

MULTI - FUNCTIONAL ROLE OF THE URBAN WATERWAYS : A CASE STUDY OF KOLKATA

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Introduction

In India, the prospect of a rapid industrial growth has brought into focus the urgent task of planned Urbanisation at an unprecedented scale. In the next 20/25 years about 60 million families will settle in newly urbanized areas.

The cost of this urbanization must be low so that it is sustainable. It must be low energy consuming, low carbon emitting, eco - friendly and environmentally much superior to the present metropolitan cities and smaller towns.

Management of water is a crucial factor in new urbanisation. Water resources must be used most prudently and supply and disposal of a very large volume of water must be planned properly with the environmental goals in view.

In this context, it is necessary to examine the possible roles of the water bodies – the rivers, the canals, the lakes, the ponds and the wetlands in and around the urbanisable areas.

This paper proposes a multifunctional role for the canals in such areas with reference to Kolkata,-a mega city of 14 million inhabitants on the Ganga approximately 130 Km up stream from the bay of Bengal.

Multi - functional role of the Canals.

In an urban setting where the land is mostly built up, any waterbody presents a pleasant contrast. A canal is a linear waterbody with flowing water. To the urban designers, it offers many opportunities. The canal banks can be landscaped with greenery, walkways, kiosks and resting places under the tree. The canals can make way for delightful intrusion of nature into the core of the city. It can also offer opportunities for boating, sailing, sightseeing and anchoring luxury yachts. In extreme cold, a canal can convert itself to an idyllic ice skating rink. For a canal, in a fully developed urban area in a high income country with advanced infrastructural facilities, this will perhaps be the best role.

But in the setting of an underdeveloped urban area which is undergoing rapid development both in terms of expansion and qualitative transformation, a planner cannot neglect the tremendous scope of utilizing waterways for various other purposes.

For a city, supplying and disposing off a very large volume of water are primary requirements. Canals can be used for both the functions.

Many industries need a big quantity of water and many river banks have been spoilt to satisfy this need of the industries.

The canals can lure them away to a planned location leaving the river banks for better uses. Supplying water for firefighting can be taken up by the canals saving the cost of laying expensive hydrants. Lifting ground water indiscriminately without recharging for piped water supply has been proved to be disastrous. Where a river or lake is the principal source, canals can carry water to the planned locations of waterworks. It saves the cost of lifting water as well as the geo-morphological balance. Cost of water-supply should also thus be reduced substantially, if it is planned properly. Braithwaite ('76) had observed that 'it is so expensive to construct new water pipes and storm water sewers that the canal is a valuable capital asset which should be used as much as possible'.(1)

The canals are more readily recognized as useful tools of disposing off water.

Most of the precipitation and approximately 80% of the supplied water are to be disposed off in a city. Rainwater harvesting is now compulsory for large scale developments. All others are also encouraged to do so. In spite of these steps, the precipitations which cannot be harvested and the sullage forms a very big quantity indeed. Canals are traditionally the final outfall of the drainage system in Kolkata area and these could be considered for the same job in new areas under planned urbanization. Canals offer a much cheaper substitute than the gigantic drainage pipes. It is not only the drainage but also the holding and storing of the water that makes the canals far more useful. Where the drainage depended upon the canals that are now blocked due to faulty planning, silting up and continuous large scale misuse, the streets have to bear the brunt during the heavy downpours. This is a lesson that is learned the hard way in Kolkata.

The canals are also natural barriers to movement. One has to cross over by a bridge or pass under it in a tunnel. This gives a feeling of separation and as a tool for enclosures. In a metropolitan city, where development tends to merge together, the canals can be used for separation. Separation of neighborhoods, of municipal boroughs, and of land-use zones can be achieved by skillful use of these water bodies.

Among so many functions that a canal or rather a network of canals can be planned for in a growing and developing metropolitan city, perhaps the most useful task that can be taken over by this network is that of the transportation of freight and to a lesser degree of passengers.

It is well known that water transport is cheaper. A litre of fuel can transport by waterways 4 times the tonnage that can be carried by road though at a lesser speed over the same distance. A study in U.S. in 1972 showed that a gallon of fuel can achieve 250 tonne mile by waterways while it was only 58 by roads. (2)

Obviously, more time means more cost as it involves human labour. Braithwaite ('76) had worked out a little sum putting a value to this labour cost and it turned out that transportation by water was more expensive. However, the sum works out in favor of water transport where labour cost is much less as in India.

It may also be pointed out that to achieve the speed on road, considerable capital outlay is necessary to ensure smooth flow of traffic without which the congestion creates a snarl that

reduces the advantage that roadways have over the canals. With motorized boats and properly designed vessels, the speed on waterways can not be so bad to be out of competition.

The one advantage the roadways will always have over the waterways is obviously the door-to-door transportation that only the former can offer. However, neither for passenger transport not for the freight, the door-to-door movement is possible excepting only by private car and in rare cases by containers.

Nevertheless, in this present era when carbon emission is threatening the Earth and when the consumption of energy in every form has become a central issue for sustainable development, one just cannot afford to neglect this energy-saving form of transport in planning our new urban centers. It may be mentioned that the automobiles are responsible for a major portion of the total carbon emission. For example, 75% of CO₂ emission in 2003 in Australia was from road transport.

Role of waterways as a transportation network

Once it is accepted that the waterways offer an opportunity to transport people and goods at a lesser cost, consuming lesser energy, emitting lesser carbon and contributing to a better environment, it becomes imperative to examine analytically the specific function that can be assigned to it. A 'modal split' is required to assign the most suitable form of traffic to a network of waterways. Lesser speed rules out passenger transport in a general way. As it is not only the cost of the labour to operate it but also the time i.e. the cost for each and every passenger that ought to be counted.

In certain cases, for instance, in a ferry crossing over a river or a bay, the time involved may be actually lesser than that needed for a journey by car or bus through congested bridges and roads. It is also suitable for leisure-time travel for tourism or entertainment.

Water transportation in metropolitan urban areas, is particularly suitable for movement of freight. This freight again, should ideally be voluminous and bulky that requires to be moved from one specific point to another. It is seen that the cargo, mainly carried by waterways, comprise traditionally the agricultural products, the construction materials and the mineral products, including industrial raw materials. Industrial products may also be included by modernisation of the system.

The network of waterways must therefore be DESIGNED to carry the goods traffic besides performing other functions i.e. broadly the supply, storage and drainage of water, within an overall policy framework for environmental improvement.

Designing the waterways

If the waterways are planned to carry the goods, identified broadly, one must find out first where these goods originate and where these are required to go.

It is important that these 'ORIGINS' & 'DESTINATIONS' are linked directly by the waterways, if these have to be commercially successful and consequently, economically viable.

For the traditional freight on waterways, as already identified, these Origins and Destinations are mainly the Ports, the Railway Yards, the Truck Terminus, the Wholesale Markets and the Industrial centers. The newly developing areas, where large scale constructions are going on, are also

desirable destinations. In any given case, the existing waterways are to be examined to find out the linkages required in the context of an overall transportation plan for the Metropolis.

It is also important to identify the possible nodal points where inter-modal transfers can be arranged. These multi-modal transport interchanges require to be connected and served by Railways, Arterial Roads and Canals. These should also have enough space to contain warehouses, and vast open air storage areas including a part for the containers.

The containers, incidentally, open up vast possibilities for inland water transport. Tug – boats to be moved by motorised pilot vessels should carry the containers, - may be singularly or in a convoy. The concept of floating containers also holds a lot of promises. Inland Container Depot have already been proposed by Kolkata port authorities .

This system is likely to attract the kind of freight, e.g. the industrial products of sophisticated variety, - which so far remained beyond the Scope of water transport.

This brings up the crucial question of standardisation of the vessels as well as the terminal facilities besides the design requirements of the canals proper.

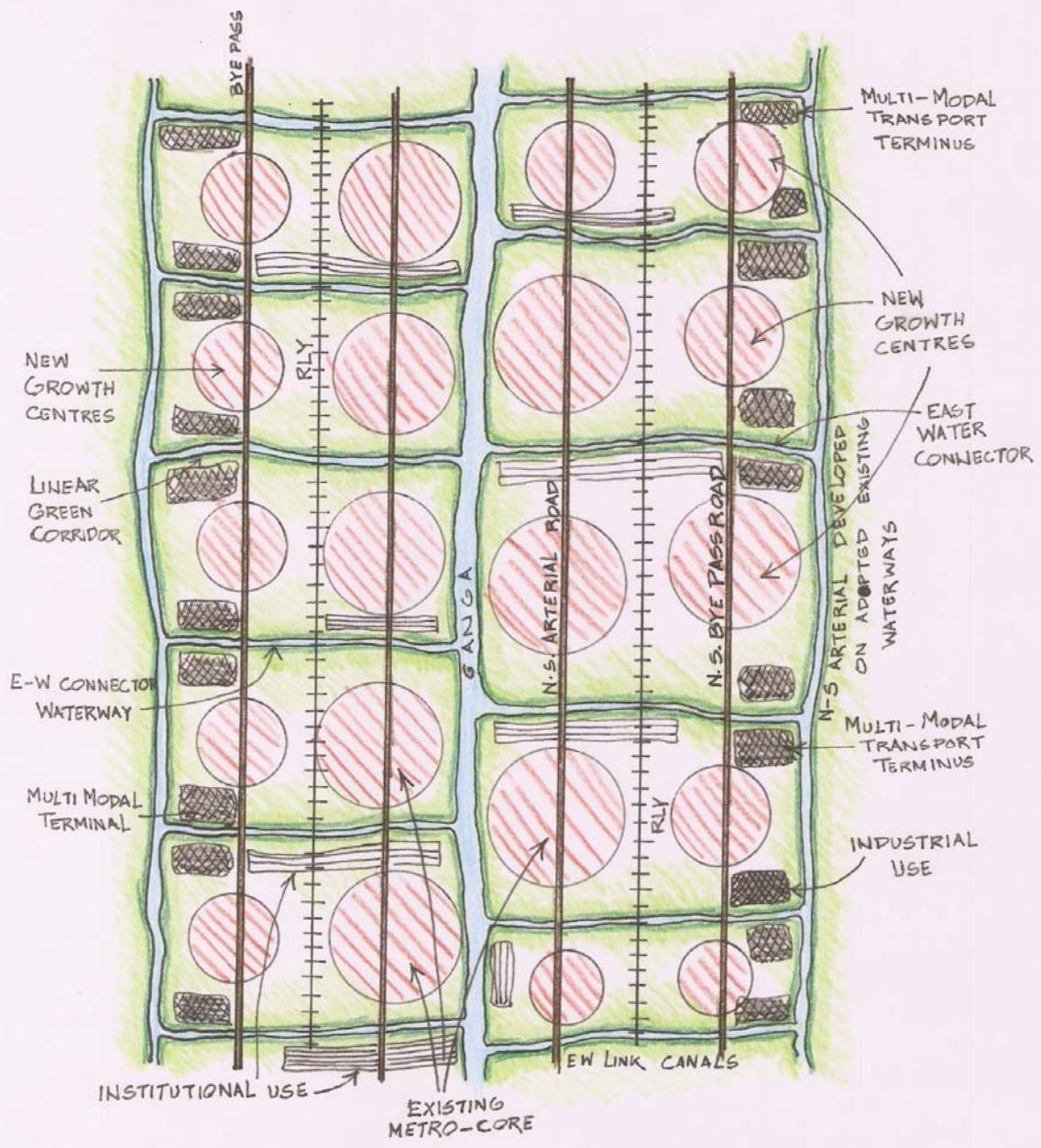
Inland water transport has suffered a big loss due to nonstandardisation. All kinds of vessels, - ranging from country boats, some still manually operated and some fitted with engine in a crude manner, - to an assortment of barges, steamers, launches and even hovercrafts and catamarans, can be seen operating in the Ganges alongside Kolkata.

The costs of transfer as well as the turn around time needed are unnecessarily high offsetting a large part of the benefit.

The design of the vehicles will obviously depend upon the design of the canals and vice versa. 6 types of vessels were identified for such standardisation. Two of these were chosen for priority R & D. The first type was a modernized country boat and the second was a flotilla to carry dry and bulk cargo and containers. (3) A study shows that a draught of minimum 2 meters in the canals is necessary to make them navigable enough to support a water transport system.(4) So these should be dug at last up to a level 2.5 meter below the lowest low water level in the Ganga. The width of the existing canals cannot be increased but these are usually 10 M or more which will be an acceptable width for the new ones.

There should be a minimum number of lock gates but these are unavoidable at the meeting points with the river where tide makes a considerable difference in the water level.

The bridges, similarly, should leave enough clearances for the boats to pass under.



SCHEMATIC DIAGRAM FOR PROPOSED WATERWAY NETWORK

The urban form of Kolkata Metropolitan District

The Kolkata Metropolitan District is not an administrative unit. It is a planning unit identified in 1960-s at the beginning of metropolitan planning. It comprises 3 Municipal Corporation, 34 Municipalities and a large number of smaller local authorities with a large semi rural and semi - urban area. Popularly, this is the Greater Kolkata.

Planning for development of waterways at this level is most pertinent as it can be considered as an integral part of a Metropolitan Transportation Plan. Only at this level, the waterways can give a direction to metropolitan growth and correspond with the planned land use.

The waterways network should also be consistent with and contribute to the urban form as it is visualised and planned for.

The Kolkata Metropolitan District is stretched along the Ganga on her both sides covering more than 80 kilometers of the river bank. Interestingly it is the water transport which has been the determining factor for the metropolitan growth. The European merchants established their bases along this river bank obviously to take advantage of the water transport for their trades. The Portuguese, The French, The Dutch, The Danes – were all there and they had their bases on the western bank. Only English had a base in the eastern side, in three villages with flourishing cotton yarn trade, which grew up gradually to be the Kolkata Metropolitan City.

Over the centuries, this resulted in a very interesting urban form which is basically linear with the urban centers strung along the river bank in the form of a necklace, Kolkata being the dominant pendant. This is a very desirable form as it combines advantages of the small towns as well as those of a metropolis.

Fortunately, later, the roads and the railways strengthened this '**String of Beads**' urban form and recently the underground railways also has followed the form.

The system of the waterways to fit

The network of waterways should be planned, therefore, in harmony with and in strengthening of this unique organic urban form derived largely from the great waterway of the River Ganga, which forms the spine of the urban structure. The waterways system that fits in with the urban form will obviously also have strong linear components.

The central spine i.e. the river needs to be dredged, maintained and equipped with jetties. The necessary infrastructure should also be built for both passenger and cargo traffic. The river is suitable for both ferries across as well as long distance high speed passenger transport. These already exist but much improvement is desirable. The river which stretches basically in a North – South direction, should have a number of East – West branches ideally running between two municipal areas. These branches should again be connected by a long arterial Waterway stretching North South at the edge of the Metropolitan District. On deciding about the most desirable form of the waterways system for Kolkata Metropolitan District, one can proceed with a clear idea about the multifunctional role of the waterways to examine the existing system in regard to their present conditions and future possibility in the context of an integrated plan. It is necessary

also to identify the steps to be taken to make the waterways suitable for the designated role. The requirement of excavating new canals, mainly links, is also to be identified. This is a theoretical framework which can suit the multiple functions of the waterways. To recall, these are drainage, supply of water to industrial sectors and for various civic purposes, forming the core of linear parkways, acting upon the micro – climate and most importantly, transportation of goods and passengers. Again to be effective, the waterways must connect the origins & destinations of the goods traffic and provide for a number of multi – modal transport interchanges.

It is important to note that this part of the Ganga has been declared to be National waterway No. 1. And a national waterway can work just like a National Highway if it is connected with the regional and sub – regional network of waterways. Kolkata urban waterways would be a part of such network.

It can be added also that such water ways connected directly with the Holy Ganga may save a lot of journey for the pious people who have to perform many rituals on the bank of the Ganga beginning with the ritual bathing to immersion of the deities and of course cremation and performing the last rites.

The existing Kolkata scenario

K.M.D.(Kolkata Metropolitan District) is well endowed with a large network of waterways, most of them are natural. The total length is approximately 1150 miles i.e. 1840 kilometers. This includes 47 kilometers of excavated canals. The eastern bank, where the city of Kolkata is situated, slopes towards east .

The central spine of this network is the River Ganga or the Ganges as it is known around the world. In the north end of KMD, the river trifurcated with a western branch called the Saraswati and an eastern branch called the Yamuna. The Saraswati was a mighty course which again met with the central stream far south near the present southern end of KMD. The eastern branch, was joined by a few tributaries and joined with the Vidyadhari which connected with the Sundarban system and provided a very popular trade route. A number of canals, both natural and man made, collectively called 'The Circular and the Eastern Canals' are still used as the main outfalls of the city but their use as trade routes have almost ceased.

Unfortunately, both the Saraswati and the Yamuna have turned into dry channels today making way for agriculture and settlements in many stretches.

Anyway, townships of various sizes grew on both sides of the river following the settling up of factories along the river bank. The railways, very rationally, were laid connecting these townships and simultaneously arterial roads between the riverbank and the railways were built putting the final seal on the emerging urban form in the shape of a '**STRING – OF – BEADS**'. Much later highways were built running further east and west of the railways where the townships started expanding. This area still holds the best possibility of accommodating another 2 million people which, in spite of the best efforts to control, is going to be added in near future to Greater Kolkata's population of more than 14 million today.

The eastern branch the Yamuna, can hardly be traced today. But there is another water course which almost follows the eastern limit of KMD known as 'Nowai khal' (khal = canal) continues to survive and on its way south is joined by the Bagzola canal which flows close through the new township of Rajarhat and the Kristopur canal which runs along the north & eastern boundary of the

earlier new town of BIDHAN NAGAR developed by reclaiming a part of the Salt Lake. Further south there is the great wetlands which is a RAMSAR site which supports a unique eco-system with sewerage – fed fisheries and agriculture. The Bhangar Khal is at the south of these wetlands. It has a healthy flow of dirty water ultimately meeting the Vidyadhari system which is also joined by the Nowai Khal.

There is an old channel of the Ganga, which was excavated and renovated in 1777 by a British Gentleman Mr. Tolly for collecting tolls from the boats. He excavated a new branch of the old channel to meet with the Vidyadhari river which provided a very popular trade route from the Sunderbans. Mr. Tolly made a huge profit after meeting all the expenditures.

On the western bank also, there are a number of east west channels connecting with the Ganges. Apart from the saraswati, mentioned earlier, there is also the Kunti river flowing in a N-S direction.

It is interesting to note that origin and development of Kolkata is intricately related with the excavation of the canals as the first thing that the English did on purchasing three villages from the Nawab was to excavate a canal along the eastern boundary to protect against the armed intrusions and possible invasions. This canal has long been filled up to form one of the major arterial roads of the city. This has also created undesirable precedents as there is a strong lobby for filling up the canals and building wide roads there to clear the stench & the squalor and to solve the problem of maintenance of canals forever. This will be like, of course, cutting off an artery to solve the problem of cholesterol blocking the blood circulation.

The Proposed Plan

The schematic plan is therefore based on the two the North- South arterial waterways, one on each bank running close to the KMD boundary and a number of east-west canals with the river Ganga as the central spine.

The North-South arterial waterway on the Eastern bank will be formed in the northern part by the Nowai Khal which will be connected to the horse – shoe Lake of Mathura Bil by a new excavation and a further stretch of excavation to connect it with the Ganga. In the southern part a new excavation connecting the Bhangar Khal with the Tolly's nullah is already proposed. This connection stretches the N-S arterial waterway further south to the Arapanja and the Keorapukur Khal.

The East West canals that are planned to connect this eastern arterial water way with the spine i.e. the Ganga, include, the Icchapur Khal the Bagzola Khal, the Kristopur Khal, the Circular Khal - Belaghata - Bhangar Khal system, the Tolly's Nallah and the Chorial Khal, which follows the proposed southern express way still to be built. In the north a couple of smaller E-W canals are proposed to be excavated between the municipal areas i.e. the beads in the string.

On the Western Bank, the N-S arterial waterway will be formed mainly by the renovated Saraswati and partly the Kunti river. The East-West connectors will be formed by the Bally Khal, the Barjola channel and a couple of other drainage channels. No new excavations are proposed on this side. However, the entire network needs full renovation and restoration by cleaning up and dredging.

The proposed system connects effectively the probable origins & destinations of freight. The Howrah, Sealdah and Chitpore Railway Stations, the Khidderpore docks, the industrial areas of Budge Budge, Howrah, Bantala, Uluberia etc. and the new development areas of Rajarhat,

Kalyani, Barasat, Baruipur, Dankuni etc.,-all will be directly linked by this waterways network. The arterial roads and the Railways will have several meeting points with the water ways network, a few of which can be selected to develop the multi model transport interchanges.

For storage of water to feed the system, it is proposed to use the horse shoe lakes of Mathura Bil & Kulia Bil on the eastern bank and a new lake to be excavated near the Kana Damodar system on the western bank.

The entire system will involve an enormous amount of dredging and removal of silt mixed with accumulated garbage. Excavating the 1800 Km. long system upto a depth of 2.5 M. plus some new excavation involves 5 million cu.-meters of dredging, apart from the works for development of canal banks, reconstruction of a number of bridges and construction of many others, lock system, roads, and others. The excavated earth will however, be in great demand for filling up lowland and raise level for new townships, highways and industries. It is also a very coveted raw material for manufacture of bricks.

The problem of rehabilitation of displaced people is not discussed here as funds for housing should be utilized for the purpose. But it is an essential task and the success of the entire project somehow depends on how efficiently this could be done.

A detailed estimate of the cost of restoration of Tolly's Nullah was prepared by Chakraborty & Roy ('97). Without the cost of rehabilitation of settlers on the canal side, it worked out to be approximately \$ 9.5 millions (5). This was for a stretch of 28 Km. only. For 1800 Km, considering a lesser cost for rural stretches it would be \$500 million. At today's cost, this will be around \$1 billion.

It is a huge cost but considering the huge benefits, the project must be implemented as the alternative scenario is even more expensive, more detrimental to environment and in the long run disastrous. We must also take into consideration the huge potential of this scheme in creating the employment opportunities, specially for the local poor.

Conclusion

The best way to conclude of a paper is to point towards a hopeful future. The Department of Environment, Govt of West Bengal assisted by the UK Overseas Development Administration (ODA) published a report prepared by CEMSAP (Calcutta Environmental Management Strategy and Action plan) ('97). While the emphasis was on the environmental aspects, it observed that "the existing canal system, at least partly, could well be utilized as Inland water transport way and could be gainfully utilized for cheaper transport of goods besides passengers" (5). The restoration of canal has been atleast taken up financed partly by Asian Development Bank.

The idea of using waterways in a planned manner for water supply, drainage, transport and improvement of environment is applicable to all emerging urban areas. Even the developed countries have already revitalized the waterways and transferred a substantial part of the cargo to their waterways.

Kolkata is uniquely rich in natural waterways. Water transport had traditionally been a part of the cultural and socio-economic life of the people in that part of the Globe.

A planned development of the waterways will give the Metropolis a unique feature –a much-sought-after for new dimension to its urban fabric, an eco-friendly environment in addition to all the socio- economic benefits discussed here.

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