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# PERMANENT TECHNICAL COMMITTEE ON PORTS



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March 25-30, 1968

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#### PORT INVESTMENT PLANNING FOR LATIN AMERICA IN THE CONTAINER AGE

by

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(Topic IV of the Agenda)

PAN AMERICAN UNION  
General Secretariat of the Organization of American States  
Washington, D.C.

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The Permanent Technical Committee on Ports was established by Resolution XV adopted by the First Inter-American Port & Harbor Conference at San Jose, Costa Rica in 1956 and attached to the Inter-American Economic and Social Council by decision of the Council of the OAS on April 3, 1957. The specific function of the Committee is to promote the implementation of the resolutions of the Inter-American Port and Harbor Conferences.

PORT INVESTMENT PLANNING FOR LATIN AMERICA  
IN THE CONTAINER AGE

by

S. M. L. van der Meer

After many years of a relatively sheltered life in technical journals, trade magazines and consultants' reports, the word "containerization" is now the most discussed subject in the port and shipping world.

Many port managers and ship owners, especially those of smaller ports and shipping lines, fear that the advent of the container and the containership will mean the beginning of the end for their ports and shipping enterprises, while others are committing themselves irrevocably to the container concept by making large investments in vessels, terminals and equipment.

As a lender to many ports in developing countries, the World Bank is greatly interested in the impact of containers on ports and shipping and the problems and possibilities the container presents for future lending in the transportation field in general and for port projects in particular.

In twenty-one years of operations, the World Bank Group has committed more than US\$4,000 million in loans and credits to transportation projects. About ten percent of this was invested for the construction of port works and the acquisition of harbor craft and cargo-handling equipment in the less-developed countries. Loans for further port projects are under consideration and a large number of general transportation studies involving ports and specific port feasibility studies are under way, with the financial participation of the Bank or of the United Nations Development Program, with the Bank acting as executing agency.

In Latin America the Bank has financed or is financing the ports of Callao, Pisco and Paita in Peru, Guayaquil in Ecuador, Asuncion in Paraguay, Puerto Cortes in Honduras, and Corinto in Nicaragua. National Transportation Studies, which include ports, have been made in Colombia, Ecuador, Bolivia, Brazil and Surinam. A number of specific port investment projects are under study in Costa Rica, Nicaragua, Honduras, Guatemala, Venezuela, Guyana and Chile.



Most of these ports are public general cargo ports, and therefore could be affected by what is often called the "container revolution".

This paper presents some thoughts on the prospects and problems of the container for the ports of Latin America, from the point of view of a lending agency interested in the development of transportation in the less-developed countries.

#### The impact of containerization

The impact of containers and containerization on the ports of South America has so far been insignificant. It has been estimated that the amount of cargo moved in containers to and from Latin America probably accounts for less than two percent of the total general cargo movement. This in spite of the fact that several shipping companies have been moving containers to Latin American ports for more than five years now and mostly in vessels specially designed to handle at least part of their cargo in containers. But it would be a mistake to conclude, on the basis of this past record only, that any major increase in the use of containers in Latin America is unlikely in the foreseeable future.

Until Sea-Land started a full containership service across the Atlantic in April 1966, there was no indication that the shipping industry would be willing to take the big step into the container age, despite the many papers written in support of containerization. Sea-Land's experience with the container in the United States gave it the confidence to make the decision to start competing in the North Atlantic trade and soon other shipping companies recognized the possibilities and began to plan their own container services. The biggest single difference between Sea-Land and other shipping companies at that time was its experience in the trucking industry, which enabled it to create an integrated system, essential for the efficient movement of containers through the ports. The door-to-door container service it provides maximizes the benefits



of the container concept. This example of vertical integration in the transportation industry is quickly being followed by other companies, either by contractual arrangements between the different links in the transportation chain or by the control of these links by one company through partial ownership. Because of the very large commitments of capital to vessels, containers, trucks and port facilities, which are to yield benefits over a long period of time, this process, once initiated, is practically irreversible.

The New York Port Authority, in its plans for new port facilities, no longer includes any conventional general cargo berths and considers that some of the older existing general cargo berths in the Port of New York may have to be written off before their physical life expires because of lack of sufficient conventional general cargo traffic. And this while it estimates that the total general cargo (import and export) traffic handled by the port will go up from 13 million tons in 1965 to 22 million tons in 1975. It is expected that 12.7 million tons of the 1975 traffic will consist of commodities that could be handled by containers and that 6.9 million tons will actually move in containers. According to this forecast, an important share of the container traffic will be formed by containers moving between New York and Latin America. It is expected that out of the estimated 3.3 million tons of general cargo traffic between New York and Latin America that could be containerized in 1975, 2 million tons would actually move in containers. This compares to 4.3 million tons and 3.2 million tons, respectively, between New York and all of Europe. While all the container traffic between New York and Europe is expected to move in full containerships, in the trade with Latin America it is expected that two-thirds would move in full containerships and the rest in combination ships. Another interesting aspect of this forecast by the New York Port Authority is the balance between import and export volume between New York and Latin America and the suitability



of Latin America's exports to containerization. The forecast shows that exports from Latin America to New York amount to 1.9 million tons and imports from New York 1.3 million tons. Of the ~~Latin American~~ exports, 1.5 million or 79 percent is considered to be potential container traffic and of the imports 1.2 million or 92 percent. Considering the skepticism expressed in some circles about the future of container movements to and from the less-developed countries and the minor impact containers have so far had on the trade with Latin America, these are startling figures and, although they may be overly optimistic, they cannot be dismissed lightly.

#### The problem for Latin America

What should the ports of Latin America do to prepare themselves for this future? In the United States, the United Kingdom and other countries in Europe there is what may fairly be described as a mad scramble among the ports to be among the first to offer facilities to serve the container-ships. It is reported <sup>1/</sup> that in the continental United States there are now 50 full container berths in operation, another 53 under construction, and plans under way for 20 more. Many port authorities in the United States feel that if they do not build container berths soon, their ports may eventually be bypassed by the main shipping lines and they would be relegated to a second-rate status.

There is little question that the advent of the containership will affect the traditional shipping routes. The container concept produces its maximum benefits if the number of ports to be served is reduced to one at either end of the line, where the vessel unloads all its containers and takes on a full load of new ones for the return trip. For the United States, this would

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1. Mr. Pennington, US Maritime Administration, at the 56th Annual Meeting of the American Association of Port Authorities, Vancouver B.C., September 1967.



probably mean that there would ideally be room for only two or three major container ports on the east coast, one on the Gulf coast and two or three on the west coast. For the United Kingdom, the McKinsey report 1/ recommends that only three or four ports be developed as major container terminals, one for each major trans-oceanic trade route.

The remaining general cargo ports would continue to serve whatever general cargo would still come to them directly in conventional vessels or they would function as feeder ports to the nearest major container port. In this last function of feeder port, they would generally be in direct competition with the inland transportation system of railroads and highways, which may in many cases be able to serve the major container port more efficiently directly than via a feeder port. This particularly applies to high volume routes between a major container port and an inland consolidation and distribution center, where volume of traffic and distances are such that point-to-point unit-trains can be used.

The McKinsey report presents some interesting cost comparisons between different combinations of land and sea transport and the cost advantages of unit-trains over road transport for moving containers over high density routes. These comparisons, however, are all based on the ideal system where sufficient containers, full container-ships, container ports, feeder services, unit-trains, and consolidation centers exist and all administrative and regulatory problems have been solved.

Returning to the reality of the situation in Latin America, where so much remains to be done in providing adequate conventional highway and railroad transport, where ports are generally under-equipped and burdened with administrative

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1. Report by McKinsey and Company, Inc., for the British Transport Docks Board, June 1967.



and regulatory problems, and where there is a tremendous shortage of investment capital, the question could be raised whether this whole container development should not be completely ignored and attention directed instead to the many current problems in transportation that urgently require solutions and with which many of us have been struggling for a long time.

I do not think the container and its implications for Latin America can or should be ignored. But neither do I think that the ports of Latin America should now engage in a race to find the funds to build container berths and acquire expensive container cranes. There is little question in my mind that containers and containerships are here to stay, but there is time in Latin America for rational planning for new facilities and for gradual adaptation of existing facilities to the new circumstances.

When we reflect on the advantages containerization offers and the specific problems it poses for port operations in Latin America, it will become apparent that we are dealing largely with the same basic problems that have been the object of much discussion by this and other organizations in the past. The container provides a solution for some of these problems, but it also creates new problems.

The most obvious advantage of the container is the opportunity it provides for fast turn-around of ships, benefiting the ship-owner by reducing his cost in port on the one hand and on the other improving the utilization of the berth in tons handled per year and thus reducing the capital investment in port facilities needed to handle a given volume of cargo. This applies particularly to a fully equipped container berth served by full container vessels. Such vessels can load and unload at rates of over 250 tons per hour per crane as compared to 15 tons or less per gang-hour for a typical conventional general cargo operation. A fully-equipped container berth, though possibly twice as



expensive as a conventional berth, can handle efficiently from five to ten times as much cargo.

The potential savings in the cost of cargo handling are equally impressive. The importance of the savings depends, of course, on the cost of the stevedore labor replaced by the container handling equipment and it is often argued that because of the relatively low cost of labor in less-developed countries, these savings may be not very significant.

For conditions in the United Kingdom, where labor productivity, expressed in tons per man-week, is generally higher than in less-developed countries, the McKinsey report calculates that fully developed container systems would increase the productivity of dock labor in general cargo operations by a factor of twenty. Thus, even when the cost of labor is relatively low, the tremendous reduction in manpower would lead to very substantial savings.

Further advantages are obtained in the protection the container provides against **damage** and pilferage, which will eventually lead to reductions in insurance rates.

The cost of packing, which often adds significantly to the cost of the delivered goods, can be greatly reduced by the use of containers. Furthermore, containers can be handled without regard to weather conditions, an advantage in many Latin American ports where heavy rains often interrupt the cargo-handling process.

Goods handled in fully developed container system will reach their destination much faster than goods handled in the conventional way. This means a reduction in the cost of financing goods in transit, which is often done at high short-term commercial interest rates.

Finally, containers provide an opportunity to simplify customs procedures and reduce the tremendous amount of paperwork now associated with



ocean shipping.

These are the ultimate possibilities of a fully developed container system, but there is a large gap between these possibilities and the present situation in the ports of Latin America. Many problems will have to be solved, most of which are all too familiar. There are the lack of investment capital and specifically foreign exchange, the political difficulties in reducing the labor force, the need for co-ordination between transportation modes - so essential for the effectiveness of the container system, the difficulties encountered in trying to simplify customs procedures, and the usual equipment maintenance problems.

The present containerships in the Latin American trade are combination container break-bulk cargo vessels. They are equipped with ship-mounted container cranes and thus do not require expensive dockside cranes. Containers are unloaded at conventional berths and handled by large forklift trucks and flat cars pulled by tractors. They are often unpacked in the port for inspection by customs officials.

It is obvious that few of the potential advantages of the container system are realized under these circumstances. Reduction of ships' time in port, when combination vessels are used that call at many conventional ports and also load and unload break-bulk cargo, is not nearly as spectacular as the time reduction achieved by full containerships plying between two ports only. Port handling costs may show little improvement if relatively few containers are handled together with other cargo and if special large forklift trucks and flat-cars have to be acquired to handle them. Opening of containers for inspection by customs in the ports is costly in time and labor and re-introduces the possibility of damage and theft.



Some advantage, however, is gained in the Latin American ports even under these far-from-ideal circumstances. And it should not be forgotten that, on the other end of the line, whether this is a port in the United States, Europe or Japan, where the container system is further developed, cost savings are substantial even for the combination ships, and the overall cost of transportation is therefore reduced.

The question of who benefits most from the use of the container is often raised, with the implication that most if not all the benefits go to the developed countries and their shipping lines. There may be some validity to this point of view in the initial stages of containerization, but I think it is erroneous over the longer term. Although comparisons are dangerous, I cannot resist drawing a parallel with the evolution of bulk-handling methods and the large bulk carrier. The lowering of transportation costs, resulting from the use of these methods, has made possible a substantial increase in exports of raw materials from the less-developed countries and has greatly improved their competitive position with alternative sources of supply in the developed countries. This applies not only to oil, but also to iron ore, and other mineral exports. Ocean transport of grain, coal and raw materials for fertilizer production is possible at a much lower cost than before because of bulk-handling facilities. It is sometimes argued that this is an advantage for exports, but that lower transportation costs for imports, especially general cargo imports, are undesirable for developing nations that want to protect their infant industries. If protection against imports is desired, however, it can be achieved by appropriate protective customs duties. The fact that low-cost transportation is available, if desired, must surely in the long run be an advantage to all.



### The need for planning

To meet the challenge of the container age, broad, long-range planning is necessary. This planning should be done on a regional, international level, especially when the countries are relatively small and alone would not provide a sufficiently large market to justify a full container port. It certainly cannot be left to individual ports and port authorities, although these agencies have an important role in the planning process.

The basic decision to be made in this long-range planning process is which port or ports should be developed as principal container ports. The aim should be to minimize the cost of transportation to the economy. Among the many factors that will have to be taken in consideration are the existing inland transportation system and its adaptability to container transport, the suitability of existing ports for development into container ports, the relative cost of coastal shipping, railroad or road transport for the feeder services to the major container ports, the optimum location of container consolidation and distributing centers and the level of investment required. All these factors should be related to a projection of the probable development of container traffic over time. Necessary administrative changes in the transportation system, the customs control system, and the manner in which adjustments in the labor force can best be made should be considered.

Although the implementation of such planning may be a long way off, depending on the particular circumstances of each country, the planning process can and should start now. It is not an easy task, but not substantially different in scope and complexity from the national transportation studies that have been made in the majority of the Latin American countries, in many cases with the participation of the Bank.



The emphasis would be, at least initially, on import and export traffic, since the impetus is coming from the ocean shipping industry. But it should not be ignored that inter-city traffic may eventually make use of the container also.

A specific case of traffic other than imports and exports that may be affected is coastal shipping, and it is useful to consider what containerization might do for the coastal shipping industry, particularly in some of the countries of Latin America with a long coastline such as Argentina, Brazil, Chile and Peru and possibly for Central America as a region.

It is no secret that coastal shipping has declined in most Latin American countries in the last decade to such an extent that many people doubt that there is a place for coastal shipping other than for the transport of certain bulk cargoes such as petroleum, coal, salt, minerals or uniform cargoes such as bagged sugar and rice. The decline of coastal shipping set in as soon as highways, more or less parallel to the coast, offered an alternative way of transport and has been most pronounced with respect to general cargo. The principal reason is usually the better service offered by the door-to-door truck. On long hauls, the basic cost of coastal shipping would, of course, be much lower than that of highway trucking, but the advantage is often lost because of the high costs incurred in the ports in the transfer of general cargo from ship to the inland transportation system. These costs are composed of cargo-handling charges, port charges to the vessel and the cost of vessel time in port. The container is designed to reduce both the handling charges and the vessel time in port, and it is therefore not impossible that for long hauls coastal shipping would again become competitive with highway trucking for containerized general cargo.



That this is not as farfetched as it may sound to some, the Australian experience with containers as expressed in Tokyo in 1967 by Mr. V. G. Swanson, Chairman of the Melbourne Harbor Trust, may be quoted here:

"Containerization is not a new concept in Australian Coastal trade, as over the past ten years we have seen the development of container and unitized cargo until the stage has been reached where it is well on the way to completely taking over the interstate general cargo trade, with more than 10,000 containers in regular use, the containers varying in size from a small 3-ton to 17-ton dead weight capacity. The first experiment in the use of the cargo container in interstate cargo trade was in its use in conventional ships to reduce handling costs and enable the coastal trade to compete with road and rail, which were making serious inroads into this trade."

In the concept of a fully-developed container system using large container ships on a major international trade route, there would, as noted before, not be room for more than one, or possibly two major container ports at each end of the line. Many of the other existing ports could, however, play a significant role as feeder ports, if an efficient coastal shipping service existed. Depending on the geographic situation of the ports with respect to the centers of production and consumption and the distances from the major container port, coastal shipping could be a strong competitor for trucks and railroads in providing this feeder service.

Long-range regional transportation planning, which has to consider many aspects of the economy in necessarily rather broad terms, cannot achieve its aim of providing an efficient transportation system if it is not supported by detailed planning on a smaller scale in the various transportation modes.

The ports will have to consider how they may become an efficient link in the system, either as a major container port or a feeder port. Major container



ports will require heavy investments and will require very large land areas, often not available near existing ports. The development of such ports, of which few will be needed, can only start after a long-range regional plan has been formulated.

Most ports will, however, be required to handle containers in the interim, since much time will elapse before the system of major and feeder ports becomes a reality and container vessels will tend to follow the traditional routes until then. Later most of these same ports would become the feeder ports of the system.

The adaptation of these ports to container handling will have to be planned by the port authorities themselves. Most existing deep-water ports in Latin America can accommodate the type of combination container and break-bulk vessel now in service on the Latin American routes. The vessel itself has the equipment to load and unload the containers. An open storage area for containers can usually be found, although often at some distance from the berth. Special equipment to move the containers from the berth to the storage yard and onto a railroad car or flatbed trailer truck usually has to be acquired. As noted before, under these circumstances the potential of the container in lowering transport costs is far from fully realized. Much can, however, be done by the ports to improve efficiency without the immediate need for large investments.

All ports can contribute to the lowering of transportation costs by improving administrative procedures and facilitating customs control. Port administrations should actively pursue with the customs authorities what administrative measures can be taken to allow containers to pass through the port in bond and promote that the packing and unpacking of containers take place as close to the points of origin and destination of the cargo as possible.



In planning improvements at existing ports, it should be investigated which part of the port will lend itself best for container handling. The basic criterion is space, not so much the space now available, but the space that can reasonably be made available in the future close to the berths, whether by removing obsolete sheds, reclaiming land or acquiring under-utilized property. An important consideration is convenient access to the highway and railway network.

If normal traffic growth requires expansion of port facilities, it would be wise to give full consideration to the requirements of the container. A type of berth construction that will easily allow the installation of container crane rail foundations at a later date, such as for instance a relieving platform and a design that allows future deepening alongside, should be seriously considered, even if the initial cost is higher. Allocation of upland areas to service the berth should consider the space requirements of the container which are of the order of 15 to 18 acres per full container berth as compared to 5 or 6 acres for modern conventional general cargo berths. This will usually mean that for full container berths a strip of land 700 to 800 ft wide will be required. Berths should preferably be of the marginal type and allow for the possibility of combining say three standard conventional 600 ft berths to accommodate two large container vessels. Depth alongside should be at least 35 ft below mean low water or berths should be so designed that future deepening to such depth is possible.

The design criteria for live loads in the cargo-handling area, with the exception of container-crane rail loads, are not in excess of standards applicable to modern general cargo berths. A uniform live load of 500 to 600 PSF and the usual railway and truck wheel loads are considered adequate.



The choice of container-handling equipment to service initially combination berths is not as critical as that of the fixed facilities because of their much shorter useful life. It would, however, be advisable in considering what type of equipment to buy, to give some thought to the usefulness of this equipment in a future large scale operation. If, for instance, large straddle carriers would be the likely choice for large scale operations, it might be preferable to use such equipment from the start, even if it is more expensive than, for instance, large forklift trucks. If the operations are not expected to expand substantially, forklift trucks may be preferable as the more flexible type of equipment. It would be unwise for any port to acquire special large container cranes before there is assurance that substantial numbers of containers will have to be handled. Initially, many vessels will be capable of handling containers with their own gear and it may well be that for many feeder services this will be the most economical long-range solution. In any case, many ports have at least one heavy lift crane or fixed derrick, which could handle the occasional container arriving on conventional vessels.

Consolidation and distribution centers, where cargo from different small shippers will be consolidated into full container loads and from where such cargo will be distributed, will eventually be set up. The location of such centers will have to be as close to the market as the volume of traffic will allow. In some ports with low traffic volumes, the ports themselves may be the only logical place.

Many problems in the customs and administrative control of containers containing several less-than-container load shipments will have to be solved and the port administrations would be well advised to take the initiative in discussing and seeking solutions for such problems with the other interests involved before the problem becomes acute.



Considerable progress is currently being made in the physical problems of fitting cargo of various types into containers and in splitting the basic 8 x 8 x 20 container unit into several standard sub-units that will together fit in the container box. Conventional, pre-palletized general cargo could also play a role, if these units are dimensioned to form a modular sub-unit of the standard container.

It is obvious that the ports, which are but a small section in the transportation "pipeline", should not invest more than is necessary to allow the cargo to flow through at the rate determined by the overall capacity of the rest of the line. The section of the pipeline represented by the port should neither be so restricted as to reduce the capacity of the system nor so wide as to lead to under-utilization of the capital invested.

#### The evaluation of port projects

The Bank, in appraising port projects that are presented to it by prospective borrowers, wants to satisfy itself of the technical, economic and financial soundness of the project. In studying the project from an economic point of view, it weighs the economic costs of the project against its economic benefits. Usually it attempts to measure the cost and benefits to the economy of the country in which the project is located. In the case of port projects in general and more specifically in the case of port projects that would involve investment in container berths and container-handling equipment, this raises the interesting question, alluded to earlier, of to whom the benefits of the project accrue. There is usually little question as to who bears the cost nor how much this cost is, but the benefits are more elusive, being both harder to identify and to measure. The principal benefits are those connected with the flow of the cargo, which is expected to take place both faster and at lower cost. The lower



cost usually results from more tons of cargo moved per unit of capital invested and greater productivity of labor, resulting in lower total operating costs per ton of cargo moved. But these savings accrue to the shipping companies and the ports as well as to the other links in the transportation chain. Some of these savings may not be passed on to the shippers and consignees of the cargo and some not even to the national economy at all, insofar as they are retained by foreign shipping companies or passed on by them to other foreign links in the chain.

There is some concern in the less-developed countries that most of the savings from reduced turn-around time of container vessels in ports would not be reflected in lower shipping rates and that the benefits would go to the foreign ship owners. The degree to which these savings would be passed on in lower freight rates depends largely on whether there is effective competition in the shipping industry. To what extent this will exist in the future remains to be seen. It is not impossible that competition may become more effective as traditional shipping routes and conference practices are disrupted with the development of the container system to its full potential. For the present, the participation of national shipping lines in shipping conferences and government pressure have to some extent counteracted the effects of restricted competition. But, if it is not entirely clear how the benefits of improved efficiency in the ports are distributed, it is very clear who bears the cost of inefficiency. If ports do not keep up with growing traffic and congestion results, shipping lines faced with increasing ship turn-around time are quick to seek the imposition of freight surcharges, which are only lifted when efficiency improves.

The financial condition of a port as an enterprise is another aspect in which the Bank takes a special interest when appraising a project. One of the problems to be faced when container facilities are to be constructed is the level of port charges, to the vessel as well as to the cargo, that will be needed to



obtain a reasonable rate of return on the total net investment in port facilities. Whether the project will pass this test depends largely on the volume of cargo that will be handled by the new container facilities, and how the traffic via the existing conventional facilities will be affected. The timing of the investment will therefore be an important consideration. Also the sensitivity of the project to variations in traffic forecasts and other uncertain factors should be investigated. If substantial under-utilization of relatively new conventional berths and other port facilities should result, it might be difficult for a new container-berth project to be operated at competitive rates. The adaptation of existing berths, if possible, might then be a financially more attractive proposition.

A sound policy for the setting of rates to the port user has to be based on a full knowledge of costs. This will demand from the ports the adoption of a commercial accounting system and the introduction of the type of cost finding and cost analysis that has characterized many railways in recent years.

The foregoing expresses some of the thoughts that occur to us in the World Bank, when we try to assess the problems and possibilities of the container for future port projects in Latin America. It is hoped that they may form the basis for some fruitful discussions during this seminar.