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ENVIRONMENTAL IMPACTS OF INTERNATIONAL SHIPPING: A CASE STUDY OF THE PORT OF ROTTERDAM

This case study was prepared by Eelco den Boer and Gijs Verbraak of CE Delft, Delft, the Netherlands, as part of the project "Environmental Impacts of International Shipping: The Role of Ports" of the Working Group on Transport under OECD's Environment Policy Committee.

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FOREWORD

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EXECUTIVE SUMMARY

As part of the project "Environmental Impacts of International Shipping: the role of ports", this case study focuses on the way the port of Rotterdam and the Dutch authorities address the environmental impacts of the port and its interactions with the hinterlands.

The port of Rotterdam is the biggest port in Europe, and is currently being expanded with the *Maasvlakte 2* area. Due to the nature and size of activities that take place in the port of Rotterdam and the hinterland, it unmistakably impacts the environment.

As compensation for the expansion of port activities, there is considerable attention for the environmental quality of the region, via a significant number of measures. The Port of Rotterdam Authority attempts to reduce the impact of port activities and has taken the initiative on several fronts. However, these activities concentrate on hinterland transport rather than on seagoing ships and settled industries. For the own organisation, the ambition level can be evaluated as high.

Two of the most remarkable developments are the use of environmental criteria in the granting of territories at *Maasvlakte 2* and coalition formation with environmental organisations. The Port of Rotterdam Authority uses environmental criteria in the areas of noise, pollutant emissions, energy consumption and land use efficiency to reduce the environmental impact of the industries. Environmental performance is part of private contracts between the Port of Rotterdam Authority and its industrial partners. Via these contracts the Port of Rotterdam Authority can influence the environmental performance of newly established industries in the port area.

Environmental organisations have taken legal action against the Port of Rotterdam Authority. To solve these disputes, alliances were concluded with two environmental organisations in the context of the environmental impact of the construction of *Maasvlakte 2*. These organisations stopped their legal actions against the Port Authority in exchange for environmental projects.

The following summarises the most relevant activities of the Port of Rotterdam:

- Environmental differentiation (NO_X, SO_X) of port dues is being discussed under the revision of the current port due system.
- The Port of Rotterdam Authority is one of leading port authorities in the World Port Climate Initiative.
- Port of Rotterdam Authority is involved in the Rotterdam Climate Initiative as co-founder. The reduction target set is 50% in 2025 compared to 1990.
- The port of Rotterdam Authority aims to be climate neutral in 2012 within its own organisation.
- Dry bulk transhipment is subject to a behavioural code, closed transhipment and surface handling with water, cellulose or latex during storage.
- Shore-side electricity for inland barges is being introduced. A pilot project will be up-scaled to all inland berths in the Rotterdam port area.

- The modal split of hinterland transport of containers from *Maasvlakte 2* will be significantly altered from the current practice in the next decades in favour of inland shipping and rail transport.

- Polluting trucks will be banned from the *Maasvlakte 1&2* areas in two stages. In addition, speed limits for inland barges will be introduced if needed to maintain the local air quality.

- The Port of Rotterdam Authority has managed to intensify the port area, by the redevelopment of areas that had come into disuse.

- The environmental impact of the construction of *Maasvlakte 2* in a Natura 2000 site is being offset by nature compensation and liveability measures. The PoRA has been granted a special permission to manage the presence of Natura-2000 species. This permission includes the creation of a livelihood for these vulnerable species and a code of conduct for each of the species.

ENVIRONMENTAL IMPACTS OF INTERNATIONAL SHIPPING: A CASE STUDY OF THE PORT OF ROTTERDAM

1. Introduction

1. The OECD is preparing the project 'the role of ports', for this project they gather information on the environmental performance of specific ports. The goal of this project is to identify how the port of Rotterdam Authority (PoRA), industry and the relevant governments address environmental issues.

2. The objective of this case study is to:

- Identify environmental impacts of the port and of their interactions with the hinterlands.
- Identify measures that have been taken to reduce environmental impacts of the port by the port itself or local and national authorities.

3. This study is limited to the port of Rotterdam (PoR) and the activities directly related to the port (hinterland distribution). Transport (all modes) rather than industry in general is the central theme of this case study. The study covers the following issues:

- Exhaust emissions.
- Energy use and emissions of greenhouse gasses.
- Noise.
- Management of ballast water, sewage and garbage.
- Dust.
- Management of hazardous cargo.
- Antifouling.
- Hinterland distribution and feeder traffic.
- Port-induced incentives to clean shipping.
- Use of port state authority to enforce environmental protection measures.
- Unilateral environmental demands on voluntary port calls.
- The use of policy instruments at national or local level to limit negative environmental impacts.

4. This report is based on available literature sources and an interview with Mr. Hoebee and Ms. Dekker of the Port of Rotterdam Authority. With the latter, non-documented activities could be included, as well as the other activities could be put in the broader framework.

2. The Port of Rotterdam

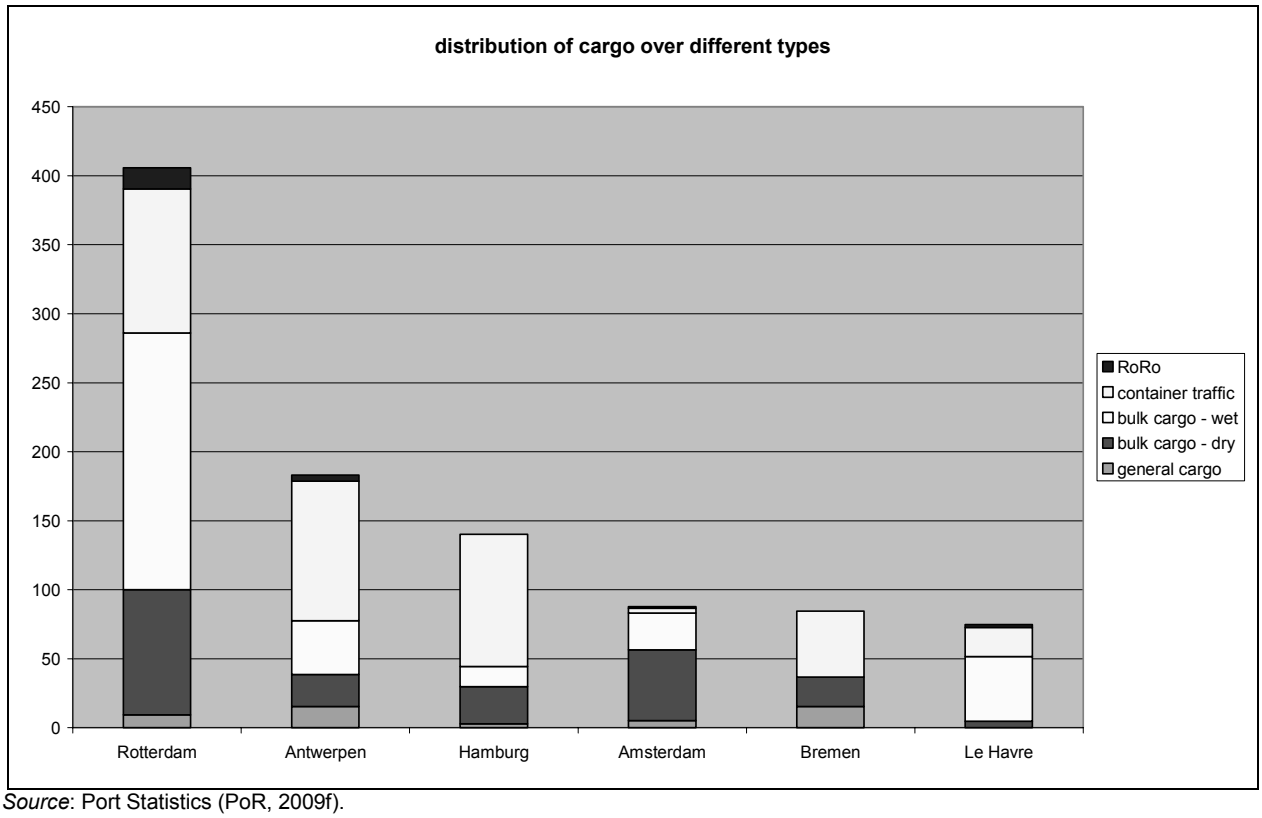
2.1 Overview of the port

5. The Port of Rotterdam is situated in the Netherlands in the Rhine and Meuse delta. The port stretches between the city of Rotterdam and the North Sea. Due to its depth and the relatively small influence of the tides the port offers good opportunities, even for the biggest vessels. On the land side the port offers good hinterland connections. Special to its location are the inland waterway linkages with

important goods destinations in the hinterland of Europe. Also the newly constructed Betuweroute rail links offer significant advantages to PoR. The PoR is the biggest port of Europe, see Figure 1.

6. The port plays an important role for Northwest Europe as it functions as a hub for both the import and export flows of the region.

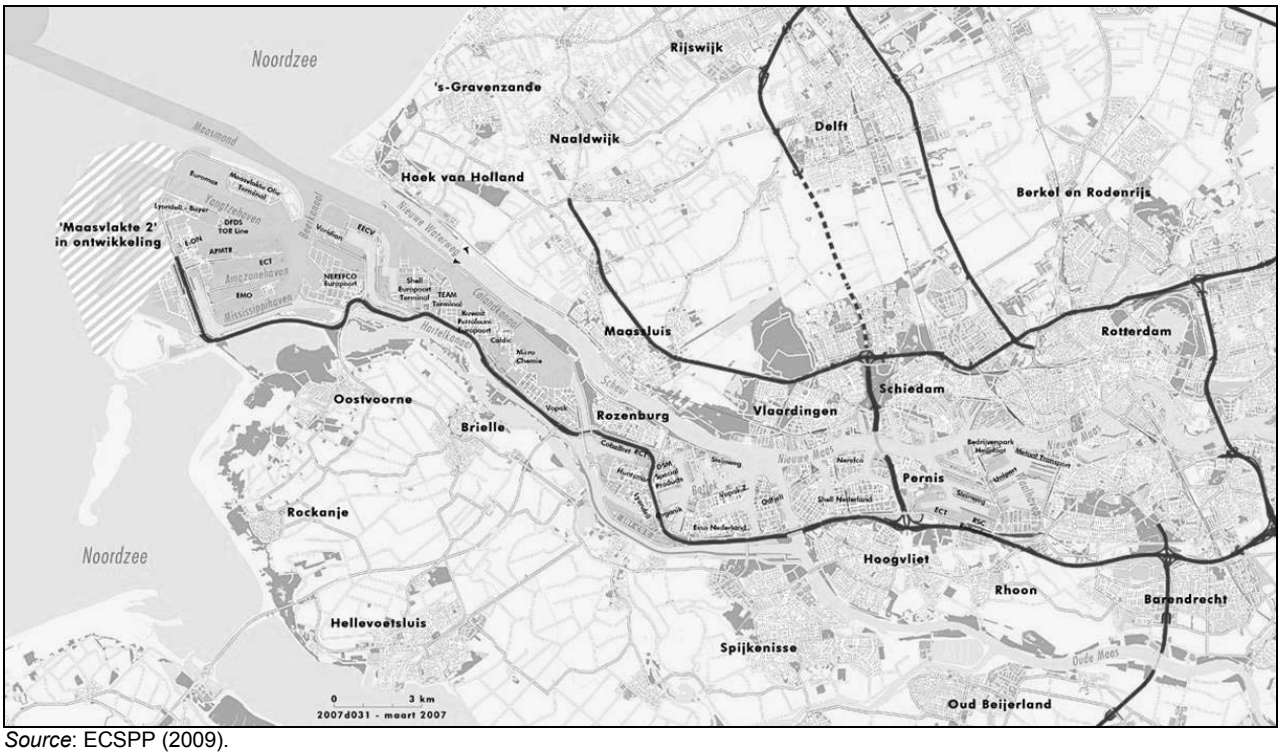
Figure 1. Port of Rotterdam compared to other ports in the Hamburg - Le Havre range
Million tonnes of cargo



Source: Port Statistics (PoR, 2009f).

7. The port is spread across the entire waterfront between the city of Rotterdam and the North Sea and due to the proximity of residential areas, the opportunities for growth are limited. Figure 2 presents an overview of this situation, with port areas coloured pink. Looking closely at the map, one can also identify the numerous residential areas surrounding the port.

Figure 2. Overview of Port of Rotterdam and Maasvlakte 2



Source: ECSPP (2009).

8. Because of the apparent lock-in, the PoRA is securing space for growth at this moment. The PoRA is creating additional land by claiming parts of coastal sea. In the 1960s, they secured an area called '*Maasvlakte 1*'. Currently, the construction of the next phase '*Maasvlakte 2'* is underway. The creation of *Maasvlakte* 2, an area of 2,000 hectares, is part of the project 'Main port development Rotterdam' to strengthen the main port position of Rotterdam and at the same time the liveability in the Rotterdam region and the development of 750 hectares of nature and leisure sites. When *Maasvlakte* 2 will be finished in the year 2013, the total port area will encompass an area of 12,000 hectares (including nature, infrastructure, coastal protection etc). Through the creation of the *Maasvlakte 2,* the PoRA is creating room for growth and development for the next decade.

2.2 Ownership and governance

9. The port of Rotterdam is managed by the Rotterdam Port Authority. However, this organisation is not the owner of the port area. The owner of the port is the municipality of Rotterdam. The municipality leases its land on a leasehold basis to the PoRA. The PoRA on its turn leases the land also on a leasehold basis to the individual organisations in the port area. Thus the PoRA manages the port and financially exploits the area. The area they manage does not include public areas, like for example the public motorways.

10. The PoRA manages the waterways in the port and it is for example responsible for traffic management in the port. Ships at berth are considered to be part of the installations therefore berthing ships fall under the jurisdiction of the public authorities.

11. This ownership structure also clarifies the sphere of influences the PoRA possesses. As the port is the governing body of the port area, it is able to decide - within the limits of the law - the type of organisations and under what conditions they will be accepted in the port.

12. Environmental licenses are awarded to industrial companies by the DCMR Environmental Protection Agency. This agency is the regional environmental agency of the local and regional authorities operating in Rijnmond, the larger 'Port of Rotterdam' area in the Netherlands. However, environmental criteria are also used in private law contracts between PoRA and industrial partners, in order to go beyond environmental laws in the Netherlands and the EU.

3. Greenhouse gas emissions

13. In this chapter we give a brief overview of the link between port activities and greenhouse gas emissions and we will address the measures taken by PoRA to reduce the climate impact of the activities in the port.

3.1 Current situation

14. Port-related activities are heavily dependent on energy. For example, energy is used for the incoming flow of goods, various kinds of processes taking place in the port and subsequently the outgoing flow of goods. For energy use caused by incoming and outgoing flows, one should think of energy consumed for shipping, road transport, rail cargo, pipelines etc. For energy used in processes taking place in the port area itself, one can think of energy consumed by industrial processes and cargo handling. These different types of processes consume vast amounts of mostly fossil fuels and thereby result in the emission of greenhouse gasses.

15. To illustrate the impact of the PoR, the emissions of ships in the port are set against regional greenhouse gas emissions by industry.

16. The emissions of manoeuvring and berthing (*e.g.* auxiliary engine use & fuel heating) are relatively limited compared to industrial emissions in the PoR area, see Table 1. If all transport related emissions (sailing ships and hinterland distribution) would be included, the share of transport would be higher.

Table 1. CO_2 emissions in the Port of Rotterdam area (Million tonnes)

Sailing	Manoeuvring	Berthing	Industry
0.2	0.1	0.5	25

Note: sailing comprises emissions from the point of entering of the pilot. Industry emissions apply to 2007. Maritime emissions apply to 2004. Source: DCMR (industry) and own model calculations EMS with model.

17. As discussed earlier, at the moment *Maasvlakte 2* is under construction. This development will result in a significant increase of CO_2 emissions. According to Friends of the Earth Netherlands the proposed *Maasvlakte 2* plan would result in a 5% to 8% increase of the total CO_2 emission in the Netherlands in 2020.[1]

18. Having touched upon the relationship between port activities in general and the relationship between the PoR on the emission of greenhouse gas in the Netherlands, it is interesting to see how the PoRA and the Dutch State deal with this significant impact.

[1] www.milieudefensie.nl/verkeer/nieuws/tweede-maasvlakte/view?searchterm=maasvlakte%202.

3.2 Abatement/Prevention

19. The PoRA and the Dutch State are well aware of the impact of the port and port related activities. To address the problem, they themselves are taking action to limit the emission of the greenhouse gas CO_2. The PoRA stimulates other actors to address the problem as well.

20. First of all, the PoRA is involved in the Rotterdam Climate Initiative. This initiative is one of the guiding initiatives in the Rotterdam Area. Within this initiative, a number of important actors joined together to try to limit the CO_2 emissions in the Rotterdam area, including those from port and port-related activities in co-operation. The Rotterdam Climate Initiative was founded by the PoRA, the municipality of Rotterdam, the environmental protection agency of the Rijnmond area (DCMR) and Deltalinqs (an industry platform). The reduction goal set by this foundation for 2025 is a 50% reduction compared to the CO_2 emission level in 1990.[2]

21. The port should develop into a so called energy port[2]. Within this initiative, a number of preventing mechanisms are in place as they want to develop the port to become:

- The energy port for low-CO_2 energy sources and products for Northwest Europe.
- A hub for carbon capturing transport and storage (CCS).
- The most energy efficient port and industrial cluster in the world.

22. In July 2008, Rotterdam hosted the C40 World Ports Climate Conference. This conference was a co-operation between the Clinton Foundation's Climate Initiative and the C40 Climate Leadership Group. The conference resulted in a statement and an action plan of 55 ports to combat climate change: the World Port Climate Initiative (WPCI). Rotterdam is one of the 55 ports that committed itself to the World Port Climate Initiative.

23. The mission of the World Ports Climate Initiative is to[3]:

- Raise awareness in the port and maritime community of the need for action.
- Initiate studies, strategies and actions to reduce GHG emissions and improve air quality.
- Provide a platform for the maritime port sector for the exchange of information thereon.
- Make available information on the effects of climate change on the maritime port environment and measures for its mitigation.

24. Several projects have been defined under the WPCI. Current projects include: Carbon Footprinting, Intermodal Transport, Lease Agreement Template, Cargo-handling Equipment, Environmental Ship Index and On-shore Power Supply.

25. Rotterdam is one of the leading ports in WPCI, and task-leader for the Environmental Ship Index project. The PoRA works together with IAPH (the International Association of Ports and Harbors), ESPO (European Sea Ports organisation), the Clinton Climate Initiative and the port of Antwerp, Bremen, Le Havre, Hamburg and Amsterdam (PoR, 2009a).

26. Another initiative of the PoRA that impacts the level of CO_2 emissions is the start of a sustainability index for its own activities relating to 'planet'. The index covers a number of issues, with

2 www.rotterdamclimateinitiative.nl/NL/Doelen_&_Resulaten/Energiehaven/?cid=333.

3 www.wpci.nl/about_us/mission_statement.php.

CO_2 as one of the most important. This index includes a CO_2 footprint, sustainable building, green purchasing, and sustainable tendering (PoR, 2009a).

27. First of all the PoRA has calculated this CO_2 footprint for its own activities, like mobility, building energy consumption and energy management including emissions from subcontractors (PoR, 2009a). The footprint has been a co-development of the port of Oslo and the PoRA. This footprint methodology has been presented and was launched to the public at the World Ports Climate Conference in 2008. The CO_2 footprint provides insight into the direct CO_2 emissions (not the whole supply chain) from the activities of the Port Authority, including those of its contractors.

28. It can be used as a tool to identify areas where emission reduction can be achieved. The PoRA uses this tool in trying to achieve its goal to become climate neutral in 2012. In 2011 they try to reach a sub-goal of 35% reduction in the footprint compared to the level in 2007 (PoR, 2009a).

29. The CO_2 reduction ambition has resulted in (PoR, 2009a):

- Sustainable lighting and heating (green label).
- Fuel savings for the own fleet of ships (81,000 litres in 2008).
- 70% of the company cars with a green energy label.

30. The PoRA has also included sustainable building under its sustainability index. They have agreed upon the RCI guidelines goals to limit the climate impact of buildings, by signing an intention declaration. The reduction target is a CO_2 reduction of 25% in 2009 in comparison to the national building standards (PoR, 2009a). A 50% reduction should be achieved over the next five years. This reduction does not only account for the exploitation phase but the whole building cycle.

31. These use of these standards have resulted in the application of innovative technologies like low-temperature floor heating, using ground and river sources (PoR, 2009a). Another sustainable technology that found its way to these projects is a thermal storage system. This project uses surface water from the port. In this project the water is used as an energy medium. Two of the buildings linked to this system in the latter project are being developed by the PoRA itself.

32. Another way the PoRA uses its index to stimulate more sustainable practices at other organisations is based in its tendering processes (PoR, 2009a). As the PoRA is the governing body of the port area, it can decide what type of organisations, and under what conditions, they will accept to the port. Through the use of such extra sustainability conditions in tendering processes, the organisations promote enhanced performances on a variety of practices. Different sustainability conditions are set for various sectors. For some sectors, energy use can play an important role in the tendering process. The PoRA has already been applying sustainability conditions in most of their tendering processes since 2008. However, it is still developing its final set of criteria.

33. An innovative joint initiative is under development. The PoRA and the company Stedin en Visser & Smit Hanab have developed a business case on a steam pipeline in the port (PoR, 2009a). Eight organisations are interested in the development of the steam pipe as they have expressed their support in 2008 via letter of intent. Organisations that produce steam (*e.g.* petrochemical companies) as a (waste) product will be linked to organisations that use steam in their processes. In case the steam is a waste product from another company, this accounts for efficient use of energy. By using such waste products the use of fossil fuels is limited and the emission of CO_2 as well. A separate firm - *Stoompijp b.v.* - should be responsible for the pipeline and the first customers should be contracted in 2009 (PoR, 2009a).

34. The RCI is also active in the development of windpower. Currently 150 MW has been installed in the port of Rotterdam, the largest share of this production capacity is located at the *Maasvlakte* area.[4]

35. This capacity is the result of the intention declaration of 2001 between the PoRA, the province, surrounding municipalities and the NGO Milieufederatie Zuid-Holland for the realisation of 120 MW in 2010.

36. As the goal has already been reached, the RCI now wants to more than double the current production capacity. In the port itself, a doubling should be possible.

37. Up-scaling will be possible due to the placement of new turbines on the *Maasvlakte 2* area and the existing port areas and by replacing older turbines.

38. Next to land-based development options, locations at sea are also being considered. For enlargement, the RCI has investigated possible locations for the development of a near-shore park in front of the *Maasvlakte* area.

CO_2 sequestration

39. Carbon Capture and Storage (CCS) is one of the main measures that are developed to reduce the emissions of CO_2 in the port area, under the RCI framework (RCI, 2009).

40. A pilot project for the storage of CO_2 is underway in Barendrecht (PoR, 2009a). However, it is uncertain if this innovative project will be executed. The municipality and community of Barendrecht have resisted against the proposal to store the captured CO_2 in empty gas fields underneath residential areas.

41. In order to understand the challenges in the up-scaling of the capture and transport of CO_2, a business case has been developed by OCAP (*Organic Carbondioxide for Assimilation of Plants*), Wintershall, DMCR and the PoRA. The outcome of the business case is that the Rijnmond area should be able to capture and store 5 million tonnes of CO_2 by 2015 if development starts soon. The project would be economically feasible, but only under certain conditions. The business case concluded that it should be possible to upscale the transport and capture of CO_2 to 20 million tonnes in 2025 (PoR, 2009a).

42. At the *Maasvlakte,* a power plant will be equipped with an experimental carbon capture and storage facility (PoR, 2009a). The facility will be able to capture a small portion of the CO_2 emissions from the power plant. This facility is a development of E-on & TNO to test CCS. New methods for the post-combustion capturing will be tested in this facility (E-on, 2009). Within the CATO program,[5] Dutch research organisations and industrial parties develop methods to capture and store CO_2, subsidised by the Dutch government. Next to the current plant E-on started the construction of a new coal fired power plant.

43. Shell is already active in capturing and transporting CO_2 (170 ktonne) to greenhouses, from their plant in Pernis to the Westland area (PoR, 2009a). The captured gas is transported via a pipeline network for use in greenhouse facilities in the neighbouring Westland area. In greenhouses, fossil fuels are being burned to obtain CO_2 for the growth of crops. Now that the waste product (CO_2) of the petrochemical installation is used, greenhouses do not need to combust fuels anymore to solely obtain CO_2.

4 www.portofrotterdam.com/mmfiles/HaveninBedrijf_juni09_tcm26-60646.pdf.

5 www.co2-cato.nl/.

4. Air pollutant emissions

4.1 Current situation

44. The application of fossil fuels in transport and industrial processes leads to the emission of air pollutant emissions. Air pollution can result in serious consequences for nature and even for the health of people living or working in these areas. Furthermore, the PoRA is subject to EU regulations on air quality, as described in EU Directive 2008/50. Directive 2008/50 describes several limit values for the concentration of air pollutants. NO_X, PM_{10} and SO_2 are the most relevant substances.

45. In Table 2, the emissions of ships and industry are depicted. The table shows that industry is the main source of air pollutants, except for fine particles.

Table 2. Air pollutant emissions in the Port of Rotterdam area (ktonnes)

	Maritime		Industry	
	Sailing	***Manoeuvring***	***Berthing***	
NO_X	1	4	4	17
Fine particulates (combustion)	0.1	0.2	0.3	0.2
SO_2	0.6	3	2	31

Note: sailing comprises emissions from the point of entering of the pilot. Industry emissions apply to 2007. Dry bulk transhipment generates another 0.4 ktonnes fine particles. Maritime emissions apply to 2004.
Source: DCMR (industry) and own model calculations EMS with model.

46. The levels of NO_2 and PM_{10} are measured at various urban locations throughout the port area (DCMR, 2009). The data below show that air quality does not meet the standards set by EU Directive 2008/50. These stations are all located in the vicinity of residential areas.

Table 3. Yearly average NO_X concentration and number of hours with exceedance of 200 and 220 µg/m^3

Station	Average (µg/m^3)	Number >200 µg/m^3	Number >220 µg/m^3
Schiedam	40.1	0	0
Hoogvliet	33.9	0	0
Maassluis	35.7	0	0
Overschie	53.2	2	0
Ridderkerk	46.4	2	1
Statenweg	49.6	5	4
Berghaven	34.1	1	0
Pernis	37.1	2	1
Rotterdam (RIVM)	39.6	1	0
Vlaardingen (RIVM)	40.8	6	3
Rijnmond	36.6	0	0

Source: DCMR, 2009.

Table 4. Yearly average PM_{10} concentration and number of 24h periods with exceedance of 50 µg/m^3

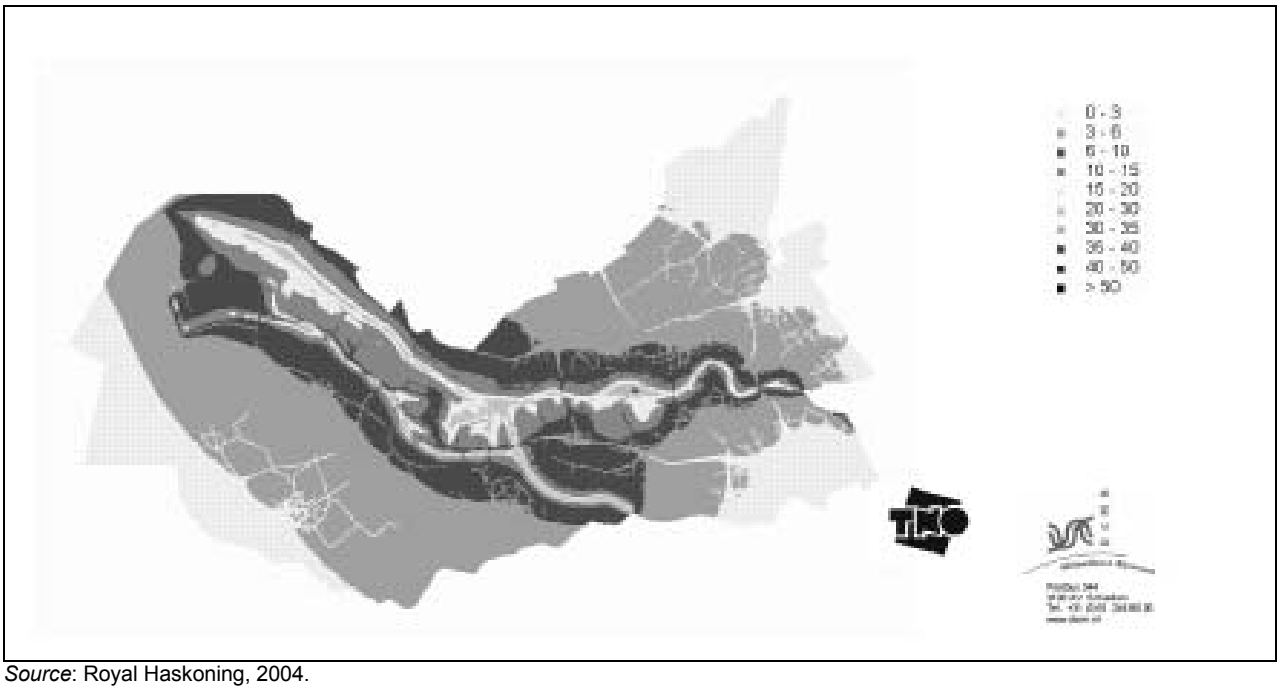
Station	Average (µg/m^3)	Number > 50 µg/m^3
Schiedam	27.3	12
Hoogvliet	23.9	6
Maassluis	26.2	10
Overschie	28.3	14
Ridderkerk	27.1	16
Berghaven	27.1	13
Rotterdam (RIVM)	25.6	10
Vlaardingen (RIVM)	27.2	17
Bentinckplein (RIVM)	31.1	30
Rijnmond	25.8	9

Source: DCMR, 2009.

47. Calculations made in the context of the construction of *Maasvlakte 2,* show that the EU air quality standards cannot be met everywhere in the Rijnmond area with *Maasvlakte 2* in operation. The 24-hour standard for PM_{10} and the yearly average NO_X concentration will be exceeded along fairways and in Hoek van Holland, a region that is located near to the harbour entrance (Royal Haskoning, 2007).

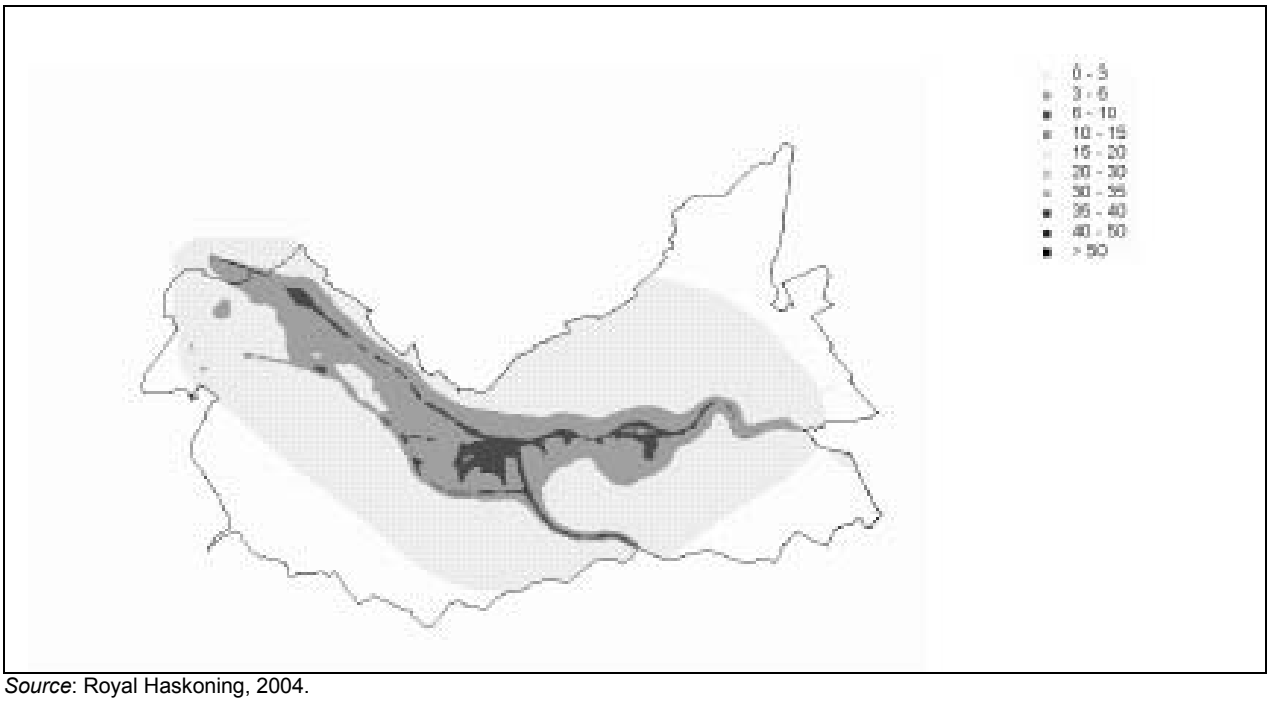
48. With industry as the biggest source, the contribution of sea and inland shipping in the Rijnmond region is significant at hotspots. The relative contribution of shipping to the total NO_x emissions in the region is 13-25%. The figures below show that 5-20% of the NO_2 concentration. The contribution of PM_{10} to the total concentration is more limited, 10-15% at maximum. The share of sea ships and inland barges is roughly equal (Royal Haskoning, 2004).

Figure 3. Contribution of sea and inland shipping to NO_2 concentration
2004



Source: Royal Haskoning, 2004.

Figure 4. Contribution of sea and inland shipping to PM_{10} concentration
2004



Source: Royal Haskoning, 2004.

49. The influence on local air quality depends on the specific activities taking place in a port. Liquid bulk (*e.g.* chemicals) may have bigger emissions of Volatile organic compounds, whereas dry bulk transhipment may cause particle emissions.

4.2 Abatement/Prevention

50. The PoRA attempts to limit the emissions of air pollutants. There are different approaches to counter the impact of harmful exhaust emissions. The port pays special attention on how to limit the impact *Maasvlakte 2* on air quality that is requested by EU. In the existing port areas the PoRa uses stricter emission standards in contract renewal processes. However the ability for tightening of standards is limited in these negotiations as compared to the issuing of new land.

51. The storage and transhipment of coal can significantly influence local air quality (DCMR, 2009). To limit the emission of dust, measures have been taken. The Rijnmond environmental protection agency determines which technical and behavioral measures a company involved in dry bulk handling has to implement (DCMR, 2009). Technical measures to decrease the emission of transhipment include closed transhipment, or the use of suction filters. To prevent dust emissions from the storage of dry bulk outdoors (ore, coal), surfaces are kept wet or are covered under a crust of cellulose or latex materials.

52. Also behavioural codes for handling dry bulk have been set (DCMR, 2009). In these codes, for example, conditions for material handling with machinery are described. The codes also include factors such as the maximum wind speed under which handling is allowed to take place.

53. A monitoring network has been created around the major dry bulk terminals. The digital network provides these organisations with information on when dust is emitted. The DCMR also uses the network to check compliance with regulations. Without these networks, it would be very difficult to check the compliance of regulations (DCMR, 2009).

54. Air pollution can also be prevented by switching to completely new techniques. Such a measure to improve air quality in the port is the installation of shore-side electricity in the port. When barges switch from their generators to the grid electricity, a reduction in air polluting emissions is achieved. The production of electricity in the Netherlands is more efficient compared to that of small generators. The PoRA and Utilinq (subsidiary of the Eneco energy corporation) have conducted a pilot shore-side electricity project in one of its inland shipping ports (PoR, 2009a). As this pilot was successful, the decision has been made to increase the availability of shore-side electricity. The availability of shore-side electricity will be expanded to all public berths (257) in the port in 2012 (PoR, 2009a).

55. Shore-side electricity can also be applied at seagoing ships, but its positive effects on air quality are yet to be fostered in the PoR. The slow adoption of shore side electricity by ports can - apart from economic considerations - be found in the fact that no common system standards have yet been set and due to the relatively large investment costs involved. The first development that will foster the positive influence of shore-side electricity for seagoing ships is being planned by the PoRA and Stena Line. They have signed an intention declaration on shore-side electricity for passenger ships in Hoek van Holland (PoR, 2009a).

56. An alternative to shore-side electricity is the installation of exhaust gas treatment systems. The PoRA has adopted such techniques on its own ships. Four of its ships are equipped with SCR catalysts and particle filters (PoR, 2007). The SCR catalysts reduce emission of NO_X with a chemical reaction into other less harmful substances. As the activities of the PoRA are highly visible in the sector, such an action might interest others to follow.

57. On a larger scale, the Dutch State is also promoting cleaner techniques. For the installation of SCR catalysts and cleaner engines, SenterNovem (an agency of the Dutch Ministry of Economic Affairs) ran a subsidy programme from 2005 to 2008 for NO_x measures on inland shipping barges. A small number of owners (10) used the programme to fit their ships with a catalyst. A possible explanation for the small result can be found in the fact that the subsidy did not compensate for the additional operating costs.

58. The option of choosing a CCNR-2 (Central Commission for the Navigation of the Rhine[6]) engine was much more popular, as 366 ships were fitted with one under the programme. Because CCNR-2 has become a EU standard for new engines in inland barges, the programme has been changed and in 2009, companies can only apply for a subsidy for the installation of SCR catalysts (SenterNovem, 2009).

59. The PoRA is also promoting further adoption of clean techniques by inland vessels in the port by pricing mechanisms and complete bans (PoR, 2009a). This was one of the criteria set by the State for the granting of the construction license of the *Maasvlakte 2*. From 2010 onwards, the most polluting ships will be charged additionally. The differentiation of the port dues will stimulate a faster penetration of cleaner ship engines. As the extra revenues generated by the differentiation will be directed to the State for the investment in the above described programme, the effect could be even higher.

60. In case the State deems the effect to be too low, additional measures will be taken. The PoRA states that in this case, a speed reduction for the most polluting ships will be set at the main waterways (PoR, 2009a). From 2025 onwards, ships using old polluting engines will be completely banned from the PoR (CCNR-1 and older). As the port of Rotterdam is a major hub for inland shipping barges, this measure will affect a large number of barges. Not only will the local air quality benefit from this measure, but the hinterland areas as well.

6 www.ccr-zkr.org/.

61. The municipality of Rotterdam is also putting in place a similar measure for road freight transport, with the creation of an environmental zone. The zone will be implemented by the municipality at the *Maasvlakte 1 and 2* area from 2013 onwards (PoR, 2009a). This zone will be installed to compensate for the impact *Maasvlakte 2* is predicted to have on air quality in the port. From 2013 onwards, trucks that do not meet the EU Euro V-standard will be banned from the *Maasvlakte 1 and 2* area. In 2016, the measure will be sharpened to the Euro VI standard (PoR, 2008). The measure will promote the application of cleaner engines and will directly result in a reduction of emissions from the vehicles that are active in the transport from both *Maasvlakte* areas to the hinterland.

62. Possible measures to promote clean techniques in sea-going ships may result from the development of the Environmental Ship Index. The PoRA is currently studying the possibilities to give preferential treatment to clean sea going ships by *e.g.* a reduction in port dues from 2011 onwards (PoR, 2009a).

63. The negative environmental impacts of current techniques can also be reduced by the application of cleaner fuels. To harvest these benefits, a coalition of nautical service providers in the PoR have agreed to only use the low-sulphur diesel in their ships. From 2011 on, 10 ppm fuel will be mandatory for inland shipping due to EU regulation. The (approximately) 130 ships they operate have already switched to the use of 10 ppm EN590 fuel.[7]

64. To reduce the impact of shipping on the North Sea a special SO_X Emission Control Area has been created in 2007 by IMO. In this zone ships should make use of either low sulphur fuels may be used with a maximum of 1.5% m/m or an exhaust gas cleaning system (IMO, 2007).

65. Further research on how the environmental impact of the growth of the port can be reduced will be conducted in 2009/2010. The PoRA agreed to do so after being pressured by the environmental NGO Friends of the Earth (FOE). The PoRA and FOE have signed an agreement to limit emissions originating from the *Maasvlakte 1 and 2* or from transport that originates from this area. This agreement focuses on a number of substances, including NO_X and SO_2. They agreed that the emission level should be reduced by an additional 10% in 2020 compared to a baseline scenario (Milieudefensie, 2009).

66. Together with Rotterdam Railfeeding and Alstom, the PoRA are currently testing a prototype hybrid shunting locomotive.[8] The emission reductions can be significant (PoR, 2009d). This locomotive can reduce the emission of air polluting substances (NO_X, PM_{10}) and CO_2 by 50%. The noise levels will also be reduced by 15 dB. No hybrid locomotives are currently in operation on a commercial basis, since trials are not finished.

5. Noise emissions

5.1 Current situation

67. Ports and port-related activities can generate high noise levels. These sound emissions can originate from a wide variety of sources; industry, shipping, cargo handling, hinterland transport, maintenance, etc. Noise emissions have been found to negatively impact its surroundings. For example, high levels of noise have found to have a serious negative impact on health (DCMR, 2009). As the port is situated in the vicinity of residential areas, noise has had continuous attention.

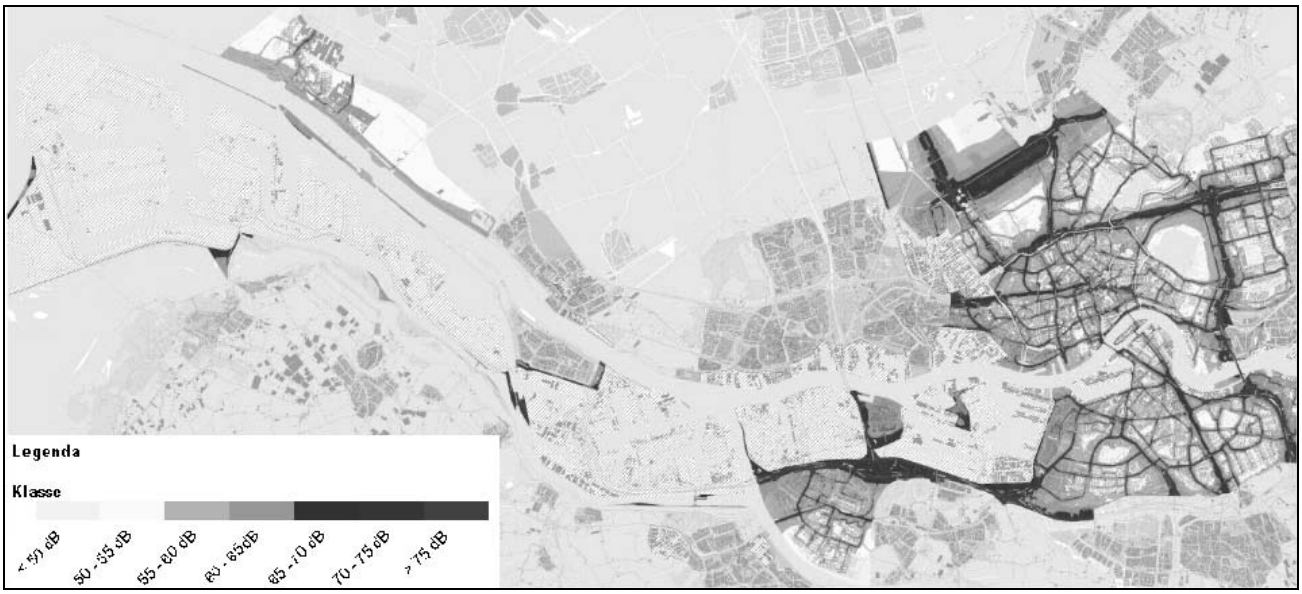
7 www.portofrotterdam.com/nl/nieuws/persberichten/2007/05042007.jsp.

8 www.portofrotterdam.com/nl/nieuws/persberichten/2009/20090406_02.jspww.

68. The DCMR has concluded that sound levels in the port present problems. They have described the effect of sound levels on residential areas. An analysis from 2004 showed that the sound levels generated by traffic in this area caused significant health problems.

69. The cumulated situation (road traffic, rail traffic, air traffic, industry) dating from 2007 is depicted in the map below. Noise mapping is prescribed by EU Directive 2002/49. As the map shows, high noise levels exist in the port area. Highly visible due to the emission of high noise levels are the road- and rail-based hinterland connections. Although less easily visible, industry noise is also prominently present in port areas.

Figure 5. Overview of the cumulated acoustical situation in the Rijnmond region



Note: This graph gives an overview of the acoustical situation, but cannot be used for a review under the current noise legislation, because that is based on a single source. In this graph, the different noise sources are cumulated. *Source*: DCMR, 2008.

5.2 Abatement/Prevention

70. To manage the sound levels in the industrial areas in the Rijnmond area, the area is divided into several zones. These zones have been granted an average specific sound emission per m^2 for industry noise. The PoRA is free to differentiate in the noise emission levels in contracts with clients, as long as the average level is maintained. Through this process, the PoRA can strategically divide the noise emissions on the basis of their preferences. As the permitted sound level is stricter during the night, the standards present an obstacle on some locations and therefore 24 hour operation is not possible. The industrial noise emission levels agreed with PoRA are defined in an environmental permit, and compliance is monitored by the DCMR.

71. Noise limits have been defined to increase living and working conditions. The noise limits seemed to be an obstacle for the development in an area where the room for expansion was limited. Therefore, in 2000 DCMR, Rijkswaterstaat Zuid-Holland and the PoRA formed a knowledge centre focused on knowledge sharing and stimulation of the application of existing sound reducing techniques (DCMR, 2009).

72. Due to technological advancements and the promotional activities as described above, sound emissions in the port area have decreased in the last years. The extra “space” that will be created by the

application of quieter techniques will be granted to the industry up to 2010. It is being discussed whether the extra available "space" that could be created by further reductions from 2010 onwards will be granted to the industry or will be taken out of the system.

73. The construction of the *Maasvlakte 2* area is also under special attention. At the moment, monitoring of the noise effects of the construction of the *Maasvlakte 2* on its surroundings is taking place. These monitoring activities were required to obtain a construction license for the *Maasvlakte 2* area. In order to determine the effects of the construction of the *Maasvlakte 2* on cetaceans, the preconstruction noise level was determined and developments will be monitored (PoR, 2009a).

74. One option recently applied that affects the emission of noise, is the installation of shore-side electricity for inland shipping barges. As ships switch from their auxiliary engines to the electricity grid, the noise generated by the auxiliary engine is eliminated. For barges, the use of their auxiliary engines has been banned at several locations where these power outlets are available. The project is currently limited to the Waalhaven, but will be expanded to all other berths for inland barges in the next years.

6. Waste and water pollution

6.1 Management of waste and effluents

75. Waste products that are being generated by shipping can affect the marine environment in case they are not handled properly. An example of irresponsible handling of waste products is the disposing of garbage or contaminated bilge water in the sea.

76. To facilitate and promote safe and environmental friendly disposing of waste products from ships, waste reception facilities have been installed by the PoRA. It is obligatory for ships to discard their waste products at the port designated waste reception facilities.

77. The availability of waste collection points in the port is the result of a European directive (2000/59/EG) to minimise environmental damage to the marine ecosystem caused by waste products from sea ships.

78. Under this directive, in the PoR ships are obliged to pay a fee for waste disposal whether they do or do not make use of the waste reception facilities, the height of this fee is dependent on the engine size. In exchange the ship is allowed to dispose garbage (Household garbage, plastic, small chemical) to a limit of 3-6 m^2 free of charge (dependent of engine size). If more garbage is handed in the ship owner will be will charged for the additional costs (PoR, 2009g).

79. For oil waste products the system is also based on indirectly financing. A ship pays a fee on every port call and receives a subsidy upon the disposal of oil.

80. In both cases the system promotes (frequent) disposal of garbage and oil at waste reception facilities for further processing (PoR, 2009g) and thereby discourages the illegal dumping of waste and effluents at sea.

81. As to make sure the ships hand in their waste and effluents all ships have to notify the port authority on the waste on board (substance, quantity) and their capacity for waste storage (PoR, 2009g). Ships are only exempted from their duty of obligatory disposal if they still have enough remaining capacity for waste storage.

82. To be able to enforce these regulations effectively Member States exchange information regarding the disposal behaviour of ships (PoR, 2009g).

83. The PoRA is the responsible party for the appointment of the waste disposal and for the redistribution of financial means. The waste is collected and processed by commercial parties.

6.2 Management of ballast water

84. Ships make use of ballast water to control their balance and buoyancy. The intake and release of ballast water can occur at locations that have completely different ecosystems. By the intake and release of ballast water, species alien to the surroundings can be released, some of the species thrive in their new surroundings and become so-called invasive species. Such species can have a severe impact on the ecosystem they are released in. The North Sea is subject to a negative impact of such invasive species.

85. To minimise the risk of ballast water, the ballast water can for example be treated with chemical substances or be filtered. To regulate the use of ballast water to prevent the introduction of alien species, the IMO proposed a new convention in 2004 to regulate the intake and disposal of ballast water.[9]

86. This convention is not yet in force, as not enough countries have yet ratified it. At the moment, around 15% of the world tonnage is covered; however, 35% of the world tonnage is needed for enforcement (IMO, 2009).

87. The convention describes ballast water exchange standards and ballast water performance standards. Depending on the ballast water tank size and the year of construction, different dates have been set for meeting the ballast water performance standard. The convention describes where and when ballast water discharging is allowed to take place. The different programmes describe how the ballast water exchange has to be conducted from a number of pumping cycles to a number of organisms still present in the ballast water.

88. The Netherlands signed this convention in 2005. The PoRA has not set any additional measures to control ballast water discharges in the port area.

6.3 Prevention of oil spills

89. The water quality can be heavily affected by activities in the port. One such example is spills of mineral oils that lead to pollution of water and sediments. Such oil spills can be accidental or illegal.

90. In the Port of Rotterdam, spills regularly occur; for example, in 2008,193 spills occurred[10]. However this number has decreased from 289 spills in 2007. Compared to the number of spills in 1993 (600 spills) the occurrence has dropped with almost two third.[10]

91. The PoRA activities are directed at the prevention and the control of oil spills. In case oil spills occur, they will try to keep the environmental damage to a minimum. An example of how PoRA tries to prevent spills is through the Bunker checklist. Ships engaged in tanking procedures have to adhere to a number of precautionary measures to reduce the risk to a minimum, controlled by the port master. This Bunker checklist describes the necessary precautionary actions to be taken prior to bunkering.

92. Compliance with these prevention regulations is monitored (inspections) by a number of organisations, including the PoRA[11].

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9 www.imo.org/.

10 http://havens.maritiemnieuws.nl/artikel/21181/minder+oliemorsingen+in+rotterdamse+haven.

11 www.portofrotterdam.com/mmfiles/ivw_jaarplan_2009_tcm26-58680.pdf.

93. As the spills still occur, the PoRA takes action to minimise the environmental impacts of occurring spills. The PoRA employs a number of ships that are capable to fight oil spills. Recently the port has taken a new ship into service that is specially adapted to fight oil spills (PoR, 2009a).

94. In the event of a spill, the responsible party will be held accountable for the costs of cleaning.

95. The PoRA policy works both preventatively (inspections) as well as correctively (prosecution).

6.4 Antifouling

96. The surfaces of vessels under the waterline are prone to fouling. The fouling of organisms on the hull increases the drag and weight of the hull which reduces the performance of the vessels – and increases its energy consumption. To prevent the fouling of organisms, special paints are applied on the hull of the ship. These antifouling substances leach into the water and subsequently the bottom. The compounds of antifouling paints can differ. This leaching process presents danger, as a number of these compounds are found to be highly toxic, such as biocide antifoulings. As these compounds constantly leach into the water, they present a real environmental risk. Next to the leaching process, the compound can also be released into the environment through ship maintenance (sanding and grinding).

97. On an international level, some action is taken to reduce negative impacts on the environment. As the toxicity of the various used substances became apparent, the use of antifouling containing biocides was banned in 2003 under the IMO[12]. Antifouling containing biocides already applied on ships were to be removed by 2008, or alternatively it was to be encapsulated with other coats of paint to prevent the substances for leaching.

98. Biocide antifoulings are not the only antifouling types that have negative side effects. Other substances still used also affect the environment, for example the ones that use heavy metals, such as copper.

99. Despite the ban on the use of antifouling containing biocide, the already applied substances can still impact nature.

100. The PoRA does not impose extra rules on the type of antifouling used. It has, however, banned the mechanical cleaning of ship hulls in the water as this resulted in extra emissions of the active substances to the water.

6.5 Management of sludge

101. Due to the natural process of sedimentation in rivers and the coastal seas, dredging needs to take place to keep the waterways in the Port of Rotterdam at proper depth for shipping. The main waterways passing through the port are under the jurisdiction of the state (Rijkswaterstaat). The state is responsible for dredging in these areas. As the port basins fall under the jurisdiction of the PoRA, the dredging in these areas is being carried out by this organisation. Combined, in Rotterdam, 20 million m^3 of sludge is being dredged each year (PoR, 2005).

102. The quality of the dredged sludge in the PoR is improving, however, still 1.5 million m^3 is of contaminated (metals, PAC, PCB) sludge is being dredged each year (PoR, 2005).

12 www.imo.org/.

103. In the past, all sludge, including the contaminated part, was disposed at sea. With the creation of a depot called 'Slufter', this situation changed in 1986. Now only clean sludge is disposed at sea. The basin was created by the PoRA in co-operation with the Dutch state; the PoRA manages the basin. The basin is primarily used to store the contaminated sludge from dredging activities in the port and the waterways leading to the port.

104. As the largest part is not contaminated, it can still be disposed in the North Sea. As the quality of sludge is increasing, more and more sludge will be disposed at sea. The obligatory separation of clean particles from the contaminated sludge also helps (PoR, 2007). These developments have prolonged the capacity of the storage basin for contaminated sludge.

105. The PoRA has set itself the goal for 2015 to improve the quality of the sludge to a level so that the sediments can be reused in, for example, infrastructure projects or disposal at sea.

106. Contamination of the waste and sludge is not only caused by port activities. Activities taking place upstream have also a significant influence on the sludge quality in the port. To tackle the problem of upstream pollution, the PoRA has signed a covenant with industries upstream the rivers to reduce their levels of pollution.

107. A number of old contaminated basins have been covered with a clean layer of sand. This prevents the further spread of the contamination.

108. Next to these damage-preventing measures, the PoRA and Rijkswaterstaat are in 2009 active in a pilot project to improve the biodiversity in the water and the overall water quality in the harbour by installing hard substrate for algae and shellfish (PoR, 2009a). Through their water filtering capabilities, these organisms are expected to improve the water quality in the harbour.

7. Management of hazardous cargo

109. Almost all commercial ports are confronted with the handling of dangerous substances. Handling these substances requires special care due to the risks involved for the general environment and also for the workers handling such transhipments.

110. To prevent damage to the environment and the health of the workers, the PoRA has introduced rules for operations involving dangerous cargo. In general, rules have been introduced for the following situations[13]:

- *The use of petroleum ports*
  Describes the rules for loading, unloading and bunkering in petroleum ports.

- *Berthing*
  Describes the rules as to where tankers carrying hazardous cargo are allowed to take berth. Next to this, it also describes the situations in which a ship is allowed to berth elsewhere in the port. It also describes where the container and general cargo vessels containing hazardous cargo are allowed to take berth.

- *Cleaning of cargo tanks*

[13] www.portofrotterdam.com/en/shipping/inlandshipping/dangerous_noxious_goods/index.jsp.

Describes the locations where cleaning, washing and ventilating of tanks are allowed to take place. It also describes the procedures to obtain permission for such activities or permission for these procedures in different locations.

- *Repairs*
  In the PoR it is not allowed to conduct major repairs to ships except in a shipyard. It also describes how ships can apply for an exemption.

- *Decontamination of cargo and degassing of spaces*
  Describes the rules on degassing and decontamination of spaces. Such procedures are only allowed under special conditions and prior permission from the harbour master is necessary.

111. In the Netherlands, dangerous goods need to be transported via dedicated links, depending on the safety category. At the same time, there are conditions for building directly around this infrastructure. The authorities use a standard of one in a million per year for the risk on fatal accidents.

8. Hinterland distribution and feeder traffic

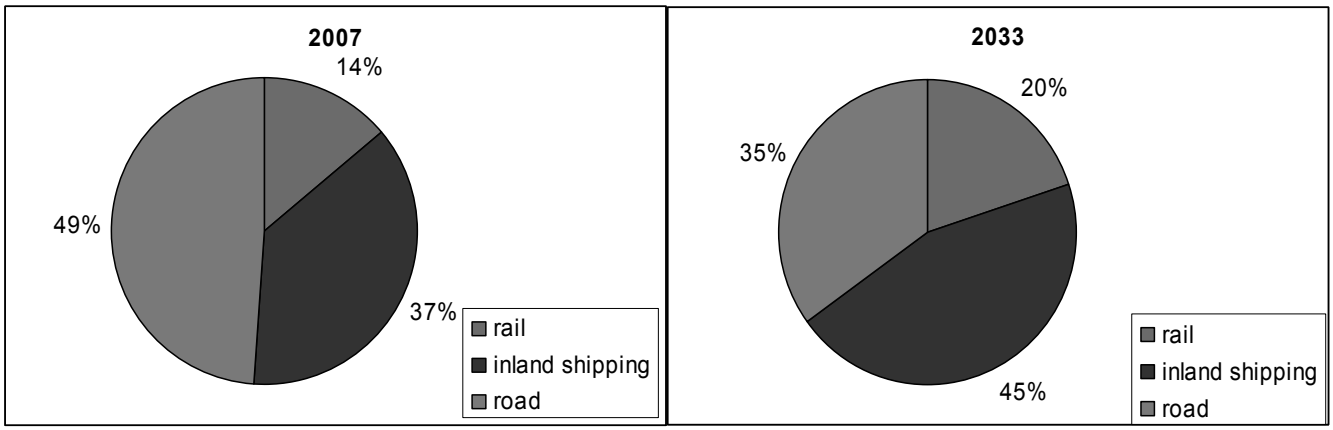
112. The PoR has a diverse range of hinterland connections. Products and goods can be distributed further into land by five different modalities (road, rail, inland shipping, short seas shipping and pipeline).

113. Traditionally, the different types of goods were being transported by specific modalities. For example, dry bulk products, such as ore and coal, were commonly transported with barges.

114. From an accessibility and air quality point of view, the PoRA wants to increase the share of inland shipping. As the port is expected to grow, additional pressure will be put on the existing hinterland connections. To maintain accessibility levels the PoRA deems a modal shift change as needed.

115. In the modal split of container transport in 2007, road transport accounted for almost half (49%) of the hinterland distribution (PoR, 2009a). Inland shipping held the second place with a share of 37%, to be followed by rail transport with a share of only 14%, see Figure 6.

Figure 6. Modal split in 2007 and the Port of Rotterdam goal for 2033
Based on the number of containers



116. To reduce the levels of congestion of the truck routes to and from the port, and to increase the energy efficiency of its operations, the PoRA set the goal to ship more goods over water and railways, and

less by the road. For 2030 the objective is 35% by road, 45% by inland barges and 20% by rail (PoR, 2009a).

117. To be able to create such a big modal shift, the PoRA has made binding agreements with container terminals at *Maasvlakte 2*. The container terminals are bound to the modal split presented above in the contracts between the PoRA and the container terminals.

118. The PoRA does not only try to guide the modal split in the *Maasvlakte 2* area; it also tries to create a modal shift in the existing port areas. However, their influence is limited in that area. One can for example not expect a modal shift from road to rail or inland shipping if there is no access to these modes.

119. Next to these activities to secure a modal shift trough the contractual terms, the PoRA is promoting the use of inland shipping as it (PoRA, 2009a):

- Creates more loading capacity for inland barges.
- Limited the increase of port dues for inland barges (1% in 2008 and 2009).
- Optimises the service to inland barges (wait times, safety improvement).

120. The situation of rail transport has also been improved with the completion of the *Betuweroute* in 2007. With the creation of the railway, a dedicated link for electric rail cargo transport between the *Maasvlakte* and Germany (Ruhr area) has been created. The port rail link will be equipped with modern technologies (25 kV on the overhead wire and the ERTMS safety system) so that the connection with the *Betuweroute* is optimal (PoR, 2009a). To increase the share of rail in the modal split, more rail infrastructure will be created in the next decade.

121. Other activities to prevent congestion are being done through traffic management. In order to guarantee the accessibility and an optimal traffic flow on the roads in the vicinity of the port, the PoRA, in collaboration with 'Rijkswaterstaat' (Ministry of Transport), the Municipality, and the city region, created the '*Verkeersonderneming*' (PoR, 2009a). This organisation tries to reduce the traffic flow on the A15 during rush hours by 20% by guiding the supply and demand of traffic on the A15.

122. To achieve this reduction in traffic, a variety of actions are taken, from traffic management initiatives to more behavioural oriented initiatives (PoR, 2009a):

- (Dynamic) traffic management.
- Avoiding rush hours (Road users are financially compensated for not using this particular highway during rush hours).
- Collective company transport.

123. As discussed earlier, the PoRA is investigating the idea to enhance the flow of goods by the creation of a container terminal downstream in the Drechtsteden region, with a capacity of 200.000 TEU[14]. A letter of commitment has been signed with twelve important partners in the container logistics (PoR, 2009a).

9. Use of port state authority to enforce environmental protection measures

124. To ensure that activities in the port are being conducted according to the applicable regulations, a large number of organisations conduct environmental and other inspections. The PoRA itself also plays an import role in the control of the behaviour in the port. Inspectors of the port mainly focus on the disposal of

[14] TUE stands for Twenty feet Equivalent Unit.

waste and waste products. Port state control is responsible for the inspection with respect to international environmental regulations.

125. The Port state control in the Netherlands is a member of the Paris Memorandum on Port state control. Through co-operation, these maritime authorities are actively trying to eliminate sub-standard ships and increasing their effectiveness[15].

126. These co-operating organisations check compliance of ships to international standards on: safety, security, working conditions and environmental standards. Ships that are found not to comply with these international standards can be detained or even banned from the ports.

127. The Netherlands has the possibility to enforce stricter environmental standards than internationally agreed to some extent, but does not make use of this option. International competition may be an argument not to introduce additional measures.

10. Nature management and compensation

10.1 Management of nature

128. Ports can affect nature in a number of ways. Ports can compete with nature for space, but also the operations can affect surrounding nature areas. Because of the nature of port areas, there may also be found protected organisms in the port area in the framework of Natura-2000.

129. The presence of such species might impact the development of that particular area as the position of the species may not be compromised. The PoRA has been granted special permission to manage the presence of these 'Natura-2000' species. This special permission has been granted under the provision that activities are being taken elsewhere to increase the livelihoods of these vulnerable species. An example in the PoR is the creation of special ponds for protected amphibians.

130. To further ensure the protection of such species, a code of conduct has been introduced to assure that people handle these species according to the management plan. Such a code of conduct has been put in place for each of the vulnerable species.

131. Another relevant development is the creation of an artificial nesting island for birds. As the *Maasvlakte* areas will affect bird populations in the vicinity, this island will counter this effect. This island is the result of an agreement between the PoRA and the 'society for the protection of wildlife' (PoRa 2009e). This organisation objected to the construction permit for *Maasvlakte 2* because of the impact it would have on the local fauna.

132. Individual organisations in the port area that significantly impact the surrounding nature are also obliged to limit their impact on these areas by the use of emission reducing techniques.

10.2 Nature compensation

133. The *Maasvlakte 2* expansion is being developed in a protected coastal zone that is part of the protected Natura-2000 areas (PoR, 2009a). The construction will affect 2,500 hectares.

134. To offset the impact of the construction of the *Maasvlakte 2* on the coastal sea, a marine protected area (MPA) of 25,000 hectares has been established by the Dutch state (PoR, 2009a), dictated by

15 www.parismou.org/.

the EU birds and habitat Directives. The protection is focused on protecting the sea bottom. This implies no bottom affecting fisheries and untouched space for several species. It also includes a number of smaller bird protection areas. With this measure, the affection of the delta should be limited. However, a MPA does not grant full protection to the area, as not all human activities are banned there.

135. The Dutch State (*Rijkswaterstaat, Directie Noordzee*) is responsible for the creation of the MPA. To compensate the damages that will be inflicted on the dune area 'Duinen van Voorne', a new dune area with a size of 35 hectares will developed by the Dutch State.

136. In addition to nature compensation, the expansion of the port area could lead to an improvement of living conditions for local people and the construction of several recreational sites in the region. These measures consist of *e.g.* improvement of city parks along the Maas, several noise-reduction programmes, traffic safety projects and socio-cultural projects.

11. Land use

137. Ports are usually spread across large areas and therefore compete with for example nature, housing or agriculture. To limit the impact of ports on the environment, efficient land use is an important factor. For ports that are limited in growth opportunities it is even more important.

138. As space for growth is limited in the Rotterdam area, and as the PoRA wants to minimise the impact of developments on the surroundings, they focus on their land use. Therefore, in existing port areas, they actively stimulate efficient use of the scarce space. The PoRA managed to intensify the land use in the port due to the re-development of 200 hectares that had come into disuse in the period up to 2008 (PoR, 2009a). As an example, PoRA reclaims land in port basins no longer being used. Another method they used to intensify business on existing land is by reducing the size of the land reserves owned by companies for future growth purposes. The PoRA also redevelops old port areas to meet the current standards. By redeveloping areas, PoRA limits the need for additional land (PoR, 2009a).

139. Another way in which the PoRA states it has kept its expansion to a minimum is by choosing a compact design for the *Maasvlakte 2,* given the projected activities in the area (PoR, 2009a).

12. Evaluation and further work

140. The Port of Rotterdam Authority has an ambitious programme to reduce its own emissions. The PoRA has the ambition to be climate neutral in 2012 within its own organisation.

141. In private contracts with industrial parties, the PoRA uses environmental criteria in the granting of new industrial sites. An example of these criteria is the illustrated requirement of a significant change to alternative modes for transport to and from container terminals on *Maasvlakte 2*.

142. The biggest environmental impacts in the port area are caused by the industry and sea going ships. Those areas should get most attention therefore. The question is how big the sphere of influence of the Port of Rotterdam is, apart from actions on the operational sphere. There is room for improvement with *e.g.* a vessel speed reduction programme like the one applied in California, and the PoRA is together with the DCMR responsible for observation of the regulations in force and for good management of nature, garbage, hazardous goods and contaminated sludge in the port. International competition makes it, however, difficult to set criteria much stronger than enforced by environmental regulations.

143. In December 2009, the PoRA announced plans to differentiate port dues on the basis of environmental criteria by 2011. A limited reduction in port dues only makes sense if the newly announced policy of PoRA is followed by many other ports. At the same time, lowering of the port dues with 10%

worldwide will not generate enough money for the installation of SCR catalysts at ocean going ships, as the costs of these installations are high.

144. That ports give environmental incentives to shipping lines is an important statement to the maritime industry, even if it will only lead to moderate investments in specific areas. But the role for governmental organisations is larger. Due to international competition, it is difficult to take significant measures regarding emissions in coastal waters, emissions on shore, industrial emissions, etc., other than at an EU level or higher, unless significant subsidies are used.

145. Many measures, both at ships and in the industry, are generally cost-effective compared to measures in other sectors (ENTEC, 2005a/b).

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