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CANALS AND LOCKS IN THE NETHERLANDS

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BIBLIOTHEEK

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Ambassàdor Kémoularia, Mayor Gallas, Prof. Veltman, Prof. Verhoeven,
ladies and gentlemen,

Many foreign visitors have been to our country. All of them took some impression with them of Holland and its citizens. Few will have formulated their opinion as briefly as Voltaire did, when he said: "Adieu, canaux, canards, canaille".

For my speech of today I appreciate it, that he put the canals in the first place, but I have some difficulties with the canaille. I am sure they are completely extinct by now, because I would not know one single, living Dutchman, who could be described as a canaille. Although, now I start to think of it, I could mention, but let me stop here.

On the other hand, 250 years later, Holland is still a country of canals and ducks.

But of course it has not always been like that. I live in a small town close to Den Haag, called Voorburg. Twice a day - on my way to and from work - I pass the statue of the Roman general Corbulo. He was the man who commissioned the construction of the second shipping canal in the low countries.

May I have the first sheet? As you can see on the left side of the map, the Corbulo canal - marked in red - runs parallel to the coast, just behind the dunes. The canal at that time connected the lower reaches of the rivers Rhine and Maas. In a somewhat widened and deepened form the canal still exists and is known as the Vliet.

I said that the Corbulo canal was the second one. Some 60 years earlier, about 10 before Christ, the Drusus canal had been dug. The exact spot is not known, but some historians locate it on the right hand side of the

map, where you see the other red line.

Both canals, built almost 2000 years ago, served the shipping, but probably they also played a role in water control. It is thought that another reason for their construction was to keep the Roman legions busy. They had just been ordered back from further penetration into the Germanic regions north of the Rhine. Perhaps hard work did not make them happier, but at least it kept them under control.

May I have the second sheet?

Only two canals 20 centuries ago, today a network of more than 3.500 km of shipping canals. A pattern that makes it possible to reach most industrial and agricultural areas in the Netherlands. A network that moreover connects the Dutch seaports with their hinterland. A hinterland that is much larger than Holland itself. The major part of Dutch inland navigation consists of transit-traffic: cargo brought by sea-going vessels to the ports of Rotterdam and Amsterdam and from there carried by inland vessels to Germany and other European countries. But of course there is not just one-way traffic: in the opposite direction inland vessels transport goods from the surrounding countries to the Dutch seaports.

I spoke about the total length of shipping canals and the connections they make possible. However, the question must be raised if inland shipping still plays an important role compared with other means of traffic.

For that I want to show you another overhead sheet. May I have it, please?

The graph represents the situation in 1980. Since then only minor changes have taken place. On the vertical axis the cargo volumes per means of traffic are shown in millions of tons. The volumes are the sum of cargos transported between places within the Netherlands and those brought to

and from Holland. As you can see road traffic is by far the most important, followed by sea-going vessels and - on the third place - inland shipping. Pipelines and railroad carry only a limited amount of freight compared with the other three.

Of the 211 million tons transported by inland vessels, 42% remains completely within the Dutch borders, while 58% is carried across the frontiers.

May I have the fourth sheet?

You see here the development in time, at least for inland transport; in other words for goods that are carried between places inside the Netherlands. Represented are the products of the weights of the cargos and the distances over which they have been transported, expressed in billions of ton km's.

Before 1965 transport by road was almost equal to that by means of inland vessels. Since then road transport has rapidly increased, whereas the volume carried by inland vessels remained more or less the same. The decrease since 1980, which still continues, is an effect of the general economic recession. However, it is expected that in the second half of this decennium transport by inland shipping will be at the same level as in 1980: no growth but no further decrease. I hope this prognosis will prove to be correct.

All in all the existing canal network still plays an important role in the goods transport in our country. A role that probably shall not diminish in the coming years.

I told you that in Roman times there were only two canals, whereas nowadays there exists a system with a total length of more than 3.500 km. But even 2000 years ago other navigable waterways were available, namely rivers.

May I have the second sheet again?

Today too, they form the backbone of our inland navigation system, especially the rivers Rhine and Maas. With about 900 km they increase the total length of navigable waterways in the Netherlands to almost 4.400 km.

But let me return to the man-made canals. The present system was not built in the last ten years, it took many centuries to realize it. For the first 1000 years after the Romans not much was done, but then it started, be it gradually. A lot of construction activities took place in the 14th century. Natural waterways were connected, while the digging of peat - for a long time the most important domestic fuel - helped to make shipping canals. Sometimes it helped too much, when vast lakes were created by the excavation of peat.

Windwaves eroded the shores and some lakes started to expand, threatening farmland, villages and even towns. Hard work was necessary to stem the threat, man himself had conjured up. A phenomenon that is not uncommon in the past and present history of man.

But the construction of shipping canals continued and since the 15th century man and later horse-towed barges maintained regular passenger-services between villages and towns. For many centuries this was the most common way of transport in our country, where roads are difficult to build, due to the poor subsoil and to the many waterways to be crossed. Compared with sailing, towing had the advantage of requiring rather narrow canals.

The great expansion of the network of shipping canals was triggered by the industrial revolution in the last century and continues up to the present.

Two examples from the last century are the 123 km long Zuid-Willemsvaart, made to connect the mining area of Liege with the sea, at the time that

Belgium and Holland formed one kingdom, and the North Sea Canal giving seagoing vessels better access to the port of Amsterdam.

The first half of this century saw amongst others the canalization of the river Maas in order to supply Holland with coal from the basin in Southern Limburg. The mines have been closed in the sixties, but the river Maas is still heavily trafficked.

After the second world war both new canals were built and existing ones were modified to meet modern traffic requirements. One of the new canals is the Hartel canal, which is shown at the exhibition. On the other hand a number of smaller canals have been closed to shipping, because transport by road had made them superfluous. However, we have not gone as far as Henry Ford - the car-builder - advised, when he visited Holland. In his opinion all canals should be filled up and be replaced by motorways.

The construction of all these canals required exertion, perseverance and above all craftsmanship. Craftmanship and knowledge that were gained through the centuries and that were fed by experiences and developments in other countries.

It is often difficult to tell who invented a certain solution, as so many people and so many countries were and are engaged in solving the same problems.

A good example of this are navigation locks. The differences in altitude, existing even in flat countries like the Netherlands, make it necessary to provide most canals with locks or other means to bring ships from one waterlevel to another.

Long ago boats were conveyed over portages. This was done by pulling the ship out of the water and towing it across the dike, that separated canal stretches with different waterlevels.

A breakthrough came when the lock was invented. Before I wrote this speech, I thought the first one had been built in faraway China, a long, long time ago. But I wanted to know exactly where and when it was constructed. So I looked it up in an English book and found that I was wrong: Italy was the place and the year about 1405. I took a second book, this time a Dutch one, and liked its contents: the first lock had been built in Holland around 1290. To make sure, I consulted a third book, a German one. The author was certainly a wise man. He wrote that the first lock was built either in Italy or in Holland, adding that both countries claim the invention. I think I shall leave it at that: someone got an idea, others used it. It was a great step forward in the history of the construction of canals.

May I have the next slide? It shows a flight of locks built in the Canal du Midi in the 17th century. Even that long ago the use of locks made it possible to cross ridges and hills. Ships left the planes and became mountain-climbers; in this case with a lovely view of the vineyards of France. With its length of 240 km and its 100 lockchambers the Canal du Midi will always remain one of the outstanding civil engineering works, comparable with the Panama Canal, but built two centuries earlier.

May I have the next slide? It shows the plan of one of the locks of the Canal du Midi and an elevation of the gates.

If one looks at the sketch of this early lock, one wonders if anything has changed since then. All the elements were there: the lock chamber in which the ships are moored when the waterlevel is changed, the gates at both ends of the lock chamber, and the filling and emptying devices necessary to lower or raise the waterlevel. But although the principle is still the same as some 300 years ago, considerable improvements have taken place.

Concrete and steel have replaced bricks and timber as building materials. This made it possible to make locks both wider and deeper. A necessity if one thinks of the huge oil tankers calling at seaports and of the large push-tow convoys sailing rivers and canals.

May I have the next slide? It shows three modern push-tow locks in the southwestern part of Holland. But even these three locks together are small in comparison with the lock in Le Havre in France, that can handle oil tankers up to 200.000 DWT. For more than 10 years the Le Havre lock has been the largest one in the world. But records have a short life-span nowadays. A lock with larger dimensions is under construction near Antwerp in Belgium.

However, modern lock-building is not a question of dimensions only. It can not be denied that wide and long locks mean that a great number of vessels can be locked through at the same time. But more important is the capacity, in other words the number of ships that can be handled per unit of time. For too long locks have been bottle-necks in shipping routes. But after the second world war much has been done to obviate this impediment.

Powerful operation gear has considerably reduced closing and opening times of the gates. It was a known fact, that a long time is needed for ships to enter the lock chamber coming from a canal, that generally is much wider than the lock itself. In recent years research and studies have been carried out to optimize the lay-out of the guiding structures, made at both ends of the lock in order to guide vessels when entering or leaving the lock. Modern guiding structures as shown on the slide have greatly reduced locking times and consequently increased the capacity. Guiding structures are of special importance when wide vessels enter a relatively narrow lock chamber, as is the case with push-tow convoys, where a clearance of only 60 cm remains between the ship's hull

and the lock wall. Here the guiding structures are not only made to reduce locking times but also to protect ship and lock from being damaged during the entrance manoeuvre. Guiding structures form an essential part of modern locks. Their costs can be as high as 20% of the total building costs of the lock.

May I have the next slide?

In the last 20 years much attention has been paid to the influence of locks on the environment, especially where fresh water canals are connected with tidal waterways with a high salinity rate. If no special arrangements are made, with each locking more salt water will penetrate into the fresh water canal, leading to a salting up of these canals, that is unacceptable from the agricultural point of view.

Ingenious systems have been developed to reduce salt penetration during the locking. One of the best ways to deal with salt intrusion came from France, where it has been applied at a lock near Dunkerque.

In a modified way the system has been used at two recently built Dutch locks. One of these, actually a twin lock, is shown on the slide. You can see that these locks are different from normal ones, as the lock chamber - with the vessel in it - is surrounded by water in stead of ground.

It should be stressed that these means to protect the environment are necessary but also costly. The costs of a push-tow lock are doubled when it is provided with a system to reduce salt intrusion.

I told you that modern technology makes it possible to build locks of any size, however large, and to reduce locking times considerably.

Nevertheless there are limits to the application of locks.

Firstly there are the losses of water. May I have the next slide?

With each locking a volume of water goes from the upstream to the downstream canal. As you can see on the photo, this also happens at one of the locks in the Canal du Midi.

If this goes on for a long time the upstream canal may lose so much water, that the waterdepth becomes too small for navigation. Of course this is no problem if sufficient quantities of water are provided by rain or can be withdrawn from adjacent brooks or rivers. But it can become a problem in hilly countries during dry seasons. A problem that can be partially solved by building multi-reservoir locks or fully solved by providing pumping stations, that pump the water back to the upstream canal. However this is generally costly and one might consider to use means of lifting ships other than locks. Please, could you switch off the projector?

But the main set-back of locks is felt when there is a large difference in level between two adjacent canal stretches. When ships have to be raised from one level to another, water from the upstream canal is brought into the lock chamber. This so-called filling has to happen quickly because locking times must be short. On the other hand vessels moored in the lock chamber must not be subjected to large forces due to the inflow of water, otherwise their hawsers will break. These contradictory requirements - short filling times and small forces - are difficult to meet. In developing adequate culvert systems and stilling basins modern technology has done much to make it possible to conquer great difference in water level. But when the difference is more than say 30 or 40 m, a lock is no longer a practical solution. Of course one can design a flight of locks, distributing the difference in level over a number of locks, but this will increase the total delay for the navigation.

However, a lock is not the only means to lift or lower a vessel. In countries, where great differences in altitude exist, a whole family of solutions have been developed: ship lifts, inclined planes and the so-called "pente d'eau" or water ramp, which you will see at the exhibition.

May I have the next slide? French engineers not only invented the pente d'eau, but also built the inclined plane shown on the photo. The structure, constructed in the Marne-Rhine canal near Arzwiller, lifts barges over a height of 45 m. Just before the photo was taken, the vessel had entered the tank from the downstream canal, which you can see in the right upper corner. Then the gates were closed and now the tank, with the barge floating in it, is being pulled uphill by means of cables. You will notice the sets of wheels, that carry the tank. Once the tank has reached the top of its 45 m climb, the gates will be opened and the barge will enter into the upstream canal, which you can not see on the photo.

As a Dutchman I envy my French colleagues for living in a country, where the differences in altitude justify the construction of fascinating structures like this one. In our flat country with canards, canaux and perhaps canaille, locks probably will remain the usual solution.

I would like to end by saying that both canals and locks are omnipresent in Holland. They are not only present but they are heavily trafficked. The existing network still needs improvements. I only mention the future six barge push-tow convoys on the river Rhine, the renovation of the Zuid-Willemsvaart and the modification of the canalized Maas and of the canals in Northern Holland to be able to handle push-tow convoys. And perhaps an old dream of Napoleon: the connection of the rivers Maas and Rhine near the town of Venlo. A dream, that is now the subject of a study carried out by the Hydraulics Engineering Group of this Institute. Research has to be done and work must be carried out in Holland and in other countries.

Canals are more than history, they are the future as well.

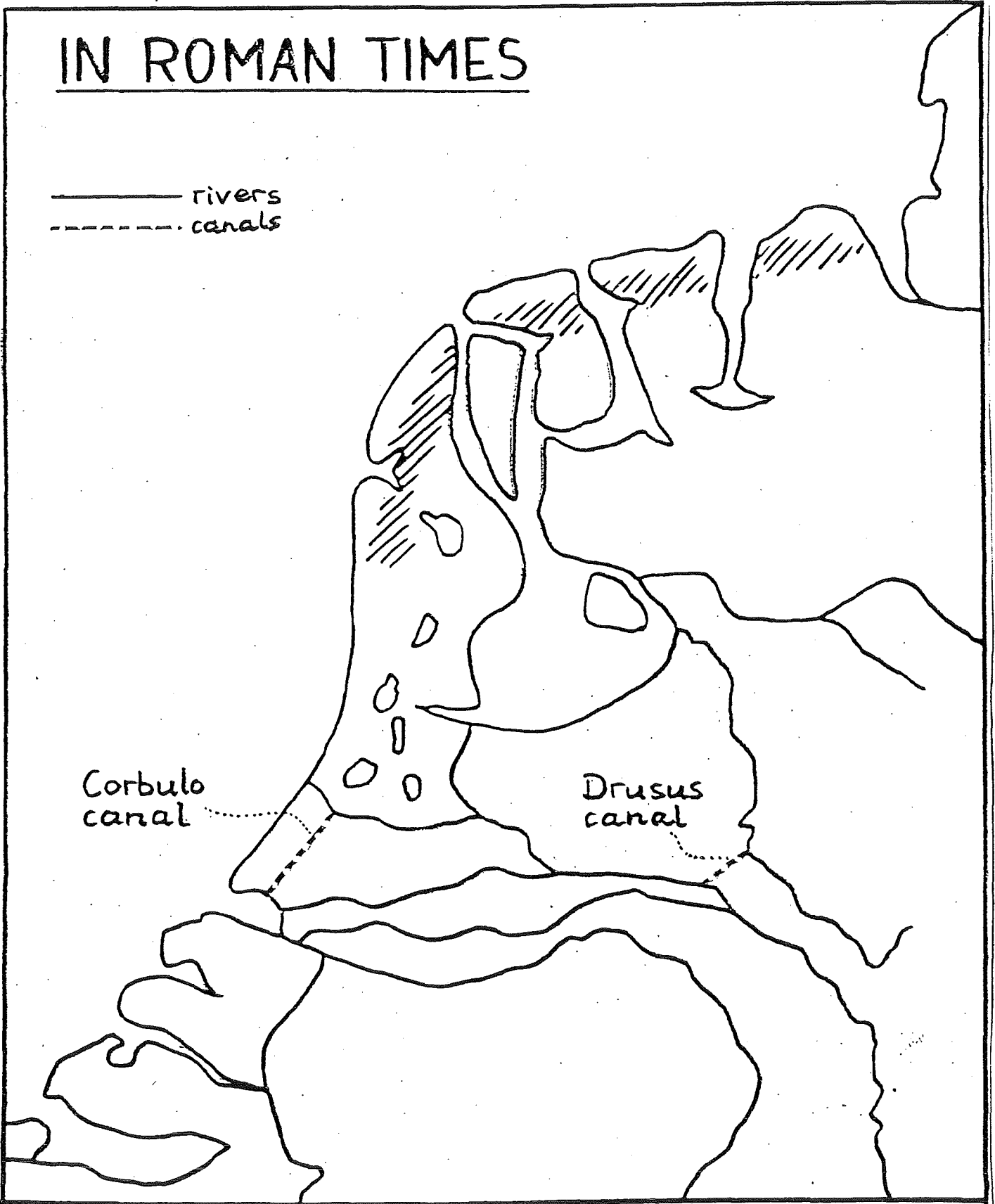
I thank you for your attention.

IN ROMAN TIMES

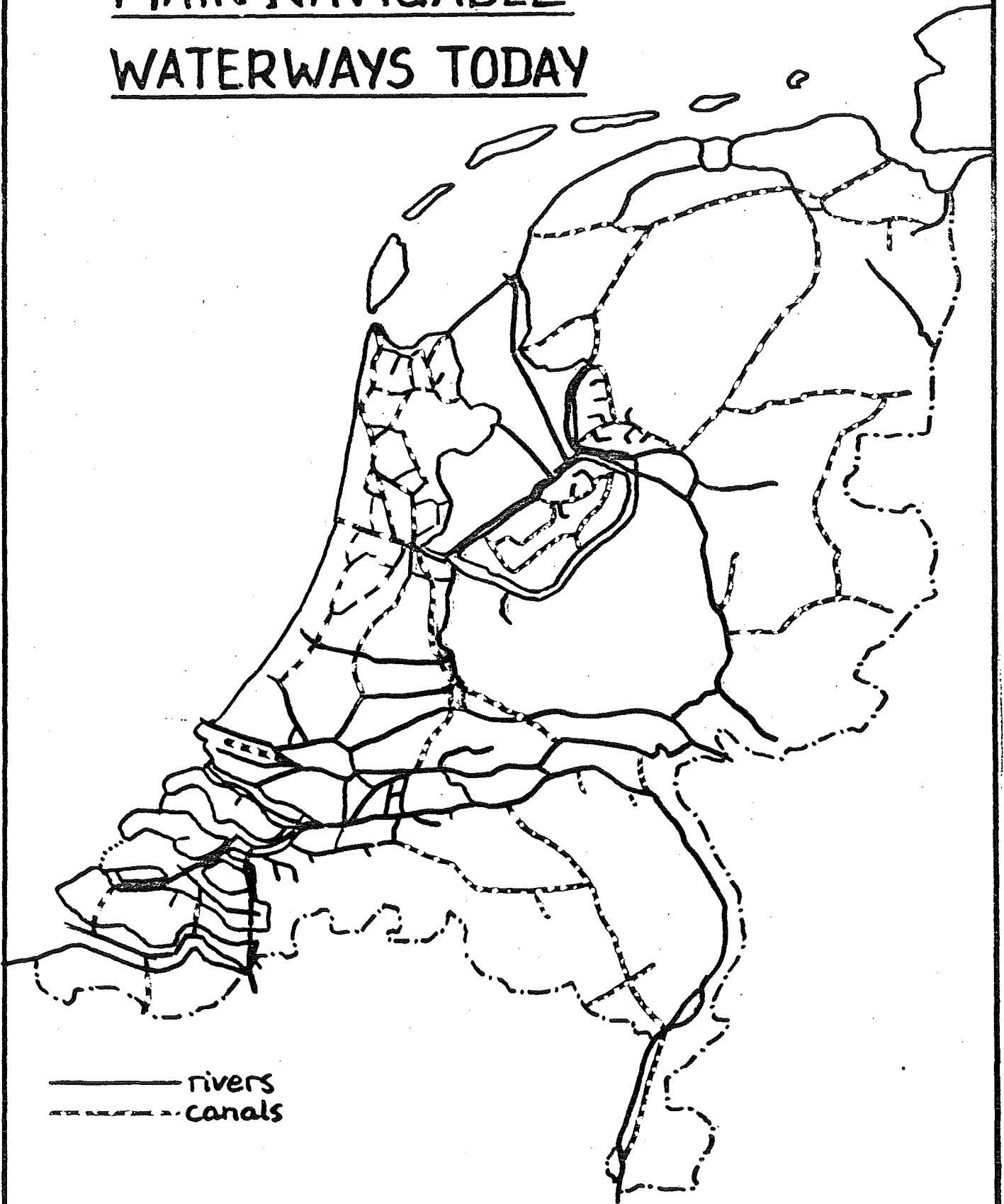
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Corbulo
canal

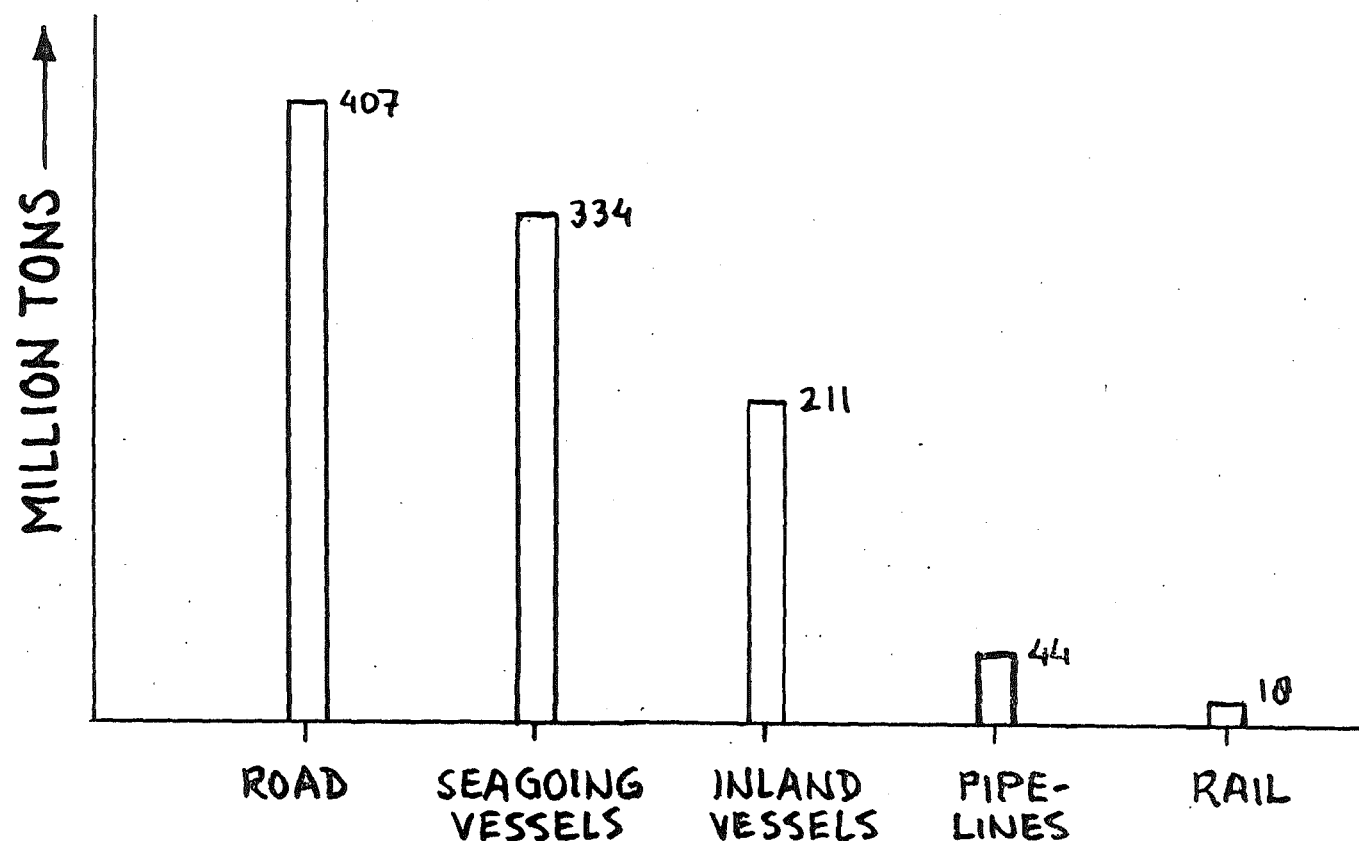
Drusus
canal



MAIN NAVIGABLE WATERWAYS TODAY



GOODS, TRANSPORTED IN, TO AND FROM HOLLAND IN 1980



GOODS TRANSPORTED INSIDE HOLLAND

