



INTERNATIONAL BEST PRACTICES

Sustainable and Clean Port Program

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Table of Contents

Table of Contents	0
List of Figure.....	1
Introduction	2
1. Air Quality improvement as part of Sustainable and Clean Port (SCP) program	3
1.1. Definition of sustainable and clean port	3
1.2. Air Quality improvement in SCP programs.....	3
1.3. Pollutant PM/BC in the SCP program.....	4
2. Air quality program in ports around the world.	5
2.1. Port of Long Beach	5
2.2. Port of Los Angeles.....	6
2.3. Sydney Ports Corporation (SPC), Australia	7
2.4. Transnet National Ports Authority (TNPA) and Transnet Port Terminals (TPT), South Africa (SA)..	8
2.5. Port of Portland	8
2.6. Port of Rotterdam Authority, The Netherland	9
2.7. Port of Singapore	9
3. Institutional framework for SCP implementation	9
3.1. Policy approach.....	9
3.2. Institutional arrangement	10
3.3. Port stakeholder	10
4. CO-Benefit and side effect of SCP.....	10
4.1. Co benefit:	10
4.2. Side effect:.....	11
5. Recommendation for Tanjung priok to address PM/BC	12
5.1. Piloting the initiative.	12
5.2. Approach for Project initiation	13
Glossary	14
References	15

List of Figure

Figure 1 Global and US BC Emission by sector, 2000	4
Figure 2. Terminal B of Port of Long Beach	5
Figure 3 Port of Los Angeles.....	6
Figure 4 Port of Sydney.....	7
Figure 5. Layout of Port of Tanjung Priok	12

Introduction

UNEP has conducted several environmental programs in Indonesia to improve air quality in Indonesia. Among other is the successful lead phasing out program for gasoline and Clean Fleet Management. In doing so, UNEP is also supporting the development of policies to improve fuel quality, to reduce mobile emission, and to develop fuel economy standard for motor vehicles.

Since 2012, UNEP has been initiated program to reduce Particulate Matter Black Carbon PM/BC emissions from transport sector, particularly heavy duty diesel vehicles and engines. As part of such initiative, UNEP is now conducting similar projects in Southeast Asia (ASEAN), Africa, Latin America and the Caribbean including Indonesia.

Port is one of major source of PM/BC. Due to busy activities of heavy engines bot in land and sea sides, port incurs significant black carbon that pollute its surrounding area. In particular Hub port, where many international, domestic, and intermodal transport activities take place. Such port in Indonesia is Tanjung Priok, which serve as hub port for both domestic and international sea transport and now is undertaking massive development that will double its output in the next five years.

Following up the CCAC and ASEAN project, UNEP is initiating a small project to support the reduction of PM/BC emissions related to operations at the Port Tanjung Priok in Jakarta. In doing so, this initiative will help Tanjung Priok port in addressing some other challenging issues such as traffic congestion, energy efficiency, port productivity, multimode logistic system, and relation with the surrounding community. As the busiest port in Indonesia which is undertaking substantial development, there are many opportunity for Tanjung Priok to combine infrastructure and system development with effort to improve environment including air quality and at the same time address mitigate climate change. Such effort could place the port as one of prominent port in the world. Therefore, it is critical to link this initiative with ongoing activities/initiatives at the Port of Tanjung Priok to ensure that all the issues are encompassed and addressed in a comprehensive and sustainable manner under clean ports program.

Many ports around the world implemented **successful program** to reduce port air pollution and improve air quality toward more clean and sustainable port. Those international best practices serve as a reference to implement similar program in Tanjung Priok. In term of pollutant, though those program may not necessarily directly address or related to PM/BC, but the environmentally nature of those programs provide valuable information and lesson learned to reduce PM/BC in Tanjung Priok.

This report provides best examples or information of SCP programs world around aiming to improve air quality in port area. First, it will explore samples of similar air quality improvement program, its objective, rationale, result, and impact. Second, this report will focus on analyzing institutional setup of implementing SCP program. Third, it will show co-benefit created by sustainable and clean port program particularly in term of port efficiency and productivity. Last, it will provide recommendation for implementing SCP program in Tanjung Priok, started with emission inventory of local air pollution such as Nitrogen Oxides (NOx), Carbon Monoxide (CO), Particulate Matters (PM10, PM2.5), Black Carbon (BC) and Sulfur Dioxide (SO2).

1. Air Quality improvement as part of Sustainable and Clean Port (SCP) program

1.1. Definition of sustainable and clean port

The definition of sustainable and clean port program varies depending on the implementation context. Abbott in 2008, as mentioned in Hiranandani (2012), defined sustainable port development as a development concept to balance current and future demand of the port itself. This definition is basically derived from the definition of sustainable development mentioned in the Bruthland report in 1987 and focus on development context. It gives a guideline for how port should approach, plan, and do its development. On the other hand, clean port are refer mostly to action to address environment excesses that port operation might cause such as air quality, climate change, water quality , minimum waste dredging, energy conservation, renewable energy, natural resources, and sustainable environmental management systems. Among those issues, air quality program is the most common action for clean port program around the world (IISS, 2010).

Environment regulation or trade globalization are the main two driving forces behind SCP program. Environment regulation directly drives ports around the world to take action on SCP program. Those regulations were either as a respond to public pressure, an implementation of central government plan, or an implementation of international agreement. Many port in the U.S. initiated SCP program as a respond to public pressure such as law suit from local community. Another port in the U.S. implement SCP program to get grant funding from central government. While in the Europe, Australia, and other developed country, the SCP program was initiated to respond international agreement that requires port around the world to take a real action to safeguard the environment (*AIVP, 2008; MISL, 2009a; Tillman, 2008*). On the other hand, ports in developing countries implement SCP program mainly as a joint program with other ports in developed country or as an implementation of technical assistance from international donor. However, only SCP program that in line with or enhance development agenda of the local port that proven to be sustain in developing world.

1.2. Air Quality improvement in SCP programs

Two of major environment issues for SCP program around the world are air quality and climate change. Different approaches and strategies have been implemented according to variation in regulatory framework, financial and managerial capacity, scale of productivity, operation and business practice, and cooperation between port stakeholders (IISS, 2010).

Air quality is a domestic environmental issue and its mitigation actions are mostly driven by growing concern or regulatory change on its impact to public health. Those regulations require ports sector to implement air quality improvement program through wide range of actions according to various context and need. Among others are 1) emission inventory, 2) use of alternative and renewable fuel, 4) replacement of old polluting equipment, 5) improvement of port process efficiency, and 6) retrofit of old equipment with emission control tools.

While on the other hand, **climate change is a global environment issues** driven by international agenda. Central government, international donors, or global port association pose more pressure to port sector to address climate change issues. Some international cooperation or non-profit organization have been established to streamline climate change issues in the port development,

management and operation. Though actions in climate change program might quite similar to that of air quality, e.g. emission measurement, equipment replacement, and efficiency improvement, but it is different in term of pollution parameters and program design. Climate change program for port sector also require reduction target over certain period of time. It might or might not co paly or contribute to GHG emission reduction target at both national and global level to keep threshold level of carbon in the atmosphere to avoid greater negative impact to the climate. Among others actions for port climate change program are 1) carbon footprint measurement, 2) intermodal green transport system, 3) innovative equipment, and 4) fuel reduction technology.

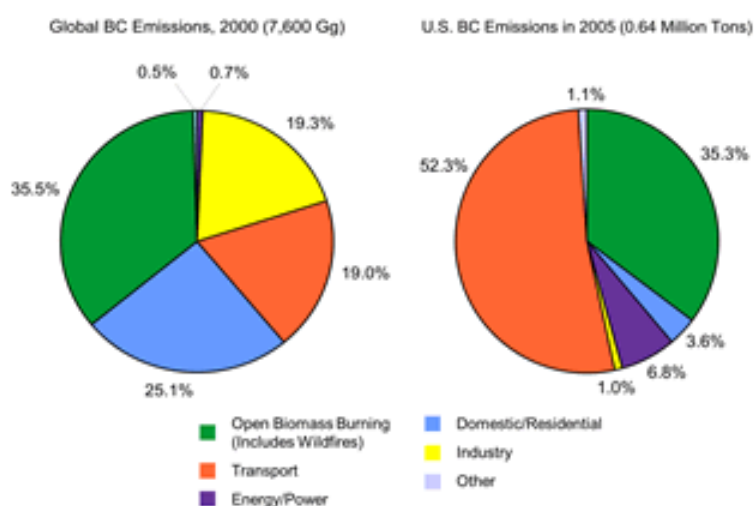
Emission inventory is one most important action in both air quality and climate change program for port. It is deemed as the first step to mitigate air pollution and address climate change, for it give information on the source and magnitude of the air quality problems, as well as help to identify priority of mitigation action. Tools and method to conduct inventory are now developed internationally. As such, emission inventory will provide baseline to monitor change of emission level over time (IISS, 2010).

1.3. Pollutant PM/BC in the SCP program

Black Carbon (BC) is particulate matter (PM) that has the strongest light absorbing character. Though it is short lived in the air, because it will quickly change to other substance, but due to its characteristic in absorbing light it has the highest content of energy per mass, that can have energy content millions time higher than CO₂.

BC comes from incomplete combustion of fuel (oil, biofuel, and biomass) and being emitted as ultrafine particulate matter (PM_{2.5}). In 2000, global BC emission was mainly came from open burning in the first place, followed by domestic/residential in the second place and industry coupled with transport both in third place. In transport and industry sector, BC mostly came from diesel combustion, especially diesel with from high sulfur content.

Figure 1 Global and US BC Emission by sector, 2000



Source: Lamarque et .al 2010

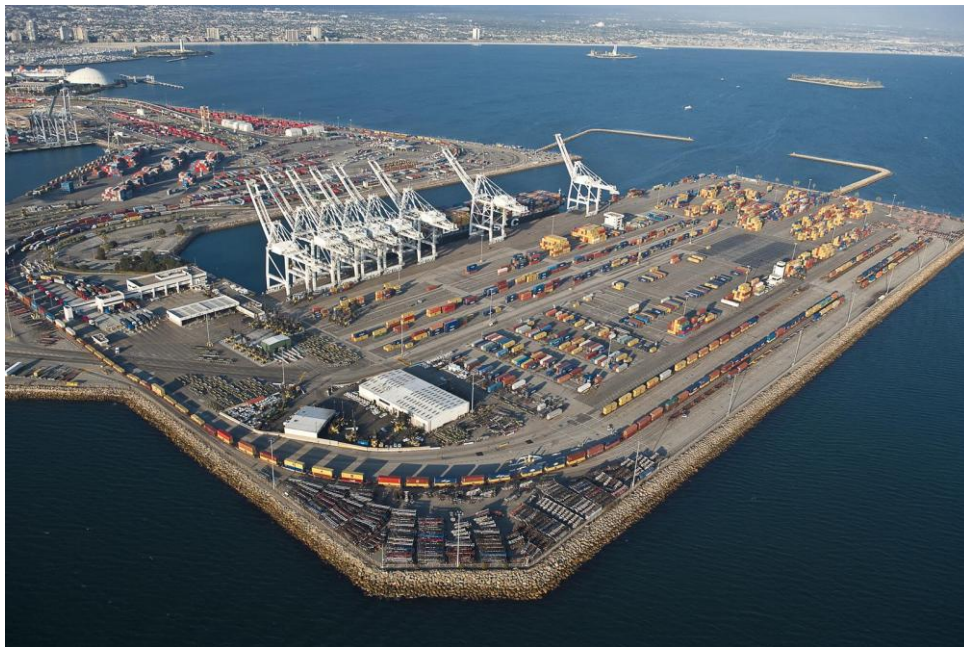
Due to its size and heat absorbing characteristic, **BC harm our health and our climate**. Particulate matter as big as PM2.5 micron is small enough to directly penetrate into blood stream and contaminate it. With energy content millions higher than CO₂, it will greatly pollute the atmosphere and impact to our climate.

For long, BC is **neither considered in public health and environmental sector, nor included in the climate change actions**. In 2012 Climate and Clean Air Coalition (CCAC) initiated a global action to address BC pollutant, in which UNEP became one of the major player in its implementation. From that time, UNEP initiated program in ASEAN started with inventory of BC emission in major source of BC including port.

2. Air quality program in ports around the world.

2.1. Port of Long Beach

Figure 2. Terminal B of Port of Long Beach



Source: [HDR Consulting](#), 2014

The Port of Long Beach belongs to the City of Long Beach and being operated under land lord regime, where the city lease port terminal to private shipping and stevedoring enterprises. Due to increasing growth of port traffic, the port is under continuous expansion and imposing greater impact to the environment and public health (*Bailey, et. al., 2004*).

In 2005, the port enacted Green Port Policy as a respond to a lawsuit from local community and pressure groups. The policy requires the port to continue obtain economic benefit from international trade while at the same time reduce its environmental impact (Musser, 2008; POLB, 2011d). The policy has change the way the port develops and implements its business culture, fiscal allocation, and stakeholder engagement.

To address air pollution problem, in cooperation immediate adjacent Port of Los Angeles, POLB initiated San Pedro Bay Ports Clean Air Action Plan (CAAP) in 2006 to reduce operation related air pollution by 45% by 2012 while maintaining growth (Ellis, 2007; GreenPort, 2009b; IAPH, 2007; POLB, 2011e).

The CAAP covers actions of 1) Clean Truck Program (TCP), 2) Clean Flag Program, 3) Shore side electricity, 4) Green lease, 5) Cleaner vehicles, and 6) other clean technology adaptation.

Hiranandani (2012) in his study **summarized aforementioned actions to improve port air quality in more detail**. Clean truck program bans diesel truck older than 1998 from operating in the port. As an incentive, trucking companies can get subsidy to replace their truck fleet with fraction of fee for POLB. The program also subsidized procurement of LNG truck that cost almost twice as high compare to modern clean-diesel truck. Green flag program provide discount and environmental certificate to vessel that approach the port with speed less than 12 knots (22 km/h) within 32 km radius from the harbor. The shore-side electricity (cold-ironing) sytem supplies electric power to container ships, so they can shot down their engine while approaching the harbor. Green lease requires terminal operator to implement cold-ironing, clean fuel use in berth facility, and cargo handling replacement to meet more stringent standard of Environment Protection Agency (EPA). Cleaner vehicle program plan to replace all locomotive, retrofit maintenance equipment, use more biodiesel, use CNG fleet, and developing hybrid tugboat. PLOB also initiated adaptation of other clean technologies such as ultra-low sulfur diesel of construction equipment, intermodal transport system (Hiranandani, 2012).

2.2. Port of Los Angeles

Figure 3 Port of Los Angeles



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