Green Inland Ports

Good Practices

Funded by
the European Union

Clean air programme

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1.1 Description

According to the European Environment Agency (EEA), (2023), air pollution is the single largest health risk in Europe and a major cause of premature death and disease. Air pollution mainly consists of particulate matter (with a diameter of less than 2.5 or 10 µm), ozone, nitrogen dioxide, benzo(a)pyrene, and sulphur dioxide. Human health problems caused by air pollution include cardiovascular diseases, irritation of eyes, nose and throat, asthma and reduced lung function, lung cancer and impacts on the reproductive system. It can also affect the environment by reducing visibility and blocking sunlight, causing acid rain, and harming forests, wildlife and agriculture (UCAR, n.d.). According to NABU, (n.d.), many European cities exceed EU-limit values for air pollutants for particulate matter, nitrogen dioxide, or sulphur dioxide permanently. Ports contribute a lot to air pollution, but it is not only the ships that pollute the air with emissions from fuels. In port operations shunting locomotives, quay cranes or heavy truck traffic from the logistics sector are additional significant emitters.

A clean air programme often includes the following steps to tackle air pollution challenges:

1. Create a baseline by measuring to understand the scope of air pollution,
2. Support high-quality research and innovations that will help develop practical solutions for air quality issues,
3. Shape new strategic air policy objectives for 2030 and 2050.

Within this factsheet, the good practice can be implemented by port authorities, but also by terminals and operating companies.

The United Kingdom and the European Commission have been working on a Clean Air Programme in the past (UK Research and Innovation, 2019, EC, 2013). As part of the efforts that has been put in improving air quality in Europe, a three-year project called “Clean Air in Ports” has been started in the past (2013 until 2015) with the main goal of addressing air pollution within ports. Air pollution reduction strategies have been identified, such as developing zero-emission terminals, developing emission models that enable ports to attribute emissions to specific areas and ship activity, low-emission zones to tackle certain fuels, more effort in a logistic modal shift away from trucks, ecological port fees when using certain fuels or when pollutant emissions are lower than a certain limit. (NABU, n.d.). Firstly, the sources of air pollution need to be identified and quantified to make an effective clean Air programme. Then, a strategy can be thought of to tackle the sources of air pollution.

The port of Antwerp-Bruges works with the Flemish Environment Agency to constantly monitor the air quality in the Antwerp port area. They are greening their own fleet and work on a transition to a multifuel port with alternative low emission fuels. Ships often run auxiliary

engines running on fossil fuels when docked, but this can be prevented when using onshore power installations. From 2000 onwards, improvements are visible (Port of Antwerp Bruges, n.d.).

The port of Detroit has set up a decarbonisation plan in partnership with Tunley Environmental, which also entails an air improvement plan. The first step has been to collect data from terminal operators, which was a difficult and time-consuming step, as they are not obliged to share data. The first task (started at the end of 2023) was to map out the baseline emissions for the port as a whole. The next step would be to formulate a vision for the port, in which the next steps are included to decrease GHG and air pollution emissions within the port area (Schrupp, M. & Moorcroft, R., 2023).

When solely looking at inland ports, this good practice is being implemented mostly in the United States, but effort is also being put into this measure in some European inland ports. Examples of actions taken that are part of a clean air programme include frequent air quality monitoring (by for example an independent body), which can include the monitoring of different types of good practices that can all be collected within a clean air programme, such as “electrification of equipment and energy efficient technologies” and “waterway discounts for cleaner ships” to name a few.

1.2 The aim of a clean air programme

The aim of a clean air programme is to reduce air pollution within the port area, and to improve the air quality in and around the port. This can be achieved through a combination of actions, such as adopting and encouraging cleaner technologies (e.g. onshore power supply, LNG, air pollutant filters), implementing a better air quality monitoring system (e.g. better insight in the air pollutant emissions can lead to measures, rules and regulations aimed directly at the largest emitters and largest emissions), enforcing and increasing regulations (e.g. low emission zones or mandatory use of onshore power supply/auxiliary generator when docked), and engagement and agreements with relevant parties within the port area, such as terminals and other companies regarding the collection of data.

1.3 Parties that have a clean air programme

- Port of Antwerp-Bruges
- Port of Barcelona
- DeltaPort (Wessel)
- Port of Giurgiulesti
- HAROPA Port
- Port of Wittingen
- Port of Seville
- Port of Detroit (as a part of the decarbonization plan)
- Port of New York/New Jersey
- Port of Los Angeles & Long Beach
- Port of Oakland

- Ports of Seattle, Tacoma and Vancouver (together)

1.4 Stakeholders

- Port authority: The port authority is responsible for what happens within the port area, which often means that they are also responsible for air quality control, which is a factor that improves the image and management of a port (Kunak, 2024). In the Netherlands however, the responsible party for air quality is the central government and municipalities. The port authority is in many cases also part of the municipality, which means that they are responsible for the air quality. However, this may differ per country. They are responsible for setting up a clean air/air quality programme, and for it being executed. They are the driving factor of collaboration within the port area. They can persuade (terminal) companies to join the programme, contribute to data collection and do their part (Schrupp, M. & Moorcroft, R., 2023).
- (Terminal) Companies located in the port area: These companies, depending on intrinsic development to become more sustainable, oftentimes play a large role in the air quality within a port area. They are not obliged to join a clean air programme, unless a (environmental) permit is necessary, which poses mandatory emissions restrictions. On the one hand, joining the programme can generate extra costs and time losses, as data monitoring and implementing measures/changes that benefit air quality can be costly and time consuming. On the other hand, this can increase their sustainable image towards, partners, customers and the surrounding city.
- National/European authorities: Depending on the policies/regulations that are in place on national level, national authorities may also play a role. Ports are often exempt from certain measures to decrease air pollution and European cities often exceed EU-limits for air quality, in which ports play a large part. Limits can become more stringent, exemptions for ports may be removed and enforcement can be increased.
- Local inhabitants: Air pollution is a global problem, but air pollutants usually remain in the vicinity of where they have been emitted. If because of a clean air programme, ports will emit fewer air pollutants, inhabitants of cities/villages nearby will benefit from it.

1.5 Voluntary or mandatory

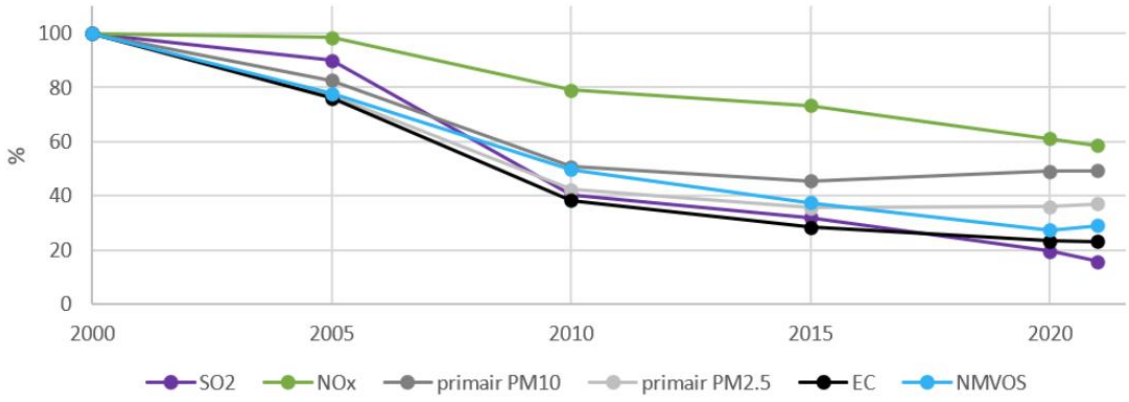
The European Commission has EU air quality standards that apply to countries within the European Union, and the United Nations have also set emission ceilings. These apply to fine particles ($PM_{2.5}$ and PM_{10}), sulphur dioxide, nitrogen dioxide, lead, carbon monoxide, benzene, ozone, arsenic, cadmium, nickel, and polycyclic aromatic hydrocarbons (EC, n.d., Government of the Netherlands, n.d.). The agreed values have been laid down in the Gothenburg Protocol (UN) and the National Emission Ceilings Directive (EU). On top of these concentration limits, Directive 2008/50/EC introduced additional $PM_{2.5}$ objectives targeting the exposure of the population to fine particles, which are set at national level and are based on the average exposure indicator (AEI) (EC, n.d.). There are mandatory rules and regulations, but as previously mentioned, in many ports and many cities, limits are being exceeded. NABU, (n.d.) also mentions that, although some measures for air pollution control are already implemented, ports are, to a certain extent, exempt from these measures. Therefore, it is

mandatory to comply with the mentioned limits, however it is voluntary to implement a clean air programme.

1.6 Realised/potential impact

In 2008, the management of the port of Antwerp, the municipality of Beveren and the Flemish Environment Agency concluded an agreement to measure and assess air quality within and around the port area (Vlaamse Milieumaatschappij, 2023b). The results apply specifically for the port of Antwerp, because the monitoring only takes place in the Port of Antwerp. Since 2000, the port authority has put effort in improving air quality with measures such as greening fleet, offering shore power, working on the transition to a multi fuel port with (local production of) alternative fuels such as hydrogen, ammonia and methanol. For example, tugboats are being built on green hydrogen or green methanol. The port of Antwerp-Bruges wants to be a forerunner in the use of new marine fuels that not only emit less CO_2, but also less PM and NO_x. Since 2000, a clear decrease is visible of the emission of air pollutants. Figure 1 shows this decrease between 2000 and 2022.

Figure 1 - Evolution of the emissions of air pollutants in the port of Antwerp (Vlaamse Milieumaatschappij, 2023a)



Between 2005 and 2010, the largest reductions are visible. It is interesting to note that after 2015, many air pollutants show a modest reduction, which could mean that the low hanging fruit has been picked. Between 2000 and 2022, an impressive reduction of air pollutants is visible, ranging from a decrease of just over 60% to more than 80% between 2000 and 2022, depending on the air pollutant.

1.7 Possible obstacles

- An important part of a clean air programme is gathering data and monitoring this. Terminal operators and companies have no direct reason or incentive to share data, as

the data can be sensitive for their business activities. Schrupp, M. & Moorcroft, R., (2023) indicated that, Tunley (a sustainability consultancy that executes the project for the port of Detroit) and the port of Detroit are building trust amidst all competitive companies within the same sector and showing that their goal is to initiate a positive change. This took more time than expected.

- This can be solved by implementing objective and external ways to measure air quality. The Port of Antwerp-Bruges uses for example sensors to measure air quality. 70 virtual noses (iNoses) have been placed within the port area to identify harmful or nuisance-causing gases at the port (Port of Antwerp Bruges, n.d.).
- Improving the air quality within the port area is important for the use of sufficient zero-emission machinery and equipment, such as wheel loaders and reach stackers that have sufficient capacity. The supply is increasing, but within the real heavy machinery segment, zero-emission options are scarce or even non-existent.
- Electrification of equipment/machinery is relatively expensive. The total cost of ownership could be beneficial in the long run, but the purchase costs must be paid in advance.

1.8 Key learnings

- A clean air programme must be designed based on the current situation. To identify the current situation, data from companies and terminal operators is very important. It can be difficult and time consuming to gather the data. It would be very useful to find solutions to aid in this, such as contractual agreements that oblige (terminal) operators/companies to supply data to the port authority on a yearly basis.
- Vessels at berth create significant air pollution. With onshore power supply and more sustainable fuels for ships at berth air pollution in the port can be decreased substantially.
- Electrification is important for an improved air quality. This means that the supply of zero-emission machinery should increase with the necessary features that companies require (e.g. carry sufficient weight).

1.9 Sources

EC. 2013. A Clean Air Programme for Europe, European Commission https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52013DC0918&from=EN.

EC. n.d. EU air quality standards, European Commission https://environment.ec.europa.eu/topics/air/air-quality/eu-air-quality-standards_en.

EEA. 2023. How air pollution affects our health, European Environment Agency https://www.eea.europa.eu/en/topics/in-depth/air-pollution/eow-it-affects-our-health.

Government of the Netherlands. n.d. Air quality standards, https://www.government.nl/topics/air-quality/air-quality-standards.

Kunak. 2024. Air quality control in ports, a factor which improves the image and management of a maritime port, https://kunakair.com/air-quality-ports/.

NABU. n.d. Clean Air in Ports, https://en.nabu.de/topics/traffic/ports/index.html.

Port of Antwerp Bruges. n.d. Air quality, odour and noise, https://www.portofantwerpbruges.com/en/our-port/people-and-environment/air-quality-odour-and-noise#geurhinder.

Schrupp, M. & Moorcroft, R., 2023. Interview port of Detroit.

UCAR. n.d. Effects of Air Pollution, https://scied.ucar.edu/learning-zone/air-quality/effects-air-pollution#:~:text=Air%20pollution%20affects%20all%20things,change%2C%20affects%20the%20entire%20planet.

UK Research and Innovation. 2019. Clean air, https://www.ukri.org/what-we-do/browse-our-areas-of-investment-and-support/clean-air/.

Vlaamse Milieumaatschappij. 2023a. Luchtkwaliteit in Antwerpse haven verbeterde aanzienlijk het voorbije decennium, maar positieve tendens stokt, https://www.vmm.be/nieuws/archief/luchtkwaliteit-in-antwerpse-haven-verbeterde-aanzienlijk-het-voorbije-decennium-maar-positieve-tendens-stokt.

Vlaamse Milieumaatschappij, 2023b. Luchtkwaliteit in de Antwerpse haven jaarrapport 2022, Aalst: Vanino, S, et al., 2023. Barriers and opportunities of soil knowledge to address soil challenges: Stakeholders' perspectives across Europe, Journal of Environmental Management, Volume 325, Part B,