



Port of  
Rotterdam

PROJECT ORGANIZATION  
**MAASVLAKTE 2**



Environmental Impact Assessment

ZONING

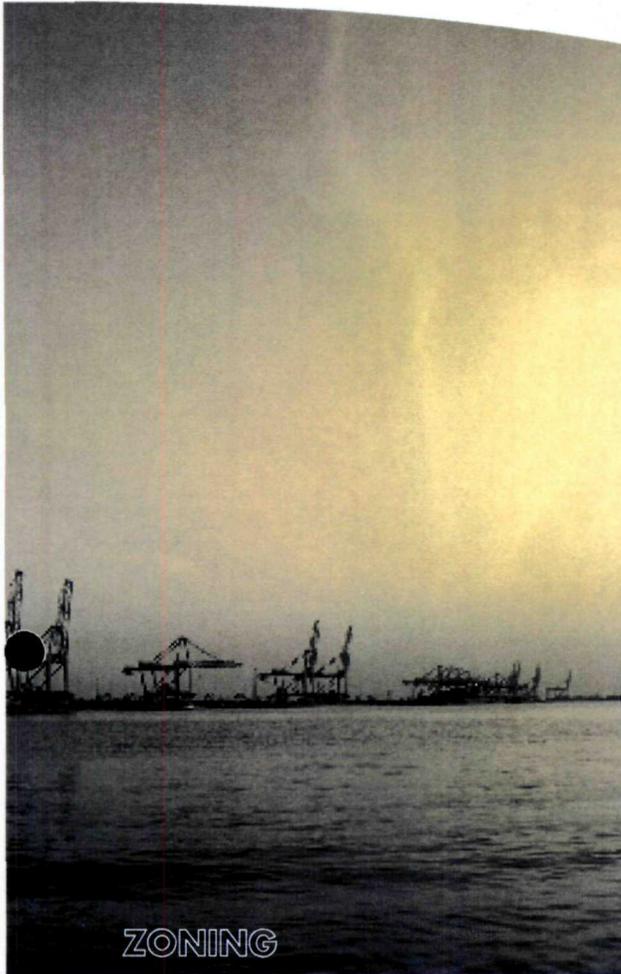
# Environmental Impact Assessment

SUMMARY

Port of Rotterdam Authority  
Project Organization Maasvlakte 2

P.O. Box 6622  
3002 AP Rotterdam  
The Netherlands

T +31 (0)10 252 1111  
F +31 (0)10 252 1100  
E [inform2@portofrotterdam.com](mailto:inform2@portofrotterdam.com)  
W [www.portofrotterdam.com](http://www.portofrotterdam.com)  
W [www.maasvlakte2.com](http://www.maasvlakte2.com)



Document title Environmental Impact Assessment for  
Zoning of Maasvlakte 2  
Summary

Date April 5, 2007

Project number 9R7008.B1

Reference 9R7008.B1/R012/CEL/IBA/Nijm

Client Port of Rotterdam Authority  
Project Organization Maasvlakte 2  
Mr R. Paul  
Director of Project Organization Maasvlakte 2

Projectleader drs. J.J.F.M. van Haeren

Author(s) H.M. Sarink and C.F. Elings

# Environmental Impact Assessment

## SUMMARY

Signature drs. J.J.F.M. van Haeren  
Projectleader

Signature Mr. R. Paul  
Director of Project Organisation Maasvlakte 2

Peer review J.C. Jumelet  
Date/initials April 5, 2007

Released by J.C. Jumelet  
Date/initials April 5, 2007



Port of Rotterdam Authority  
Project Organization Maasvlakte 2  
P.O. Box 6622  
3002 AP Rotterdam  
The Netherlands  
T +31 (0)10 252 1111  
F +31 (0)10 252 1100  
E infomv2@portofrotterdam.com  
W www.portofrotterdam.com  
W www.maasvlakte2.com



Royal Haskoning Division Spatial Development  
Barbarossastraat 35  
Nijmegen  
P.O. Box 151  
6500 AD Nijmegen  
The Netherlands  
T +31 (0)24 328 42 84  
W www.royalhaskoning.com

**CONTENTS****PAGE**

1	A NEW MAASVLAKTE	4
2	WHY DO WE NEED MAASVLAKTE 2	6
3	REQUIREMENTS AND WISHES FOR MAASVLAKTE 2	8
4	LAND RECLAMATION PLAN	9
5	THREE LAYOUT ALTERNATIVES	11
6	PLAN ALTERNATIVE	13
7	MOST ENVIRONMENT FRIENDLY ALTERNATIVE	14
8	PREFERRED ALTERNATIVE	14
9	OVERVIEW OF ALTERNATIVES	15
10	EFFECTS	18
11	CONCLUSIONS	24
12	WHAT NOW?	26

## 1 A NEW MAASVLAKTE

Maasvlakte 2 is a new port and industrial site that will be built alongside the existing Maasvlakte. Maasvlakte 2 is of an unprecedented size and scale by Dutch standards because of its large surface area, location and magnitude. It will be used by companies that need a lot of space and have to be alongside deep sea water. This means mainly companies involved in large-scale container storage and transshipment, related distribution activities and the chemical industry.

Maasvlakte 2 will be land reclaimed in the North Sea and will be surrounded by sea walls with a natural transition to the Voordelta. As on the present Maasvlakte, there will be space on Maasvlakte 2 for recreation. Maasvlakte 2 will cover approximately 2000 ha. Up to 1000 ha will be used by port and industry companies. The other 1000 ha will be needed for docks, canals, turning basins, roads, railways, pipelines and sea defences with dunes and beach. The planning calls for construction to start in 2008 so that the first port sites can go into operation in 2013. The remaining sites will be developed gradually. There will be synchronisation with market developments and the demand for space on Maasvlakte 2. Maasvlakte 2 is expected to be fully operational in 2033.

Maasvlakte 2 may look like this in 2033:



Maasvlakte 2 is a large project requiring substantial investments. The project is important for the European transport network, Dutch economy, inhabitants of Rijnmond and the Rotterdam port. The reclaimed land will be located in the Voordelta, a protected European nature area. In the proximity there are important protected dunes. Furthermore, quality of life in the Rijnmond area is under pressure here and there. Therefore, decisions about Maasvlakte 2 must be prepared carefully and it is essential to weigh up the different interests properly. Central government has made a start by means of its Key Planning Decision for the Rotterdam Mainport Development Project.

### Key Planning Decision (PKB) for the Rotterdam Mainport Development Project (PMR)

In its Key Planning Decision ("PKB – Planologische Kermbeslissing") for the Rotterdam Mainport Development Project ("PMR – Project Mainportontwikkeling Rotterdam") 2006 (PKB PMR 2006), the Dutch government cleared the way for construction of Maasvlakte 2. The decision provides for strengthening of the position of the Rotterdam port and improvement of quality of life in the Rijnmond region. Three distinct projects have been started to achieve this dual objective:

- Maasvlakte 2: expansion of the Rotterdam port by adding 1000 ha of port and industry land;
- Existing Rotterdam Area: a plan to increase utilisation of the existing port area and improve the residential and human environment in the region;
- 750 ha for new nature and recreation to the south and north of Rotterdam.

These three projects will be elaborated out simultaneously. The Port of Rotterdam Authority is working out the Maasvlakte 2 sub-project.

### Maasvlakte 2: history of project

- A PKB-Plus procedure was originally carried out for the Rotterdam Mainport Development Project. This procedure got underway in 1998 with publication of a kick-off memorandum. The memorandum announced extensive research into the consequences for nature, environment and recreation in an Environmental Impact Assessment.
- In 2001 the Dutch government announced its intention to construct Maasvlakte 2. The intention was laid down in the draft (part 1) of the PKB-Plus PMR, which was published together with an Environmental Impact Assessment for the project. The PKB-plus included various concrete policy decisions.
- The definitive text (part 4) of the PKB-Plus PMR came into effect in September 2003.
- In September 2003, appeals were lodged against the concrete policy decisions contained in the PKB-Plus. They resulted in the Council of State nullifying all of those decisions. It meant the PKB-Plus had to be revised.
- In the subsequent revision process, it was decided to convert the concrete policy decisions into 'decisions of fundamental importance'. They were set down in a new government position paper (part 3) on the PKB PMR. A strategic environmental assessment was carried out to identify the environmental effects of the strategic choices made in the PKB PMR. The assessment was made available for public inspection at the same time as the government's position on the PKB PMR.
- The Upper and Lower Houses of the Dutch Parliament have now approved the revised PKB. The definitive text of the PKB PMR (part 4) came into effect on January 30, 2007. This marked completion of the PKB procedure.

### Decision-making on construction and zoning

The PKB was the point of departure for the decision-making procedures now underway. The procedures concern an earth removal licence for extraction of sand in the North Sea that will be laid on Maasvlakte 2 and a concession for construction of the reclaimed land with details of the building work. They also concern the zoning plan necessary for the construction and layout of Maasvlakte 2. The zoning plan will regulate what may be built or constructed at certain places and what kind of usage will be allowed. This concerns Maasvlakte 2 being used as industrial land but also the construction of the necessary infrastructure, like roads, railways, pipelines and recreational facilities.

Two separate environmental impact assessments were produced for these procedures. The sand extraction and land reclamation concern construction of Maasvlakte 2 and were examined in the EIA Construction for Maasvlakte 2. The other activities will be made possible spatially in the zoning plan and have been included in the EIA Zoning. All information necessary to give full consideration to environmental interests in decision-making is available in these two environmental impact assessments.

### Summary of EIA Zoning

This document contains a summary of EIA Zoning, in which the most important results of the EIA are described. Besides the summary, EIA Zoning consists of a main report, impact report and numerous annexes. The main report describes in general terms all elements of the Environmental Impact Assessment. The impact report explains in greater detail the effects described in the EIA and addresses working methods, key principles and results. The annexes contain detailed information about specific subjects and validate the information provided in the main report and impact report. Some of the annexes were drawn up not only for the purposes of EIA Zoning, but also for EIA Construction. All documents can be found on the Internet at [www.maasvlakte2.com](http://www.maasvlakte2.com).

The 'marine reserve' is now called the 'sea bed protection area'. The name was changed because 'marine reserve' wrongly suggested that the area in question is one in which many restrictions are in place to limit human activities. The focus, however, is on protecting the sea bed and providing a haven for protected bird species. So in this report and its annexes you should read 'sea bed protection area with havens for protected bird species' wherever reference is made to 'marine reserve'.

## 2 WHY DO WE NEED MAASVLAKTE 2

The Rotterdam Mainport is one of the key pillars of the Dutch economy. It is vitally important to retain and strengthen this position. Deep sea activities, one of the cornerstones of the Rotterdam port, have grown steadily in recent years and will grow further in the coming period. The port is now nearing the limits of its capacity. The existing Rotterdam port area has insufficient space to absorb this growth. If the Rotterdam port is to continue operating responsibly in the years ahead, new space will have to be available for deep sea related companies. This will avoid a situation where Rotterdam will be obliged to say "no" to companies that want to expand or set up in business in the port.

The Emma Maersk, one of the world's largest container ships



Space is needed particularly by companies involved in container storage and transhipment, by associated distribution companies and by large chemical companies. Container transhipment has grown considerably and will continue to do so. A great demand exists for large sites alongside deep navigable water. Even now there is no more space for new, large companies. From 2010 onwards, there will be a demand for new sites and the space required in 2030 for containers is estimated at 625 ha. Demand for distribution sites is linked to the size of the container terminals and is estimated at 165 ha.

In the chemical industry there are mergers, scaling up operations and the forming of clusters in which similar and complementary industrial activities are located close to each other. Existing companies still have limited scope for expanding in the present port, but there is no longer any space for new, large companies. The chemical industry will need an estimated 210 ha of space. This figure makes allowance for an electricity station.

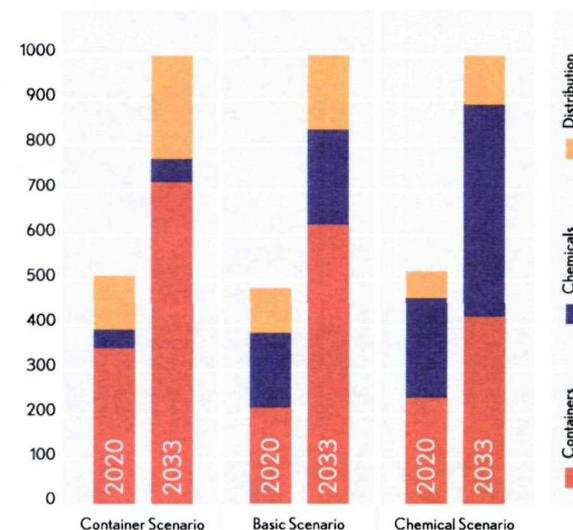
All together the estimated demand for space totals 1000 ha. The distribution of the number of hectares stated for each branch of industry is a "basic scenario". Research has shown that in the Netherlands only Rotterdam can provide the space required for activities related to navigable water. This space cannot be found in the existing port. Therefore, the Dutch government decided to reclaim land in the North Sea.

### Market demand

The Maasvlakte 2 project makes allowance for the demand for space up to the year 2033, the year when Maasvlakte 2 is expected to be fully operational. In this period the market may develop differently to current predictions. For that reason, two scenarios have been developed, additional to the basic scenario, for a situation where the demand for space differs from current forecasts.

The Container Scenario assumes a stronger growth of the container sector. If this happens it will be necessary to build more container terminals and the space requirement will rise from 625 to up to 720 ha. The Chemical Scenario assumes a greater demand for sites for the chemical industry, i.e. up to 470 ha instead of 210 ha. In each scenario, the total space requirement will not exceed 1000 ha. The relationships between these sectors can be seen in the graph below.

Three scenarios with their space requirements in each sector (in hectares)



Great interest exists for sites on Maasvlakte 2. The first contract for a container terminal has already been signed. Companies have expressed a need to be able to use these sites from 2011 onwards. Given the time necessary to construct and lay out the reclaimed land, this will not be feasible. It will take years to construct and lay out the reclaimed land.

### Existing Rotterdam Area

As part of the PKB PMR, the Dutch government decided to carry out a sub-project called Existing Rotterdam Area, which has two pillars: intensification of the existing area and improvement of the quality of life in the area. This is achievable by relocating environmentally harmful companies from the Waal-Eemhaven area to other parts of the port and by transforming parts of the port area into an urban area. In the short term this concerns the Rijnhaven and Maashaven and in the longer term the Merwehaven and Vierhaven. This can be done only if there is space to relocate the companies. A study was conducted to find out whether it is possible to move out the companies to Maasvlakte 2.

The deep sea related container transhipment that now occurs in the Waal-Eemhaven will increasingly be handled on Maasvlakte in the future. Ultimately the environmental burden will be lower in this area. Small-scale industrial activities cannot be moved to Maasvlakte 2. In terms of their size and scale they are unsuited to Maasvlakte 2. Plots are also available in Botlek and Europoort. Only some of this space is suitable for companies from the CityPorts. While a few companies have been successfully relocated in recent years, the container sector present in the Waal-Eemhaven and the fruit and juice cluster on the northern bank are unsuited to the freed up plots within the Botlek and Europoort. Relocating companies from Botlek/Europoort to Maasvlakte 2 so as to create space would amount to the destruction of capital. Therefore, the relocation of companies from the city port areas to Botlek/Europoort or Maasvlakte is not a feasible operation.

### 3 REQUIREMENTS AND WISHES FOR MAASVLAKTE 2

As mentioned earlier, the Dutch government cleared the way for construction of Maasvlakte 2 in its PKB PMR. The decision contains several requirements concerning the layout and usage of Maasvlakte 2:

1. The net size of the port and industrial land may not exceed 1000 ha.
2. The reclaimed land must provide space for deep sea related activities, like large-scale container storage and transhipment and directly related distribution activities. Additionally, the reclaimed land may possibly provide space for large-scale deep sea related chemical companies. It must remain possible to establish on the reclaimed land activities other than the aforementioned ones, under exceptional circumstances and based on careful deliberations.
3. The reclaimed land must be laid out, operated and managed according to the principles of a sustainable industrial site.
4. The negative environmental effects of the ultimate plan may not exceed the environmental effects of the two reference plans, as inventoried in the strategic environmental assessment.

Moreover, the construction of sites must be synchronised with the actual market demand for space. It goes without saying that all existing laws and regulations must be met, regardless of whether laid down at European, national, provincial or municipal level. This issue arises particularly with regard to noise, air quality, water, external safety and nature.

#### Nature conservancy

Maasvlakte 2 will be constructed in the Voordelta, a protected part of the North Sea. In the immediate vicinity there are other protected nature areas, namely Voornes Duin, the dunes of Goeree and Kwade Hoek. Near Hook of Holland there are Solleveld and the Kapittelduinen dunes, other protected nature areas. These areas form part of Natura 2000, a cohesive network of protected nature areas. All are vulnerable landscapes: shallow coastal waters, drying up tidal marshes and flats, wet dune slacks and dry dune grassland where rare plants and animals occur. Natura 2000 areas enjoy special protection under the European Birds and Habitats Directives and the Dutch Nature Conservation Act. Virtually all wild animals in the Netherlands are protected by the Flora and Fauna Act. The same applies to rare or endangered plants.

#### Fen Orchid (*Liparis loeselii*)



The law prescribes that alternatives must be designed in a way that limits the negative effects for nature as far as possible. If negative effects occur despite these efforts, there must be timely compensation for those effects. EIA Zoning addresses the consequences of the use that will be made of the land reclaimed from the sea and the dune landscapes in the vicinity. It has been established that nature compensation will be necessary for the dune areas. Central government will take care of the nature compensation needed for Maasvlakte 2 in the form of a new dune area of 35 ha near the coast of Delfland.

#### Basic principles and wishes

During preparation of the plan many choices were also made that do not stem from the requirements mentioned above. One of choices is that the recreational facilities on Maasvlakte 2 must be at least equivalent to those on the existing Maasvlakte. It has also been decided to continue on Maasvlakte 2 the policy now conducted in the port and on the existing Maasvlakte.

Port and industrial land of a size and scale of Maasvlakte 2 offers opportunities to fulfil the ambitions and wishes that exist with regard to sustainability. Sustainability is a general term that must be interpreted from situation to situation. What does it mean if Maasvlakte 2 is created as a sustainable industrial site? For Maasvlakte 2, sustainability has been translated into three concepts (lines of thinking), which have been fleshed out to differing degrees in the alternatives.

The first concept calls for a clustering of companies. This applies particularly to the chemical industry. Chemical companies can benefit from each other's proximity because semi-manufactures, residual substances and residual heat will be within easy reach of the companies. This will save energy and raw materials. The present Maasvlakte already has such a cluster; by way of extension, Maasvlakte 2 will also have a cluster. Depending on the chemical industry's demand for sites, a second chemical cluster may be created in the northwest.

The second concept provides for possibilities for utilising the outer contour for several functions. The outer contour provides protection against flooding from the sea, but it will also be developed into a dune landscape. Recreation will be made possible on the outer contour as well. Safety is a matter requiring attention on account of the companies in the proximity.

It is also possible to install wind turbines on the sea walls to generate clean energy. This concept has been called the multifunctional outer contour.

The third concept, sustainable logistics, seeks to optimise the accessibility of Maasvlakte 2 and to improve air quality in combination with the fullest possible use of environment friendly transport modalities for hinterland connections. This concept calls for a reduction of transport of containers by road by stimulating container transport by railways and waterways. The efficiency of freight traffic can be increased by raising the capacity utilisation of trucks.

### 4 LAND RECLAMATION PLAN

Two reference plans were developed and examined for the PKB PMR. They were found to impact substantially on the Dutch coastal foundations. Therefore, there was extensive research into how the reference plans in the PKB PMR could be improved. This resulted in the "cut-through alternative". This alternative is the point of departure for this EIA Zoning. The most important features are:

- a compact design so as to limit the impact on nature and landscape as much as possible;
- a favourable plan for the currents along the coast and the safety of the port entrance, with hard sea walls on the northern site and soft sea walls elsewhere;
- access for seagoing vessels and inland vessels via the Yangtzehaven that will be extended from the present Maasvlakte. This explains the name "cut-through alternative";
- two docks with two turning basins in which the largest container ships will be able to berth;
- construction of roads, railways and pipelines parallel to the sea walls, so that they run around the outside of the port and industrial land;
- gradual construction of the inner site, enabling Maasvlakte 2 to grow in step with the market. However, the sea walls will be put in their definitive position in one go.

The northern edge of Maasvlakte 2 will have "hard" sea walls. The western edge will have soft sea walls with dunes and beaches. The existing Slufterstrand beach, with valuable nature in the south, will remain as it is now.

On the inside of the sea walls there will be room for infrastructure consisting of:

- an extended A15 motorway;
- a railway line for goods;
- a secondary road for slow-moving traffic and for use as an emergency route;
- a recreational route and cycle path across the dunes;
- a pipeline route for oil and chemical products and for public utilities;
- a non-public transport lane for internal traffic between companies (mainly container companies).

Additionally, a direct connection will be necessary between the terminals on Maasvlakte 2 and on the present Maasvlakte. This "shortcut route" will have, in addition to a road and railway line, a cycle path, pipelines and an internal transport lane.

#### Wind energy

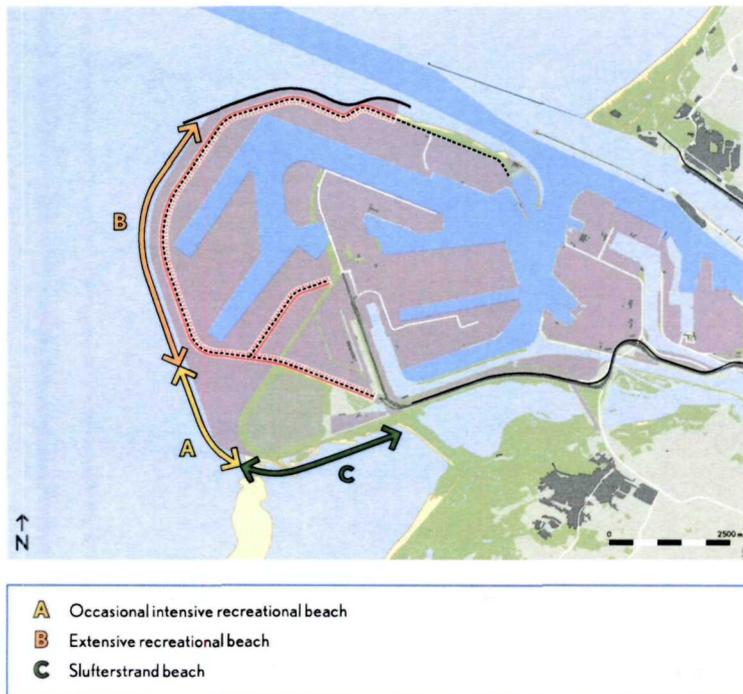
Other functions were also examined when looking at the layout of Maasvlakte 2. Wind turbines are well suited to a sustainable industrial site, for example. There are already turbines on the existing Maasvlakte. Some will have to be removed on account of construction of Maasvlakte 2. On the new sea walls new space will be created to put up wind turbines.

#### Recreation and nature

Like the present Maasvlakte, Maasvlakte 2 will provide space for people engaging in recreational activities. In the southwest there will be a beach of 22 ha with 1500 car parking spaces and entrances to the beaches. This beach will be used intensively in summer. Approximately 10,000 visitors are expected to come to the beach on a summer day, just as on the existing beach. Temporary hospitality facilities will be allowed along the road. Further to the north, along the dunes on the western site of Maasvlakte 2, there will be a beach of 27 ha. This beach will be narrower and less easily accessible. Therefore, its use for recreational purposes will be less intensive. The beach will be suitable for a long walk, for anglers, kite flyers, water sports enthusiasts and active outdoor sportspeople who will use the beach for activities like kite surfing or paragliding. Some parking places and one beach entrance will be sufficient at this location.

The Slufterstrand beach south of the present Maasvlakte will remain as it is now, particularly for nature lovers. The tranquility here will allow nature to continue flourishing. Along the soft sea walls there is going to be an adjoining natural dune landscape where nature will have an opportunity to flourish at the transition between the new port and industrial area and the Voordelta.

The spatial plan of Maasvlakte 2 will then look like this:



## 5 THREE LAYOUT ALTERNATIVES

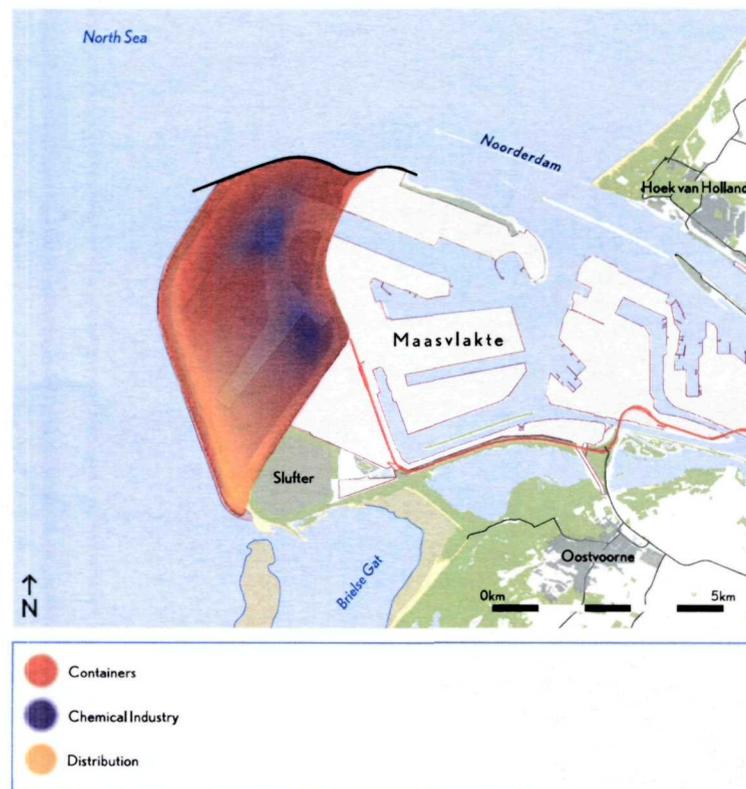
EIA Zoning addresses the effects of the use made of Maasvlakte 2. Its use as a port and industrial area is closely related to the way the new reclaimed land will be arranged. Different alternatives exist for the layout of the land, but all are based on the cut-through alternative. So from a spatial point of view they appear to resemble each other. A requirement for each alternative is that the environmental burden may not exceed the impact identified in the reference plans examined for the PKB PMR. Measures have been built into each alternative to ensure this is the case. The alternatives differ particularly in terms of these measures.

The alternatives were established in four steps.

1. In an Exploratory Spatial Study, the land was arranged to accommodate different types of activities and infrastructure. Allowance was made for the Basic Scenario, Container Scenario and Chemical Scenario. The environmental impact of each scenario was calculated. This led to two conclusions:
  - Not every company can be located anywhere. Chemical companies can best be located centrally, alongside the chemical cluster on the present Maasvlakte. A second cluster is conceivable on the northwest edge. Container storage and transshipment will obviously be grouped around the docks. The distribution site is suited to the south, immediately alongside the Slufter, because it will cause relatively little disturbance to nature and recreation in the proximity;
  - Without additional measures, there will be problems in respect of a number of matters, because the environmental impact will breach legal requirements. This concerns traffic and transport, air quality, external safety and water.
2. Measures are necessary to solve these problems. The Plan Alternative came about by adding these measures to the Exploratory Spatial Study. This is a plan in which Maasvlakte 2 will be laid out in a way that satisfies laws and regulations.
3. By taking more additional measures, the environmental impact of Maasvlakte 2 can be reduced still further. This led to the Most Environment Friendly Alternative. This alternative will further improve the quality of the surroundings and give even more substance to the sustainability ambitions. What's more, this alternative will provide more space for recreation and nature development.
4. The measures in the Plan Alternative and the Most Environmental Friendly Alternative will help to resolve the problems and reduce the environmental impact. The Port of Rotterdam Authority can carry out some of the measures on its own. There are also measures the Port of Rotterdam Authority cannot take alone or which at the present time are apparently not feasible. So the Port of Rotterdam Authority cannot guarantee that all possible measures will actually be carried out because it will be dependent upon other authorities and organisations. Therefore, after a critical examination of all potential measures, it was decided to select measures that meet three criteria: they are effective, they are feasible and they will definitely be carried out. This resulted in the Preferred Alternative.

Each alternative is thus characterised by a set of measures, and this is where the differences lie. Primarily, the measures are aimed at reducing the environmental consequences. But they may also allow the development of nature and increase the quality of the landscape, make Maasvlakte 2 more attractive for recreational visitors or enable installation of wind turbines. Chapter 9 contains an overview of all measures for each alternative. Complete descriptions can be found in the main report and, in greater detail, in the Development of Alternatives annex. The figure below shows in general terms the spatial layout of the examined industrial sectors.

Rough distribution of industrial sectors across Maasvlakte 2



## 6 PLAN ALTERNATIVE

If Maasvlakte 2 is laid out according to the Exploratory Spatial Study, it will produce problems in respect of traffic/transport, air quality, external safety and water. The Plan Alternative has solutions to these issues.

### Traffic and transport

It is busy on the roads in the Rijnmond region. Despite measures already being taken, the road traffic will increase until 2020, even without Maasvlakte 2, by double figure percentages. This is a general picture for commuting, business traffic and recreational traffic. On the A15 and A4 motorways, and on Voorne also on the N57 and N218, bottlenecks look likely to occur as regards accessibility. The increase in traffic will cause a slight decrease in road safety. The daily rush hours are the greatest problem. The Port of Rotterdam Authority has been tackling the growth in traffic by encouraging the transport of containers by inland vessels and trains. Nevertheless, this will not entirely solve the future problems. With Maasvlakte 2, accessibility by road will slightly deteriorate still further, even though central government is increasing the capacity of the A15 motorway. The enlargement of the A15 will provide breathing space until 2020. For the period after 2020, too, the government has guaranteed the accessibility of Maasvlakte 2.

### Air quality

Air quality in the Rijnmond region will improve noticeably in the coming years at most places. However, the standards laid down for air quality are still being violated at a few places in respect of nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>10</sub>). But these problems are already occurring even without Maasvlakte 2.

Although Maasvlakte's contributions are small, it is mandatory to avoid these negative contributions in violation areas to the fullest extent possible. This will be achievable with the Plan Alternative. Preventing pollution at source is generally the preferred option; combating the effects comes second. The transportation of more containers by inland vessels and trains instead of by road is already being encouraged. If there are fewer trucks on the road, they will cause less air pollution. Moreover, it is assumed that in the future there will be larger trucks that will drive less frequently without cargo. The inland vessels of the future will have cleaner engines and use cleaner fuel. If this helps insufficiently, the vessels will have to sail slower. The emission of particulate matter through the storage and transhipment of dry bulk will be limited by agreeing arrangements with the sector. At the tunnel mouths along the A15 and A4 motorways the situation will remain precarious despite these measures. Exhaust gases are emitted in a more concentrated form at those locations. But by means of technical measures, like extraction at the tunnel mouths, it will be possible to reduce the concentrations sufficiently.

### External safety

Safety is an important subject for Maasvlakte 2. The chemical industry and wind turbines on Maasvlakte 2 and the transport of hazardous substances through pipelines add up to a potential risk to the safety of people on the beach of Maasvlakte 2. In the Plan Alternative, the beach where it may be relatively busy will remain outside the risk contour. This is because the companies with the greatest risks will not be located in the south of Maasvlakte 2 and thus be at a safe distance. The pipelines will be made safer by technical measures where necessary. No problems are expected on the roads, railways or waterways as a result of the transport of hazardous substances to and from Maasvlakte 2.

### Water

Maasvlakte 2 will not cause any new water quality problems. However, the concentration of organotin in the docks will probably remain too high for a while, even if Maasvlakte 2 is not constructed. Organotin is a constituent of antifoulings, which ensure the hulls of ships do not get covered in algae. Its use has now been prohibited in Europe. Worldwide this is not yet the case, however. After a general prohibition the substance will remain in the water and waterbed for a long time yet, but will then gradually disappear.

The electricity station and chemical companies on the present Maasvlakte currently discharge cooling water into the North Sea. The construction of Maasvlakte 2 will render this impossible, and the cooling water will then be discharged in the new docks. The water temperature in the docks of Maasvlakte 2 will therefore increase by a few degrees. The temperature rise caused by discharges of cooling water by companies established on Maasvlakte 2 will be limited. The already planned expansion of electricity stations on the existing Maasvlakte will pose a problem, however. Unless measures are taken the water temperature will increase by more than is permitted. To satisfy the directive the Plan Alternative provides for the installation of a sluice in the southwest seawalls of Maasvlakte 2. From the eastern docks, the water will be discharged into the North Sea. Ecologically this is not a problem and the water temperature will again meet the standard.

## 7 MOST ENVIRONMENT FRIENDLY ALTERNATIVE

On top of the measures in the Plan Alternative, the Most Environment Friendly Alternative provides for far more investments in sustainability. Among other things this alternative calls for a second chemical cluster in the northwest. The Port of Rotterdam Authority is also actively looking for companies at the forefront of energy reduction and clean production. This fits in with the ambitions contained in the Port Plan 2020. In the hinterland there will be less inconvenience for traffic as a result of road pricing, noise abatement measures at the Suurhoffbrug and the banning of trucks on the N218 at Oostvoorne.

While the water temperature problems have been solved in the Plan Alternative by constructing a sluice, this solution was not adopted in the Most Environment Friendly Alternative. The sluice will result in very high costs and high energy consumption but deliver only a limited benefit for the environment. Therefore, it was decided in the Most Environment Friendly Alternative to opt for measures that limit the scale of cooling water discharges into the new docks. The temperature increase of the water in the Most Environment Friendly Alternative is, at a maximum of 0.4°C, slightly higher than the desired maximum increase of 3.0°C. Nevertheless, no negative ecological effects are expected.

Public transport and cycling will receive a boost through the construction of a 'transferium' on Maasvlakte 2 and a ferryboat to Hook of Holland. It is also assumed that the Oranjetunnel will be built, connecting to the Veilingroute. This will ease pressure on the A15 motorway and improve accessibility.

The soft sea walls will be created as a dune landscape that will be as natural as possible. On top there will be two vantage points and a recreational route for cars and cyclists. A beach along the west of Maasvlakte 2 will increase opportunities for active outdoor sports enthusiasts and a trailer slope will be constructed for them. The Most Environment Friendly Alternative actively stimulates temporary nature. The Slufterstrand beach will remain quiet, as in the Plan Alternative, to spare the local nature. The landscape and architecture will be made more attractive by arranging them according to the image quality plans.

## 8 PREFERRED ALTERNATIVE

The Plan Alternative and Most Environment Friendly Alternative are realistic alternatives. The Port of Authority will be unable to take some of the measures in the alternatives on its own. However, the authority does want to make the Preferred Alternative as certain as possible. Many measures contained in the Most Environment Friendly Alternative can also be found in the Preferred Alternative. Consequently, this alternative will generally speaking produce a more favourable result than the Plan Alternative. The measures the Port of Rotterdam Authority cannot take on its own, or for which other parties have not given any guarantees, have been omitted from the Preferred Alternative. Other measures have been chosen particularly for air quality, measures that will definitely help and will definitely be carried out.

There will be full compensation for the increasing concentrations of particulate matter and nitrogen dioxide so as to meet the requirements contained in the Air Quality Decree. The preference is always to take measures that tackle pollution at the source. If they are then found to help insufficiently, additional measures will be available to achieve the goal. Inland vessels must be fitted with cleaner engines not later than in 2025. To promote the switchover the Port of Rotterdam Authority will increase port fees for dirty ships by 10% from 2010. Until that time, the maximum speed for inland vessels will if necessary be reduced by an average of 20% at problem spots on the Hartelkanaal and Oude Maas as soon as the first companies are operational on Maasvlakte 2 after 2013. A speed restriction for inland vessels will also be introduced on the Nieuwe Maas, in the vicinity of the centre of Rotterdam. This approach will combat pollution at the places where it is most urgently necessary.

Road traffic on the A15 and A4 motorways will be subject to variable maximum speeds if necessary. Not later than in 2013, screens will be put up along different sections of the motorways, especially at tunnel mouths. This will send polluted air higher into the atmosphere, keeping the environment cleaner at living level.

The Preferred Alternative includes many measures contained in the Plan Alternative. Similarly, many features of the Most Environment Friendly Alternative can be found in the Preferred Alternative, such as the more sustainable measures for limiting the effects of discharges of cooling water, the beach for extensive recreation in the west, the extra recreational facilities and the natural dune landscape.

## 9 OVERVIEW OF ALTERNATIVES

The overview below shows the outcomes of the exploratory spatial study and the three alternatives and accompanying measures.

Table 9.1: Summary of all measures

	Exploratory spatial study	Plan alternative	Most environment friendly alternative	Preferred alternative
<b>SPATIAL ASPECTS</b>				
Allocation of business plots				
Bandwidth in the space needed by business sectors: at most 720 ha of container storage and transhipment, at most 470 ha for chemical companies and at most 230 ha for distribution, together totalling not more than 1000 ha	*	*	*	*
Optimum business location subject to external safety risks around the occasionally intensive recreational beach		*	*	*
Chemical cluster that will be aligned to the chemical cluster on the present Maasvlakte	*	*	*	*
A second chemical cluster in the north-west			*	*
<b>Wet access</b>				
Cut-through Yangtzehaven	*	*	*	*
Yangtzehaven, two docks oriented southwest-northeast and turning basins	*	*	*	*
<b>Dry access</b>				
Main infrastructure bundle:	*	*	*	*
Extended A15, with 2x2 lanes and emergency lanes	*	*	*	*
Expansion of capacity of A15 in period up to 2020 and in period up to 2033, which will be laid down in the Proposed A15 Route Decree	*	*		
Secondary road for slow-moving traffic, plus recreational and emergency route at the foot of the sea walls, with a cycle path on the dunes			*	*
Railway: main track with queuing or marshalling track	*	*	*	*
Split-level crossings between road and rail on Maasvlakte 2			*	
Reservation of space for Internal Transport Lane	*	*	*	*
Pipes for carrying hazardous substances on the outside of the bundle immediately alongside the sea walls	*	*		
Other cables and pipes on the inside of the railway	*	*	*	*
Shortcut route consisting of a road with two lanes, double railway line, internal transport lane, a cycle path and public utility lines	*	*	*	*

	Exploratory spatial study	Plan alternative	Most environment friendly alternative	Preferred alternative
Other elements				
Maximum number of wind turbines on the outer contour	*			
Maximum number of wind turbines on the hard and soft sea walls, up to the occasionally intensive recreational beach		*		
Maximum number of wind turbines on the hard sea walls			*	*
Creation of 2 vantage points: 1 landmark and 1 elevated dune			*	*
Recreational beach for occasionally intensive use in the southwest - at least 5 beach entrances - ~1500 car parking spaces	*	*	*	*
Recreational beach for extensive usage in the west - 1 or 2 beach entrances - ~50 car parking spaces	*		*	*
Possibilities for outdoor sport on the extensive recreational beach			*	*
Limited access to extensive recreational beach for cars and a trailer slope			*	*
Limited access to Slufterstrand beach			*	*
Limited seasonal hospitality establishments on the occasionally intensive beach in the southwest			*	*
Avoid temporary nature		*		
Manage and orchestrate temporary nature			*	
Stimulate temporary nature			*	
Image quality plan and integrated management of green spaces			*	*
Outer contour as a natural dune landscape			*	*
Creation of stepping stones for nature development			*	
NON-SPATIAL ASPECTS				
Measures on Maasvlakte 2:				
Technical changes to the pipelines at the location of the occasionally intensive recreational beach	*	*	*	
Extra earth covering on the pipelines at the location of the occasionally intensive recreational beach	*	*	*	
Active acquisition for logistics of companies			*	*
Active acquisition for substances and energy management of companies			*	*
Creation of a Chemical Logistics Centre			*	*
Temporary use of unused sites			*	*
Limit light nuisance			*	
Measures for the wet infrastructure:				
Dynamic management of inland shipping traffic on all waterways: 45% speed reduction (in 2020 and 2033)	*	*		
Dynamic management of inland shipping traffic at bottlenecks: 20% speed reduction if necessary from 2013 until 2025 at the latest			*	

	Exploratory spatial study	Plan alternative	Most environment friendly alternative	Preferred alternative
Dynamic management of inland shipping traffic at bottlenecks: 20% speed reduction if necessary from 2013 until 2025 at the latest				*
Quality mark for inland shipping: 90% reduction of PM10 and 50% reduction of NOx for 25% of all vessels		*	*	
Prohibition of dirty engines of inland vessels as of 2025 and stimulation of rapid introduction of cleaner engines (phase 2 or better) in the period up to 2025				*
Limiting of emissions of PM10 of dry bulk storage and transhipment (0% increase in emissions) at existing port and industry complex		*	*	
Construction of a sluice in the southwest of Maasvlakte 2		*		
Limiting of discharges of cooling water by the chemical industry			*	*
Cluster chemical companies that need cooling water in the northwest of Maasvlakte 2			*	*
25% of chemical companies without need for cooling water			*	*
Use of residual heat			*	*
Improve substrates of slopes and quays			*	
Improve substrate of slopes				*
Measures for the dry infrastructure:				
Reduce emissions by road traffic by introducing dynamic driving speeds on the A15 (between Thomassentunnel – Beneluxplein) and A4 (between Beneluxplein – Ketelplein)			*	*
Placing of local air screens along the A15 and A4				*
Utilisation of load capacity of trucks: 2.8 TEU/visit (in 2033)	*			*
Utilisation of load capacity of trucks: 3.2 TEU/visit (in 2033)		*	*	
Green Gate concept		*	*	
Extraction at tunnel mouths		*	*	
Construction of Oranjetunnel			*	
Load gates			*	
42% Container transport by road in 2020, 35% Container transport by road in 2033	*			*
36% Container transport by road in 2020, 30% Container transport by road in 2033		*	*	
Introduction of road pricing			*	
Public transport 'transferium' on Maasvlakte 2, express service to Spijkenisse and other concentration areas			*	
Public transport closer to the recreational beach			*	
Cycle/pedestrian ferry between Maasvlakte 2 and Hook of Holland			*	
Freight traffic over N57 and A15, not N218		*		

### 10 EFFECTS

What environmental effects will occur when Maasvlakte 2 is operational? This is the key question in the EIA Zoning. Numerous specialists have studied this question. The studies focused on the matters likely to be subject to effects: traffic and transport, noise, air quality, external safety, water, light, nature, landscape and shared recreational use. The reference years were 2003 (current situation), 2020 (Maasvlakte 2 partly operational) and 2033 (fully operational). The situation where Maasvlakte 2 exists was compared, for each of the alternatives, with the situation that would exist in the year in question without Maasvlakte 2. The fullest possible use was made of computing models for this purpose. Where this was not possible, a qualitative opinion was given. This exercise produced a large overview of effects. Table 10.1 shows alongside each other the results of the Plan Alternative ('PA'), Most Environment Friendly Alternative ('MMA') and Preferred Alternative ('VKA') for the situations in 2020 and 2033.

Table 10.1: Environmental effects of the alternatives in 2020 and 2033

			2020			2033		
			PA	MMA	VKA	PA	MMA	VKA
Traffic and transport	Reachability	Reachability by road	0	+	-	-	+	-
		Reachability per rail	0	0	0	-	-	-
		Reachability for inland shipping	-	-	-	0	0	0
		Reachability for seagoing shipping	0	0	0	0	0	0
		Reachability by pipeline	0	0	0	0	0	0
	Traffic safety	Road safety	-	0	-	-	0	-
Nautical safety		0	0	0	0	0	0	
Noise	Industrial noise	Noise load on Maasvlakte 2	0	0	0	0	0	0
		Noise load in entire port area	0	0	0	0	0	0
	Traffic noise	Noise load of road traffic	0	0	0	0	0	0
		Noise load of rail traffic	0	0	0	0	0	0
		Noise load of shipping	0	0	0	0	0	0
	Accumulation of noise	Noise load on quiet areas	-	-	-	-	-	-
Noise load on noise-affected parties		-	0	-	0	0	0	
Air quality	Nitrogen dioxide (NO <sub>2</sub> )	Annual average concentration	0	0	0	0	0	0
		Hourly average concentration	0	0	0	0	0	0
		Size of violation area	+	+	+	+	+	+
		Number of parties exposed	+	+	+	+	+	+
	Particulate matter (PM <sub>10</sub> )	Annual average concentration	0	0	0	0	0	0
		Daily average concentration	0	0	0	0	0	0
		Size of violation area	0	0	0	0	0	0
		Number of parties exposed	0	0	0	0	0	0

Legend: -- Negative effect, - Limited negative effect, 0 Neutral effect, + Limited positive effect, ++ Positive effect

External safety	Transport of hazardous substances in the hinterland	Road, rail and waterway	Localised risk (PR)	0	0	0	0	0	0
			Group risk (GR)	0	0	0	0	0	0
		Transport of hazardous substances on Maasvlakte 2	Road and rail	Localised risk	0	0	0	0	0
			Group risk	0	0	0	0	0	0
	Pipelines		PR occasionally intensive beach	0	0	0	0	0	0
		PR extensive beach	0	-	-	0	-	-	
		Group risk	0	0	0	0	0	0	
	Stationary establishments	PR occasionally intensive beach	0	0	0	0	0	0	
		PR extensive beach	0	-	-	0	-	-	
Group risk		0	0	0	0	0	0		
Water	Chemical water quality	Discharge of problems substances	0	0	0	0	0	0	
		Good chemical condition of water body	-	-	-	-	-	-	
	Thermal water quality	Rise in temperature of surface water	0	-	-	0	-	-	
Light	Direct light incidence	Direct light incidence	0	0	0	0	0	0	
	Visibility	Visibility	Not valuated			Not valuated			
Nature	National/international diversity of habitats	Habitat 2130 'Grey dunes'	0	0	0	0	0	0	
		Habitat 2190 'Wet dune slacks'	0	0	0	0	0	0	
	National/international diversity of species	Higher plant species requiring attention	0	0	-	-	-	-	
		Breeding birds requiring attention	0	0	0	0	0	0	
	Coastal and sea birds requiring attention	0	0	0	0	0	0		
	Habitat of sand lizard	-	-	-	-	-	-		
Landscape	Form and size	Experience of openness and natural landscape	-	-	-	-	-	-	
	Structure and cohesion	Connection to spatial structures	0	+	+	0	+	+	
		Orientation and recognisability	+	+	+	+	+	+	
	Identity and image	Port's image	+	+	+	+	+	+	
Experience of port and sea		0	+	+	0	+	+		
Shared recreational use	Reachability	Travel time	0	+	0	0	+	0	
		Capacity problems	0	0	0	0	0	0	
		Car parking spaces	-	0	0	-	0	0	
	Beach recreation	Size	-	0	0	-	0	0	
		Accessibility	-	0	0	-	0	0	
		Experience value	-	0	0	-	0	0	
	Outdoor sports	Size	-	+	+	-	+	+	
		Accessibility	-	0	0	-	0	0	
	Port-related recreation	Size	++	++	++	++	++	++	
		Accessibility	0	+	+	0	+	+	
		Experience value	+	++	++	+	++	++	
	Nature recreation	Size	0	++	++	0	++	++	
Accessibility		+	++	++	+	++	++		
Experience value		+	++	++	+	++	++		

Legend: -- Negative effect, - Limited negative effect, 0 Neutral effect, + Limited positive effect, ++ Positive effect

To allow comparison of the alternatives, the obtained results were summarised in a clearer table. The different scores from – to ++ were added together qualitatively for each subject. Some scores are more important than others because of the consequences for the environment or on account of legislation. The sum total in table 10.2 makes allowance for this situation. As different types of effects were added up, the level of detail is lower than in table 10.1. Therefore, the following summarising overview provides less detailed information than the complete table of effects above. If there are no effects or no significant effects, the table shows a zero. If positive effects occur, the table shows a plus sign (+) and if a deterioration occurs because of Maasvlakte 2 there is a minus sign (-). The situation where Maasvlakte 2 will not be constructed is always neutral. This has been called the autonomous development (AO).

Table 10.2: General overview of the alternatives

	2020				2033			
	AO	PA	MMA	VKA	AO	PA	MMA	VKA
Traffic and transport	0	0	+	-	0	-	0	-
Noise	0	0	0	0	0	0	0	0
Air quality	0	0	0	0	0	0	0	0
External safety	0	0	0	0	0	0	0	0
Water	0	-	-	-	0	-	-	-
Light	0	0	0	0	0	0	0	0
Nature	0	0	0	0	0	0	0	0
Landscape	0	0	+	+	0	0	+	+
Shared recreational use	0	0	+	+	0	0	+	+

-- Negative effect    - Limited negative effect    0 Neutral effect    + Limited positive effect    ++ Positive effect

#### Traffic and transport: it will still be busy

The accessibility of Maasvlakte 2 is very important to the port and industry. There will be particular pressure on accessibility by road. In the future it will be even busier than it already is, even without Maasvlakte 2 and regardless of planned capacity expansions on the A15, A4 and N57. Compared with total traffic on the road, the port-related traffic on the motorways around Rotterdam is small. Therefore, Maasvlakte 2, with less than 2%, will not produce much extra traffic. The increasing traffic caused by Maasvlakte 2 will be noticeable mainly in the immediate vicinity, on the westbound A15 motorway and on the N218 and N57 roads. The container sector in particular will contribute to this increase. The differences between the alternatives are caused mainly by differences in the distribution of transport by road, rail and water. Container transport by road will be reduced greatest in the Most Environment Friendly Alternative, while it will be less in the Plan Alternative, and the least in the Preferred Alternative. This is because the Port of Rotterdam Authority is unable at the present time to assure a number of measures designed to guarantee that there will be more transport by rail or by water. Moreover, the measures that will result in the Most Environment Friendly Alternative actually having a positive effect cannot be assured by the Port of Rotterdam Authority. This is, for example, the case for the introduction of road pricing, closure of the N218 across the Brielse Maasdam for freight vehicles and the construction of the Oranjetunnel.

It will also remain busy on the railways. The construction of the Betuwe line means more trains will be able to run from the port to the hinterland. More and more trains will use this line thanks to stimulation of more environment-friendly transport and through the growth of container transport. If the more sustainable railway traffic must also have room to grow after 2020, it will be necessary to examine an expansion of railway capacity, because after 2020 a bottleneck will occur in accessibility by rail due to exhaustion of expansion capacity.

The accessibility of Maasvlakte 2 via inland vessels appears to decrease when you examine the scores in the tables above. However, the declining accessibility is not as bad as it looks; in actual fact, there will only be temporarily longer sailing times due to speed restrictions that may be imposed on shipping to reduce air pollution. As soon as the air quality has improved sufficiently through other measures, the speed restrictions will be lifted and accessibility will again be satisfactory for inland shipping. Road safety is linked to traffic intensities on the roads and so it will decrease slightly in step with accessibility. Nautical safety for shipping will not deteriorate, because precautions are always taken to ensure the number of accidents does not increase.

#### Noise: neutral effect

The noise effects of Maasvlakte 2 are neutral in all of the alternatives. However, there will be negative effects for quiet areas. But there are no legal standards for these areas. The total number of people inconvenienced by noise in 2020 will in the Preferred Alternative come very close to the number determined for the other alternatives. However, the score is slightly negative only in this case. As these numbers of people who will be inconvenienced by noise differ so little, it did not result in a different final score in the summary. Therefore, the effects of noise will not lead to bottlenecks or a violation of standards.

#### Air quality: under control

Air quality in the Rijnmond region will improve significantly at most places in the coming years. The airborne concentrations of sulphur dioxide (SO<sub>2</sub>), volatile organic substances (VOS) and ammonia (NH<sub>3</sub>) and odour nuisance will not produce any problems, even with Maasvlakte 2 included. Without taking measures the standards prescribed for air quality will still be breached at a few places in respect of nitrogen dioxide (NO<sub>2</sub>) and particulate matter (PM<sub>10</sub>). However, these problems would occur even without construction of Maasvlakte 2. Although Maasvlakte's contribution is small, it is mandatory to avoid this negative contribution in violation areas to the fullest extent possible.

Under certain conditions the Air Quality Decree allows deterioration in violation areas to be counterbalanced by making an improvement elsewhere. This is called balancing. Without measures the concentration of particulate matter caused by Maasvlakte 2 in the vicinity of Hook of Holland, Europort and the existing Maasvlakte seems likely to increase to a (very) small extent. According to present insights this will not lead to a violation of the limit values. The high concentrations in the vicinity of Hook of Holland, Europort and the existing Maasvlakte will occur even without Maasvlakte 2 and is due largely to the growth of emissions caused by the storage and transhipment of dry bulk in the port. Emissions by seagoing vessels that call at Maasvlakte 2 will contribute a little more in this respect. The South Holland provincial government has given an undertaking that in the violation area near Hook of Holland the existing and future activities will not cause a violation of the limit values in practice. The South Holland provincial executive can use the zoning plan for Maasvlakte 2 as an autonomous development when licensing individual companies.

Without measures the concentrations of nitrogen dioxide (NO<sub>2</sub>) will be too high on a number of waterways and railway lines to the hinterland. The contribution of Maasvlakte 2, particularly as a result of container transport by road, will be limited. Without measures violation areas will continue to exist in the area only around a number of motorway tunnel mouths.

The standard will ultimately be met everywhere because the alternatives include measures to reduce the concentrations of particulate matter and nitrogen dioxide as much as possible. The Preferred Alternative will achieve this result on the one hand by taking measures at source, such as restricting the speed of road traffic and inland shipping at bottleneck locations, prohibiting dirty engines aboard inland vessels in due course and stimulating the use of clean engines, while on the other the dissemination of particles into the air near motorways will be influenced by taking specific measures, such as the targeted placing of screens along the A15 and A4 motorways. The Plan Alternative and Most Environment Friendly Alternative will solve the air problem by stimulating use of clean engines aboard inland vessels and by stimulating transport by rail and inland waterways and imposing speed restrictions on roads and waterways. The result will be less transport of containers by road, so emissions of substances along motorways will also decrease. The measures that will be taken in all alternatives will help improve air quality in the region. If the monitoring of effects reveals that these measures are insufficient, targeted additional measures can be taken.

#### Climate

The Maasvlakte 2 plan, the ambitions of the Port of Rotterdam Authority and the contractual conditions for future users of Maasvlakte 2 will limit emissions of CO<sub>2</sub>. Emissions of CO<sub>2</sub> impact on a national to global scale in the form of the greenhouse effect. Local effects related to Maasvlakte 2 will therefore be unobservable. The total emission of CO<sub>2</sub> as result of Maasvlakte 2 in 2033 has been calculated at 2.5 to 5 megatons, depending on the proportion of chemical industry present. An estimate of total emissions of CO<sub>2</sub> over that period of time is not available. The expected emissions of CO<sub>2</sub> in the Netherlands in 2012 come to approximately 220 megatons, of which 110 megatons will be caused by industry and electricity stations and 40 megatons by traffic. The plan for Maasvlakte 2 provides for wind energy. The quantity of CO<sub>2</sub> this will prevent amounts in the Preferred Alternative, with the erection of wind turbines only on the hard sea walls, to a maximum of 60 kilotons per year, or a maximum of 3% of the total CO<sub>2</sub> emissions of Maasvlakte 2. If wind turbines are installed along all the sea walls in the Most Environment Friendly Alternative, the avoided CO<sub>2</sub> emissions may rise to up to 8% of the total emissions of Maasvlakte 2.

**External safety: controllable**

No external safety problems are expected due to the transport of hazardous substances by road, rail and water, because the risks are controllable. Combining recreation with the presence of industry requires attention in all alternatives. The spatial allocation of business sectors across Maasvlakte 2 means the legally prescribed risk contour will not fall across the intensive recreation beach in the southwest. This beach is regarded as vulnerable in the zoning plan. For the extensive beach in the west, however, there is a choice. The consequences of the choices with the various alternatives were identified. One choice is to discourage extensive recreation by not providing any facilities appropriate to this form of recreation. Another choice is to accept a lower safety level on the extensive beach, as identified in the Preferred Alternative and Most Environment Friendly Alternative. As Maasvlakte 2 is obviously being constructed primarily as port and industry land, no measures were included in these alternatives to prevent the legally prescribed risk contours falling over this extensively usable beach. This would be at the expense of intensive use of space of the sustainable industrial site. It was decided not to include in the Plan Alternative any facilities for an extensive recreational beach. As the beach will be omitted in this alternative, it cannot be subject to any negative effects. No other problems are expected with regard to external safety. Therefore, the effects of the alternatives on external safety have been summarised as neutral.

**Water: slight deterioration**

The effects on surface water have been summarised as negative. This is because of the use on ships' hulls of antifoulings that contain organotin. The use of organotin has, however, been banned in the European Union since 2003. But there is not yet a worldwide ban. Therefore, the presence of organotin will reduce only slowly. An international ban on use of this substance is expected to come into force from 2008. In view of the uncertainty regarding this matter, however, it was not factored into the description of the effects. Another matter requiring attention is the water temperature in the docks on Maasvlakte 2. The water temperature may increase slightly due to discharges of cooling water by power stations and chemical companies. Only in the Plan Alternative will there be no violation of the target value. This matter has been addressed through the installation of a costly sluice. Given the enormously high costs and high energy consumption, it was decided in the Most Environment Friendly Alternative and Preferred Alternative to take measures to limit discharges of cooling water. The desired value of a maximum water temperature increase of 3°C will be exceeded slightly, however. Nevertheless, no ecological problems are anticipated.

**Light: acceptable**

Although no legal standards exist for checking light nuisance caused by ports and industrial sites, this subject was examined for the purposes of Maasvlakte 2. On Maasvlakte 2 there will be companies that work round the clock and thus also at night. Therefore, there will be more shining lights. Container companies cause more light than chemical companies. Container companies use strong lights installed at large heights to light up a large area. The direct incidence of light on the sea water along the sea walls will occur little if at all, so it was rated neutral for all alternatives. Maasvlakte 2 will be more visible at night primarily due to the ascending light.

Natural dune landscape, dry grasslands, wet slacks

**Nature: compensation arranged**

While an attempt will be made to spare nature to the fullest possible extent, there will still be a number of negative effects. Shipping to and from Maasvlakte 2 will emit substances into the air that will result in nitrogen falling in vulnerable dune areas in the vicinity. This will acidify the soil and create a fertilising effect. Consequently, plant growth will change and impoverishment will occur. Various rare plants and animals will lose part of their habitat. This effect will occur mainly in Voornes Duin and exists to varying degrees in all alternatives. Unfortunately the reduction of a maximum of 3.8 ha in total of dry dunes and wet dune slacks can not be prevented by mitigating measures. However, these effects will be amply counterbalanced by the new 35 ha dune area along the coast of Delfland.

Just as on the present Maasvlakte, temporary nature will establish itself on Maasvlakte 2. The conditions for this will be at their most favourable in 2014, because that is when most land is expected to be empty. Subsequently, the space for temporary nature will decrease through the further starting up operations on Maasvlakte 2. All alternatives include temporary nature, but they differ in the degree to which this development will be stimulated. The Plan Alternative counters this development, whereas the Most Environment Friendly Alternative stimulates establishment of temporary nature. The Preferred Alternative comes somewhere in between by choosing to manage and orchestrate temporary nature. This means the Preferred Alternative is in line with the policy that has already been conducted in this respect on the existing Maasvlakte.

**Landscape: recognisable image**

Maasvlakte 2 will be a striking new element in the coastline. The reclaimed land will protrude into the sea and will be visible from far away, partly because of the buildings that will be erected on it. Viewed from the land, Maasvlakte 2 will be completely or partly invisible behind the present Maasvlakte or Slufter. Maasvlakte 2 will be most visible from Goeree and from sea. The interruption of the coastline is comparable with that of the existing Maasvlakte: hard sea walls on the northern site, soft sea walls adjoining the dune coast of the South Holland and Zeeland islands. Maasvlakte 2 will form a good completion of the port area and will be clearly recognisable as the port's entrance. Rotterdam's profile as a world port will be strengthened still further. The Most Environment Friendly Alternative and Preferred Alternative score higher than the Plan Alternative. This is because the soft sea walls in these alternatives will be designed more as a natural dune landscape. Moreover, an image quality plan will be prepared for these alternatives, providing for the furnishing of the outer contour and construction of eye-catching buildings. This will create more accents in the landscape and may reinforce the image conveyed by the port.

Recreational beach: busy on fine summer days

**Shared recreational use: more opportunities on Maasvlakte 2**

Even more than the existing Maasvlakte, Maasvlakte 2 will offer opportunities to people who wish to engage in recreation. The Plan Alternative is the only alternative that does not provide for an extensive recreational beach in the west of Maasvlakte 2; the Most Environment Friendly Alternative and the Preferred Alternative do provide for such a beach. This has resulted in the effects of the Plan Alternative being summarised as neutral, while the effects of the Most Environment Friendly Alternative and Preferred Alternative have been summarised as positive. Those alternatives allow shared recreational use of the port and industry area, particularly on the sea walls.

#### Cumulation: simultaneous effects fair

A number of effects of the construction and use of Maasvlakte 2 will occur simultaneously while construction of the reclaimed land is still in progress and the first sites of Maasvlakte 2 are already in use. This is the cumulation of the effects described in the EIA Construction and EIA Zoning. The cumulative effects in the year 2015 were examined. As only a small surface area will then actually be in use as port and industry site, the traffic and transport streams will still be limited. Additionally, a large proportion of the construction work will have been completed in 2015. The contribution of traffic necessitated by the construction work will have minor effects. What's more, the cumulative effects for all other matters are not greater than the effects caused by the ultimate use of Maasvlakte 2. For nature it is also important to determine whether cumulative effects will occur as a result of other projects. It was concluded that there are no projects that will lead to a cumulative effect. This also applies to the high profile projects like a revised opening regime for the Haringvliet locks, the sand extraction at sea for other projects and the strengthening of the "weak links" in the coastal defences. There are not expected to be any other activities or projects that will cause localised air quality problems. Therefore, no public health problems are anticipated.

## 11 CONCLUSIONS

As part of the Environmental Impact Assessment, the effects were examined of various alternatives for laying out Maasvlakte 2. The most important drivers of the alternatives are sustainability and flexibility in meeting market demand for space for container storage and transhipment, chemical companies and new industry and distribution. The development started with the constraints imposed by the PKB and legislation, the Cut-through variant and an empty planning map. The planning map was filled in step-by-step and the spatial possibilities (and impossibilities) were examined. Numerous measures were examined, particularly as regards air quality. At present the air quality in the Rotterdam port area does not satisfy legally prescribed standards at some places. There are some measures that the Port of Rotterdam Authority cannot take alone. An Air Agreement has been signed with other stakeholders. In the agreement the parties have given an undertaking to take the necessary air quality measures.

#### Environmental effects not underestimated

The effects were determined for a bandwidth in long-term market demand (2020 and 2033). Cautious assumptions were made about the development of emissions. Also, a large study area was examined. Use was made in the impact study of the latest insights and models. Worst-case assumptions were made. Only known developments in legislation, policy and technology were taken into account when determining the nature and scale of future emissions of light, noise and substances. The calculations of effects consistently have as a point of departure the most unfavourable combination of the Chemical Scenario with the Container Scenario. The Chemical Scenario will cause more effects on Maasvlakte 2 itself, whereas the Container Scenario will have greater effects in the hinterland. In reality, this combination cannot occur. In practice, therefore, the environmental effects of Maasvlakte 2 are likely to be better rather than worse than expected. To check this matter the City of Rotterdam is preparing a monitoring and evaluation programme. The programme will be used to keep track of the actuality of assumptions and the effects actually occurring.

#### Comparison with the PKB

One of the conditions embodied in the PKB PMR concerns the environmental impact of Maasvlakte 2. In this respect the final plan must score at least as high as the first reference plans produced for the PKB. These plans were considerably larger (2500 ha instead of 2000 ha gross) and protruded farther into the sea. Two reference plans were usable for comparison. One plan had a dedicated port entrance, whereas the other provided for access via Yangtzehaven, i.e. in the same way as the Cut-through alternative now on the table. Older environmental reports are also available for these plans. While they cannot be compared one-to-one, the conclusion is that the alternatives now described in EIA Zoning get equally good or better scores than the reference plans contained in the PKB.

#### Sustainability

Sustainability is an important matter in the design, construction and start-up of Maasvlakte 2. The Dutch government had already made this point in the PKB. There will be an intensive use of space, the largest possible proportion of cleaner transport modalities, the restriction of (internal) transport streams, a clustering of activities, the use of industrial ecology, the efficient use of the required energy and the establishment of the right company at the right place. Sustainability has been factored into the choice of location and the land reclamation plan. More information on this matter can be found in EIA Construction. Sustainability also plays an important role in the furnishing, use and management of Maasvlakte 2. Three aspects have been identified in this regard:

#### Lay-out of Maasvlakte 2

The alternatives provide for the creation of clusters, with the clusters that cause most nuisance being placed as far away as possible from places sensitive to them. During preparation of the lay-out plans there will be an examination of where the interests of the port, human environment and nature converge and can reinforce each other. More containers will be transported by water and rail and fewer by road. The contracts of container terminals on Maasvlakte 2 will stipulate that in 2033 not more than 35% of all freight traffic may take place by road. Additionally, the Port of Rotterdam Authority is encouraging the increased load capacity utilisation of trucks.

#### Use of Maasvlakte 2

Matters that contribute to the sustainable development of Maasvlakte 2 will be laid down in the contracts with customers wherever possible. The Port of Rotterdam Authority's policy for acquiring companies in the chemical sector seeks to attract and embed companies that are able to exchange with each other raw materials, residual substances and residual heat. In the container sector, the logistics of companies will be an important item that receives attention when acquiring and embedding companies. Maasvlakte 2 will be characterised by the highly intensive use made of the sites; allowance has been made for this circumstance in the Environmental Impact Assessment.

#### Management and maintenance of sites

Sites on Maasvlakte 2 will be managed and maintained sustainably and ecologically. Use will be made of instruments including the Image quality plan, Nature management plan and Port and nature plan.

#### Most important conclusions

All in all, EIA Zoning leads to the following conclusions:

- the plan and lay-out of Maasvlakte 2 have gradually been optimised and additional measures have been chosen in a way that is designed to minimise the environmental impact as far as possible;
- in respect of most subjects, the alternatives satisfy the defined constraints and legally prescribed standards;
- even without construction of Maasvlakte 2, it will still be busy on the roads. By taking numerous measures, it will be only slightly busier because of construction of Maasvlakte 2. Accessibility by rail and waterways requires attention;
- in the absence of international arrangements, the water quality in the docks will still fail to meet the standard for one substance, organotin. The target value for the maximum increase in water temperature in the docks will be slightly exceeded, because existing companies on the present Maasvlakte will no longer be able to discharge their water directly into the North Sea;
- the required nature compensation has been amply arranged;
- the cumulative effects of construction and use of Maasvlakte 2 will not be greater in 2015 than the effects determined in EIA Zoning for the various subjects;
- no public health risks are expected, even at places where several effects might occur simultaneously. Legally prescribed standards formulated in order to protect public health were observed when choosing measures;
- the research guidelines were always based on worst-case assumptions. Consequently, the environmental effects that will occur later will be better rather than worse than anticipated;
- there are considerable uncertainties in the longer term. An extensive monitoring programme will show to what extent additional measures will be necessary in due course;
- the environmental effects of the alternatives are not more unfavourable than those of the reference plans contained in the PKB PMR;
- the alternatives give substance to the ambition to create Maasvlakte 2 as a sustainable industrial site;
- Maasvlakte 2 will be a leading sustainable industrial site capable of responding flexibly to market demand.

In short, the Environmental Impact Assessment shows that sufficient information is available to take a responsible decision about the Maasvlakte 2 zoning plan.

## 12 WHAT NOW?

EIA Zoning provides the environmental information that makes it possible to factor environmental interests into decision-making on the Maasvlakte 2 zoning plan.

### **Parties involved**

The following parties are involved in EIA Zoning:

- Port of Rotterdam Authority - initiator and author of the EIA.
- City of Rotterdam – competent authority that will decide on the zoning plan.
- Province of South Holland – the zoning plan is subject to the approval of the provincial executive.

The Environmental Impact Assessment will be made available for public inspection at the same time as the Preliminary Zoning Plan. Anybody will be able to respond to these documents. They may do so in writing or at one of the public hearings that will be held. More practical information on this matter has been provided in advertisements and at [www.maasvlakte2.com](http://www.maasvlakte2.com). During the consultation period the independent Committee for Environmental Impact Reports will check whether EIA Zoning is correct and complete. The committee will submit its advice on this matter. The advice will be sent to the Rotterdam city council, which will use it when determining the new zoning plan and adjusting the existing zoning plan for Maasvlakte. For the new noise contour the municipality of Westvoorne must revise the Sea Area Zoning Plan. Ultimately, the South Holland provincial government must approve the zoning plans.