OPPORTUNITY GREEN

Air pollution, people and ports: a human rights perspective

Legal Briefing | October 2025

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Executive Summary

Ports are hotspots for air pollution and greenhouse gas emissions. This poses serious risks to human health and the environment, with particularly acute impacts on vulnerable groups. Despite this, monitoring and mitigation of air pollution in ports remains inadequate across much of Europe. This report sets out how the health, climate and environmental impacts of port-related pollution may be legally actionable under human rights law. It demonstrates that states and private actors have legal obligations to reduce air pollution, as well as greenhouse gas emissions, emanating from ports. This document focuses on port-sourced pollution in the European context; however, its conclusions are likely to be relevant for other regions.

Key findings are:

- Human rights law requires action to reduce air pollution, including greenhouse gas emissions, from port activities. Failure to do so may constitute a breach of binding legal obligations.
- Legal accountability is not limited to states. Courts and international bodies are showing a growing willingness to hold private actors responsible for contributing to human rights violations.
- Failure to monitor emissions may be a breach in itself. The duty to monitor, assess, disclose, and act on air pollution is fundamental to human rights compliance, yet monitoring near ports is often incomplete, inaccurate, or absent.
- Legal risks are escalating. Affected communities, NGOs, and regulators are increasingly turning to courts and other legal pathways to challenge failures to mitigate pollution, which could extend to pollution in ports.

Accordingly, our key recommendations for port stakeholders, including local and national governments are:

1. **Monitoring and transparency:**

- Establish comprehensive air quality monitoring systems in and around ports.
- Guarantee affected communities' right to access information on air quality, pollution risks, and health impacts in a timely and accessible format.

2. **Prevention and mitigation**

- Phase out reliance on highly-polluting marine fuels and avoid 'false solutions' such as LNG.
- Accelerate the deployment of shore-side electricity infrastructure and expand shore power requirements under EU law to a broader range of ships at berth.
- Ensure that ports meet EU and WHO air quality guidelines and implement corrective air quality action plans where exceedances occur.
- Prioritise targeted interventions in communities disproportionately affected by port pollution.

3. **Accountability**

- Align port and shipping regulation with states' binding duties under international climate treaties and human rights law to reduce GHG emissions and air pollution.
- Ensure appropriate remedies, including compensation, are available and accessible to individuals whose rights may be violated due to port-related air pollution.

Air pollution in ports: an introduction

In the shipping context, pollution presents a significant challenge. To start with, the shipping industry's reliance on fossil-based fuels that release greenhouse gases (GHGs) into the atmosphere makes it a considerable source of pollution. Globally, shipping produces approximately 3% of GHG emissions, primarily through emissions of carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O).[1]

As well as releasing pollutants that accelerate climate change, the shipping sector emits substances that affect air quality. According to the European Environment Agency,[2] air pollution is the single largest environmental health risk in Europe and a major cause of premature death and disease. In addition to health issues, air pollution can considerably affect Europe's economy, for example through increased healthcare costs and damaged ecosystems. The emissions of the following substances form the bulk of air pollution from shipping:[3]

- **Nitrogen oxides** (NO_X) which arise during the combustion of fuels in the ship's engine.
- **Sulphur oxides** (SO_X) which arise from the combustion of sulphur-containing fuels in the ship's engine. Both NO_x and SO_X can be transported over very long distances by the wind, meaning remote and even hinterland regions get polluted by shipping and port-related emissions.
- **Particulate matter** (PM) with the subgroups PM_{10}, $PM_{2.5}$ and $PM_{0.1}$ depending on their size, which arise during combustion of diesel, biofuels and heavy fuel oil. PM also develops when certain pollutants meet other substances (secondary PM). The smaller the particles, the worse the impacts on human health.
- **Black carbon** (BC), a component of fine PM which results from the incomplete combustion of fossil fuels, biofuels and biomass. BC has harmful health effects and is also a short-lived climate pollutant (meaning it will remain in the atmosphere for less time than carbon dioxide, but have a potent impact on near-term global warming).[4]

Emissions from ports come from a wide range of sources, including ships, cargo handling equipment, harbour craft, trucks, rail locomotives, port administration vehicles, and power plants.[5] Whilst the ownership and management structures of ports vary, the following entities generally form part of the stakeholder landscape involved in port operations (and, by association, port pollution):

- Public entities, such as **port authorities**, **local and municipal governments**, and **central or national government bodies,** which often play a central role in managing port operations, enforcing rules and regulations, and leasing terminals.
- Commercial entities, such as **privately owned port authorities**, **terminal operators**, **shipping lines** and **ship owners**, **charterers**, **bunker fuel suppliers**, **dockworkers**, **crew management firms**, **logistics providers**, and **freight forwarders**.
- Financial entities, such as **private equity firms**, **pension funds**, and **sovereign wealth funds** investing in terminals and infrastructure, as well as **banks** and **insurers**.

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[1] International Maritime Organization, 'Fourth IMO Greenhouse Gas Study 2020' (2020), online at: https://www.imo.org/en/ourwork/environment/pages/fourth-imo-greenhouse-gas-study-2020.aspx accessed 18 September 2025
[2] European Environment Agency, 'Air pollution' (2025), online at: https://www.eea.europa.eu/en/topics/in-depth/air-pollution accessed 18 September 2025
[3] NABU, 'Clean Air in Ports: EU LIFE+ Project "Clean Air"' (2015), online at: https://en.nabu.de/imperia/md/content/nabude/verkehr/cleanair/150529-nabu-cleanair_manual.pdf accessed 3 September 2025
[4] World Resource Institute, '3 Reasons Why Countries Must Take Faster Action to Reduce Short-lived Climate Pollutants' (2023), online at: https://www.wri.org/insights/short-lived-climate-pollutant-reductions accessed 18 September 2025
[5] United Nations Environment Programme, 'Global Clean Ports' (n.d.), online at: https://www.unep.org/explore-topics/transport/what-we-do/global-clean-ports accessed 18 September 2025

Considering the immense adverse effects of air pollution from shipping and port activities on human health, the climate, and the environment, the issue can be viewed through the lens of human rights law. This report analyses the impacts of port pollution on a range of human rights, and explores the underlying legal risks and implications for port stakeholders.

Legal analysis: the consequences of air pollution in ports under human rights law

An overview of the human rights law regime

Human rights law consists of global and regional treaties (i.e., agreements between states), as well as national laws. In particular, of relevance to this report:

- **Protecting civil and political rights,**[6] the International Covenant on Civil and Political Rights (ICCPR) is a legally binding treaty with over 170 States Parties globally. It is monitored by the Human Rights Committee (HRC) through state reporting and individual complaints. In Europe, civil and political rights are further secured in the European Convention on Human Rights (ECHR), which is legally binding upon the 46 Member States of the Council of Europe. The European Court of Human Rights (ECtHR) is the highest court tasked with interpreting the ECHR, and is an important source of legal precedent.
- **Protecting economic, social and cultural (ESC) rights**,[7] the International Covenant on ESC Rights (ICESCR) also applies to over 170 states globally, with oversight by the Committee on ESC Rights. For the Member States of the Council of Europe, these rights are also governed by the European Social Charter, enforced by the European Committee of Social Rights. Each ESC right entails core obligations that must be met immediately.[8] However, due to the inherent complexity of such rights, States Parties are expected to work towards fully realising them progressively over time. The pace of this is to be determined by the resources available to the given State, with an obligation to allocate maximum available resources.[9]

States carry the primary obligation and responsibility to respect, protect and fulfil human rights.[10] As such, central and local government bodies in violation of human rights law risk legal and regulatory consequences.[11] States also have an obligation of due diligence: a duty to take appropriate steps to prevent human rights violations, and to issue appropriate penalties for the perpetrators, including corporate actors.[12]

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[6] Civil and political rights are those which protect individuals from state interference and ensure their participation in society.
[7] ESC rights can be described as 'everyday rights' focused on basic needs, such as the right to food and education.
[8] Office of the United Nations High Commissioner for Human Rights, 'Economic, social and cultural rights' (n.d.), online at: https://www.ohchr.org/en/human-rights/economic-social-cultural-rights accessed 18 September 2025
[9] Nikolaos A Papadopoulos, 'Revisiting the Preamble of the European Social Charter: Paper tiger or blessing in disguise?' (2022) *Human Rights Law Review*, *22*(1), online at: https://academic.oup.com/hrlr/article/22/1/ngab021/6334043 accessed 18 September 2025; Office of the United Nations High Commissioner for Human Rights, 'Economic, Social and Cultural Rights' (n.d.), online at: https://www.ohchr.org/en/human-rights/economic-social-cultural-rights accessed 18 September 2025
[10] UN Human Rights Council, 'Business and Human Rights: Mapping International Standards of Responsibility and Accountability for Corporate Acts - Report of the Special Representative of the Secretary-General (SRSG) on the issue of human rights and transnational corporations and other business enterprises', 9 February 2007, UN Doc. A/HRC/4/035, para. 35.
[11] There are limits on the applicability of the human rights framework, since a State can only be responsible for human rights violations committed against individuals within its jurisdiction. While some developments challenge and incrementally erode this rule, this is beyond the scope of this report. The focus of this report is the human rights of the inhabitants of the relevant States, who are under the jurisdiction of those States. However, continuous scientific developments are making it increasingly feasible to attribute specific environmental harms to particular emissions sources. In future, this 'attribution science' may enable individual responsibility (whether State or corporate) for transboundary environmental harm to be established with more precision, making the jurisdictional goalpost easier to reach. See for example: Renée Cho, 'Attribution Science: Linking Climate Change to Extreme Weather' (Columbia Climate School, 2021), online at: https://news.climate.columbia.edu/2021/10/04/attribution-science-linking-climate-change-to-extreme-weather/ accessed 18 September 2025; Global Witness, 'The supermajors' plans could kill 11.5 million people' (2024), online at: https://globalwitness.org/en/campaigns/fossil-fuels/the-supermajors-plans-could-kill-115-million-people/ accessed 18 September 2025
[12] Timo Koivurova and Krittika Singh, 'Due Diligence' in Rüdiger Wolfrum and Anne Peters (eds), *The Max Planck Encyclopedias of Public International Law* (Oxford University Press, 2022), online at https://opil.ouplaw.com/display/10.1093/law:epil/9780199231690/law-9780199231690-e1034 accessed 18 September 2025

In addition, legal recognition of human rights obligations for corporate entities is increasing. Soft law measures, such as the United Nations Guiding Principles on Business and Human Rights and the OECD Guidelines for Multinational Enterprises on Responsible Business Conduct, set standards and expectations on corporate responsibility for respecting human rights. Additionally, in recent years, a growing number of strategic litigation cases have been brought against corporate entities,[13] with some setting landmark judicial precedents holding them directly accountable for human rights violations and environmental harm.[14] This trend may gain strength in the EU by virtue of emerging legislation on corporate sustainability due diligence.[15] Recent evidence suggests that such legal actions against corporate actors detrimentally affects share value[16] and consumer confidence.[17]

Accordingly, private stakeholders – such as those involved in the operation of ports - may also be held accountable for their human rights impacts, and face legal and regulatory risks, both direct (litigation being brought against them, or states taking enforcement action) and indirect (states changing laws and regulations to comply with their own human rights obligations).

The sections below examine the three most significant impacts of air pollution in ports – health, climate and environmental - and analyse those impacts in line with human rights law. Additional information about air pollution regulations at the international, European and UK levels can be found in the Annex.

The effects of air pollution on human health

The issue

Air pollution is the largest environmental health risk in Europe and a major cause of premature death and disease.[18] Exposure to high levels of air pollution is linked to an increase in mortality and morbidity,[19] respiratory illness and infections, heart disease, stroke, lung cancer, and several other adverse health outcomes.[20] Significantly, the most harmful impacts on human health are typically borne by the most vulnerable groups, including children, people with pre-existing conditions, elderly persons, persons with disabilities, and those living in poorer socio-economic conditions.[21] Against this backdrop, around 0.5% of global mortality can be attributed to global shipping and port-sourced emissions.[22]

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[13] Joana Setzer and Catherine Higham, 'Global Trends in Climate Change Litigation: 2025 Snapshot' (Grantham Research Institute on Climate Change and the Environment, 2025), online at: https://www.lse.ac.uk/granthaminstitute/publication/global-trends-in-climate-change-litigation-2025-snapshot/ accessed 18 September 2025

[14] *Milieudefensie and Others v Royal Dutch Shell plc* (District Court of The Hague, 26 May 2021); *Luciano Lliuya v. RWE* Case number 5 U 15/17 OLG Hamm

[15] However, in light of the ongoing Omnibus simplification proposal, the scope and influence of the EU's Corporate Sustainability Due Diligence Directive is subject to change. See: European Commission, 'Omnibus I package - Commission simplifies rules on sustainability and EU investments, delivering over €6 billion in administrative relief' (2025), online at: https://finance.ec.europa.eu/publications/omnibus-i-package-commission-simplifies-rules-sustainability-and-eu-investments-delivering-over-eu6_en accessed 18 September 2025, and European Commission, 'Corporate sustainability due diligence' (n.d.), online at: https://commission.europa.eu/business-economy-euro/doing-business-eu/sustainability-due-diligence-responsible-business/corporate-sustainability-due-diligence_en accessed 18 September 2025

[16] Erdin Akyildirim et al. 'Greenwashing: do investors, markets and boards really care?' (2023) *Swiss Finance Institute Research Paper* 23-90; Mao Xu et al. 'Greenwashing and market value of firms: An empirical study.' (2025) *International Journal of Production Economics* 284

[17] Thorndon Partners, 'Beyond Dispute: Environmental litigation & public opinion' (2024)

[18] European Environment Agency, 'Air pollution' (2019), online at: https://www.eea.europa.eu/en/topics/in-depth/air-pollution accessed 18 September 2025

[19] Hannah Ritchie, 'Deaths from air pollution are high, but the data contains hope' (Clean Air Fund, 2024), online at: https://www.cleanairfund.org/news-item/deaths-air-pollution-data-hope/ accessed 18 September 2025

[20] For example, lung cancer, negative birth outcomes, cataracts, ear infections, the onset of asthma in children, chronic deficits in lung function, stunting, diabetes, childhood obesity, developmental delays, reduced intelligence and neurological disorders afflicting both children and adults. See: https://www.who.int/publications/i/item/9789241511773

[21] European Environment Agency, 'Unequal exposure and unequal impacts' (2019), online at: https://www.eea.europa.eu/publications/unequal-exposure-and-unequal-impacts accessed 18 September 2025;
César Ducruet et al. 'Ports and their influence on local air pollution and public health: A global analysis' *Science of the Total Environment* 915 (2024)

[22] Natalie Mueller et al. 'Health impact assessments of shipping and port-sourced air pollution on a global scale: A scoping literature review.' *Environmental Research* 216 (2023)

While most shipping emissions occur at sea, the sector still contributes markedly to the exposure of European populations to PM and gaseous pollutants with negative health effects.[23] For example, research has shown that international shipping accounts for 18% of average annual surface nitrogen dioxide (NO_2) concentrations, as well as 11% of average annual surface SO_x concentrations, over Europe.[24] Port cities, coastal communities and workers are particularly impacted, because of their relative proximity to emissions occurring both at sea and within ports.[25] Around three quarters of all international trade in and out of the EU is carried by sea,[26] with key European ports such as Rotterdam, Hamburg, Valencia and Antwerp ranking among the world's busiest.[27]

In 2023, ships subject to the EU's monitoring, reporting and verification rules (which only includes ships greater than 5,000 gross tonnage) reported CO_2 emissions while within EU ports of more than 8m tonnes,[28] more than Luxembourg's annual CO_2 emissions in the same year.[29] Although CO_2 is a GHG and does not itself contribute to worsening air quality, this statistic illustrates the scale of the emissions occurring within Europe's ports. Considering emissions which impact air quality specifically, limited monitoring means there are significant gaps in the data on localised air quality in and around ports,[30] however, existing research clearly demonstrates that air pollution is a systemic issue in European ports.

For instance, a study of 23 major European ports found that, in 2021, three ports (Antwerp, Marseille and Napoli) exceeded the EU 2030 limit (see 'Annex' below) for average annual NO_2 concentrations, while 10 ports exceeded the EU 2030 limit for average annual PM_{10} concentrations.[31] Meanwhile, a health impact assessment in Barcelona estimated that 7% of NO_2 and 1% of PM_{10} pollution came from port activities, causing around 90 premature deaths annually from NO_2, plus further deaths linked to PM.[32] In the UK, pollution from ports in cities like Southampton is similarly known to impact air quality and health outcomes.[33;34;35] Detailed case studies of the air quality impacts of two ports, Rotterdam and Southampton, are provided below.

Future projections of air pollutant emissions suggest that emissions from shipping will play a growing role in determining health impacts. In the UK, NO_x emissions from road transport fell by more than 75% between 2000 and 2023,[36] and are projected to continue to fall over the coming decade. However, less progress has been made in reducing NO_x emissions from UK domestic and international shipping – total NO_x emissions from these sectors are currently equivalent to those from the road transport sector,[37] and NO_x emissions from domestic shipping alone are projected

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[23] Daniele Contini and Eva Merico 'Recent advances in studying air quality and health effects of shipping emissions.' *Atmosphere* 12.1 (2021) 92.
[24] Athanasios Megaritis, 'The impact of shipping emissions on urban air quality in Europe — a port/city analysis' (Concawe, 2024), online at: https://www.concawe.eu/publication/the-impact-of-shipping-emissions-on-urban-air-quality-in-europe-a-port-city-analysis/ accessed 18 September 2025
[25] Domenico Toscano. 'The impact of shipping on air quality in the port cities of the Mediterranean area: a review' *Atmosphere* 14.7 (2023): 1180.
[26] European Maritime Safety Agency (EMSA), 'the EU Maritime Profile – overview of the EU maritime economy' (n.d.), online at: https://www.emsa.europa.eu/eumaritimeprofile/section-1-overview-on-the-eu-maritime-economy.html accessed 18 September 2025
[27] World Shipping, 'The Top 50 Container Ports' (n.d.), online at: https://www.worldshipping.org/top-50-ports accessed 18 September 2025
[28] European Maritime Safety Agency (EMSA), THETIS-MRV GHG EMISSION REPORT 2023 (2025), online at: https://mrv.emsa.europa.eu/#public/emission-report accessed 18 September 2025
[29] European Environment Agency (EEA), 'EEA greenhouse gases — data viewer' (2025), online at: https://www.eea.europa.eu/en/analysis/maps-and-charts/greenhouse-gases-viewer-data-viewers accessed 18 September 2025 .
[30] Luca Pozzoli et al., 'ETC HE Report 2024/12: Air quality around ports' (2024), online at: https://www.eionet.europa.eu/etcs/etc-he/products/etc-he-report-2023-6-assessing-the-environmental-burden-of-disease-related-to-air-pollution-in-europe-in-2022 accessed 18 September 2025
[31] Ibid.
[32] Natalie Mueller et al., 'Health impact assessment of port-sourced air pollution in Barcelona' (2024) *Plos one*, *19*(8), e0305236.
[33] Shnelle Owusu-Mfum et al., 'Atmospheric Pollution in Port Cities' (2023) *Atmosphere* 14, 1135. https://doi.org/10.3390/atmos14071135
[34] Adam Meylan-Stevenson and Josn Boswell, 'CLEAN AIR SOUTH. An evidence-based exploration of air quality in the Central South and how we might improve it' (2025), online at: https://issuu.com/university_of_southampton/docs/108062_a4_28pp_booklets_-_sri_civic_clean_air_-_jo accessed 18 September 2025
[35] Ricardo Martinez-Botas et al., 'Chapter 4 – Outdoor and indoor air pollution solutions. 4.1.4 Aviation and shipping' In Department of Health and Social Care*, Chief Medical Officer's annual report 2022: air pollution* (2022), online at: https://www.gov.uk/government/publications/chief-medical-officers-annual-report-2022-air-pollution accessed 18 September 2025
[36] National Atmospheric Emissions Inventory (NAEI), 'UK Air Quality Pivot Table: 1970-2023' (2025), online at: https://naei.energysecurity.gov.uk/air-pollutants/air-pollutant-emissions-data accessed 18 September 2025
[37] Ibid.

to exceed those from road transport before 2035 (Figure 1).[38] The health impacts of emissions from different sectors depend not only on the quantity of emissions, but also a variety of factors such as the location and timing of emissions. However, research suggests that shipping emissions could become the main contributor to adverse health impacts in Europe's coastal cities by 2030.[39]

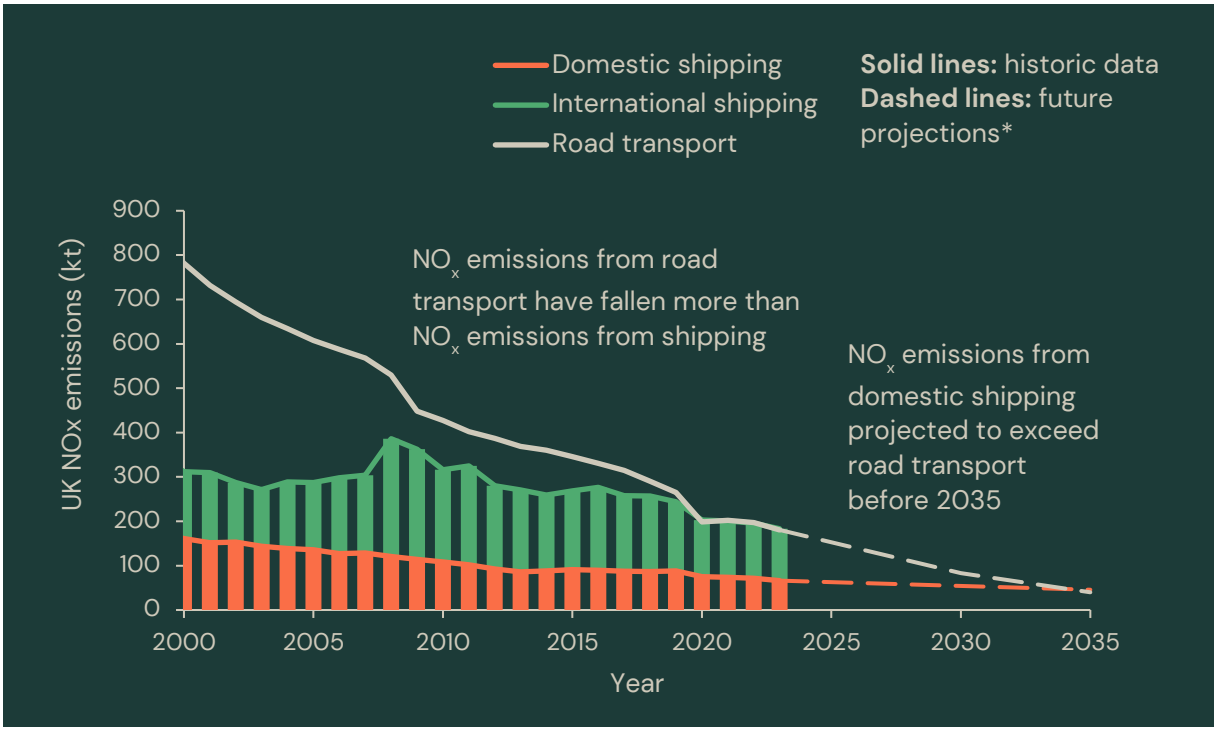

*Figure 1. NO_x emissions from road transport, domestic shipping and international shipping in the UK (excluding Gibraltar). Both historical data[40] and future projections[41] (for 2030 and 2035) are shown. Projections use a "with measures" scenario, including the effects of policies already adopted. *No future projections were available for international shipping emissions.*

Legal analysis

The duty to protect humans from adverse health effects, such as those caused by pollution, stems from several key human rights provisions.

- Under the **right to life** (Article 2 ECHR; Article 6 ICCPR), States Parties must not only refrain from unlawfully taking a life, but also take active steps to protect individuals from threats to their lives.[42] This applies in cases where there is real and imminent risk to human life,[43] which extends to cases of widespread environmental pollution,[44] and thus may apply to air pollution in ports.

[38] National Atmospheric Emissions Inventory (NAEI) 'Projected Air Quality Emissions Data: 2025-2050' (2025), online at: https://naei.energysecurity.gov.uk/air-pollutants/air-pollutant-emissions-data accessed 18 September 2025
[39] (n30)
[40] (n36)
[41] (n38)
[42] *Centre for Legal Resources on behalf of Valentin Câmpeanu v. Romania* (European Court of Human Rights, Grand Chamber judgment of 17 July 2014, application number 47848/08), para 130
[43] European Court of Human Rights, 'Guide on Article 2 of the European Convention on Human Rights' (2025), online at: https://ks.echr.coe.int/documents/d/echr-ks/guide_art_2_eng accessed 18 September 2025
[44] *Cannavacciuolo and Others v. Italy* (European Court of Human Rights, Chamber judgment of 30 January 2025, application no. 51767/14) and others; *Norma Portillo Cáceres and Others v. Paraguay* (UN Human Rights Committee, Communication No 2751/2016, Views adopted 25 July 2019) CCPR/C/126/D/2751/2016

- In cases where a concrete interference with a victim's private life took place, but did not necessarily result in the victim's death, the **right to respect for private and family life** (Article 8 ECHR) is engaged. It is well established that such interference includes environmental factors, particularly pollution.[45]

- Furthermore, air pollution engages ESC rights.[46] The **right to the highest attainable standard of physical and mental health** (Article 12 ICESCR)[47] means that States Parties must take steps necessary for the "*improvement of all aspects of environmental and industrial hygiene*", including preventing and reducing the population's exposure to harmful substances and detrimental environmental conditions. States are therefore expected to formulate and implement robust national policies and laws aimed at preventing, reducing, and eliminating air pollution.[48]

- The **right to an adequate standard of living** (Article 11 ICESCR), in its turn, encompasses adequate housing, food, and water, each of which is directly threatened by air pollution from port and shipping activities. Under Article 11, housing should not be built on polluted land or in immediate proximity to pollution sources. [49]

Since air pollution in ports has been shown to significantly affect human health and contribute to excess deaths, states have clear human rights obligations to take proactive measures to minimise or eliminate this issue.

While the precise adverse contribution of ports to overall air quality in surrounding areas can be difficult to calculate, not least due to the above-mentioned lack of air quality measurement, case law from the ECtHR shows that the obligations apply even when the sources of pollution are diffuse.

In ***Cannavacciuolo v Italy***, the Court found that it was not necessary to establish a proven link between exposure to a specific type of pollution and a direct life-threatening illness or death as a result of that pollution.[50] The Court embraced the precautionary principle:[51] in other words, the lack of scientific certainty about the precise effects of the pollution did not negate the existence of a protective duty in the case of the right to life.[52]

Similarly, in ***Pavlov and Others v Russia***, the ECtHR found that Russia had failed to minimise or eliminate the effects of industrial air pollution, in breach of the right to respect for private and family life. Crucially, the Court found that there was an elevated risk to health, even though there was no unequivocal medical evidence proving that the pollution had caused the applicants' negative health conditions,[53] and despite the fact that the applicants in the case lived a considerable distance from the polluting enterprises.[54]

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[45] *López Ostra v Spain* (European Court of Human Rights, Chamber judgment of 9 December 1994, application number 16798/90); *Fadeyeva v. Russia* (European Court of Human Rights, Grand Chamber judgment, 9 June 2005, Application No 55723/00); *Greenpeace e.V. and Others v Germany* (European Court of Human Rights, Chamber judgment of 12 May 2009, Application No 18215/06); *Locascia and Others v Italy* (European Court of Human Rights, Chamber judgment, 19 October 2023, Application No 35648/10, ECHR 2023)
[46] *Marangopoulos Foundation for Human Rights (MFHR) v Greece* (Complaint No 30/2005, European Committee of Social Rights, Admissibility 10 October 2005; Merits decided 6 December 2006)
[47] See also Article 11 of the European Social Charter
[48] Committee on Economic, Social and Cultural Rights, General Comment No 14: The Right to the Highest Attainable Standard of Health (Art 12 of the Covenant) (11 August 2000) UN Doc E/C.12/2000/4
[49] Committee on Economic, Social and Cultural Rights, General Comment No 4: The Right to Adequate Housing (Art 11(1) of the Covenant) (13 December 1991) UN Doc E/1992/23, para 8
[50] *Cannavacciuolo and Others v. Italy,* para 390
[51] The precautionary principle is rooted in environmental law, and states that in the face of "*threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation*" (Principle 15, Rio Declaration)
[52] *Cannavacciuolo and Others v. Italy*, Para 391
[53] *Pavlov and Others v Russia* (European Court of Human Rights, Third-Section judgment, 11 October 2022, Application No 31612/09), para 70
[54] Ibid., para 71

These cases demonstrate that it is not acceptable to hide behind the lack of data on air quality to justify a lack of active measures to reduce air pollution. Indeed, the scarcity of appropriate air pollution monitoring around ports[55] may constitute a human rights violation in itself.[56]

In terms of specific actions, case law clarifies that, where a source of air pollution is established, states have obligations to:

- Comprehensively assess the extent of the pollution.[57]
- Investigate the impacts of the pollution on the health of individuals in affected areas.[58]
- Provide the individuals in affected areas with timely information enabling them to assess the risks to their health and lives.[59]
- Take action in order to manage any revealed risk.[60]
- Proactively regulate the conduct of public and private polluters.[61]
- Make reparation for the harm caused. [62]

In accordance with the principle of **maximum available resources** under the ESC rights regime, these obligations apply particularly strongly to the many European countries which have access to significant economic resources, including those housing the biggest, and most polluted, European ports: the Netherlands, Belgium, Germany, Spain, France and the UK.

In light of the unequal health impacts of air pollution on vulnerable groups noted above, the **right to be free from discrimination** may also be engaged. This is a cross-cutting human right enshrined in numerous international and regional instruments, including the ECHR (Article 14), the ICCPR (Articles 2(1) and 26), and the ICESCR (Article 2). It is also a core principle of key equality-focused human rights treaties.[63] These legal standards collectively prohibit both direct and indirect discrimination, including in the context of environmental harms and public health.

For relevant stakeholders involved in the operation, regulation, and financing of ports and shipping infrastructure, respecting the right to freedom from discrimination demands a proactive and inclusive approach to addressing pollution, which sufficiently prioritises the needs of those most affected. Practical measures to comply with this requirement include targeted air quality interventions and meaningful engagement with affected groups.

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[55] (n30)
[56] *Cannavacciuolo and Others v. Italy,* paras 366, 395; see also UN Committee on Economic, Social and Cultural Rights (CESCR), Concluding observations on the second periodic report of China, including Hong Kong, China, and Macao, China (13 June 2014) UN Doc E/C.12/CHN/CO/2
[57] *Cannavacciuolo and Others v. Italy*, para 391; 395
[58] Ibid., para 395
[59] Ibid., para 395; see also UN Committee on Economic, Social and Cultural Rights (CESCR), Concluding observations on the second periodic report of Kuwait (19 December 2013) UN Doc E/C.12/KWT/CO/2
[60] Ibid., para 395
[61] *Caceres v Paraguay*, para 9; see also UN Committee on Economic, Social and Cultural Rights (CESCR), Concluding observations on the second periodic report of China, including Hong Kong, China, and Macao, China (13 June 2014) UN Doc E/C.12/CHN/CO/2
[62] *Caceres v Paraguay*, para 9
[63] Notably the International Convention on the Elimination of All Forms of Racial Discrimination (CERD), the Convention on the Elimination of All Forms of Discrimination Against Women (CEDAW), the Convention on the Rights of the Child (CRC), and the Convention on the Rights of Persons with Disabilities (CRPD)

Air pollution and human health: key takeaways

- States have binding human rights obligations to address air pollution from ports and its associated health impacts. This includes an obligation to regulate the conduct of **private entities.**
- These obligations apply even when the precise sources of port pollution are difficult to identify.
- To reduce the legal risk of human rights violations, port stakeholders should:
  - ➔ **Comprehensively assess and monitor** port-related pollution.
  - ➔ Undertake proactive measures to **minimise or eliminate** associated health risks.
  - ➔ Transparently provide timely **information** to affected communities.
  - ➔ Carry out **targeted interventions** and meaningful community engagement aimed at **vulnerable groups**.

Air pollution and climate change

The issue

The shipping sector (including international and domestic shipping) produces approximately 3% of global anthropogenic GHG emissions, significantly contributing to the climate crisis.[64] Although the majority of shipping's GHG emissions occur when vessels are sailing between ports, substantial GHG emissions do occur within ports. As noted above, for example, in 2023 ships subject to the EU's monitoring, reporting and verification rules (which only includes ships greater than 5,000 gross tonnage) reported CO_2 emissions while at berth in EU ports of more than 8m tonnes,[65] which is more than Luxembourg's annual GHG emissions in the same year,[66] and accounts for 6.4% of total European shipping emissions.[67]

Some air pollutants emitted in ports also contribute to the GHG effect indirectly.[68] BC is especially potent as a short-lived climate pollutant, meaning it will remain in the atmosphere for less time than carbon dioxide, but have a powerful impact on near-term global warming. BC also has a disproportionate effect on the Arctic region;[69] it is a major contributor to accelerated Arctic warming, which will have immense global consequences.[70]

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[64] This is according to 2018 emissions levels. See: Jasper Faber et al., 'The Fourth IMO GHG Study 2020' (2021), online at: https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Fourth%20IMO%20GHG%20Study%202020%20-%20Full%20report%20and%20annexes.pdf accessed 18 September 2025

[65] (n28)

[66] European Environment Agency (EEA), 'EEA greenhouse gases — data viewer' (2025), online at: https://www.eea.europa.eu/en/analysis/maps-and-charts/greenhouse-gases-viewer-data-viewers accessed 18 September 2025

[67] Transport and Environment, 'European ports unplugged : The state of shore power deployment' (2025), page 4, online at: https://www.transportenvironment.org/uploads/files/20250711_OPS_-Briefing_Final.pdf, accessed 18 September 2025

[68] NABU, 'Clean Air in Ports: EU Life+ Project "Clean Air"' (2015), online at: https://en.nabu.de/imperia/md/content/nabude/verkehr/cleanair/150529-nabu-cleanair_manual.pdf accessed 18 September 2025

[69] Clean Arctic Alliance, 'Is the EU About to Ignore the Impact of Shipping's Black Carbon Emissions in the Arctic?' (14 February 2023), online at: https://cleanarctic.org/2023/02/14/is-eu-about-to-ignore-impact-of-shippings-black-carbon-emissions-in-arctic/ accessed 18 September 2025

[70] Pacific Environment, 'On Thin Ice : Why black carbon demands urgent action' (July 2025), online at: https://www.pacificenvironment.org/wp-content/uploads/2025/07/OnThinIce_BlackCarbonDemandsUrgentAction_2.pdf accessed 18 September 2025

The significant adverse impacts of the climate crisis are well documented.[71] As well as causing widespread and rapid changes in the atmosphere, ocean, cryosphere and biosphere, climate change negatively affects human health and wellbeing, access to water, food security and leads to hundreds of thousands of excess deaths.[72] In Europe specifically, extreme weather events have accounted for 85,000 to 145,000 human fatalities over the past 40 years, whilst economic losses from weather and climate-related extremes in Europe reached around half a trillion euros over the same period.[73] Meanwhile, with Europe being the fastest-warming continent, the climactic changes are expected to increase in severity in the future, affecting Europe's energy and food security, ecosystems, infrastructure, water resources and human health.[74]

Globally, ports are uniquely vulnerable to the adverse effects of climate change, including rising sea levels, extreme weather events and increasing temperatures.[75] These impacts disrupt the lives and livelihoods of local communities. Additionally, port infrastructure suffers as a result of climate change-induced weather events, which presents a salient challenge for global supply chains.[76]

Legal analysis

As detailed above, emissions emanating from shipping and ports create a two-pronged issue of air pollution and climate change. Indeed, within international human rights law, it is acknowledged that many of the activities which harm air quality also contribute to climate change, and that states have a legal obligation to mitigate both.[77]

- In ***KlimaSeniorinnen v. Switzerland***, the ECtHR confirmed that the right to private and family life encompasses a right to effective protection by states from the adverse effects of climate change on people's lives, health, and quality of life. Accordingly, this ruling set a powerful precedent for the obligation of states under human rights law to adopt and apply measures to mitigate climate change, in line with the best available evidence.[78]
- This precedent was recently bolstered by the International Court of Justice (ICJ) – the world's highest court adjudicating on issues of international law – in its ***Advisory Opinion on Climate Change***. It found that, in light of the adverse effects of climate change hindering the enjoyment of human rights, states are required to take necessary measures to protect the climate,[79] which includes regulating the conduct of private actors.[80]

Thus, with evidence pointing to ports as major sources of emissions, states which fail to regulate those emissions risk liability for not taking the necessary mitigation and protection measures. With

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[71] See IPCC, 2023: Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, H. Lee and J. Romero (eds.)]. IPCC, Geneva, Switzerland, pp. 1-34, doi: 10.59327/IPCC/AR6-9789291691647.001

[72] World Health Organization, 'Climate Change' (2023), online at: https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health accessed 18 September

[73] European Environment Agency, 'Climate change impacts, risks and adaptation' (2025), online at: https://www.eea.europa.eu/en/topics/in-depth/climate-change-impacts-risks-and-adaptation accessed 18 September 2025

[74] Ibid.; See also: Imperial Grantham Institute, 'Institute reports and analytical notes Climate change tripled heat-related deaths in early summer European heatwave' (2025), online at: https://www.imperial.ac.uk/media/imperial-college/grantham-institute/public/publications/institute-reports-and-analytical-notes/Climate-change-tripled-heat-related-deaths-in-early-summer-European-heatwave.pdf accessed 18 September 2025

[75] Global Center on Adaptation, 'Climate Adaptation in Ports: A Global Imperative for Resilience' (2024), online at: https://gca.org/climate-adaptation-in-ports-a-global-imperative-for-resilience/ accessed 18 September 2025

[76] United Nations Trade and Development, 'Climate change impacts on seaports: A growing threat to sustainable trade and development' (2021), online at: https://unctad.org/news/climate-change-impacts-seaports-growing-threat-sustainable-trade-and-development accessed 18 September 2025

[77] OHCHR, 'Analytical study on the relationship between climate change and the human right of everyone to the enjoyment of the highest attainable standard of physical and mental health' (2016), UN Doc A/HRC/32/23, para. 14

[78] *Verein KlimaSeniorinnen Schweiz v. Switzerland* (European Court of Human Rights, Grand Chamber judgment, 9 April 2024, Application No 53600/20), paras 550, 552

[79] *Obligations of States in respect of Climate Change (Advisory Opinion)* (International Court of Justice, General List No 187, 23 July 2025), para 403

[80] Ibid.

increasing accountability for corporates on climate-related human rights harm (see 'an overview of the human rights law regime' above), private entities may also be at risk of liability.

In fulfilling their obligations on climate protection, states must consider the systemic nature of air pollution and GHG emissions arising from port activities. Effective measures to address both aspects must be developed without delay, such as rapidly advancing shoreside electric infrastructure. However, recent evidence shows that European ports are slow to comply with obligations under EU law to install shoreside electric infrastructure, an essential component for improving air quality and reducing the climate impact of ports.[81] In absence of such investment, air quality, environmental and climate impacts will continue to affect coastal communities.

Avoiding false solutions

Measures to ensure compliance with human rights obligations related to port pollution must address both health and climate impacts, so as not to inadvertently support solutions that seek to address one impact while overlooking the other. A key example where this is relevant is the use of **liquefied natural gas** (fossil LNG) as a shipping fuel; fossil LNG is often promoted as a 'sustainable' fuel as it is capable of achieving reduced levels of air pollution compared to conventional marine fuels.[82] However, the wider climate impact of fossil LNG must also be taken into consideration.

In particular, a strong evidence base demonstrates that the use of fossil LNG as shipping fuel can increase GHG emissions in the sector.[83] This is because fossil LNG consists primarily of methane – a GHG which is 82.5 times more potent than CO_2 over a 20-year period, and 29.8 times more potent over a 100-year period.[84] Methane emissions across the fossil LNG fuel lifecycle, whether methane leaks in the supply chain or 'slippage' of unburned methane from ship exhausts, dramatically reduce the climate benefits of using fossil LNG as a marine fuel. Over the whole fuel lifecycle, fossil LNG ships can deliver at most a 15% reduction in equivalent GHG emissions over a 100-year timescale compared with oil-based shipping fuels. In higher-emissions scenarios, and when considering shorter (e.g., 20-year) timescales, the warming impacts of methane emissions cancel out any climate benefit from LNG entirely.[85]

Port operations contribute to this impact - methane leaks have been observed during unloading of LNG cargo from LNG tanker vessels,[86] while the auxiliary engines which many ships use to generate power when at berth – low-pressure, dual-fuel, four-stroke auxiliary engines (LPDF 4-stroke) – result in higher levels of methane slip than other engine technologies.[87]

Thus, despite its potential for reducing local air pollutant levels when burned, fossil LNG remains an environmentally harmful fuel with devastating effects for the climate. **Climate change and air pollution are inextricably linked, and solutions must be implemented systemically in an integrated manner**.[88] Accordingly, and in light of the obligations noted above to mitigate climate change as part of protecting human rights, the use of LNG in ports (and more broadly as a shipping fuel) is a false solution and must be avoided.

[81] Transport and Environment, 'Europe's ports not doing enough to tackle toxic air pollution – study' (2025), online at: https://www.transportenvironment.org/articles/europes-ports-not-doing-enough-to-tackle-toxic-air-pollution-study accessed on 18 September 2025

Air pollution and climate change: key takeaways

- Ports are **major sources of GHG emissions**, as well as air pollutants with climate-warming effects.
- States must take active steps to **reduce these emissions** to protect human rights.
- Climate change and air pollution must be considered together as **interconnected issues**.
- States must steer clear from **false solutions**: the use of climate-harming fossil LNG will not support compliance with human rights obligations.

The environmental impacts of air pollution

The issue

As mentioned above (see 'the effects of air pollution on human health'), there are significant gaps in local data on air quality and pollution around ports; however, existing data strongly points towards systemic air pollution issues in European ports. As well as impacting health and contributing to climate change, port pollution can lead to environmental degradation. Specifically, the air pollutants emitted by ships within and around ports degrade local air quality.[89] Furthermore, air pollution can cause environmental damage by contaminating soils and water: for example, SO_x and NO_x are known to contribute to the formation of acid rain.[90]

Broader adverse impacts from air pollutants on ecosystems, vegetation and biodiversity have also been identified.[91] For instance, SO_x and, NO_x emissions from shipping have been shown to contribute significantly to ocean acidification, with research showing impacts concentrated along

[82] International Council on Clean Transportation, 'The climate implications of using LNG as a marine fuel' (2020), online at: https://theicct.org/wp-content/uploads/2021/06/LNG-as-marine-fuel-working-paper-02_FINAL_20200416.pdf accessed 18 September 2025
[83] Elizabeth Lindstad and Agathe Rialland, 'LNG and Cruise Ships, an Easy Way to Fulfil Regulations—Versus the Need for Reducing GHG Emissions' (2020) *Sustainability* 2020, *12*(5), 2080; https://doi.org/10.3390/su12052080
[84] IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2391 pp. doi:10.1017/9781009157896
[85] (n82)
[86] International Council on Clean Transportation, 'Fugitive and Unburned Methane Emissions from Ships (FUMES)': Characterizing Methane Emissions from LNG-Fueled Ships Using Drones, Helicopters, and On-Board Measurements' (2024), online at: https://theicct.org/publication/fumes-characterizing-methane-emissions-from-lng-fueled-ships-using-drones-helicopters-and-on-board-measurements-jan24/ accessed 18 September 2025
[87] Paul Balcombe et al., 'Total Methane and CO2 Emissions from Liquefied Natural Gas Carrier Ships: The First Primary Measurements' (2022), *Environmental Science and Technology*, 56, 13, 9632–9640
[88] This was emphasised in a report by the Special Rapporteur on human rights and the environment, which highlighted that mistakes have been made in seeking solutions for one issue (climate change) without considering the other (air pollution). See: David Boyd, 'Issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment (Report of the Special Rapporteur, 8 January 2019)', UN Doc A/HRC/40/55, para 43
[89] Ducruet et al. (n21)
[90] Scotland's Environment, 'Air Pollution Impacts on the Environment' (2024), online at: https://www.environment.gov.scot/our-environment/air/air-pollution-impacts-on-the-environment/#:~:text=Air%20pollution%20can%20lead%20to,chronic%20exposure%20to%20air%20pollution accessed 18 September 2025
[91] European Environment Agency, 'Impacts of air pollution on ecosystems in Europe' (2024), online at: https://www.eea.europa.eu/en/analysis/publications/impacts-of-air-pollution-on-ecosystems-in-europe accessed 18 September 2025

heavily trafficked routes, and similar or even larger effects expected near to major ports.[92] NO_x emissions from shipping also contribute to eutrophication (i.e., an excess of nutrients) both on land and at sea, which can cause rapid growth of plants and algae in marine and aquatic environments. When these die, they can be decomposed by oxygen-consuming microorganisms, stripping oxygen from the water. This creates low-oxygen ('hypoxic') conditions with potentially deadly consequences for marine and aquatic life.[93] In Sweden, for example, NO_x emissions from shipping make important contributions to eutrophication in counties in the south and southwest of the country, which are close to major shipping routes and house a number of major ports.[94]

On top of this, shipping and port activities produce other forms of marine pollution, including marine litter,[95] underwater noise[96] and wastewater discharge from scrubber systems.[97] While discussing these issues is beyond the scope of this report, they further illustrate that shipping and ports are a significant source of environmental pollution.

Legal analysis

The **right to a clean, healthy, and sustainable environment** has been recognised as a fundamental human right by the international legal community, and in a growing body of international legal instruments.[98] It is also acknowledged in the jurisprudence and practice of international human rights bodies.[99] More recently, the ICJ stated in its ***Advisory Opinion on Climate Change*** that "*a clean, healthy and sustainable environment is a precondition for the enjoyment of many human rights*", and the right is therefore inherent in, and essential for, the enjoyment of other human rights.[100]

At the national level, all EU Member States have recognised this right, either through constitutional provisions, statutory law, or ratification of regional or international agreements that incorporate it. Clean air is an inextricable part of a clean, healthy and sustainable environment,[101] and marine shipping-associated air pollution has been specifically linked to human rights.[102] Thus, states have obligations pertaining to the right to breathe clean air, summarised by the UN Special Rapporteur on human rights and the environment as follows:[103]

- **Procedural obligations** which include promoting education and public awareness, providing access to information, facilitating public participation in the assessment of proposed projects, and ensuring affordable, timely access to remedies.

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[92] Ida-Maja Hassellöv et al., 'Shipping contributes to ocean acidification' (2013) *Geophysical Research Letters 40*, 2731–2736 https://doi.org/10.1002/grl.50521
[93] John Gray et al., 'Effects of hypoxia and organic enrichment on the coastal marine environment' (2002) *Marine Ecology Progress Series 238*, 249–279 https://doi.org/10.3354/meps238249
[94] Sara Jutterström et al., 'The impact of nitrogen and sulfur emissions from shipping on the exceedance of critical loads in the Baltic Sea region' (2021) *Atmospheric Chemistry and Physics 21*, 15827–15845 https://doi.org/10.5194/acp-21-15827-2021
[95] Francois Galgani et al., 'Marine litter within the European Marine Strategy Framework Directive' (2013) *ICES Journal of Marine Science 70*, 1055–1064 https://doi.org/10.1093/icesjms/fst122
[96] Christine Erbe et al., 'The Effects of Ship Noise on Marine Mammals—A Review' (2019) *Frontiers in Marine Science 6*, 606 https://doi.org/10.3389/fmars.2019.00606
[97] Johannes Teuchies et al., 'The impact of scrubber discharge on the water quality in estuaries and ports' (2020) *Environmental Science Europe 32*, 103 https://doi.org/10.1186/s12302-020-00380-z
[98] UN HRC Resolution 48/13; UNGA Resolution 76/300
[99] The UN Committee on the Rights of the Child was among the first to refer explicitly to the right in its 2018 Concluding Observations to the Marshall Islands, urging the State party to address the ongoing impacts of US nuclear testing on children's health and the right to live in a healthy environment, among others.
[100] *Obligations of States in respect of Climate Change (Advisory Opinion)* (International Court of Justice, General List No 187, 23 July 2025), para 393
[101] David Boyd, 'Issue of human rights obligations relating to the enjoyment of a safe, clean, healthy and sustainable environment (Report of the Special Rapporteur, 8 January 2019)' UN Doc A/HRC/40/55, para 17
[102] Marcos Orellana, 'Implications for human rights of the environmentally sound management and disposal of hazardous substances and wastes' (Report of the Special Rapporteur, 13 July 2023), UN Doc A/78/169, para 25
[103] (n101) paras 58-62

- **Substantive obligations,** where states must not violate the right to breathe clean air through their own actions, must protect the right from being violated by third parties, and must establish, implement and enforce laws and policies to fulfil the right.
- **Special obligations** to fulfil the right to breathe clean air, including monitoring air quality and impacts on human health, assessing sources of air pollution, making information publicly available, establishing air quality regulations, and developing, implementing and evaluating air quality action plans. At each of these stages, procedural obligations must be adhered to.

Where the right to a clean, healthy, and sustainable environment is incorporated into national law, as is the case with many European states, such as Greece, Portugal, Spain, Belgium, the Netherlands and France,[104] air pollution becomes a directly justiciable issue within the relevant national jurisdictions. For example, the High Court of Galicia recently held that environmental pollution, including air pollution, from industrial livestock farming was in breach of human rights law.[105]

Furthermore, a right to clean air can be implied from the **EU Air Quality Directive** (AAQD - see Annex). The Directive itself does not explicitly incorporate such a right for individuals; however, ample jurisprudence by the Court of Justice of the European Union (CJEU) established that this is implicitly the case.[106] Indeed, proper construction of the Directive means that EU law grants individuals a right to air quality with levels of pollutants not exceeding the limit values set under Article 13 and Annex XI of the Directive for the protection of human health.[107] As noted in the Annex to this paper, these limits have now been tightened by the recast Ambient Air Quality Directive.

Example cases demonstrating this implicit right to clean air include:

- ***Janecek v Freistaat Bayern***,[108] where the Court held that citizens must be able to (i) access the competent authorities, including domestic courts, when there is a risk that limit values are exceeded; (ii) ask for an air quality action plan; and (iii) ask for a judicial review of that plan.
- ***ClientEarth v United Kingdom***,[109] where the Court held that limit values are legally binding. Additionally, an air quality action plan must ensure the compliance with limit values in the shortest time possible.
- ***Craeynest v Brussels***,[110] where the Court clarified that the clean air protections under the Directive include the right to challenge how authorities monitor and assess air quality, and that national courts are able to review and take all adequate measures to make sure that sampling points are situated properly. This was the result of the claimants arguing that the Brussels authorities did not measure air quality appropriately by avoiding measurement in the most congested and polluted streets.[111] In an important legal precedent, the CJEU stated that, whilst the placement of monitoring stations is a matter of national policy, it is nevertheless subject to intense scrutiny from national courts.

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[104] David Boyd, 'The Status of Constitutional Protection for the Environment in Other Nations' (David Suzuki Foundation, 2013), online at: https://davidsuzuki.org/wp-content/uploads/2013/11/status-constitutional-protection-environment-other-nations.pdf accessed 18 September 2025

[105] ClientEarth, 'A Landmark Ruling: the Full Judgment of our Fundamental Rights case on Industrial Livestock Farming' (2025), online at: https://www.clientearth.org/latest/documents/a-landmark-ruling-the-full-judgment-of-our-fundamental-rights-case-on-industrial-livestock-farming/ accessed 18 September 2025

[106] Delphine Misonne, 'The emergence of a right to clean air: Transforming European Union law through litigation and citizen science' (2021) *Review of European, Comparative & International Environmental Law*, *30*(1), 34-45

[107] Accordingly, this implied right to clean air is also relevant with regards to health. On construction of the Directive, see: ClientEarth, 'Individual right to clean and healthy air in the EU: An analysis of the existing system of legal protection and possible options to strengthen the legal framework' (2021), online at: individual-right-to-clean-and-healthy-air-in-the-eu-pdf.pdf accessed 18 September 2025

[108] Court of Justice of the European Union Case C-237/07 *Dieter Janecek v Freistaat Bayern* [2008]

[109] Court of Justice of the European Union Case C-404/13 *ClientEarth v United Kingdom* [2014]

[110] Court of Justice of the European Union Case C-723/17 *Craeynest and Others v Brussels Hoofdstedelijk Gewest and Brussels Instituut voor Milieubeheer* [2019]

[111] ClientEarth, 'Court of Justice of the EU backs Brussels citizens' right to clean air' (2019), online at: https://www.clientearth.org/projects/access-to-justice-for-a-greener-europe/updates-annual-newsletters/court-of-justice-of-the-eu-backs-brussels-citizens-right-to-clean-air/ accessed 18 September 2025

In the context of ports, the growing recognition of the right to a clean, healthy, and sustainable environment reinforces existing duties under other human rights frameworks by explicitly linking environmental degradation, particularly through air pollution, to potential violations of a standalone human right. Inaction or insufficient pollution mitigation efforts could expose both public and private actors to legal, reputational, and operational risks, as the normative force of this right continues to strengthen through national and international jurisprudence.

Furthermore, the jurisprudence of the CJEU sends a clear signal to public authorities in the EU (particularly the competent authorities responsible for the development and implementation of air quality plans or roadmaps under the AAQD) that they are under a legal duty to ensure that pollutant levels do not **exceed the legally binding air quality limit values**. Where emissions from ports contribute to exceedances, affected individuals may have a directly enforceable right to demand the preparation of robust air quality action plans and to challenge their adequacy before domestic courts.[112] The revised AAQD, to be transposed by Member States by December 2026, introduces a right to compensation for individuals harmed by breaches of the rules. The European Commission also has the power to bring infringement proceedings against a Member State for failure to implement the AAQD. Thus, without appropriate action on port pollution, the relevant public authorities in places where AAQD limits are being exceeded expose themselves to legal risk.

Equally, the CJEU's jurisprudence demonstrates the legal risks associated with **inadequate air quality monitoring**, which is a known issue across European ports. States in Europe must build up air pollution monitoring practices in ports and ensure that information regarding air quality near ports is made available in a transparent and democratic manner. Otherwise, they risk facing legal action pursuant to the international and EU human rights law regimes.

Air pollution and the environment: key takeaways

- The **right to a clean, healthy, and sustainable environment** is increasingly recognised, and enforced, nationally and internationally.
- **Clean air is a core element of this right**, and with port pollution adversely affecting air quality and the environment, relevant port stakeholders should undertake mitigation action to ensure the right is respected.
- Under EU law, states must ensure that **legally binding air pollution values** are not exceeded, and air quality appropriately **monitored,** or risk facing legal action.

[112] However, it is important to acknowledge that access to justice issues have been identified in certain jurisdictions, including Central and Eastern Europe, and that there are large discrepancies between the mechanisms for remedies and enforcement at national levels. See: ClientEarth (n 107) , page 14.

Air pollution in ports: case studies

This report has demonstrated how air pollution in ports is a systemic issue in Europe that adversely impacts human health, the climate and the environment. Accordingly, inadequate action to monitor and mitigate such impacts may result in a breach of human rights. To illustrate the issues we identified, we consider NO_x pollution data from two major European ports.

Case study A: Port of Rotterdam

In Rotterdam, shipping activities are estimated to contribute to 24% of total NO_2 concentrations in the city centre and more than 50% of total NO_2 concentrations in the port area.[113] Average annual NO_2 concentrations in 2021 were 19 $\mu g/m^3$, just below the 2030 limit set by the revised EU Ambient Air Quality Directive (20 $\mu g/m^3$) but far exceeding the limit recommended by the World Health Organisation's (WHO) Air Quality Guidelines (10 $\mu g/m^3$).[114] Further, a recent investigation claims that in 2022, average annual NO_2 concentrations in several areas in and around Rotterdam exceeded EU 2030 limits, with areas on the west side of Rotterdam – some of the closest areas to the Port of Rotterdam - experiencing the worst air quality in the Netherlands.[115]

The adverse health, climate and environmental impacts resulting from NO_x emissions can engage a wide range of human rights, such as the right to life, private life, and to a healthy environment. In light of this data, further action to reduce NO_x (and other emissions) in the Port of Rotterdam must be considered to ensure that these rights are respected.

Case study B: Port of Southampton

Monitoring within the Port of Southampton shows that annual NO_x levels average around 30 $\mu g/m^3$,[116] which, though below the UK annual average legal limit (40 $\mu g/m^3$), is three times higher than WHO's air quality guideline level. One recent study suggested that vessels in the Port of Southampton produced more NO_x than vessels at any other UK port, with cruise ships responsible for 50% of those emissions.[117] In 2023, an investigation reported that only 1 in 10 cruise ships docking in Southampton used available electrical shore power connections, with the majority still relying on burning fossil fuels for power.[118]

Despite agreement that the Port of Southampton contributes to air quality issues in the city, there is continued debate as to the relative contribution of port and shipping activities to those issues.[119] Some studies have suggested that shipping and port machinery are responsible for on average 3.3% of the annual average NO_x concentrations at sites across the city, with contributions ranging between 1-8% depending in part on proximity to the port.[120] The UK's National Emissions Inventory suggests that, in 2022, shipping activities were responsible for some 30% of total NO_x emissions occurring within the Southampton Local Authority area,[121] consistent more broadly with the fact that domestic shipping alone contributes 10% of total domestic UK NO_x emissions[122] with far larger contributions from international and in-transit shipping through UK waters.[123]

These statistics offer apparently contrasting perspectives, but in reality the different metrics and methodologies used makes their comparison challenging. This highlights the need for additional studies to address these uncertainties, as well as accurate and transparent communication regarding air quality data and issues. In any case, what is clear is that shipping and port activities contribute to increased NO_x (and other) emissions. Both mitigation action and transparent monitoring of pollutants are critical to ensure that human rights are upheld.

Conclusion and recommendations

The emissions produced by ships using high-polluting fuels, and other activities in ports, create a dual threat: they significantly degrade local air quality and contribute to the global climate crisis. Both issues have well-evidenced and serious consequences for human health, particularly for vulnerable groups, and both engage a broad array of human rights. As demonstrated by the evolving body of international, regional, and national laws and jurisprudence, these rights generate concrete legal obligations.

When pollution from port activities and operations is not effectively limited, regulated, or monitored, a wide range of stakeholders, from public authorities and port operators to shipping lines and investors, may find themselves at risk of human rights harms. As legal accountability mechanisms continue to strengthen, these stakeholders may face a rising tide of litigation, regulatory enforcement, and reputational risk.

The growing legal recognition of environmental harms as human rights violations, coupled with binding obligations under air quality, climate, and due diligence frameworks, creates a strong imperative: ports must urgently address air pollution. A proactive transition toward cleaner shipping fuels and robust pollution controls is not only a matter of public health and environmental necessity: it is a legal and strategic imperative for avoiding liability and securing a just, sustainable future.

Accordingly, our key recommendations for port stakeholders are as follows:

1. **Monitoring and transparency:**

- Establish comprehensive air quality monitoring systems in and around ports.
- Guarantee affected communities' right to access information on air quality, pollution risks, and health impacts in a timely and accessible format.

2. **Prevention and mitigation**

- Phase out reliance on highly-polluting marine fuels and avoid 'false solutions' such as LNG.
- Accelerate the deployment of shore-side electricity infrastructure and expand shore power requirements under EU law to a broader range of ships at berth.
- Ensure that ports meet EU and WHO air quality guidelines and implement corrective air quality action plans where exceedances occur.

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[113] Janot Tokaya et al., 'The impact of shipping on the air quality in European port cities with a detailed analysis for Rotterdam' *Atmospheric Environment*: X 23, 100278 (2024) https://doi.org/10.1016/j.aeaoa.2024.100278
[114] (n30)
[115] Pointer, 'Hier vind je de vieste lucht van Nederland (en zo zit dat in jouw buurt)' (2025), online at: https://pointer.kro-ncrv.nl/hier-vind-je-vieste-lucht-nederland-luchtkwaliteit-jouw-buurt#/ accessed 18 September 2025
[116] Associated British ports (ABP), 'Cleaner Air for Southampton' (2023), online at: https://www.abports.co.uk/news-and-media/latest-news/2023/port-of-southampton-publishes-air-quality-strategy-update/ accessed 18 September 2025
[117] Transport and Environment (T&E), 'The UK's most polluted ports, ranked' (2024), online at: https://www.transportenvironment.org/te-united-kingdom/articles/the-uks-most-polluted-ports-ranks accessed 18 September 2025
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- Prioritise targeted interventions in communities disproportionately affected by port pollution.

3. Accountability

- Align port and shipping regulation with states' binding duties under international climate treaties and human rights law to reduce GHG emissions and air pollution.
- Ensure appropriate remedies, including compensation, are available and accessible to individuals whose rights may be violated due to port-related air pollution.

Annex

Overview of the air pollution regulatory regime

The air pollution regulatory regime largely rests on three pillars:

- Air quality standards for concentration levels of key air pollutants.
- Emissions reductions commitments for certain air pollutants.
- Regulation of air pollutants from key sources, such as shipping.

In the below section we provide an overview of the key sources of legislation regulating air and shipping pollution at international and regional levels.

International level

- The **Gothenburg Protocol (as amended) to the 1979 UNECE Convention on Long-Range Transboundary Air Pollution**[124] establishes binding national emission reduction targets and emission limit values for specific pollutants. Parties have recently commenced a revision process to negotiate additional commitments, which remains ongoing.[125]
- The World Health Organization's 2021 updated **Air Quality Guidelines**[126] set non-binding, evidence-based recommendations for key pollutants such as $PM_{2.5}$, PM_{10}, nitrogen dioxide, sulphur dioxide and carbon monoxide, serving as an authoritative reference.
- **The International Convention for the Prevention of Pollution from Ships (MARPOL) Annex VI** governs air pollution from shipping, limiting sulphur oxide and particulate matter emissions via fuel sulphur caps, regulating nitrogen oxide emissions from ship exhausts, and establishing Emission Control Areas subject to more stringent standards.
- In May 2024, the International Tribunal for the Law of the Sea (**ITLOS**) produced its **advisory opinion on climate change**,[127] clarifying State obligations in respect of GHG emissions under the United Nations Convention on the Law of the Sea (**UNCLOS**). It found that human-caused GHG emissions constitute marine pollution under UNCLOS, engaging legal obligations for states, including the requirement to take "*all necessary measures*" to prevent, reduce and control marine pollution from "*any source*". In assessing what constitutes the necessary measures, states should take into account relevant international rules and standards, such as Annex VI to MARPOL and the UN Framework Convention on Climate Change and the Paris Agreement.
- In July 2025, the International Court of Justice (**ICJ**) published its own **advisory opinion on climate change.** It stated that climate change poses "*an existential threat*".[128] The ICJ affirmed the findings of ITLOS regarding the law of the sea, and further found that states have binding legal obligations (derived from climate treaties such as the Paris Agreement, and customary international law) to prevent significant environmental harm, cooperate in good faith, and uphold human rights by protecting the climate system from GHG emissions.

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[124] Protocol to Abate Acidification, Eutrophication and Ground-level Ozone to the Convention on Long-Range Transboundary Air Pollution (opened for signature 30 November 1999, entered into force 17 May 2005; amended 4 May 2012, entered into force 7 October 2019) (Amended Gothenburg Protocol)

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European Union

- The **Ambient Air Quality Directive 2008** established EU-wide standards for key pollutants including SO_2, NO_2/NO_x, PM_{10} and $PM_{2.5}$, requiring Member States to monitor ambient air quality, adopt corrective measures such as air quality action plans where exceedances occur, and report data and plans to the Commission and the public. A recast **Ambient Air Quality Directive 2024**[129] tightens air quality standards for 2030 in line with WHO recommendations, strengthens monitoring obligations, and introduces a right to compensation for individuals harmed by breaches of the rules. The revised Directive also promotes early action: where air pollution levels are already higher than the new 2030 standards over the coming years, Member States must analyse their ability to comply with the legislation on time, and, if required, take additional measures to ensure compliance by 2030.[130]
- The **National Emissions Ceilings Directive 2016**[131] sets binding national emissions reduction commitments for several major pollutants and obliges Member States to prepare national air pollution control programmes and maintain detailed emission inventories.
- The **FuelEU Maritime Regulation 2023**[132] limits the annual average GHG intensity of energy used by ships over 5,000 gross tonnage visiting EU ports.
- The **Alternative Fuels Infrastructure Regulation 2023**[133] mandates the development of infrastructure to deliver alternative fuels and onshore electricity.
- The **Sulphur Directive**[134] imposes strict limits on the sulphur content of fuels.

United Kingdom

- UK air quality legislation comprises a combination of international obligations, retained EU law including ambient air quality requirements, and domestic measures such as statutory targets set under the **Environment Act 2021** and secondary legislation.[135]
- In relation to shipping, the **Merchant Shipping (Prevention of Air Pollution from Ships) Regulations** give effect to MARPOL Annex VI standards, while the **Maritime Decarbonisation Strategy**[136] serves as a central policy framework for decarbonising maritime emissions.

[129] Directive (EU) 2024/2881 of the European Parliament and of the Council of 23 October 2024 on ambient air quality and cleaner air for Europe (recast)
[130] Ibid., Article 19(4)
[131] Directive (EU) 2016/2284 of the European Parliament and of the Council of 14 December 2016 on the reduction of national emissions of certain atmospheric pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC
[132] Regulation (EU) 2023/1805 of the European Parliament and of the Council of 13 September 2023 on the use of renewable and low-carbon fuels in maritime transport, and amending Directive 2009/16/EC
[133] Regulation (EU) 2023/1804 of the European Parliament and of the Council of 13 September 2023 on the deployment of alternative fuels infrastructure, and repealing Directive 2014/94/EU
[134] Directive (EU) 2016/802 of the European Parliament and of the Council of 11 May 2016 relating to a reduction in the sulphur content of certain liquid fuels (codification)
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About

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