

Implementation of Green Port Policy Due to Climate Change



Ir. Prof. Dr Abdul Saman Abd. Kader

Global climate change and warming due to excessive emission of carbon dioxide (CO₂) have an impact on the Malaysian climate and environment. Shipping and, in particular, port operations are exposed to the vagaries of climate change. The rise in sea level, increase in temperature, rainfall, storm, flood and runoff affect overall port operations, damaging infrastructure, equipment, cargo as well as contribute to coastal erosion and sedimentation.

Data from the United Nations shows that in Malaysia, carbon emissions in 2006 stood at 187 million tonnes (or 7.2 tonnes per person), one of the highest in the world. In view of this, the government established the National Climate Change Policy in 2009 with the aim to reduce CO₂ emission in Malaysia to 40% by 2020 compared to 2005.

Ports are an important player in the shipping industry; they play a crucial role as transportation hubs for most of the goods transported globally. Ports are usually located in areas of sensitive environment and high risks, which make them vulnerable to climate-related changes. *Becker, et al., (2012)* stated that most port operators believe that climate change will significantly affect operations.



Artist's impression of the Green Port of Hull (Port of Hull 2017)

human activity which alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods" (UNFCCC, 2004).

CLIMATE CHANGE

Climate change can be "attributed directly or indirectly to

Green Port Policy by the Numbers

The landmark Green Port Policy was adopted by the Board of Harbor Commissioners in 2005, and reaffirmed in 2015. The policy was and still is a game changer for the Port of Long Beach - directing the Port to do business in an environmentally friendly way.



10
Years of the Green Port Policy

1
Rank of the Port of Long Beach in the world for environmental leadership in 2014, according to readers of Cargonews Asia

82↓
Percent of diesel particulate exhaust eliminated overall from Port sources

500 million
Dollars invested in clean air projects for ships, trucks, trains, and cargo-handling equipment

300+ Spesies of Marine animals
60+ Spesies of fish
100+ Spesies of birds

78
Acres of kelp beds in the Port

17.4 million
Dollars awarded to schools, health outreach, and renewable energy programs

14,000
Trucks of year 2007 or newer registered in the Clean Trucks Program

99
Percent of cargo ships slowing to 12 knots or less near the Port to reduce emissions

99
Percent of cargo ships slowing to 12 knots or less near the Port to reduce emissions

Green Port Policy by the numbers (The Port of Long Beach 2017)

CLIMATE HAZARDS



EXTREME TEMPERATURE

SEA LEVEL RISE

STORMS

FLOODS

WAVE HEIGHT

POTENTIAL RISKS

YARD OPERATIONS

- Physical damage

PORT OPERATIONS

- Physical damage
- Interruption of supply of goods and transport of passengers

SHIP OPERATIONS

- Loss of lives, ships and cargo
- Downtime
- Changes in ship routes
- Changes in global trading patterns
- More complex marine operations

Climate change risks for the maritime value change.

Climate change risks for maritime value change

Likewise, IPCC (2007) defines climate change as “a change in the state of the climate that can be identified (e.g. using statistical tests) by changes in the mean and/or the variability of its properties, and that persists for an extended period, typically decades or longer”. It also refers to any change in climate over time, whether due to natural variability or as a result of human activity.

The shipping industry requires fossil fuel for engines and this produces gas and aerosol products such as CO₂ and water vapour, nitrogen oxides (NO_x), VOCs, carbon monoxide (CO) and sulphur dioxide (SO₂) (Dessens, et al., 2014). These gases cause ozone layer depletion, global warming and climate changes either regionally or

globally as they affect the composition and the balance of the atmosphere. It was reported that nearly 70% of ship emissions occur within 400 km of coastlines, causing air quality problems through the formation of ground-level ozone, sulphur emissions and particulate matter in coastal areas and harbours (Eyring, et al., 2005).

1. IMPACT OF CLIMATE CHANGE ON NATION AND PORT OPERATION

In Malaysia, NAHRIM (2006) reported that the national warming trend had increased +0.18°C per decade (1951-1996) and that the sea level was raised about +1.3mm/year (1986-2006), based on 2 pilot sites in

Green patrol

At some point in 2017, you may spot it moving through the port yourself: RPA 8, the first of the Port Authority's new generation of patrol boats. Its key innovation: a hybrid propulsion system (powered by both diesel fuel and electricity) with a lower environmental impact.

UNDERWATER SPOILER

A special hull vane - a kind of underwater spoiler - means that the vessel produces fewer waves, which has a positive effect on fuel consumption. It is also better for the quays and other ships along the patrol boat's routes, which can be damaged by heavy wave action.

LIGHTWEIGHT

The hull is made from aluminium. Aluminium is three times lighter than steel, meaning that the RPA 8 consumes less fuel.

HYBRID FLEET

RPA 8 isn't the only hybrid patrol vessel that can soon be seen moving through the port area. Once RPA 8 has been taken into operation in September, work will start on RPA 10 and 11. These existing vessels will be converted so that soon they can also be powered by a combination of diesel fuel and electricity.

8,088 TREES

With its innovative technology, RPA 8 saves roughly the same amount of energy per year as is consumed by 65 households. This also means far lower CO₂ emissions - equivalent to the annual CO₂ uptake of 8,088 trees.

HALF POWER OR 'FULL STEAM AHEAD'?

Is there an emergency? Full steam ahead! Good news for the diesel engines. Because they're made to work hard: diesel engines operate best at full capacity. And this also reduces the emission of pollutants like CO₂ and particulates. These are lowest, relatively speaking, when the engine is going full out.

FOR TECHNOLOGY FANS: HYBRID IN A NUTSHELL

When the engine is in hybrid mode, **diesel engine D** is powered off and uncoupled. **Diesel engine B** supplies 85% of the power used by **propeller 1**. In addition, the engine allows **electric motor A**, which is connected via the propeller shaft, to serve as a generator for **electric motor C**. This motor powers **propeller 2**. The maximum speed in hybrid mode is 23 km/h.

The remaining electricity generated by **A** is used to power the boat's **on-board equipment (E)**. Total fuel savings: 15-20%. Resulting in lower CO₂ and particulates emissions.

Green Patrol Technology (Port of Rotterdam Authority)

NATIONAL POLICY ON CLIMATE CHANGE

Policy Statement

Ensure climate-resilient development to fulfil national aspirations for sustainability.

Policy Principles

P1: Development on a Sustainable Path

Integrate climate change responses in national development plans to fulfil the country's aspiration for sustainable development.

P2: Sustainability of Environment and Natural Resources

Initiate actions on climate change issues that contribute to environmental conservation and sustainable use of natural resources.

P3: Integrated Planning and Implementation

Integrate climate change considerations into development planning and implementation.

P4: Effective Participation

Improve participation of stakeholders and major groups for effective implementation of climate change responses.

P5: Common but Differentiated Responsibility

International involvement on climate change will be based on the principle of common but differentiated responsibilities and respective capabilities.



National Policy on Climate Change in Malaysia

the peninsula. One of the factors that caused the rise in temperature was the high level of carbon dioxide (CO₂) emissions.

Climate changes affect the overall operations of ports in the country as well as their related infrastructure due to changes in sea levels, floods, storms, strong winds and higher temperatures (Gallivan, Bailey, & O'Rourke, 2009). These have a huge impact as ports are located along the coast, in low-lying areas and deltas (UNCTAD, 2011). According to PIANC (2008), sea levels had already risen by 10-20cm in the past century and was projected to continue rising due to the melting of polar ice and mountain glaciers as well as the expansion of warmer sea water.

Any increase in temperature also impacts port operations as it will affect auxiliary port infrastructures such as paved surfaces which may deteriorate faster in hotter conditions. Finally, higher temperatures also affect humans and natural environments as most port employees work in the outdoors. Operational changes may be required to protect these workers from extreme heat and to avoid heat-related health problems (Gallivan et al., 2009).

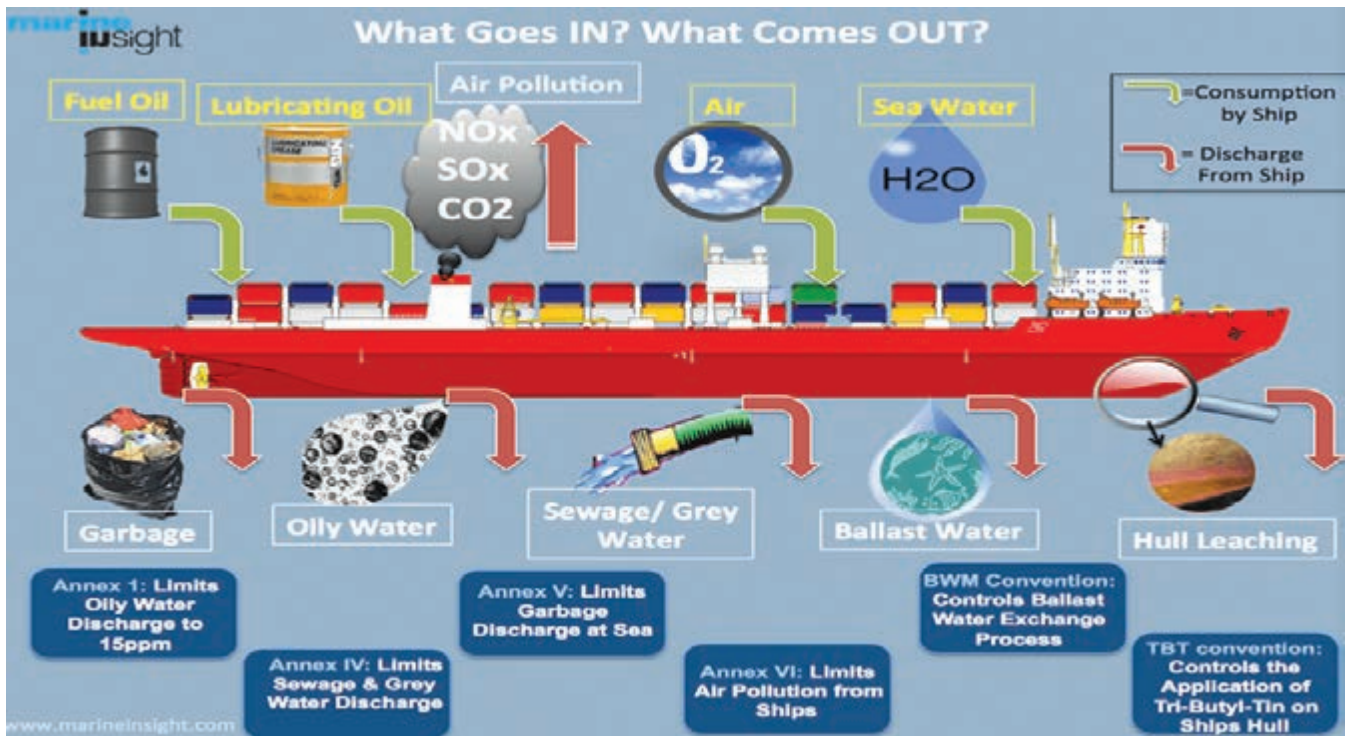
2. MALAYSIAN CLIMATE CHANGE POLICY

At the United Nations Conference on Climate Change in Copenhagen in 2009, Malaysia agreed to reduce its CO₂ emission to 40% by 2020 from 2005 levels, subjected to assistance from developed countries. Our government has approved a policy on Climate Change, aimed at ensuring climate-resilient development to fulfill national aspirations for sustainability (NRE, 2010). The objectives are to strengthen competitiveness and to improve the quality of life, the integration of climate change responses into

policies, plans and programmes and the strengthening of institutional and implementation capacities (NRE, 2010).

3. ACTION PLAN CONTROL MEASURES AND INITIATIVES

- a) **Vessel Speed Reduction Programme:** The voluntary vessel speed reduction programme has been established for vessels to slow down to 12 knots within 20 nautical miles of the port. For example, it is reported that current compliance is about 95% for Port of Long Beach and 88% for Port of Los Angeles (Kanter, 2006). The objective is to reduce NO_x emissions from ocean going vessels (OGVs) when they slow down as they approach or depart from ports as reduced vessel speed demands less power from the main engine which, in turn, reduces NO_x emissions and fuel consumption.
- b) **Vessel Fuel Incentive Programme:** This programme encourages vessel operators to use low sulfur (0.2% sulfur or less) Marine Gas Oil (MGO) or Marine Diesel Oil (MDO) in their main engines during their approach to or departure from ports up to 20-40 nautical miles (CAAP, 2000-2014). For the programme, ports provide funding to cover the cost differential between the cleaner burning low-sulfur fuel and the heavy bunker fuel typically used. To receive the incentive, vessel operators are required to be compliant with the Vessel Speed Reduction Programme speed limit of 12 knots over the distance they wish to receive the incentive (20 or 40 nautical miles) and to use low sulfur fuel in the auxiliary engines while berthed.



Consumption and discharge processes of a ship
Source: www.marineinsight.com (Sept. 2017)

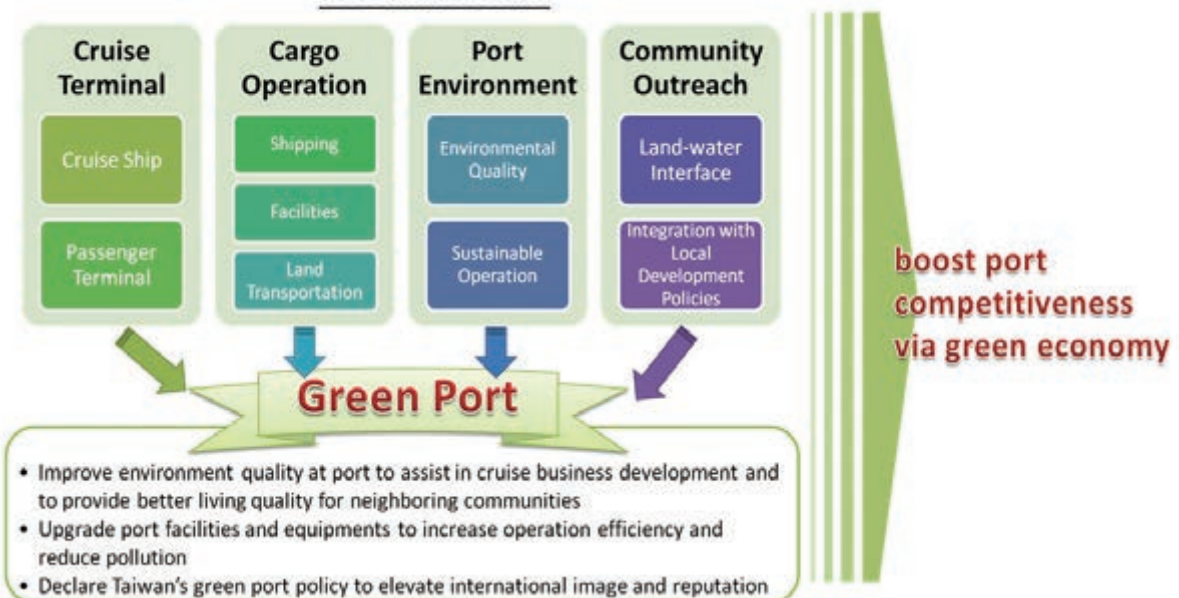
c) On-shore Power: One effective strategy to reduce emission is to replace the use of a ship’s auxiliary engines by plugging them to on-shore power. This is an application of using electrical power for ships at berth rather than diesel-burning engines, a practice called shore power or “cold ironing”; it is reported that on-shore power can reduce air pollution from ships at berth by 95% (POLB, 2014). For instance, the California Environmental Protection Agency (CEPA) regulation and the California Air Resources Board (CARB) in 2007

approved the "Airborne Toxic Control Measure for Auxiliary Diesel Engines Operated on Ocean-Going Vessels At-Berth in Port" regulation.

d) Cargo-handling Equipment: Cargo-handling equipment is considered a major contributor to gas emission as diesel is the fuel used. The standards include:

1. Cleanest available alternative-fuelled engine that achieves maximum reductions in NO_x and reduces particulate matter (PM) to 0.01 g/bph-hr.

FOUR ASPECTS



Steps for port competitiveness via Green Policy

2. Cleanest available diesel-fuelled engine which achieves maximum reductions in NO_x and reduces PM to 0.01 g/bph-hr.
3. If there are no engines available at the time which can reduce PM to 0.01 g/bph-hr, then the cleanest available engine (either fuel type) should be purchased and retrofitted with the cleanest emission control technology.
4. All cargo-handling equipment engines which have more than 750hp will be equipped with the cleanest emission control technology.

e) Harbour Craft: The Ports Clean Air Action Plan also has developed strategies to reduce emissions from harbour crafts, including:

- All harbour crafts need to meet the Environmental Protection Agency (EPA) Tier 2 Standards or equivalent reductions by 2008.
- All previously repowered harbour crafts will be retrofitted with the most effective NO_x and/or PM emissions reduction technologies by 2011.
- When Tier 3 engines become available, all harbour crafts will be repowered with the new engines within five years.
- All tugs will use shore-power at home fleeting locations (CAAP, 2000-2014).

CHALLENGES IN GREENING MALAYSIAN PORTS

There are many challenges in areas such as regulations, technology, operations, human resources and financing, among others. Adjusting to a low-carbon future requires port managements to cap their carbon emission to address the issue of climate change. To significantly reduce carbon emission within port operations, they must overcome challenges such as lack of resources, weak regulatory frameworks, lack of consensus among stakeholders and technological limitations.

That there are misconceptions among port managements is acceptable, given that port operation is not the key emission culprit. There is a lack of awareness on the part of the associated parties on their contributions to carbon emission and global warming as well as a lack of financing and human capital to procure and operate green technologies.

CONCLUSION

Our country's ports handle a total of 17 million TEU containers and act as pulse points to its economic focus. Two of our ports are on the list of the world's top 20 container ports by volume handled. Due to the expansion of global trade, it is likely that this capacity will be increased in the future. While this leads to the growth of our economic wellbeing, it also contributes significantly to pollution, particularly in CO₂ emissions which has been identified as one of the contributors to climate change.

To support the National Climate Change Policy from the perspective of port operations, one approach to reduce CO₂ emissions is to have Green Port initiatives and our major ports have undertaken efforts to apply Green Port initiatives in their businesses and operations. Their efforts are laudable and should be emulated by other ports in Malaysia. ■

BIBLIOGRAPHY

- [1] Becker, A., Inoue, S., Fischer, M., & Schwegler, B. (2012). Climate change impacts on international seaports: Knowledge, perceptions, and planning efforts among port administrators. *Climate Change*, 110(1), 5-29.
- [2] BPC Policy (2008). San Diego Bay Green Port Policy.
- [3] CAAP. (2000-2014). San Pedro Bay Ports Clean Air Action Plan. The Ports of Long Beach and Los Angeles. Retrieved 20 Dec, 2014, from <http://www.cleanairactionplan.org/>.
- [4] CAAPTAP. (2008). 2007 Annual Report of Clean Air Action Plan Technology Advancement Program The Ports of Long Beach and Los Angeles (Vol. 1, pp. 6).
- [5] CAAPTAP. (2014). 2013 Annual Report of Clean Air Action Plan Technology Advancement Program The Ports of Long Beach and Los Angeles (Vol. 7, pp. 8).
- [6] CARB. (2014a). Rail Emission Reduction Program California Air Resources Board. Retrieved 20 Dec, 2014, from <http://www.arb.ca.gov/railyard/railyard.htm>.