs as is suggested by these songs.

මහියංගනේ එක එළියයි බන් නැහා
ඒ එළියට පියවර මං කඩ යේනා
වේරගංතොටේ ඔරු දෙක යස ඌනා
එක තුවරක උපදිමු රන්කුරු නැනා

Oh Cousin, by the sole light at Mahiyangana
I see my footpath.
Like the two boats at Weragantota
Let us be reborn in one city, oh golden cousin.

ඔන්න මලේ ඔය නාමල නෙලා වරෙන්
අත්ත බිඳෙයි පය බුරුලෙන් තබා වරෙන්
කැළණි ගඟේ ඔරු යනවා බලා වරෙන්
සාදුකාර දී ඔරුවට නැඟී වරෙන්

Now brother pick that Na flower,
Tread gently lest the branch breaks
Behold the boats plying on Kelani river
Cry Sadhu and climb the boat to depart.

In the southern province as noted elsewhere in this journal there had been a network of canals around Galle and Matara, linking with the Gin Ganga and Nilwala Ganga. Even today these are in use for the transportation of bricks and sand from Horakkoga to Matara by means of 'Paruwas'. It appears that recently, rice has been transported from Hiniduma on the 'paruwas' down the Gin Ganga and then along the canal to Mahamodera at Galle.

The paru kavi of the Matara region displays parochial themes and styles—

මතර ගඟේ ඉන්නා කිඹුලිගෙ පැටියා
තල්ල සුදු බෙල්ලේ ගෝමර කැටියා
යන එන ඔරු පාරු නවතාගෙන සිටියා
මිනී නොකයි මාතර කිඹුලිගෙ පැටියා

The baby crocodile in the Matara river
With a white pallete and beauty spots on the neck
He stops boats and barges plying on the river
This baby crocodile is no man-eater.

Pari Kavi of Matara area may have had some influenced of the literary renaissance of Matara and may be particularly of two well-known folk poets of the region, Gajamannona and Andare. This folk song suggests such literary influences.

ගී රුව බිමට කදු නොම සිටුවා මඟක
වාරුව ඇතුව දියයිට තැනූ ගෙයක් ඇත
මාරුව තැනින් තැන බඩු ගෙන ගමන් ඇත
පාරුව වැනි ගෙයක් මේ මුළු ලොවේ නැත

It is not a house that is grounded
Yet it is a strong house (on water)
Shifting from place to place with cargo
There is no house like the barge.

ed for this item in 1975. The extent of Canal Bank erosion that was likely to take place, after dredging operations and increased depth, brought about by faster speeds, had not been anticipated in the first instance. This expenditure was therefore, not foreseen in its full implications at the early stages. The Canal Development Division was now of the firm opinion that the entire length should be reinforced, on both banks of the canal sections, from Hekitta to Pamunugama and from Negombo to Kochchikade. The Committee emphasised that in by-gone days canal transport was manually operated. Hence, there was little consequent bank erosion through wave action. At the present moment, however, the mechanised nature of operating crafts, as well as the tendency for greater speeds (made possible by adequate depths of canal obtained through dredging operations), were eroding the canal banks. Therefore, suitable action needed to be taken to protect the canal banks.

This Committee too listed a range of other benefits that could accrue from this project. (See box below on this page).

Of the estimated Rs 23.1 million the balance work yet to be done was estimated at Rs 15.9 million. The Committee concluded that the "net cash inflow during the economic period of the project does not match the investment". For this purpose the economic period was taken at only 20 years. Its recommendation, however, was: "although the financial return on investment from transporting building materials and coconut products is marginal, the Committee recommends going ahead with the Stage I Phase A of the Project. Investment on redevelopment of the canal should be considered to be an infra-structural element, servicing: Transport, Drainage, Improved Irrigation due to better drainage, Tourism and the Development of the hinterland. Being an infra-structure element with a multi-purpose function it should not be expected that the financial result of *one* part, (viz. transport) of the activities will cover all cost of investment as well as all maintenance costs and the operation of the canal."

A strong criticism made subsequently by two foreign experts was that despite the fact that this committee arrived at negative results (i.e. initial investment could not be covered by future revenues over 20 years and this implied a negative rate of return) that it should have recommended that the canal be completed. It's reasons for completion of this project were for those other than economic—transport, such as improved possibilities of drainage and irrigation, tourism, development of the hinterland etc. This Committee may not have been able to quantify in money terms these other benefits but, the reasons were obvious. This will, however, remain a much disputed issue.

With over seven reports, covering economic and technical feasibility of this project, the Ministry decided to appoint another Canal Development Study Committee in July, 1980 to review the feasibility of this project. This was the sequel to a Government decision of March 1980 that a feasibility study based on 'current costs' be undertaken. Perhaps with fuel and other economic conditions constantly changing a periodical review of the situation seemed necessary. This six member Committee, however, started its sittings only in 1981 as it was expected that foreign expertise would join the committee in its sittings.

Meanwhile, at the invitation of the Ministry of Local Government, Housing and Construction two transport economists from the Netherlands visited Sri Lanka for about two weeks in mid May this year and they decided to submit their own report in June 1981. Their findings were based mainly on the numerous documents already available and they stated that in view of all the previous investigations only a short study would be sufficient to reach the desired results. Their main finding was that trying to promote canal transport at the cost of other transport modes (road and rail) would be uneconomical and inefficient. They were of the firm opinion that from a transport economic point of view rehabilitation of the Colombo-Puttalam canal is considered wholly unfeasible; and they recommended that all further efforts in this direction should be discontinued. Their report was submitted to the Canal Development Study Committee which is now finalising its own report. The outcome of this committee's deliberations are eagerly awaited and can decide the future of the entire project. The question as stated at the outset, is now that the canal system is already there; should we keep the system going, and if so on what scale. The answer may be found to an extent in the accompanying paper by John Diandas a well informed student of transport who has written several papers on waterways over the last decade and is also serving with the current Study Committee.

BENEFITS (OTHER THAN FOR GOODS TRANSPORT) FROM RE-DEVELOPMENT OF THE COLOMBO-PUTTALAM CANAL

Since the inauguration of the Project in August, 1975, not only has it provided employment to a large labour force, but the work has also brought about:—

(a) better drainage facilities,
(b) easier movement to fishing crafts,
(c) secure protection to the adjoining public road as a result of canal bank protection which in turn prevents the erosion of this road.
(d) increased tourist promotional activities in the canal.

In view of the widespread unemployment prevailing in the country at the moment it is useful to note that this project which is predominantly labour intensive will give steady employment for over 600 persons in the next 2 years.

With the canal being operational there will be a rapid development of the hinterland. Re-development of the canal will enhance the beauty and cleanliness of the area and will facilitate better drainage facilities, eliminate land erosion, and generally improve the quality of life in the hinterland.

As a result of the re-development of the canal better irrigation facilities will be provided for the Muthurajawela area.

There is also much scope for the introduction of passenger boats to ply on the lagoon and canal for recreational purposes. The General Manager of the Ranweli Tourist Hotel with whom the Committee had an opportunity to discuss this matter informed the Committee that his hotel is planning to operate a weekly boating trip from Ranweli to Colombo. This indicates that there is a considerable scope for developing the canal area and Negombo lagoon for pleasure transport purposes.

The C.T.B. has also indicated to the Canal Development Division that they are looking into the possibility of providing boat trips for tourists. Although this aspect of additional recreation to tourists has not been quantified, its importance in the background of the extra efforts of the Government to promote tourism cannot be overlooked.

SOURCE: *Report of the Committee appointed by the Secretary to the Ministry of Local Government Housing & Construction to undertake an economic feasibility Study of the Colombo — Puttalam Canal Development Project. June 1978.*

To have or not to have inland waterways

J. Diaudas FCA

1. One of the fundamental aspects of the first commercial growth of inland waterway transport was its association with energy constraints. Energy in pre-industrial Europe and America was supplied by man and animal, so that goods and people were hauled or carried by horses, mules and men. The fundamental thing about a waterway was that it enabled the same horse or man to move much heavier loads for the same effort.

2. A second, fascinating aspect of early commercial waterway transport was the conflict in the use of water between two of the catalysts of the industrial revolution, namely water-power and transport. Watermills were there first on every river, and their owners built local dams to impound and channelise the water to turn their primitive waterwheels. Their dams were impediments to river navigation. On the other hand the dams ensured upstream stretches of level water which was good for navigation.

3. The conflict was resolved by pound locks which enabled boats to pass the dams or weirs with the least "loss" of water for the miller. It became useful, other things being equal, for highway river crossings and factories to be located adjacent to the dams, locks and mills.

4. Thereafter river navigation and man-made canals proliferated, and industry too proliferated at waterside locations. The need to move goods uphill in one direction was also met by the lock which enabled downflowing water to raise the canal boats. So long as water was available from a higher elevation, even climbing was energy-free. All that was needed was a little push (or pull) from man or animal on the tow-path, or from poles pressed against the bed of the waterway, or from sails. The limit to speed was imposed by the ability of water to part at the boat's helm, and this was a function of the interaction of energy applied, boat shape size and load, and the waterway's draught and width. In practice speeds of 2 to 3 miles per hour were general, but with teamed horses even 12 mph was achievable for special cargo or for passenger boats.

5. An important aspect was that the goods moved were not, as and for themselves, in a hurry. Such cargo tended to wait long periods at source, or at destination, and the time duration of the journey was of little consequence. Until the advent of steam railways, from 1825 onwards, there were no faster practical means of transporting goods.

6. However, even in the days of air-cargo, 70 mph freight trains, and door-to-door lorry service, waterways still retain from 15% to 25% of inland transport in most of the big industrial countries. The technology has progressed. Diesel Push-tugs propel upto 15 barges lashed rigidly together, with payloads upto 15,000 tons. Radar is employed at night. Radio connects vessels to headquarters. Containers reduce the dwell-time of barges at inland ports.

7. Even so 80% of European firms engaged in water transport were one-boat-owner-operators and 14% of the vessels had capacities of less than 250 tons. Thus in Europe, inland waterway transport holds its share of inland freight over a considerable range of goods, boat-size, and length of haul. Typically in Netherlands, international traffic moves an average of 100 miles by waterway, and internal traffic, mostly building materials, move typically between 10 and 40 miles.

8. Modern 50-ton multi-axle highway trucks, moving over autobahns and motorways have made considerable inroads into freight that formerly moved by rail or water, yet water holds its present share of the market. Recent studies by OECD (Organisation for Economic Co-operation and Development) and ECMT (European Conference of Ministers of Transport) have shown that the biggest factor in choosing the water-way mode is not cheapness or energy-thrift or length of haul, but location of origin and/or destination of goods alongside the waterway. In fact, modern industry and warehousing tends to locate abreast of water, rail and road so as to provide future flexibility as to choice of transport mode for raw materials and finished goods Moreover, most seaports are at river estuaries, and hence by definition are alongside inland waterways.

9. The significant European country where waterways have all but closed down, as in Sri Lanka, is Great Britain, where the canal mania of the 1790's led to proliferation of marginal, ill-planned, unstandardised waterways which could not stand the competition of the early railways, let alone the highways and motorways of the present era. The factors weighing against waterways in England included carrying 30 tons or less, differing size constrictions (length, width and draught) from one canal to the next, lack of co-ordination between owners of adjoining canals, and insufficiency of water supplies to keep the upper reaches navigable. However, just now there is a vigorous program to revive and expand the surviving waterways, especially those connecting the River Humber to the big industrial areas centering on Leeds and Sheffield.

10. This rather international introduction serves as a useful background to a discussion of inland waterways in Sri Lanka because many of the attributes are similar. In this discussion the term 'inland waterway' is preferred to 'canal' even though rivers do not play a big role in Lanka.

11. In fact the 82 miles of the climb-free Colombo-Puttalam waterway is only half canal, being made up of lagoons and rivers with short links of pure man-made canals:

Sections	Mls
6 stretches of canal	46
4 lengths of lagoon	20
Gin & Lunu Oyas	13
Kelani River	3
Total	82

12. The somewhat derelict Sri Lanka West coast inland waterways in fact consist of three connected but different infrastructure systems namely:

    Colombo-Puttalam waterway
    Colombo-Bentara waterway
    Port-Beira-interconnecting system.

13. The Colombo internal system of waterways is in some senses a mere extension of the harbour to the warehouses situated around the two Beiras. Each of the warehouses has access from the road on one side and a Beira wharf on the other. This system also has two large basins for direct interchange from lighter to railway freight wagon or vice versa. At San Sebastian lock the Beiras are connected to the San Sebastian canal. Thus this system, though underused today has the potential to relieve the city of Colombo of much congestion arising from lorry trips between harbour and warehouses, between harbour and railway, and between warehouse and warehouse.

14. The San Sebastian Canal joins the Kelani River 3 miles away, and near Orugodawatta joins the net work of local canals to Kolonnawa, Kotte, Wellawatte, Dehiwala, and the long waterway south to Bentara which, like that to Puttalam consists partly of cut canals and partly of natural waterways.

15. The basic advantages of inland waterway transport, some of which have already been mentioned in the introductory paragraphs, and which will be discussed below, are:—

    . 1 Much less energy required than other modes for the same load.

    . 2 Keeps traffic off congested roads (by grade separation)

    . 3 Freedom from serious accidents.

. 4 Smooth travel with low damage risk in movement.

. 5 Low maintenance cost of the vessel and the waterway.

. 6 Multipurposeful (transport, drainage, water-supply, fish etc.)

. 7 Enhance environmental quality.

16. The corresponding disadvantages include:-

. 8 Probable need for transhandling at one end of the water journey.

. 9 Slowness of the journey and consequent high crew cost.

.10 Loss of control of the cargo by the consignor or consignee.

.11 Consequent higher risk of deterioration or pilfarage of the goods.

.12 Unavailability of the barge for sundry tasks en route or on return.

17. Energy: a typical 5-ton lorry should obtain an average 13½ miles per gallon of diesel laden with a five ton payload one-way and returning empty. But the canal barge, with a 25 ton pay-load one way and returning empty, should perform 20 miles per gallon of diesel-oil in its outboard motor. One and a half times the mileage is obtained with five times the load, giving a factor of 7½ advantage. Thus 25 tons of copra moving from Chilaw to the BCC canal-side warehouses at Hulftsdorf would need 5 gallons of diesel for the 100 miles round trip by barge and 37 gallons for five lorries doing the same round trip. At Rs 27/- per gallon the energy cost would be Rs 135/- by barge but Rs 1000/- by lorry. For a feeder lorry trip of five to ten miles from a copra mill to the canal at Chilaw the energy cost, and all other costs, would be the same as for the extra mileage of the main haul lorry running direct from copra mill to BCC. Hence, the economic issue is whether the energy saving of 32 gallons and Rs 865/- per 25 tons of copra (1.3 gal/ton and Rs 35/ton) together with any other savings and benefits of water transport will cover the transhandling cost at Chilaw and the higher labour cost due to the slowness of the barge's journey. For an annual movement of 10,000 tons covering an average 40 miles the energy saving would be about 10,000 gallons, which at Rs 27/- amounts to Rs 270,000/-.

18. To deal straightaway with transhandling at the canal bank, whether at Chilaw or Nattandiya or Lunuwila or Kochchikade, at a piece-work rate of Rs 10/- per ton (Rs 50/- per lorry-load) the annual cost would be Rs 100,000/-. If however continuous monthly or daily paid labour could be used, and NERD (Sri Lanka's National Engineering Research and Development Centre) could devise unsophisticated hoists, or chutes or other transhandling devices, this cost should be reducible to a half or a third.

19. Where vehicle crews are concerned, assuming daylight navigation only, a barge round-trip at 4 mph giving allowance for locks and other delays, and for loading and unloading, will require 5, 4 or 3 days for 50, 40 or 30 miles. Taking four days, and a crew of two, each 25 tons of copra will employ 8 man-days of 12 hours on the barge and at least two more man-days for the feeder trips. By comparison 5 lorries performing one round-trip per day for the whole journey will employ 10 man-days of eight hours. In this case of copra, the extra manpower cost consists of the longer day, amounting to 10 half-days or 5 man-days which at say Rs 50/- per day comes to Rs 250/- or Rs 10/- per ton. For 10,000 tons per year this extra employment generation and consequent distribution to labour amounts to another Rs 100,000/-.

20. Hence, looking only at energy and labour, and looking at copra, the energy saving of Rs. 270,000 more than pays for the extra labour of both the journey (Rs 100,000) and the handling (Rs 100,000/-). If, however, one were to look at heavier or denser cargo, such as cement, or bricks, where the lorry carries 10 tons of cargo, the barge energy saving is less at .008 gal/ton-mile as against .013 gal/ton-mile for copra (i.e. a factor of 5 instead of 7½) and the extra crew labour is considerably more.

21. Reverting to advantages of water transport, a recent survey at Kochchikade showed about 1000 lorries per day were plying in each direction over the Maha Oya bridge. For a highway which has a capacity of over 500 lorries (or 1500 cars) per hour per direction this is not a big number. Yet if half the lorries could be removed by transfer of their cargo to water transport, (or with equal effect to the railway) it could relieve some congestion at bottlenecks like Victoria Bridge and Divulgas Junction, not to speak of early morning lorry queues outside BCC near the Ferry Street-Sangaraja Mawatha Junction.

22. Whether the removal of 1000 lorry trips per day (500 in each direction) on the stretch between Negombo and Colombo would help to materially reduce risk of accident is a matter for statisticians to work out. Based on per-mile statistics - lorries are less accident-prone than cars, but with lorries the damage to life or property per accident is likely to be greater.

23. The damage caused to the highway by the passage of lorries, in conjunction with rain and weather induced damage, is the subject of much world-wide controversy. Generally it is thought that on roads built to adequate design-standards, the damage effect, and hence the repair and maintenance cost, is a function of the fourth power of the load on the axle. Thus a recent study by the US Federal Highway Administration shows that a lorry axle carrying 10 tons causes 7,550 tons as much damage as a motor-car axle carrying one ton. On the Puttalam road most lorry axles carry between 4 and 8 tons. Even so the damage they cause, along with that of a much lesser number of buses, on a reputedly under-designed and inadequately constructed road, would probably cause very much more damage than that caused by motor-cars. In fact the great bulk of the annual maintenance cost would be lorry-induced. At an estimated cost of -/15 cents per axle-mile, 1000 lorries per day (500 in each direction) over 25 miles from Maha Oya to Colombo would cause Rs 7,500 worth of damage per day or Rs. 2 million per year on this stretch.

24. By comparison the damage to the waterway caused by the passage of boats is nil in lagoons and rivers and minimal in canals provided the speed is appropriate to the design of the canal banks. However, bank damage and maintenance cost rises in proportion to the square of speed. Thus a diesel powered boat moving at 4 mph causes wave action on the banks four times as powerful as that caused by manually propelled boats at 2 mph. The 4 mph boat has been estimated to need -/10 cents worth of bank maintenance per barge-mile, which works out to 0.8 cents per payload-ton-mile as against 8 cents highway damage by lorries. However, fishing boats travelling unrestricted at 5 mph — 6 mph can cause bank damage which may be difficult to recover from them.

25. As with the maintenance of the way, so with maintenance of the vehicle, the smooth movement of the barge through water compared to the uneven movement of lorry on variable quality highway surfaces, and of the lorry wheels and all the associated moving parts, leads to very different costs. Barge maintenance has been estimated at 16 cents/ton-mile against a range from 44 cents to 88 cents for lorry.

26. Summing up all the cost factors, after taking account of feeder lorries to the canal, for every 10,000 tons of copra transferred from road to water over an average distance of 40 miles, the net annual savings to the national economy would be in the following order of magnitude:-

Gallons of diesel oil		10,000
Value of diesel saving	Rs	270,000
Other resource saving	Rs	370.000
Total resource saving	Rs	640,000
less extra labour cost	Rs	(120,000)
net saving	Rs	520,000

27. If man-propelled barges were used, the resource cost saving would be 12% greater, but extra labour would cost nearly three times as much, leaving a net saving of about Rs 360,000/-.

28. At this point it is relevant to ask whether similar savings could not be achieved by the railway. After all the railway is there. It is reputed to be underutilised not only in regard to trains per day per section of track and use of yards and sidings, but also, nowdays, in regard to wagons. Furthermore railways, like waterways, are inherently thrifty in energy, maintenance and depreciation because of the smooth movement of steel wheels on steel rails. Trains are also man-power thrifty in that a crew of 3 or 4 can move several hundred tons of cargo. Finally, railways relieve highways of congestion, accidents and air pollution. It is true the railway does not have an unloading point at the BCC or any other coconut oil mill, nor alongside loading potential for Palavi salt. But it does have direct feed from the Puttalam Cement Factory's packing plant conveyors, and a cement warehouse inside Maradana yard.

29. If one could extrapolate from the copra example and guesstimate that intensive canal transport could save resources to the tune of say Rs 5 million yearly, and that this would necessitate an investment in rehabilitation of over Rs 100 million, then would not a like modal transfer from road to rail save like resources with no investment need at all. The sensible answer is that the railway ought to take on all that it can, that even a lesser saving in the order of Rs 2 million is worthwhile capturing, and that investigation is needed of why so much cement travels from Palavi to Colombo at a road cost of Rs 4/- to Rs 6/- per bag in the face of a quoted railway rate of only Rs 1/50.

30. This fact of life leads on to inquiry as to what non-cost factors inhibit cement from moving cheaply by rail, and whether similar factors would inhibit cement, or copra, or bricks or any other commodity from moving by canal.

31. But before discussing these inhibitors, one should also look at the non-transport advantages and functions of canals. In urban areas rain water drainage is an important function, so much so that most of the Colombo canal network ought to be dredged and bank-protected for reasons of drainage and civic amenity without regard to transport. Moreover, urban canals can be useful suppliers of non-potable industrial water supply. In some countries urban canals serve as sources of water to fire brigades. Canals with their tow-paths also serve as linear parks. All waterways serve as fishing grounds. In Negombo and Hendala-Uswetikeiyawa the recently rehabilitated canal serves as a way home for fishermen and parking space for their boats.

32. That it is difficult to quantify the value of all these uses and benefits is no reason to ignore them when considering the return on investment for rehabilitation.

33. Calculating the return on investment is indeed fraught with difficulties because any computation is extremely sensitive to variation in many of the assumptions that have to be made for such unknowns as cost of barge operation, actual energy consumption of barges, trains and lorries, future costs of barges and many other factors.

34. For example two Dutch transport economists who reported recently were unfortunate in picking on two less suitable commodities, bricks and cement, both of which have neither origin nor destination at waterside, compounded it by obtaining outdated size and weight of local bricks; and came up with an adverse set of figures which fortified their own native conception that barges as small as 25 ton payload over short distances cannot be economic. They furthermore drew on international experience as to equality of energy-intensiveness between rail and water which is valid for 12 mph barges but not for 4 mph barges as proposed in Lanka.

35. However a complete examination of all possible cargos for inland water transport, including bricks, tiles, clay, sand, coconuts, copra, fibre, dessicated coconut, cement and salt can produce varying degrees of economic advantage and disadvantage for each one depending on the assumptions made.

36. Morover, even if an undoubted economic transport advantage could be proved, to which should be added some value for non-transport benefits, it does not follow that cargo will rush to waterside as soon as the boats are afloat.

37. At present cement, salt, bricks and tiles are sold at place of manufacture to lorries which come to collect a lorryload. Why should the manufacturers bother how they are transported? Even if they could get a higher price in Colombo, more than sufficient to cover the cost of water transport, will they take on added problems when all of them have enough problems inside their own premises. At present coconut oil mills, and fibre and DC exporters pay for produce delivered to their warehouses. Will they take on a transport problem external to their gates for the sake of a few rupees extra margin per ton? They too have management problems enough within their doors.

38. Who should own and operate the boats? If a large transport company (whether state or private), there will be extreme difficulty in managing boats and crews far in distance and time from base and in agreeing on overtime and subsistence rates for crews. If operation is by one-boat-owner-operators, working for negotiated tariffs or even acting as traders buying and selling the goods they transport, who will finance the vessels and the cargoes, and which boat-owner will idle in times (as in Europe in recent decades), when excess capacity competes for declining volumes of cargo. These are some of institutional and operating problems for which easy answers are not available, and which will reinforce inertia in the existing patterns of trade in the relevant cargos.

39. Although clear cut overall advantages may be difficult to prove to the market, if not to economists and planners, there is a future for the existing waterways (and even for extensions through the lagoon systems to Galle and Matara) which will become more apparent as the real price of oil tends to increase with dimunition of world-wide supplies of this finite commodity. A decision to release monies for rehabilitation needs considerable foresight and faith. Yet in purely resource terms the investment is largely in employment of unskilled labour to dredge the bed, obtain and crush rock and reconstruct bank and tow path.

40. This need not be a once and for all massive short term project, but could be gradually done over the years with available local resources, with the proviso that transport benefits do not accrue mile by mile, but only when the Colombo sections are made navigable and specific origins, such as Waikkal or Nattandiya are reached. Certainly the investment already made on original construction, and recently on rehabilitation from Hekitta to Negombo cannot be put to use unless, at a minimum, the section to the Maha Oya is made navigable.

41. Finally, if present acclaimed difficulties force postponement, as it has to the Mahaweli Railway, it is of fundamental importance that the right-of-way of all the canal sections and their branches is legally protected from encroachment. Better would be to allow reasonable annual sums for maintenance of what has already been done and for slow steady progress into Colombo and northward toward Chilaw, so that something will be available when the real energy crunch comes.