INTERNAL AND EXTERNAL SHIPPING ON THE GREAT LAKES

Harold M. Mayer, Center for Great Lakes Studies, University of Wisconsin—Milwaukee

Significant changes in shipping are now under way on the Great Lakes. These changes involve internal Great Lakes shipping, including both domestic trade and trade between the United States and Canada, and external shipping among the Great Lakes, lower Saint Lawrence River ports, and overseas. This paper provides a general overview of some recent changes and prospective changes in Great Lakes shipping.

•SIGNIFICANT changes in shipping are now under way on the Great Lakes. These changes involve internal Great Lakes shipping, including both domestic trade and trade between the United States and Canada, and external shipping among the Great Lakes, lower Saint Lawrence River ports, and overseas. This paper provides a general overview of some recent changes and prospective changes in Great Lakes shipping that are relevant to policy decisions.

The Great Lakes together constitute the largest body of navigable fresh water in the world. With a relatively small drainage basin of 295,000 miles^2 (767 000 km^2), the lakes themselves have a surface area of just under 100,000 miles^2 (260 000 km^2). Elevations above sea level range from 246 ft (75 m) for Lake Ontario to 602 ft (183 m) for Lake Superior. The head of the tidewater at Montreal is 1,337 statute miles (2139 km) from the head of the lakes at Duluth; it is 1,244 miles (1990 km) from the head of the lakes at Chicago. Montreal is 800 miles (1280 km) from the Atlantic Ocean south of Newfoundland, and it is 1,000 miles (1600 km) from the Atlantic Ocean north of Newfoundland. Although a significant proportion of the Great Lakes and much of the Great Lakes-Saint Lawrence route involve open-water navigation, the connecting channels between the lakes and much of the Saint Lawrence River, especially above Montreal involve transit through confined channels. These place serious limitations on the dimensions (especially the drafts) of vessels. The seasonality of the interlake and Saint Lawrence operations also imposes further handicaps. The attempts to overcome these limitations are among the most significant current developments.

The Saint Lawrence route between the Great Lakes and overseas was not created when the Saint Lawrence Seaway was opened in 1959. Small canals circumvented the rapids of the Saint Lawrence River in Canada, and the predecessor of the Welland Canal connected Lake Erie and Lake Ontario from the end of the War of 1812. These competed with the Erie Canal, which connected the Great Lakes and the New York tidewater. As early as the middle 1850s, wheat was shipped from the upper Great Lakes to Europe. A series of enlargements of the Saint Lawrence route culminated around the turn of the century in a number of canals along the present Saint Lawrence Seaway route. In 1932 the Welland Ship Canal, with 8 locks, opened up Lake Ontario to the large "upper laker" bulk carriers. That canal, which has since been partially rebuilt, constitutes part of the present seaway. In 1933, the first regularly scheduled cargo liner service connected the Great Lakes with Europe by means of small vessels. Service was interrupted only during World War II. The depths to which the channels were dredged and the dimensions of the locks along the route were more influenced by the characteristics of lake-user bulk vessels than the characteristics of salt-water ships. The standard seaway depth is 27 ft (8.2 m), and most of the major Great Lakes harbors have been dredged to the same depth. This normally permits access and transit by vessels of up to 26.75-ft (8.2-m) draft. Because of these decisions that were made several decades ago, a rapidly decreasing proportion of the world's ocean-going vessels can use the Great Lakes-Saint Lawrence route, and the economies of scale currently realized on most of the principal ocean routes cannot be realized for Great Lakes-overseas movements.

Until 1959, 22 small locks were in the 6 canals that bypass the rapids of the Saint Lawrence River in the 110 miles (176 km) above Montreal. Lake vessels transiting to and from the lower Saint Lawrence River were designed to fit these locks. They were limited to a length of 259 ft (79 m), a beam of 23.5 ft (7.2 m), and a draft of 14 ft (4.3 m). With those dimensions, they could carry up to 3,000 tons (2700 metric tons) of cargo. More than 200 such canallers operated in the Saint Lawrence canals from World War II to the opening of the enlarged seaway in 1959. Virtually all of them were under Canadian registry, and they included both package freighters and bulk carriers. The early, preseaway general-cargo liners that pioneered the Great Lakes-overseas direct trades between 1933 and 1959 were limited to the same dimensions, but, because of their necessarily finer lines as seagoing ships, such salt-water ships could not move more than 1,600 tons (1440 metric tons) on canal draft. They usually added a few thousand tons more cargo in the lower Saint Lawrence area for the ocean voyage. The vessels moved slowly through the canals and channels paralleling the Saint Lawrence above Montreal whether they were lake-user or saltwater ships. They commonly took 3 days between Lake Ontario and tidewater.

After 5 years of construction from 1954 to 1959 the seaway was opened. The Saint Lawrence portion involved the building of 2 dams (a diversion dam at Iroquois and the Moses-Saunders dam) with 2 million kW of electric generating capacity, between Massena, New York, and Cornwall, Ontario. Without the power, the seaway as a navigation project probably would have been economically and politically infeasible because all construction and facilities jointly used for navigation and power are charged against power, rather than navigation. Originally, 29 percent of costs and benefits for navigation was assigned to the United States; the remainder was assigned to Canada. Later, this ratio was changed slightly. Toll revenues are similarly assigned. Two of the 7 locks between Lake Ontario and tidewater and the 10-mile (16-km) Wiley-Dondero Canal are within, and were constructed by, the United States.

Most of the preopening traffic estimates for the seaway were optimistic. During the early 1970s volume reached the projections. But, in 1974, a substantial decline was noted although final figures are not yet available. Throughout the entire 16 years of its operation, the seaway, as anticipated, has been predominantly an artery for bulk traffic rather than for general cargo. Through the Lake Ontario-Montreal section, which is the seaway proper, the predominant downward-bound cargoes are grains. The predominant upward-bound cargoes are iron ore, which are principally from the Quebec-Labrador area. These cargoes are carried in lake-type vessels that are slightly modified for seaway operation with bronze bearings and constant-tension winches. Many of the vessels were built to the maximum dimensions of the Welland and Seaway Locks [730 ft (222 m) long, a 75-ft (22.9-m) beam, and a maximum draft of 26.75 ft (8.2 m)]. Vessels with these dimensions normally can carry about 28,000 tons (25 200 metric tons) of cargo. Because of the higher costs of U.S.-flag operations, the overwhelming proportion of the "maximum lakers" are under Canadian registry, although recent additions have been made to the U.S.-flag fleet.

Many of the lakers carry grain from both Canadian and U.S. lakehead ports to the lower Saint Lawrence for transfer to larger ocean-going vessels. The proportion of lakers to saltwater vessels engaged in seaway grain movement is mostly a function of the worldwide demand for tramp bottoms. When demand is high for ocean-going, dry-cargo ships, such as during a war, a higher proportion of the outbound grain is transshipped in the lower Saint Lawrence, and fewer saltwater vessels are loaded at lake ports.

Except for the unusual circumstances of 1974, when strikes partially crippled the movements, a collision blocked the Welland Canal during peak season, and the recession resulted in lessened industrial activity, it appears that the long-term capacity of the Saint Lawrence Seaway system will be limited not by the ability of the system to attract bulk cargoes but rather by the physical capacity of the system to handle the cargo movement. In the early 1970s, the Lake Ontario-Montreal section handled nearly 60 million tons (54 million metric tons) of cargo/year, which was very close to the early estimates of its capacity. Fortunately, the efficiency of the waterway route has been substantially improved by the trend toward larger vessels that can

handle more tonnage per transit. The maximum laker is now much more typical than the preseaway small canallers, which have virtually disappeared. Also, additional annual capacity has been provided by the lengthening of the navigation season with earlier openings and later closings.

General cargo, which moves in scheduled liners, has been declining after an initial period of expansion. It declined precipitously in 1973 and declined even more in 1974. The number of cargo liner services between the Great Lakes and overseas had reached about 60, but it has declined to about 12 in recent years. No U.S.-flag liners have been engaged in direct Great Lakes-overseas services since the early years following the seaway opening although a number of operators tried it and gave up. A high proportion of the current service is by Soviet, Polish, and Yugoslavian vessels.

In addition to the Saint Lawrence Seaway route, the Great Lakes are connected with salt water by the Illinois Lakes-to-Gulf Waterway, which is part of the Mississippi River system, the dominant inland waterway route of North America. Although internal Great Lakes transportation has remained fairly constant in volume over the past several decades, the Mississippi River system, operated almost entirely with barges and towboats, has witnessed a rapid long-term increase, stimulated by the extensive federal improvements to the waterway system. The 2 inland waterway systems meet at Chicago, which is the only port on both systems. Modern barge navigation to and from the lakes became practicable when improvements on the Illinois Waterway were completed in 1933. The Calumet-Sag route, whose enlargement was authorized in 1946 and begun in 1955, is now nearing completion. It provides a second major connection that serves the Calumet region of metropolitan Chicago, which has one of the world's largest concentrations of heavy industry.

The Port of Chicago has been, for many years, a leading bulk port on both waterway systems. It also has handled the greatest proportion of the Great Lakes-overseas direct general-cargo traffic. It is a fragmented port that involves several local agencies, but it probably will remain the dominant inland port of North America. The development of barge-carrying ships [lighter-aboard-ship (LASH) and Seabee vessels] gives Chicago as well as nearby ports on the Lake Michigan shore the opportunity to develop direct overseas services via the 2 competitive routes. Both can involve transfer at deepwater ports near the sea or direct barge service without break of bulk; the barges are carried across the oceans by LASH or Seabee vessels. Until now, these "kangaroo" services have been used primarily to facilitate turnaround time for the large vessels; the barges normally do not venture far inland although some have reached Chicago, St. Louis, and other ports upriver from New Orleans. The other alternative—use of LASH and Seabee barges through the Great Lakes-Saint Lawrence route to the lower Saint Lawrence River—has not yet been developed. Meanwhile, much bulk traffic is transshipped in the lower Saint Lawrence River. One general-cargo operator uses small ocean-type feeder vessels for container traffic in connection with its larger vessels at Montreal by shuttling the containers between Montreal, Chicago, and other ports on the Saint Lawrence-Great Lakes system.

Although the terminals for general cargo and for bulk traffic are different around the Great Lakes (the former generally is under public ownership and the latter usually is under private ownership), most of the lake ports have both types, and most of the channels serve both types of traffic.

Internal Great Lakes traffic is changing and, with it, vessels and ports are changing. The dominant bulk commodities, however, have not changed significantly for decades. General cargo, or package freight, has, with the exception of a small amount of Canadian domestic traffic, disappeared since World War II. Virtually all internal domestic and U.S.-Canadian international traffic either is associated with heavy industrial development in and near the lakes or involves fossil fuels moving to utility plants along the shores.

Along the shores of Lakes Ontario, Erie, and Michigan, and in the nearby lake hinterlands, are the world's largest concentration of basic iron and steel production and innumerable metal fabricating, machinery, and other establishments that use the output of the iron and steel plants. Geographers have long recognized the lower lakes area as the core region of the United States and Canada. Great Lakes transportation is the vital

link connecting this area with the sources of raw materials such as ore, limestone, and coal. Major changes in the direction and character of movement of these materials have taken place recently. These changes are reflected in the characteristics of the vessels and of the port terminals.

Direct shipments of iron ore from Lake Superior, the principal source for more than a century, began with the opening of the first canal circumventing the rapids of the Saint Marys River, which connected Lake Superior with the lower lakes, in 1855. The subsequent series of enlargements of locks at Sault Sainte Marie (Soo) has been accompanied by larger ships. After the opening of the Welland Canal in 1932, which has locks identical in size to what was then the largest of the Soo locks and the later locks of the Saint Lawrence Seaway, the maximum lakers gained access first to Lake Ontario and later to the lower Saint Lawrence River. The ranges around Lake Superior have been the overwhelmingly dominant source of ore, but with the opening of the seaway the ores of the Quebec-Labrador area have become competitive at the Canadian plants of Lake Ontario, and through the Welland Canal, in the Cleveland-Youngstown-Pittsburgh area. After 1959, the maximum lakers no longer were confined to the area of the Great Lakes proper. They carry grain eastward to the lower Saint Lawrence River and return with ore. Some vessels were designed for ocean service as well as for operations within the lakes, and they commonly engage in worldwide tramping during the closed season on the lakes.

Until recently, nearly all world records for rapid loading of bulk cargoes were held by the upper lake ports. Ports such as Duluth, Two Harbors, and Superior, which are highly mechanized, are links in an integrated chain of transportation involving railroads from the mines to lakehead ports, water movement through the lakes, and either termination at waterfront plants in lower lake ports or further rail movement to nearby inland points such as Pittsburgh and Youngstown. Ton-mile (metric-ton-kilometer) costs of this transportation traditionally have been among the lowest in the world.

Lower lake ports, particularly those along the south shore of Lake Erie, and, to some extent, South Chicago, handle return cargoes of coal; the former handle cargo from the Appalachian region, and the latter handle cargo from central and southern Illinois and western Kentucky. These cargoes are shipped to the thermal electric utilities of the upper lakes including those serving such industrial cities as Detroit, Chicago, and Milwaukee.

Grain movement in the Great Lakes has fluctuated from year to year, but the development of larger canals and locks along the entire Great Lakes-Saint Lawrence system has shifted the movements substantially. Buffalo was, until 1932, the easterly head of lake grain movement, except for the small canallers previously mentioned. After the opening of Lake Ontario to the large upper lakers in that year, the decline of Buffalo as a major flour milling center accelerated. Baltimore, the closest rail-connected U.S. saltwater port, also declined as an exporter of grain. Transfer of grain between lake and canal vessels took place at Prescott, Ontario, and Ogdensburg, New York, which between 1933 and 1959 constituted the lower head of navigation for the lake vessels, and at other ports of the upper Saint Lawrence River and Lake Ontario. In such instances, another transfer of export grain took place between cannallers and ocean-going ships at Montreal or other lower Saint Lawrence ports. With the opening of the enlarged Saint Lawrence Seaway, direct Great Lakes-overseas movement of grain in ocean-going vessels was supplemented by transfer between lakers and ocean ships in Saint Lawrence ports below the canals. The balance between direct Great Lakes-overseas and transfer movements now depends on the relative rates for lakers and saltwater vessels, which in turn are a function of the world tramp market. In the Great Lakes, grain can be handled in either of the 2 principal types of lake vessels: "straight-deckers," which have no unloading equipment on board, and "self-unloaders," which can discharge cargoes independent of shore-based equipment. Several developments of recent years have shifted the character of the typical lake vessel from the straight-decker to the self-unloader.

The development of iron ore concentrates, particularly taconite, is rapidly changing the character of the Great Lakes iron ore traffic. The proportion of concentrate to direct shipping ore (principally hematite) between the upper lakes and lower lake ports,

has made greater efficiency possible through use of self-unloaders in the iron ore trades. Taconite, unlike direct shipping ores, is dehydrated. Formerly, it was not possible to use self-unloaders in the ore trade partly because during cold weather the water content would freeze the ore and partly because of the nonuniform sizes and shapes of the ore. Taconite concentration plants are located in the upper lakes region, and an increasing proportion of the ore moving in the lakes is concentrated. As a result, although the amount of iron involved is increasing year by year, the total volume of ore has remained fairly constant. Currently the proportion of total ore tonnage movement both within the lakes and through the seaway from eastern Canada is about 75 percent taconite and 25 percent direct-shipping ore.

For a number of years, nearly all new bulk carriers on the Great Lakes have been self-unloaders. These can be used for ore, coal, stone, and grain trades. A significant number of the older vessels have been retrofitted as self-unloaders.

A second relatively recent development of great significance is the completion of the Poe Lock at the Soo, which was opened in 1970. In contrast to other parallel locks that limit the dimensions of the vessels operating between Lake Superior and the other lakes to seaway size, the Poe Lock admits vessels up to 1,000 ft (300 m) long and with 105-ft (32-m) beam; such lakers can carry over 56,000 tons (50 400 metric tons) on normal lake draft, which is more than twice as much as any prior lakers. Almost immediately, vessels of these dimensions were under construction and older vessels were enlarged. A new generation of lake ships is under way. Again, however, a portion of the Great Lakes fleet, for the first time since 1932, is unable to operate east of Lake Erie because the vessels exceed the dimensions of the locks in the Welland Ship Canal and the seaway proper.

Two other developments affecting the character of internal Great Lakes traffic are of great significance. One concerns energy. There is an awareness of the environmental impacts of power plants and the fuels that they use. The emphasis on use of low-sulfur coal is rapidly expanding traffic that is the reverse of the previous lake coal movements. Now there is a downward-bound movement of western low-sulfur coal from Lake Superior that is received at the lower lake ports. Unlike the upward-bound movement, which dominated the lake trades for decades, coal now moves in the same direction as ore does. Additional major loading facilities are under construction and planned for lakehead ports. These ports are connected with the western coal fields by unit trains. This greatly reduces the costs of long-haul movement. Unit trains compete with lake shipping by offering low rates for the through movement between mines and consuming plants. Commitments have been made in several instances for long-term investments to handle downward-bound lake coal movements. So this type of movement will increase, but through unit-train movement may, in the long run, restrain competition. To some degree, this is not unlike the movement of petroleum from the refinery district of northwestern Indiana to other Lake Michigan ports such as Milwaukee and Green Bay, Wisconsin, which are now served by pipelines paralleling the lake shore. Unit trains between the Appalachian coalfields and utility plants north of Lake Erie, most notably in the Detroit area, constitute a challenge to short-haul coal movements across western Lake Erie. Levels of all-rail and rail-lake movement are not yet clear. The proliferation of nuclear power plants in the Great Lakes region, now slowed by environmental constraints, the recession, and technological difficulties, will significantly affect the total demand for Great Lakes coal transportation.

The second development affecting Great Lakes shipping is the prospect of continued extension of the navigation season. Overseas shipping is about 1 month longer within the lakes than it was during the early years of the seaway. Internal interlake shipping has been extended in some instances from 8 months to 10 months. Some lakers currently operate into February and resume in March. Substantial additional annual capacity can be generated by continued extension of the season. Whether all-year operation of interlake shipping will be practicable has not yet been determined.

In summary, in internal Great Lakes traffic, new conditions of operation, new types and directions of traffic flow, and fewer but larger and more efficient bulk-carrying vessels represent the current trend and the short- and intermediate-range future prospects.

A major change in character and volume in Great Lakes-overseas direct trades has occurred in the past several years. The volume of general cargo carried by scheduled liner services peaked several years ago at about 5 million tons (4.5 metric tons)/year. There were about 60 regular liner services. Since the seaway opening, radical changes in the technology of both inland and ocean transportation have had almost catastrophic effect on the Great Lakes-overseas general-cargo trades.

In the early years, Great Lakes-overseas movements involved break of bulk at the Great Lakes ports. Within the lakes, turnaround time of break-bulk liners is slow, and the port operations are labor intensive. Load centers developed that involved concentrations of cargoes at fewer but larger and more efficient ports. The smaller Great Lakes ports were bypassed. Great Lakes-overseas vessels were transiting the seaway that were several times larger than their preseaway counterparts. Then, in the late 1960s, containerization became dominant on the major ocean routes, and intermodal transportation rapidly replaced break-bulk movements on many such routes. Modern container ships are far too large to transit the seaway, and operating and fixed costs are so high that they require very fast port turnarounds. Therefore, they must carry concentrations of cargo volume several times greater than that which would justify port calls by conventional break-bulk vessels. The infrastructure of inland transportation, including railroad piggyback and container operations and faster freight trains, the building of the Interstate Highway System, rapid expansion of intercity trucking, and the adoption of new technology at ports for intermodal interchange of containerized cargoes and roll-on-roll-off intermodal movements combined to make the capital investment easier at coastal ports. A modern container ship represents as much as $25,000/day, a container crane may cost up to $2 million, and an efficient berth for a container ship uses 30 to 50 acres (12 to 20 hm^2) of land. Even if all general-cargo Great Lakes-overseas traffic of the recent peak year were concentrated at a single port, it would scarcely justify the huge investment that would be required. Furthermore, the limited navigation season, the hazards of operation in confined channels, the necessarily long turnaround time between entering and leaving the Great Lakes-Saint Lawrence Seaway system, the prospect of pyramiding delays caused by channel blockages and strikes combine to limit the prospects for future general-cargo movement by the Great Lakes-Saint Lawrence Seaway route in competition with load centers at coastal ports.

This pessimistic picture was compounded by a precipitous decline in general-cargo traffic in 1973 and an even greater decline in 1974. In the past year, certain sporadic events led many to believe that the decline was unusual. These events included strikes, the recession, completion of grain movements to the Soviet Union, and the blocking of the Welland Canal at a critical time. In spite of these events, several of the major Great Lakes ports are preparing and developing plans for greatly expanded overseas general-cargo traffic. Cleveland is contemplating a new outer harbor area, Chicago, a container terminal, and Milwaukee, an extensive harbor north of its present port terminals. Meanwhile, in 1974, direct overseas general-cargo traffic is reported to have declined to about half of that in 1973, which was a poor year, at the Port of Chicago. At Milwaukee, the 1974 total overseas tonnage was less than half the volume of the previous year. Thus, the Great Lakes-overseas general-cargo traffic no longer is as vital as it once was, and the optimistic projections of the preseaway years will not be realized in the foreseeable future. This does not mean, however, that overseas trade through the seaway will not continue in substantial volume. The seaway is causing a "handy size" bulk carrier to be produced that will be built to the maximum dimensions admissable in the seaway. Furthermore, some of the Great Lakes ports are in a strategic position to handle specialized cargoes. Major metropolitan industrial areas on the lakes, such as Chicago, Milwaukee, and Cleveland, produce heavy and bulky manufactured products, such as mining and construction machinery and locomotives, that cannot be transported overland because of their bulk or weight. Heavy-lift traffic at such ports represents a movement of considerable consequence that has excellent prospects for the future involving specialized port terminal facilities and, in some cases, specialized vessels. Expansion of container feeder services and LASH and Seabee

barge services between Great Lakes ports and those of the Gulf Coast and the lower Saint Lawrence River also is possible.

All of these prospects are tentative. Their ultimate development will depend on outside forces: the economic, political, social, and military conditions in the Great Lakes region, and the nation, and the world. Projection and, even more, prediction are dangerous.

The intralake operations are the third facet of transportation on the lakes.

The short-haul package freight and passenger steamer within the lakes no longer exists. It disappeared before World War II. However, several ferry services, particularly those across Lake Michigan, remain within the lakes. On Lake Superior, a railroad-car-ferry service was initiated recently connecting the Canadian lakehead port of Thunder Bay with the American lakehead port of Duluth-Superior, providing a link where no parallel railroad exists.

On Lake Michigan, however, the situation is critical. That lake, except for the ferries, is a barrier over 300 miles (480 km) long straddling the main east-west transportation corridor of the nation, and it forces all movement except air transportation around the ends of the lake, especially through the congested Chicago gateway. Three railroads operate car-ferry services across Lake Michigan. Several of their routes were abandoned in recent years, and the remaining ones are greatly curtailed. Most of the vessels were decommissioned or scrapped recently. None are equipped to handle heavy trucking, and most do not conform to contemporary environmental requirements.

The ferries enabled coastal cities, such as Milwaukee and the hinterland northwest of Chicago, to be placed on a rate equal to that of Chicago and thus gain access to the northeastern railroad territory on an equal basis. How long this rate situation could be maintained without the ferries is problematical. Rail, and especially highway, traffic to and from most of Wisconsin and adjacent states is subject to the handicap of circuitous routes around the southern end of the lake, which involves interline instead of single-carrier movement.

Several studies of prospects for a modern and comprehensive service across Lake Michigan to replace the existing deteriorating services are under way. No such service, by itself, could operate profitably, but the economic benefits to the regions on both sides of the lake and the nation as a whole justify some sort of public subsidy for a comprehensive cross-lake service run by fast, efficient, modern vessels equipped for both truck and automobile traffic. A Milwaukee-Muskegon route is favorably located to maximize benefits from such a service and would supply a missing link in the nation's highway network. There are Interstate as well as other federal highway routes extending east and west on both sides of the lake from the prospective terminals; the cost of a ferry service, however organized, would be substantially below the cost per mile (kilometer) of providing a typical highway on land.

Ferry services, unlike the interlake and overseas services, can operate year round. U.S. Coast Guard icebreakers are stationed within the lakes, and plans are under way for smaller craft to keep the harbors, and eventually the connecting channels between the lakes, open the year round. The existing ferries, and those that may be developed in the future, have icebreaking characteristics, and the newest Great Lakes bulk carriers, as well as many of the ships in Great Lakes overseas services, can operate under some ice conditions.

Although the Great Lakes overseas general-cargo services face an uncertain future, certain specialized types of service by salt-water vessels will continue to be important, and even may expand. On the other hand, Great Lakes ports are not now justified in placing heavy investments in facilities for direct overseas general-cargo trades. Interlake movements are changing rapidly in character, direction, and types of vessels. Even though such movements have not grown significantly in total volume for many years, they are carried out more efficiently and more economically than in the past.