



Delta-Expo & Storm Surge Barrier

Questions and exercises Secondary school – lower level

Dear teaching staff,

Enclosed you will find a number of questions and exercises, which you can use for your pupils in the Delta-Expo exhibition, in/on the storm surge barrier and the "safe Zeeland" exhibition you will find there. Everything is multiple choice and the pupils can do them alone or in groups.

All the elements of the exhibition are dealt with, i.e. the geographical, historical, technical and biological aspects.

It would be impractical to have every pupil complete every exercise and about four exercises per pupil or group should suffice. We recommend maintaining a good balance of multiple choice and open questions.

Next to each question and exercise are instructions on where in the exhibition it is to be completed.

You can download this material from our website if you wish and make as many copies as you need.

If you have any comments on the material or come across any discrepancies, we would appreciate hearing from you.

We would also like to wish you and your pupils an enjoyable and educational visit to WaterLand Neeltje Jans.

WaterLand Neeltje Jans (Eiland Neeltje Jans)
Postbus 100
4328 ZJ Burgh-Haamstede
Telephone account manager schools: +31(0)111 655653
E-mail account manager schools: school@neeltjejans.nl
Fax (general number): +31(0)111 653164



Questions and exercises Delta-Expo & Storm surge barrier

The Delta-Expo exhibition is in the Delta Plaza.
Delta Plaza is the reception building at WaterLand Neeltje Jans.

There are three chapters to the Delta-Expo exhibition:

Water, friend and foe: about the history of the Delta. This chapter can be found on the ground floor of the Delta Plaza.

The 1953 flood disaster: This chapter can be found on the ground floor of the Delta Plaza.

The Delta Works: This chapter can be found on the ground floor of the Delta Plaza.

Storm surge barrier

You will find a number of answers in and on the storm surge barrier. Inside the storm surge barrier you will find the 'Safe Zeeland' exhibition where you will also find answers to questions.



Exercise 1

Water, friend and foe (ground floor of Delta Plaza)

Roman times

Find the model of the landscape as it was in Roman times. Look at it carefully and read the blue, upright information plate.

1 Sea level in Roman times

What do you think the level of the sea was in Roman times? Was it higher or lower than now? Write down your reasons.

- 2 Name an important aspect of Roman culture that can be seen in the Delta?
- 3 In Roman times who was responsible for the roads and waterways?
- 4 The local population depends on a natural economy. Explain what this means?

The Middle Ages

Read the text panels and answer the multiple-choice questions.

- 1 What were the significant ranks in the feudal system?
A the church and the nobility
B the church
C farmers and serfs
D the merchants
- 2 Why were the first dikes built?
A to get rid of excess water
B to protect the population and its property from floods
C to gain new land
D to protect the population and gain new land
- 3 At the end of the Middle Ages some towns in the Delta grew vigorously. Why was this?
A as a result of the new land reclamation
B through the growth of trade
C through the growth of agriculture and livestock farming
D as a result of the rise in sea level
- 4 In 1585 Antwerp fell to the Spaniards. Many Flemish people fled North. This was very important for the Northern Netherlands, because:
A the refugees brought money and knowledge with them
B most of the refugees were Protestants
C the port of Antwerp was neglected by the Spaniards
D a great deal of money became available for land reclamation



Exercise 2

Water, friend and foe (top floor of Delta Plaza)

The Middle Ages

Find the model of the landscape during the Middle Ages, look at it carefully, read the standing text panel and look at the surrounding photographs.

- 1 Where did most of the population live during the Middle Ages?
- 2 Despite this, the towns were very important; in your own words, say why this was so.
- 3 Why did towns with good waterway connections grow fastest?
- 4 Dikes were built in the Delta from the 10th century. There were 2 reasons for this. What were they?
- 5 What was the greatest problem encountered during new land reclamation projects?
- 6 Sluice gates were built into the dikes to get rid of excess water. In your own words, explain why these were the weak spots in the dikes.
- 7 Ships got bigger and needed deeper water to travel in. This made dredging necessary. In the exhibition you can see a model of a dredger: a scraper. In your own words explain how this works.



Exercise 3

Water, friend and foe (ground floor of Delta Plaza)

The Middle Ages

Find the model of the landscape during the Middle Ages, look at it carefully, read the standing text panel and look at the surrounding photographs.

Drainage

Somewhere in the model landscape you will see a model of a sluice gate. It is hardly more than a wooden door in a dike. These sluice gates were used to drain excess water from the polder into the sea.

- 1 When can water be drained from the polder, when the tide is going out or coming in, explain!
- 2 What do you think happens to the door at high tide?
- 3 Would a sluice gate have had a long life? Explain!
- 4 When storm surges occur sluice gates are a weak spot in the dike. Why is this?

The Golden Age

Find the model of the landscape during the Golden Age, look at it, and read

- 1 The affluent middle classes affect the changes in the landscape. Where can this be seen?
- 2 Compared with the Middle Ages there are major changes in trade, what are these?
- 3 The organisation of dike construction and maintenance changes. In what sense?
- 4 What energy was used to drive dredgers?



Exercise 4

Water, friend and foe (ground floor of Delta Plaza)

The Nineteenth Century (1900)

Find the model of the landscape, look at it, read the text panels and look at the surrounding photographs.

- 1 As time went by less and less people were needed to dig canals etc. In your own words explain why this was.
- 2 The Nieuwe Waterweg (New Waterway) was dug in around 1872. Which large town received better access to the sea as a result?
- 3 What are 'The Muralt-walls' and what are they for?
- 4 The Haarlemmermeer was a huge lake between Haarlem and Amsterdam. Through the ages many attempts have been made to drain it. It was not successful until 1852. Which machinery played an important part in this?
- 5 Look at the old map of the Haarlemmermeer and surrounding area. You can see lots of ditches and channels. These had two important functions. What were they?
- 6 On the map you can see the Pesthuis near Amsterdam. This is where plague victims were sent during the Middle Ages. Why do you think it was sited outside the city?



Exercise 5

Water, friend and foe (ground floor of Delta Plaza)

The Nineteenth Century (1900)

Find the model of the landscape, look at it, read the text panels and look at the surrounding photographs.

- 1 Many new inventions appeared at the end of the 19th century. Name five:
- 2 Look at the photographs of an automobile business and answer the questions. Which brand of car is sold here?
- 3 At what time was the photograph taken?
- 4 What is the name of the business owner?
- 5 Look at the photograph of the bicycle shop. Which brand of bicycle is sold here?
- 6 Look at the photograph of a ship. It is moving through an industrial city. How can you tell?
- 7 Look at the small photographs of inventors and read the texts. The theory of evolution is formulated. By whom?
- 8 There is also a pioneer in the field of psychology. Who is he?



Exercise 6

Water, friend and foe (ground floor of Delta Plaza)

Multiple-choice questions

- 1 Who was the Roman goddess Nehalennia said to protect?:
 - A sailors
 - B the Romans
 - C the people of Colijnsplaat
 - D poachers

- 2 The feudal system developed between 1100 and 1300. Who was in charge?
 - A the parishes
 - B the Normans and the Franks
 - C church and nobility
 - D Flanders and the bishopric of Utrecht

- 3 What made Middelburg and Zierikzee increasingly important?
 - A the merchants guild
 - B the good waterway connections
 - C the conferred city rights
 - D the Flemish abbeys

- 4 In the Golden Age merchants earned large sums of money, what did they do with it?
 - A they fled North with it
 - B they set up the East India Company
 - C they paid for land reclamation with it
 - D they used it to develop trade

- 5 At the end of the 19th century many people moved to the towns and cities. Why?
 - A as a result of the exploitation of the colonies
 - B because of the difficult situation in the countryside
 - C as a result of the labour movement
 - D because of the industrial revolution



Exercise 7

1953 flood disaster (ground floor of Delta Plaza)

Go to the big, circular display showing the 1953 disaster. Behind you there is a long, circular screen with photographs and texts. The next questions concern these texts.

1 Photographs and texts about the 1953 flood disaster
Dikes too low

Give two reasons why no work had been carried out on the dikes before the disaster.

2 The Storm

From what direction was the storm blowing during the 1953 flood disaster?

3 Low spring tide

The 1953 disaster could have been even worse; explain why?

4 Wild evacuations, speedy action

What is an evacuation?

5 Why are people evacuated?

In the inner circle you will see lots of cupboards with doors from which coloured lights shine. If you open a door you will see and hear all sorts of things about the 1953 flood disaster.

(You can use the translated texts on a plastic mobile textboard)

6 Find the cupboard with wood inside.

What were the flashboards used for?

7 What are flashboards?

8 Find the cupboard with the two children's shoes.

What does the woman say when you open the door?

9 What do you think happened to the child who was wearing the shoes?

10 Eventually most people survived the 1953 disaster. They returned home from the places to which they had been evacuated. Try to imagine what they had to deal with and write it down:



Exercise 8

Delta plan (ground floor of Delta Plaza)

The Delta plan

From 1958 a great deal of work went into the Delta plan. Dams were to ensure that the flood disaster of 1953 could never be repeated.

1 Go to a large, circular map. This will tell you when the dams were finished. Fill them in:

	Year	dam
A	1958	Storm surge barrier Hollandse IJssel
B
C
D
E
F
G

Read the panel entitled 'Implementation of the Delta plan'. The various dams are explained. Choose one of the dams and answer the questions on it:

2 Which arm of the sea does your dam shut off?

3 Which two islands does your dam connect?

4 How is your dam constructed, which materials, which machinery?

Caissons were used in the construction of some dams. These are actually just big concrete boxes.

5 Why is it not possible to use these everywhere?

6 Name two dams where other methods of shutting off were used as well as caissons.

7 In the Eastern Scheldt dam was built 3 artificial islands were constructed. Name all three. The three islands are:



Exercise 9

Delta Plan (ground floor of Delta Plaza)

Multiple choice questions

- 1 The storm surge barrier in the Hollandse IJssel has double gates because:
 - A one gate would not be sufficient to keep out all the water
 - B two were made by mistake, so they used two
 - C if one fails, the other will still be there in reserve
 - D so that ships can get through at all times

- 2 The Haringvliet sluice gates are very important to water management because:
 - A the sluice gates are always kept shut
 - B a great deal of excess river water can be drained off via the sluice gates
 - C the sluice gates ensure no flooding can occur
 - D there are 17 openings

- 3 Caissons cannot be used when:
 - A they may sink into the soft seabed
 - B they are too expensive
 - C there is a risk of concrete rot
 - D more than 10 are needed

- 4 The Grevelingen dam was built by two methods:
 - A the northern part by cable railway, southern part with standard caissons
 - B the southern part with through flow caissons, the northern part by cable railway
 - C the southern part with standard caissons, the northern part with through flow caissons
 - D the southern part with gates, the northern part by cable railway

- 5 In the Sixties there was a great deal of protest against closing off the Eastern Scheldt because:
 - A the government decided to review the plan again
 - B environmentalist groups are anti economies of scale
 - C a unique habitat would be lost to flora and fauna
 - D there was not enough experience available



Exercise 10

Delta plan (ground floor of Delta Plaza)

Eastern Scheldt: criticism and protests

Find the glass case containing posters etc. with criticism of the Eastern Scheldt project.

Answer the questions:

The original plan was to close off the Eastern Scheldt completely from the North Sea by means of a closed dam. Increasing numbers of people protested at this and they got together to form an action group.

- 1 What was the name of the action group?
- 2 In your own words describe how the Eastern Scheldt would have ended up (according to the action group!) if a closed dam had been constructed:

The action group was afraid that a closed dam would cause death and destruction in the environment. One of the posters showed this in a very clear way.

- 3 How?

Many mussel and oyster producers also protested, as did the fishermen. One fishing boat bears the legend 'stop the works'.

- 4 Which works are meant?
- 5 Which place in Zeeland is the centre of the mussel and oyster trade?



Exercise 11

Delta plan (ground floor of Delta plaza)

Multiple choice questions

Read the info panels, look at the maps, answer the questions.

- 1 The first stage of the Delta plan involved the construction of:
 - A Storm surge barrier in the Hollandse IJssel
 - B Storm surge barrier in the Eastern Scheldt
 - C Lock in the Grevelingen dam
 - D Closed dam in the Eastern Scheldt

- 2 The Veerse Meer lies between:
 - A Noord-Beveland and Schouwen-Duiveland
 - B de Veerse Gat dam and the Zandkreek dam
 - C the Zandkreek dam and the Brouwers dam
 - D the Veerse Gat dam and the Grevelingen dam

- 3 Concrete blocks were used in the construction of some dams because:
 - A it was impossible to supply rocks by ship
 - B concrete blocks are cheaper and can be produced on the spot
 - C no foreign aid was offered
 - D they are heavier than basalt

- 4 The Grevelingen meer lies:
 - A between the Zandkreek dam and the Grevelingen dam
 - B less than 10 km from Rotterdam
 - C to the North of Goeree-Overflakkee
 - D between Brouwers dam and Grevelingen dam

- 5 When was the originally planned closed dam in the Eastern Scheldt supposed to be ready?
 - A in 1985
 - B in 1978
 - C in 1967
 - D in 1986



Exercise 12

Delta plan (ground floor of Delta plaza)

Eastern Scheldt

Read the info panels, look at the maps, answer the questions.

Before the pillars were constructed, mats were unrolled on the seabed of the Eastern Scheldt

1 What is the purpose of these mats?

The mats are made up of three layers of different materials

2 Which materials?

The three layers were separated by plastic sheeting. They are also pinned in place.

3 Why are they pinned in place?

4 Which ships were used to lay the mats?



Exercise 13

Delta plan (ground floor of Delta plaza)

Eastern Scheldt

Read the info panels, look at the maps, answer the questions.

Compartment dams

The Eastern Scheldt storm surge barrier is only one element in the complete Eastern Scheldt Works. Two dams were also built in the rear of the Eastern Scheldt.

- 1 In your own words, explain what the two compartment dams are for
- 2 Give the names of the two dams
- 3 The Zoom meer was created behind the two compartment dams. What type of water is in it and where does the water come from?

The Philips dam separates salt and sweet water. The Philips dam contains shipping locks.

- 4 What are these locks called and what is special about them?



Exercise 14

Delta plan (ground floor of Delta plaza)

The environment of the Eastern Scheldt,
Read the info panels, look at the contents of the big glass display case, answer the questions.

Instead of a closed dam an open storm surge barrier was constructed in the Eastern Scheldt.

This brought safety and protected the environment. Answer the questions.

- 1 The Eastern Scheldt is a very significant natural environment. There are two reasons for this; name them both

If you look at the globe you will see major bird migration routes. They are shown using yellow arrows. Western Europe is an important migration route and winter habitat for millions of birds.

- 2 How is this shown on the globe?
- 3 Take a look at the map next to the globe: Name three large, important winter habitats for water birds in the Netherlands?

In the large display case (diorama) you can see three characteristic biotopes (types of landscape) found in the Eastern Scheldt. Salt marshes, mudflats and dikes.

- 4 Name two major difference between mudflats and salt marshes?
- 5 What do you think causes these major differences?

On the left hand side you can see three different dike surfaces: basalt, concrete and asphalt.

- 6 What stands out when you compare the vegetation on the various dikes?
- 7 Which dike is best for vegetation?



Exercise 15

Delta plan (ground floor of Delta Plaza)

Eastern Scheldt,

Read the info panels, look at the contents of the big glass display case, answer the questions.

When the Eastern Scheldt storm surge barrier was constructed, prefabrication was the preferred construction method.

- 1 What sort of a system is this?
 - A the elements are filled with water
 - B a system in which new techniques are developed
 - C the elements are constructed separately and put together in the water
 - D the shifting seabed is treated with sand suction equipment

- 2 The storm surge barrier in the Eastern Scheldt reduces the through flow opening. Consequently:
 - A current speeds in the storm surge barrier rise
 - B the difference between high and low tide in the Eastern Scheldt becomes greater
 - C fissures appear in the seabed in the Eastern Scheldt
 - D more water gets in

When the Haringvliet dam was constructed, a building site was created in the middle of the water where the floodgate system was completely constructed.

- 3 This was not possible in the case of the storm surge barrier in the Eastern Scheldt, because:
 - A the water flowed too fast and would have become sweet water
 - B the Eastern Scheldt was too deep and contained too many rocks
 - C this would re-route the flow channels and affect the natural environment
 - D not enough sand was available

- 4 The construction of the storm surge barrier meant that other work also had to be carried out:
 - A the creation of a sweet water peripheral lake
 - B raising the dikes around the Western Scheldt
 - C constructing the island Neeltje Jans
 - D constructing the compartment dams

The pillars of the storm surge barrier are situated in three flow channels in the Eastern Scheldt.

- 5 The names of these three flow channels are:
 - A Roompot, Hammen and Schaar van Roggenplaat
 - B Krabbengat, Hammen and Roompot
 - C Groot-Vuilbaard, Eastern Scheldt and Grevelingen
 - D Schaar, Hammen and Oliegeul



Exercise 16

A visit to the storm surge barrier and the 'Safe Zeeland' exhibition at its centre

Look at the exhibition, study the photographs and read the texts. The title of each panel is shown in large letters. The title of the panel in question is indicated before each question so that you will know which panel is meant.

1 Storms

What was the date of the only hurricane to hit the Netherlands in the 20th century and where was it?

2 Tides

There is a spring tide twice a month. Why is this?

3 History

When was the flood of St. Felix?

4 1953 Flood Disaster

What proportion of the Dutch coastline was destroyed during the 1953 disaster?

5 Rising sea levels

Greenhouse gases are heating up the atmosphere. This causes the level of the seas to rise. Give the two main reasons why global warming causes sea levels to rise.

6 Delta Works

What were caissons originally developed for?

7 Ecology

Fish and birds benefit from the food found in the Eastern Scheldt. What type of food is this?

8 Fishing

What are the three most important shellfish harvested in the Eastern Scheldt?

9 Eastern Scheldt Politics

At a very early stage in planning it was feared that closing off the Eastern Scheldt could be dangerous for nature and the environment. Who said this and in which year?