SUSTAINABLE PORTS ON THE HORIZON

By Constance Stickler, Identec Solutions

In today's world, where environmental changes occur, a drastic change is crucial for the sustainability of ports. Ports significantly impact the environment, including air and water pollution, energy consumption, and greenhouse gas emissions.

In this article, we will discuss the various impacts of ports on the environment and the measures to improve sustainability. We will also explore the challenges of decarbonisation and electrification and the benefits of embracing these concepts for the future of port sustainability.

**TIC4.0
CONFORM**

BECAUSE IT WORKS

WHAT IS AN ENVIRONMENTAL POLICY?

Environmental policy is any action taken by governments, corporations, and public or private organisations concerning the impact of human activities on the environment.

These guidelines are necessary because organisational decisions usually do not consider environmental values. On the one hand, the consequences of the action did not occur at the polluter's location but elsewhere or in the future. On the other hand, it has long been assumed that natural resources are practically unlimited. Individual actors for short-term profit exploited common resources; since the incentives to use commons wisely were too weak, the state as regulator played the most crucial role in their protection.

(1)

But who was the first to recognise that environmental impacts must be regulated?

THE HISTORY OF ENVIRONMENTAL POLICIES

Politics dealing with the protection of the environment has been around longer than expected: long before the birth of Christ, sewers were built in India (4,500 years ago) and in Rome (2,700 years ago). Ancient Greece's city-states installed laws to regulate forest harvesting 2,300 years ago. Around the year 1,000, European feudal societies controlled game and timber harvesting in unique preserves.

Thousands of years after ancient societies, Paris developed modern Europe's first large-scale sewage system in the 17th century.

Development took a massive leap in the late 19th and early 20th centuries when the consequences of industrialisation and urbanisation began to threaten human health.

As a result, rules for hygiene, sewage, sanitary facilities and housing were laid down, and the first national parks to protect nature and wildlife were created. Incidentally, the first national park in the world, Yellowstone, was established in 1872. In addition to public efforts, the initiatives of wealthy individuals and private foundations were also important.

The harmful effects of chemicals and pesticides were recognised around the middle of the last century. As a result, the subject began to penetrate the public consciousness, and in industrialised countries, regulations were drawn up on the use of hazardous substances and permitted maximum emissions values. For example, one of these was the Clean Air and Clean Water Acts in the United States (1970/72), which successfully and directly addressed identified polluters.

(2)

Other environmental problems with unclear immediate culprits were much more challenging, such as car exhaust. Here the issues only arise as a result of the accumulation of causes. The detection of cause-effect chains was often tricky. In the 1980s, the acid rain problem showed that causes and effects could be geographically far apart.

It became clear that natural resources would not be available forever, so sustainability and sustainable development became the buzzword. The latter means promoting economic growth while conserving the environment's quality for future generations.

Environmental policy was no longer just a matter for governments but also the private sector and non-governmental organisations. Therefore, every single person has to take responsibility for their actions.

Along with industries such as fossil fuels, agriculture, fashion, food and construction, the transport sector and its ports are among the top polluters. So let's take a closer look at the environmental impact of port operations:

ENVIRONMENTAL IMPACTS OF PORTS

To capture all environmental effects, one must look beyond the port's borders. Not only the issues caused by the port's activity itself have to be considered, but also the issues caused at sea by incoming and outgoing ships and the issues caused by intermodal transport.
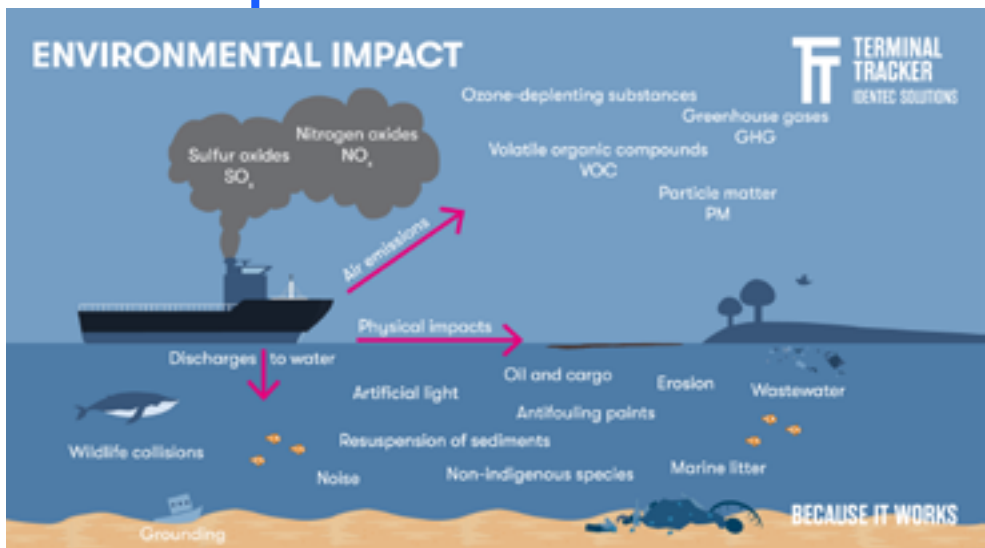
(3)

AIR POLLUTION
Vessels, vehicles, and machinery still use fossil fuels for the most part. These produce greenhouse gases such as carbon dioxide (CO_2), carbon monoxide (CO), nitrogen oxides (NOx) and sulfur oxides (SOx), as well as volatile organic compounds (VOCs) and particulate matter (PM). Another source of air pollution is the power generation for the port, even if it might not occur directly at the port itself.

A significant factor here is the transport to and from the port on the inland side. The vast majority of trips are still handled by trucks, which are very slow to switch to electric cars.

Besides the environment, humans suffer directly if exposed to this air pollution, which can cause respiratory diseases, cardiovascular disease, lung cancer and premature death.

WATER POLLUTION

Many ships still dispose of their sewage and bilge water simply by dumping it at sea. Bilge water is created using huge machinery and accumulates in the hulls of ships. It is a polluting mixture of water, oil, fuel and detergents.

The paint used to paint ships contains toxic additives to discourage barnacles from attaching to the hull. These additives are gradually leached out and end up directly in the sea.

Unfortunately, a lot of waste and broken equipment still gets thrown overboard. Around 20% of marine litter comes from the shipping industry.

NOISE POLLUTION

The soundscape of the port: engines of large machinery and equipment constantly moving day and night. Not a concert you would visit to relax.

(4)

The WHO defines noise above 65 decibels (dB) as noise pollution (this volume roughly corresponds to the noise in a cafeteria), as harmful above 75 dB (running a petrol lawn mower) and as painful above 120 dB (jackhammer). The European Environment Agency estimates that noise is responsible for 72,000 hospitalisations and 16,600 premature deaths annually in Europe alone. In addition, of course, it also seriously damages wildlife, interfering with breeding cycles and rearing. (http://bit.ly/415cZE6)

LIGHT POLLUTION

The effects on people who "turn night into day" have been researched quite well. The natural day-night rhythm is disrupted, which can cause a lack of energy, sleep disorders, eye diseases and other secondary diseases. The effects on animals and plants are also far-reaching: Birds become disoriented, and newly hatched turtles crawl towards the light source instead of into the sea.

In addition, corals no longer reproduce properly, and lit plants are less likely to be pollinated and bear less fruit.

That's a bunch of severe impacts presenting ports with significant challenges. To complete the picture, let's look at other impediments, this time those posed to ports by climate change:

HOW DOES CLIMATE CHANGE AFFECT PORTS?

Extreme weather events and other impacts of climate change have increased in recent years. Problems you often only hear from the news about distant regions of the world are now at our doorstep, and we have to deal with them in our private lives and the working world.

	Incident	Impact
	More and longer heat waves	■ Limit human working ability ■ Reefer need more energy to maintain temperature ■ Thermal deformation of infrastructure
	Sealevel rising & heavy rainfalls	■ Disruption and damaging of low-lying infrastructure ■ Flooding ■ Erosion ■ Structural measures at port and intermodal facilities
	Weather extremes	■ Disruption and damanging of infrastructure ■ Clean up of debris
	Warming of the Arctic	■ Shipping season expands ■ Northern ports stay ice-free ■ Trans-arctic routes become available ■ Disruption and damaging due to permafrost thawing

The effects of climate change that ports already experience and will increasingly do so in the years and decades include the following:

- Rise of the sea level
- Severe tropical storms
- Flooding of the inland
- Droughts
- Extreme heat events

If emissions are not reduced by 2100, climate change could cost the shipping industry an additional $25 billion - per year! For comparison, all profits of the global container shipping industry combined averaged less than $20 billion a year before the pandemic.

Keep in mind - the costs are just estimates from today's perspective, so they may need to be revised upwards in the future.

So how do these costs come about? Here are some examples of impacts that have been observed in recent years:

- With sea levels rising, the intensity of tropical storms also rises - with increased wind speeds, wave heights, and rainfall. In addition to the damage, there are often downtimes lasting several days.
- After detailed analysis, it can even be determined that an additional meter in the storm surge or an increase in wind speed of 10 meters per second increases the outages by two days (Act Now or Pay Later: The Costs of Climate Inaction).
- Between 2015 and 2019, 400 total vessel losses took place worldwide. 20% of them and many of the deaths of 142 crew members were caused by weather-related conditions.
- If you want to avoid storms, the route change leads to delays and additional costs. Add to that an estimated 150 tons of fossil fuel for about $75,000 a day.
- Costs for adapting ports for the results of global warming and weather extremes can range from 30Mio USD to 200Mio USD per km2.
- A rise in the water level may also affect rivers and canals, causing disruptions.
- Extreme heat stresses both cooling systems and port equipment made from metal, like cranes and warehouses.

(5)

The effects just mentioned must always be kept in mind for all measures taken from now on. Anyone planning sustainable cooling solutions, for example, must do so by taking future temperature peaks into account.

No matter how humanity wants to combat climate change, the solution is sustainable actions. Ports have long recognised their importance in combating environmentally harmful behaviour. Today, many of them call themselves sustainable ports:

SUSTAINABLE PORTS

WHAT ARE SUSTAINABLE PORTS?
Sustainable ports follow strategies and activities to meet their users' current and future needs while protecting and preserving human and natural resources. These ports are committed to causing the minimum possible negative impacts while building prosperity for today and in the future.

They must not be confused with green ports, which proactively implement processes that reduce environmental effects beyond compliance. Green ports target only the environment, whereas sustainable ports include social and economic questions as well.

(6)

Quick reactions to industry trends and new technologies are crucial; thus, planning sustainable actions should be dynamic, and reviews should be done at short intervals.

To fulfil the numerous tasks effectively, it is advisable to appoint dedicated, responsible persons, so-called sustainability managers:

THE SUSTAINABILITY MANAGER

While environmental protection used to be just one marketing topic among many, quite a lot of greenwashing was done, and the job title was simply given to someone, companies' situation and awareness have changed dramatically. The consequences of global warming, which can be felt firsthand, and strict laws made it necessary to have at least one person - if not a whole team - dedicated exclusively to sustainability issues.

Typical job profiles with responsibilities in sustainability are:

- **Chief Sustainability Officer (CSO)**
- **Environmental Manager**
- **Chief Green Officer**
- **Director of Sustainability**
- **Environmental Policy Manager**
- **Director of Environment, Energy, & Safety**
- **Director of Social & Environmental Responsibility**
- **Chief Officer of Environment**
- **Social & Environmental Sustainability Manager**
- **Chief of Environmental Health and Safety**
- **Certified Sustainability Administrator**

The sustainability manager is responsible for analysing the present and leading the future actions of companies regarding their impacts on the environment:

- Evaluate the status quo impacts and processes.
- Research the current and foreseeable applicable legislation.
- Close collaboration with management and all relevant departments to gain awareness and support for the implementation of changes.
- Set up monitoring mechanisms for all relevant processes and impact indicators, including tools, reporting cycles, report scope, and addressees.
- Define and articulate environmental goals and the timeframe for achievement in consideration of present and predictable future legislation.
- Implement the changes in the corporate strategy.
- Communicating changes and achievements internally to HR, suppliers and customers, press, and other relevant stakeholders.
- Continuous training and workshops on sustainability knowledge and practices for employees.

They should have an agile way of working, be flexible to change and inspire others by setting an example of how to work as efficiently as possible. Since the job often requires convincing and motivating people, they must have strong social skills and technical expertise.

It is crucial for the success of corporate sustainability activities that managers support them as at this point, profit, people, and the planet face each other.

ENVIRONMENTAL MANAGEMENT DEVELOPMENT
The fact that the topic is taken seriously and measures are implemented is also shown by how many ports have processing tools and publish regularly:

The ESPO (European Sea Ports Organisation) showed in their 2022 Environmental Report the positive trend in environmental management at European ports based on 10 indicators observed over a period of 10 years.

INDICATORS	'13 %	'17 %	'18 %	'19 %	'20 %	'21 %	'22 %	Change 13-22 (%)
A: Existence of a certified Environ-mental Management System (EMS) - ISO, EMAS or PERS	54	70	73	71	65	75	75	+21
B: Existence of an Environmental Policy	90	97	96	95	96	93	90	-
C: Environmental Policy makes reference to ESPO's guideline documents	38	35	36	38	43	39	46	+8
D: Existence of an inventory of relevant environmental legislation	90	93	98	96	91	88	90	-
E: Existence of an inventory of Significant Environmental Aspects (SEA)	84	93	93	89	92	92	90	+6
F: Definition of objectives and targets for environmental improvement	84	93	93	90	88	87	88	+4

INDICATORS	'13 %	'17 %	'18 %	'19 %	'20 %	'21 %	'22 %	Change 13-22 (%)
G: Existence of an environmental training programme for port employees	66	68	58	53	55	56	49	-17
H: Ecistence if an environmental monitoring programme	79	89	89	82	81	86	90	+11
I: Environmental responsibilities of key personnel are documented	71	86	86	85	85	82	88	+17
J: Publication of a publicly available environmental report	62	68	68	65	69	68	74	+12

Source: https://bit.ly/3KPCx29

(7)

IMPORTANT INITIATIVES

The importance of sustainable ports can be easily seen: A good 80% of international trade in goods is transported by sea, and the proportion is even higher when looking at the most developed countries alone.

As mentioned above, ports have recognised for some time their responsibility, as the following list shows. The highlighted initiatives affect the shipping industry alone.

YEAR	ORGANISATION	DESCRIPTION
1979	World Meteorological Organisation (WMO)	Humankind must collect and improve the knowledge of climate, as well as "foresee and prevent potential man-made changes in climate that might adverse to the well-being of humanity".
1988	"United Nations Environmental Program (UNEP) and World Meteorological Organisation (WMO)"	The Intergovernmental Panel on Climate Change (IPCC) was created as the UN's body for assessing the science related to climate change.
1992	United Nations (UN)	The United Nations Framework Convention on Climate Change (UNFCCC) was created to support the global response to the threat of climate change.
1995	"Intergovernmental Panel on Climate Change (IPCC)"	A set of guidelines for national GHG inventories was published. In 2006 and 2019, updated versions of the guidelines were released.
1997	United Nations (UN)	The Kyoto Protocol aimed to limit GHG emissions by at least 5% below 1990 levels from 2008 to 2012. Today (2023) there are 192 parties to it.
1997	GRI (Global Reporting Initiative)	The GRI provides best practices for businesses, governments and other organisations on how to communicate and show responsibility for their impacts on environment, economy, and people.
1998	"World Resources Institute (WRI) and World Business Council for Sustainable Development (WBCSD)"	The GHG protocol was established to provide standards, guidance, tools, and training to measure and manage GHG emissions from businesses and governments.
1998	U.S. Environmental Protection Agency (EPA)	In a legal opinion, the EPA concluded that CO_2 emissions are within its purview of regulation.
2003	World Wide Fund for Nature (WWF)	The Gold Standard emission allowance was introduced; thus, projects reduce carbon emissions under the UN's Clean Development Mechanism (CDM).

YEAR	ORGANISATION	DESCRIPTION
2005	The International Maritime Organisation (IMO)	The MARPOL Annex VI - limiting the primary air pollutants - was adopted in 1997 and entered into force in 2005.
2006	"International Organisation for Standardization (ISO)"	ISO 14064 specifies principles and requirements for the design, development, management and reporting of greenhouse gas inven-tories at the organisational or enter-prise level. It was updated in 20018.
2007	Ecological Transition Ministry (MITECO) of the Spanish government	The MITECO provided a tool and guidelines to calculate the carbon footprint for direct and indirect emissions.
2008	Catalan Office for Climate Change (OCCC)	The OCCC provided a tool (excel-based) to calculate CO_2 emissions for direct and indirect emissions generated by the consumed elec-tricity, steam, heating, and cooling as well as all other indirect emissions that occur in a company's value chain. An update was published in 2019.
2008	International Association of Ports and Harbours (IAPH)	The IAPH provided a tool to support ports in moderating climate change. The World Ports Climate Initiative (WPCI) was created to draw the ports' awareness towards the importance of actions against GHG emissions.
2009	United Nations (UN)	The UN set up the Climate Change Partnership (UN CC:Learn), an initiative to support countries with climate knowledge and applied skills education.
2010	World Ports Climate Initiative (WPCI)	The WPCI presented guidelines for ports to mitigate their impact on climate change by improving their GHG emissions inventories.
2011	The International Maritime Organization (IMO)	IMO adopted binding energy efficiency measures as the first mandatory GHG reduction rules for an international industry.
2014	"The World Association for Waterborne Transport Infra-structure (PIANC)"	The PIANC provided a guide for port authorities to introduce the green port concept and contribute to the shift from reactive to proactive approach.
2015	United Nations (UN)	At the COP 21 (Paris Climate Conference) an international agree-ment was reached to limit the global warming at 2°C, ideally at 1.5°C.
2015	The Clean Cargo Working Group (CCWG)	This initiative is dedicated to the improvement of environmental performance in marine container transport. It provides tools to determine the CO_2 footprint for a individual cases or the whole approach in the logistic chain.

YEAR	ORGANISATION	DESCRIPTION
2017	World Wide Fund for Nature (WWF)	The Gold Standard was updated to gauge, attest, and optimase impacts on climate security and sustainable development.
2017	Carbon Trust (UK based company)	"Two types of carbon footprints were defined: a company's overall activity and the life cycle of a single product or service"
2018	Marine Environment Protection Committee (MEPC 72)	The strategy envisions a peak in GHG emissions as soon as possible and a subsequent reduction of annual emissions to at least 50% (compared to 2008) by 2050.
2018	TheWorld Ports Sustainability Program (WPSP)	The WPSP empowers ports to create sustainable added value by the subscription of ports to the Paris Agreement.
2019	United Nations (UN)	COP 25 in Madrid focused on increasing the ambitions of the indi-vidual countries to achieve the goals of the Paris Agreement of 2015.
2019	PIANC's Working Group 188	Working group 188 focused on the carbon footprint of activities related to the development, maintenance, and operation of navigation channels and port infrastructure, including the management of dredged material.
2019	World Ports Climate Action Program (WPCAP)	The WPCAP established 5 working groups for efficiency, policy, power2ship, fuels, and cargo handling equipment. Their actions include increasing awareness, models, pilots, and research.
2019	The Green Ship Technology Conference	The IMO strategy to reduce GHG emissions from the shipping industry by 50% until 2050 was adopted.
2020	PIANC Working Group 178	Working group 178 presented a four-stage guideline framework for ports and waterway operators to adapt effectively to climate change.
2020	European Sea Ports Organisation (ESPO)	The ESPO presented a position paper relating to the European Green Deal: by 2030, CO_2 emissions from ships at berth and in ports should be reduced by 50% on average and across all segments of shipping.
2021	United Nations (UN)	Emission of methan should be decrea-sed by a third until 2030, several countries will allow only emission-free cars from 2040 onwards.
2022	United Nations (UN)	A fund to compensate for loss and damages was created. Until the end of 2023 it should be defined which coun-tries will pay what amount of money until when.

The initiatives start at the top, for example with a UN agenda, which then flows into the programs of entire industries. These, in turn, formulate goals that individual countries and ports adopt and implement for themselves:

FROM SETTING WORLDWIDE GOALS TO IMPLEMENTATION AT ONE SINGLE PORT

UN's 2030 Agenda for Sustainable Development
This initiative was adopted by all United Nations (UN) members in 2015. It aims at peace and prosperity for people and the planet, now and in the future. Its core is the 17 Sustainable Development Goals (SDGs):

(8)

World Ports Sustainability Program
Two years after the SDGs were adopted, the IAPH (International Association of Ports and Harbours) set up the World Ports Sustainability Program (WPSP) in 2017. This builds on their World Ports Climate Initiative, which was launched in 2008.

Based on the 17 UN SDGs, the program aims to improve and coordinate the efforts for sustainability ports around the world. This also includes working with supply chain partners.

IMO Emission Target 2030
The International Maritime Organisation's (IMO) initiative aims to reduce greenhouse gas (GHG) emissions in international shipping. Based on the 2008 value, a reduction of 40% is to be achieved by 2030, and by 2050 even a decrease of 70%. The goal is to support the UN's Sustainable Development Goal number 13, urgent measures to protect the climate. This goal also guides many port authorities.

Maritime India Vision (MIV) 2030
With intermediate targets of 2025 (40%) and 2028 (60%) (https://bit.ly/3o78M44), all major ports in India are to be self-sustainable on electricity through renewable sources by 2030. In addition to sun and wind, India also wants to rely on tidal energy.

According to a study by the Ministry of Non-Conventional Energy Sources, there is a potential of 8,000 to 12,000 megawatts of tidal energy in India. (https://bit.ly/3o1RZzf)

Cochin Port
Cochin port is one of the larger container ports in India and is owned by the government. As part of the Maritime India Vision 2030, the Port of Cochin aims to convert its operations to solar energy by 2030 fully. The goals include 100 per cent solar-powered cranes and solar-based shore power for all vessels.

SOLUTIONS FOR SUSTAINABLE PORTS

So how can the ports' pollution problems be addressed? Here are some proposals for solutions (not exhaustive):

AIR POLLUTION

- The worst effects of environmental problems are to be expected from global warming, which is why most of the energy is put into solving this problem. Decarbonisation is being driven forward with various regulations and initiatives and has found its solution in electrification, but of course, its speed needs to be faster.
- When switching to electric solutions, however, it should also be clear that the days of wasting energy are over and that energy is not yet produced from 100% renewable sources. Saving energy is clearly here to stay.
- Planting trees, roof greening, and wall-climbing plants not only helps to get rid of the CO_2 but also cools down buildings and places and improves the work environment.

WATER POLLUTION

- Collection facilities and drainage channels must be provided. Discharge stations should be directly connected to sewage treatment plants.
- Accidents cannot be avoided entirely. Hence, emergency plans, a rapid reporting system and equipment (Recovery vessels, oil fences and treatment chemicals) must be prepared and ready for use at all times.
- In order to maintain the port's water quality, floating debris should be removed regularly.

NOISE POLLUTION

- The layout of the port and the positioning of the different functions have a significant impact on noise levels. The noisiest activities should happen furthest away from residential areas and wildlife habitats.
- The optimisation of traffic enables the shortest possible routes inside the port.
- Modifying the ramp design with rubber liners and insulation may reduce the noise.
- Driving more smoothly as far as possible without significantly slowing down operating times.
- Quieter machines, such as electric or hybrid models.
- Noise barriers and walls.

LIGHT POLLUTION

Light pollution cannot be easily eliminated everywhere; for safety reasons alone, some areas must be illuminated extensively around the clock.

Nevertheless, there are still plenty of opportunities for improvement:

- The brightest possible light is only sometimes required; less light intensity is often sufficient. And if it should be possible to switch between light levels, a dimmer can help.
- Motion sensors can switch lights on or brighten a dimmed light up to a higher level only when someone is nearby.
- Warm light disturbs people and animals much less than cold light. LEDs can also shine in warm light colours, so no compromises have to be made regarding energy efficiency.
- The optimal placement of the lamp or "lampshades" direct the light to exactly where it is needed and prevents stray light.

THE BIG GOAL: DECARBONISATION

Decarbonisation means reducing CO2 emissions caused by human activity, and the eventual goal is to eliminate them.

CO2 plays a central role in global warming, which is aimed to be limited below 2°C above pre-industrial levels. A publicly declared intention of members across all industries is to become carbon neutral by 2050 so that even 1.5°C can be achieved.
(http://bit.ly/3GCzFDw)
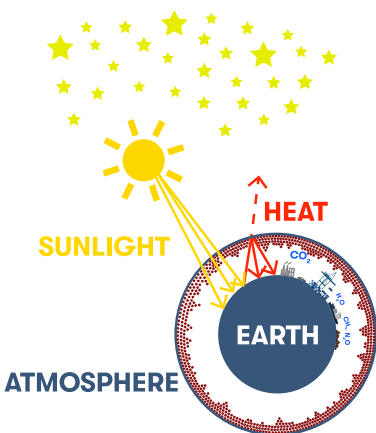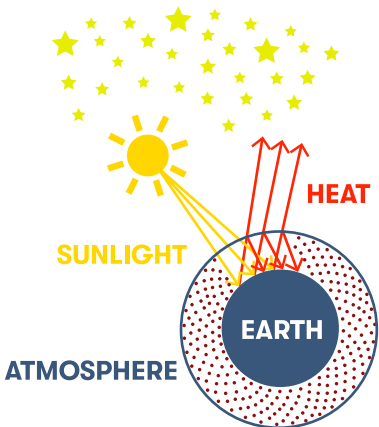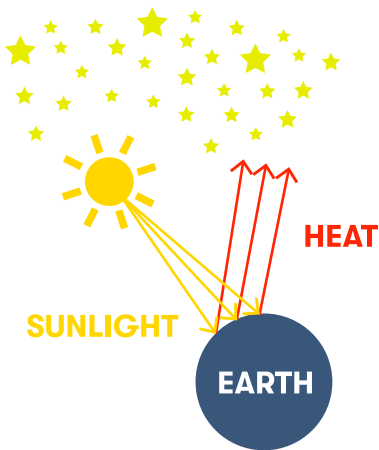
Why is decarbonisation so important?

The temperature in space is minus 270 degrees Celsius, and the atmosphere protects us from it. It consists of gases that act like a protective greenhouse that retains heat on earth. That is why we also call them greenhouse gases (GHG) because they have a similar effect to the glass roof of a greenhouse. Sunlight can pass through, but thermal radiation reflected from the earth's surface is blocked.

As long as the gases prevent the right amount of radiation, all is well. However, if too much radiation is stopped, it gets warmer and warmer - until it is too warm. The focus is on CO2 because humans are constantly increasing its proportion, and this is where we can apply the most effective levers.

It is, therefore, a question of not allowing as much CO2 to be produced in the first place. Since ports are complex and multifaceted, one must bring all stakeholders to the table. Port authorities and all those involved must coordinate their strategies to get the most out of the measures.

The introduction of innovative technologies enables profits here, and those who use them early have a competitive advantage over other ports. Even if there remains some time before the rules are introduced, customers and consumers are increasingly attaching importance to the fact that their goods are transported in an emission-efficient manner.

The EPA (United States Environmental Protection Agency) lists various approaches to reducing air emissions:

TYPE OF REDUCTION APPROACH	REDUCTION PRINCIPLES
Technology-oriented approaches	■ Replace: Replace entire vehicle or equipment with newer or less-polluting model, including zero--emissions technologies. ■ Repower: Replace only the main engine and associated components that provide power. ■ Rebuild: Retain the same engines, but rebuild them to higher emissions standards. ■ Refuel: Select a compatible fuel that is cleaner burning or use electric technologies. ■ Retrofit: Fit with device designed to reduce pollution.
Program-oriented approaches	■ Repair: Ensure optimally maintained equipment. ■ Relocate: Consider whether pices of equipment that produce emissions can be relocated to an area less impacted by air quality. ■ Repurpose: Ensure that all fleet equipment is being used optimally. ■ Right Size: Ensure that equipment is not over-powered for its primary functions.
Operational approaches	■ Reduce: Lower fuel consumption and speeds to lower emissions. ■ Retrain: Train equipment operators and field personnel to reduce emissions with everyday decisions. ■ Reward: Incentivize results for individuals and programs to emphasize and reinforce gials and reorient organizational behavior.

(https://bit.ly/3GECZ0O)

In the following chapter, we will focus on replacement by zero-emissions technologies, to which almost all vehicles will probably be converted in the long term.

SUSTAINABLE PORTS' BIG CHALLENGE: ELECTRIFICATION

What helps the most in the fight against CO2 is not letting it occur in the first place. To say it clearly and upfront: of course, the electricity must come from renewable sources; otherwise, it would just be a shift of the problem to another place.

Let's take a look at some aspects of the electrification of ports:

CONTAINER TERMINAL VEHICLES AND EQUIPMENT
As with road transport, vehicles and other equipment development is moving towards electrification. However, while automation is still a long way off in road traffic, it is already in full swing at the port.

In addition to the decarbonisation effect, automated and electrically operated vehicles have other advantages:

- Optimised processes that save time and avoid idle time
- Improved workers' safety since dangerous activities are handled by machines and monitoring occurs in a safe environment

A report on Container Handling Equipment (CHE) electrification stated a forecast of 60% electric equipment by 2030.
(http://bit.ly/3KVMbAx)

Regulations on cargo handling equipment, not only at seaports, are currently in the works. In California (USA), for example, in 2017, the Sacramento State Air Resources Board (CARB) directed its staff to develop new seaport CHE regulations requiring 100% zero-emissions equipment by 2030.

The effort began in 2018 and is expected to be completed and presented to the Board in 2024. It is expected that the measures may lead to a reduction in emissions of pollutants, air toxins and greenhouse gases from 2026 onwards.

By 2036, over 90 per cent is expected to have zero-emission devices.

CHE at Ports

To give you an idea of how many different types of CHE exist, have a look at the list below. The ones associated with the bulk of CHE emissions are highlighted.

- Aerial lifts
- Compressors
- **Container handlers (side and top handlers)**
- **Cranes**
- Excavators
- Forklifts
- Generators/power packs
- Light towers
- Manlifts
- Off-highway trucks
- Rail pushers
- Reach stackers
- Rollers
- Skid steer loaders
- Sweepers
- Tractors/loaders
- Welders
- **Yard trucks**

A side effect of electrification is often a higher degree of automation. In addition to the improvements in efficiency and productivity that are noticeable right from the start, automation always offers the possibility of more precise monitoring and evaluation of collected data. These evaluations can then be used to examine all process changes for effectiveness.

For example, it is straightforward and quick to find out the results of a change in the routes of yard trucks. It's also worth trying out more minor changes that add up to a pretty good improvement.

By the way: Even if they will only have a small share in consumption, one should not lose sight of the fact that private cars are increasingly being converted to electric drives, and it should be possible to charge them at work.

SHORE POWER

Usually, the onboard network of vessels is fed by diesel or shaft generators. For many years, only with long idle times, the vessel's power supply connected to the shore power supply. For about twenty years, ports have made efforts to provide shore power also for short stays. Some ports even have anti-idle laws that require shore power to be used.

Shore power is the supply of electricity to a ship at berth with its main and auxiliary engines shut down. The power can come from an electric utility grid or an external remote generator. However, for shore power to be truly sustainable, the latter must be powered by renewable energy.

(9)

Shore supply saves fuel and reduces air and noise pollution in the port. It increases the competitiveness of a port and helps with successful liaisons with neighbouring communities otherwise negatively affected by the port's emissions. A truly critical matter: The fewer harmful effects, the more willing the surrounding stakeholder will be to agree to a port's expansion plans.

By the way, another term – "cold ironing" – is used in the shipping industry, which arose when ships were still powered by coal. The fires were not fanned any further in the harbour, and the iron machines slowly cooled and finally became cold.

ENERGY GENERATION AT SUSTAINABLE PORTS

More and more ports and port companies are generating their energy. Their success shows that renewable energy is competitive; it actually saves companies money.

Hamburg (Germany)

For example, several wind turbines tower above Hamburg's already impressive harbour silhouette; some belong to a plant manufacturer and some municipal companies.

Not far away, EUROGATE also has its wind turbine, which has long since surpassed its target and paid for itself within a few years. The terminal operator relies on a mix and also operates a photovoltaic system on its buildings. Together with a combined heat and power plant, these systems cover almost all energy requirements.

Barcelona (Spain)
The goal of Hutchison Ports BEST, a semi-automated terminal, is nothing less than to be the greenest container terminal in the Mediterranean. 100% of the used electricity comes from renewable sources; they recently invested in even more solar panels for self-consumption and now have a total surface area of 4,763m2 at their disposal. This will reduce CO_2 emissions by 250 tons.
(http://bit.ly/3ME8dca)

Cochin (India)
By 2030, all operations shall be shifted to solar power. Already today, many roofs of port buildings are completely covered with solar panels. The port is also considering installing further rooftop solar power plants with a capacity of 350 kW as well as putting up floating solar panels in the next two years.
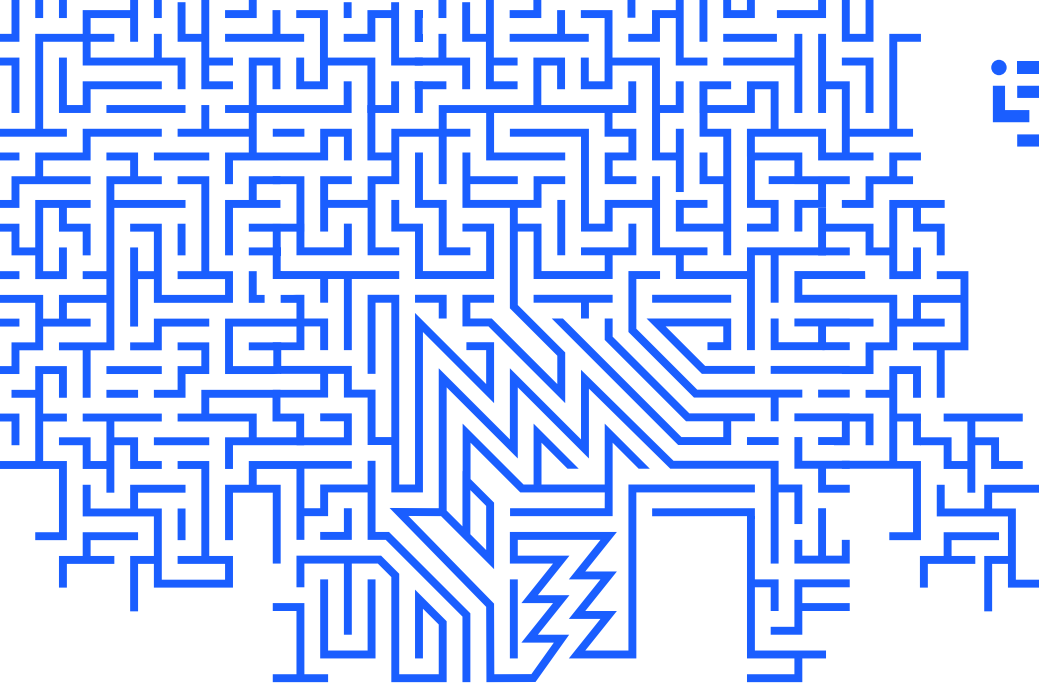(https://bit.ly/3KRbgwq)

TAKEAWAY

Port operations contribute to air, water, and noise pollution and disrupt natural rhythms. As we learned, the environmental effects beyond the port's borders must also be considered, including those caused by incoming and outgoing ships and intermodal transport.

The most important fight is against CO_2; preventing it, for example, through electrification, is key. However, the power needed must come from renewable sources to avoid shifting the problem elsewhere.

Only if they prioritise sustainable operation solutions, renewable energy sources, and emissions reduction ports can become sustainable.

Sources - Pictures

1: (c) YuriArcursPeopleimages //Freepik; 2: (c) TravelScape //Freepik;
3: (c) Identec Solutions AG; 4: (c) Jonasweinitschke //Freepik; 5: (c) Vecstock //Freepik;
6: (c) Wirestock //Freepik; 7: (c) Uiinternational //Freepik; 8: (c) UN (SDG's);
9: (c) Identec Solutions AG

IDENTEC SOLUTIONS

Our solutions help to
make your
workplace safer and
more productive

GO THE NEXT STEP

Visibility is the key to safety and productivity in container terminals. Transponders provide visibility in a reliable way. They are the cornerstone of your successful container terminal operations.

If you'd like to learn more about automating container terminal operations, call us now on +(43) 5577 87387-0 or visit identecsolutions.com and look for Terminal Tracker.

TIC4.0
CONFORM

BECAUSE IT WORKS

TERMINAL TRACKER

IDENTEC SOLUTIONS