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**ACE Paper 5/2012**  
***For discussion on 19 March 2012***

## **Update of Air Quality Objectives**

### **PURPOSE**

This paper seeks the views of Members on the proposed new Air Quality Objectives (AQOs) and air quality improvement measures for achieving these new objectives.

### **THE PROPOSAL**

2. On 17 January 2012, Government announced that -

- (a) the proposed new AQOs at **Annex A** will be adopted together with the package of air quality improvement measures listed at **Annex B**, drawn up based on the result of the public consultation, which would be implemented subject to resource availability;
- (b) we start the preparatory work for the amendment of the Air Pollution Control Ordinance (Cap. 311) (APCO) with an aim to table the Amendment Bill in the 2012-13 session of the Legislative Council for effecting the proposed new AQOs in 2014;
- (c) a further provision to be included in the Bill to amend the APCO to provide for a time-limited transitional period to the effect that, for a project in respect of which an Environmental Permit (EP) has been issued under the Environmental Impact Assessment Ordinance (Cap. 499) (EIAO) before the coming into operation of the new AQOs, the new AQOs shall not apply to an application

for variation of the EP submitted within 36 months from the commencement date of the new AQOs; and

- (d) for Government projects for which EIA studies have not yet commenced, they should endeavour to adopt the proposed new AQOs as the benchmark for conducting the air quality impact assessment under the EIA studies.

## JUSTIFICATIONS

3. The current AQOs, which were promulgated in 1987 under the APCO, set out the concentration limits of seven key air pollutants <sup>[1]</sup> in the ambient air. In response to the release of the new Air Quality Guidelines (AQGs) by the World Health Organisation (WHO) for global application for protection of public health, the Environmental Protection Department commissioned a consultancy study in 2007 to review Hong Kong's existing AQOs and develop a long-term air quality management strategy. Taking into account WHO's new guidelines and practices in other advanced countries, the review proposed a set of new AQOs which benchmarks against WHO's Interim Targets (ITs) and AQGs, accompanied by a host of proposed air quality improvement measures that are required to help Hong Kong achieve the new objectives. To gauge the public's response to the recommendations, a four-month public consultation was launched from July to November 2009. We reported the consultation findings, which show a general support for the proposed new AQOs, adoption of a staged approach in achieving the WHO's AQGs and implementation of the proposed package of air quality improvement measures to the Environmental Affairs Panel of the Legislative Council in June 2010.

4. Taking account of the views of the community, we consider it appropriate to adopt the proposed AQOs at **Annex A** put forth in the public consultation as the new AQOs for Hong Kong, which are broadly comparable to those being adopted in the EU and US.

## ACHIEVING THE PROPOSED NEW AQOs

5. To attain the proposed new AQOs, the AQOs Review has recommended 19

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<sup>[1]</sup> The seven key air pollutants include sulphur dioxide (SO<sub>2</sub>), nitrogen dioxide (NO<sub>2</sub>), total suspended particulates (TSP), respirable suspended particulates (RSP or PM<sub>10</sub>), carbon monoxide (CO), ozone (O<sub>3</sub>) and lead (Pb).

Phase I air quality improvement measures. These include, inter alia, changing the fuel mix of the power sector in favour of cleaner fuel, early replacement of aged vehicles, wider adoption of hybrid and electric vehicles, transport management measures such as bus route rationalization, setting up low emission zones, expanding the rail network and promotion of energy efficiency, etc. Of these, we have already been pressing ahead with implementation of those measures over which the community has wider consensus. We are in the process of charting the way forward for the remaining measures. Meanwhile, we have also identified additional measures with a view to attaining as soon as practicable the new AQOs. In this connection, we have proposed to reduce emissions from ocean-going vessels and upgrade the quality of marine fuels for local vessels, retrofit Euro II and III franchised buses with selective catalytic reduction devices to reduce their emissions of nitrogen dioxides and introduce a strengthened emission control regime on petrol and liquefied petroleum gas vehicles. A list of these proposed air quality improvement measures together with the progress of their implementation are at **Annex B**.

## **TRANSITIONAL ARRANGEMENT**

6. We need to consider carefully the impact the introduction of the new AQOs might have on projects already granted with an EP before the new AQOs come into operation. In the event that the amendments to the scope of such projects should warrant an application for a variation to the EP to be supported by a new EIA, the application of the new AQOs may cause substantial changes to the original design of the project and have major cost and programming implications. Having considered carefully the need to preserve the integrity of the EIA system as an ongoing mechanism, as well as the regulatory certainty for proponents of projects that have already completed the EIA process, we propose to provide for a time-limited transitional period of 36 months from the commencement date of the new AQOs, within which the new AQOs will not apply to an application for variation of an EP.

## **GOVERNMENT PROJECTS TO BENCHMARK AGAINST NEW AQOs**

7. Although the proposed new AQOs will only become statutory standards when they come into operation, to underscore Government's commitment to adopting the best practices as well as provide greater certainty to works departments in planning new development projects, all Government projects for which EIA studies have not yet

commenced would endeavour to adopt the proposed new AQOs as the benchmark for conducting the air quality impact assessment under the EIA studies.

## **REVIEW MECHANISM**

8. Our long-term goal is to achieve the WHO AQGs. To deliver this target progressively, we will put in place a review mechanism to regularly ascertain the extent to which the new AQOs have been achieved, the progress of the air management strategy, as well as the need and practicality of further tightening the AQOs. The frequency of the review should be no less than every five years to allow reasonable time to assess the impacts of the earlier emission control measures on air quality.

## **PROMULGATION OF NEW AQOs**

9. We will update the air pollutant concentration limits taking into account the guidelines promulgated by WHO and overseas practices for the application of such limits. Adoption of the proposed new AQOs and transitional arrangement require amendments to the APCO. We aim to introduce the Amendment Bill in the 2012-13 session of the Legislative Council. Taking account of the lead time for completing the legislative process and other necessary preparatory works, including formulation of modeling guidelines and compilation of emission inventories, we plan to effect the new AQOs in 2014.

## **IMPLICATIONS OF UPDATING THE AQOs**

### **Enviromnetal Implications**

10. The proposed new AQOs aims to provide better protection of public health against air pollution. Modeling results show that with implementation of the proposed air quality improvement measures at **Annex B**, coupled with the continuous efforts of Guangdong in reducing air pollution, our ambient air quality would broadly comply with the proposed new AQOs.

## Economic Implications

11. The delivery of the proposed new AQOs and the air quality improvement measures would help combat air pollution, thereby improving quality of life, reducing medical cost and indirectly raising labour productivity. The consultant estimates that about 4,200 unnecessary hospital admissions and 7,400 statistical life years would be saved each year (or an improved average life expectancy of around one month for the entire population) upon attainment of the proposed new AQOs<sup>[2]</sup>. Other health benefits, such as less people contracting asthma or other respiratory diseases, would also be expected. In addition, better air quality and visibility would help attract more tourists and foreign investments, and are conducive to attracting talents to stay and work in Hong Kong. All these would contribute to reinforcing our position as a world city and leading international business hub. The proposal would also facilitate further collaborative efforts with Guangdong in improving regional air quality and the development of environmental industry in the region.

12. The impacts of individual proposed air quality improvement measures, which have to be assessed on a case-by-case basis, would be felt differently by different sectors of the economy. In particular, the more stringent standards and requirements to comply with the proposed AQOs would incur implementation costs for various businesses and raise their operating costs. Moreover, the proposed AQOs would raise the standards required for obtaining the EIA approval for infrastructural projects, which may lead to higher mitigation costs in order to comply with the standards. The consultant nevertheless advises that, for indicative purpose, the annualized cost incurred by the public for implementing the proposed Phase I air quality improvement measures would be about HK\$ 596 million<sup>[3]</sup>. This is, however, significantly lower than the anticipated benefit of HK\$ 1,228 million per year due to the improvement of public health<sup>[3]</sup>.

13. Moreover, the proposed measures may have more significant impact on certain sectors of the economy, such as the power and transport sectors, than the others. The

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<sup>[2]</sup> It should, however, be noted that these public health benefits are by no means definitive as the assessment is subject to different assumptions being used.

<sup>[3]</sup> The costs include the incidental capital and operational costs on the entire community as a consequence of implementing the measures. For those measures involving accelerated replacement of assets, only the residual values of the assets but not the entire cost of replacement would be included because the proposal has merely advanced their replacement.

increase in electricity tariff arising from changing fuel mix to reduce emission would add burden to household's cost of living and increase the business cost for firms. Sectors with low profit margin and those which are heavy users of electricity, such as hotel and food services, would be more significantly affected. In the AQOs Review, it has estimated that the proposal for increasing the share of natural gas to 50% of our domestic electricity generation would raise the electricity tariff by at least 20%.

## **WAY FORWARD**

14. We will take into account Members' views in preparing the Amendment Bill for effecting the proposal for updating the AQOs. Meanwhile, we would continue our efforts to implement the host of air quality improvement measures for attaining the new AQOs.

## **ADVICE SOUGHT**

15. Members are invited to comment on the proposal for updating the AQOs as set out in paragraph 2.

**Environment Bureau/Environmental Protection Department**  
**March 2012**

### Proposed New AQOs for Hong Kong

Pollutants	Avg. Time	Existing AQOs		Proposed AQOs				
		( $\mu\text{g}/\text{m}^3$ )	No of Exceed-ances Allowed	WHO IT-1 <sup>[3]</sup> ( $\mu\text{g}/\text{m}^3$ )	WHO IT-2 <sup>[3]</sup> ( $\mu\text{g}/\text{m}^3$ )	WHO IT-3 <sup>[3]</sup> ( $\mu\text{g}/\text{m}^3$ )	WHO AQG ( $\mu\text{g}/\text{m}^3$ )	No of Exceed-ances Allowed
Sulphur Dioxide	10-min	--	--	-	-	-	<b>500</b>	3
	24-hr	350	1	<b>125</b>	50	-	20	3
Respirable Suspended Particulates (PM10)	24-hr	180	1	150	<b>100</b>	75	50	9
	Annual	55	NA	70	<b>50</b>	30	20	NA
Fine Suspended Particulates (PM2.5)	24-hr	--	--	<b>75</b>	50	37.5	25	9
	Annual	--	--	<b>35</b>	25	15	10	NA
Nitrogen Dioxide	1-hr	300	3	-	-	-	<b>200</b>	18
	Annual	80	NA	-	-	-	<b>40</b>	NA
Ozone	8-hr	240 <sup>[1]</sup>	3	<b>160</b>	-	-	100	9
Carbon Monoxide	1-hr	30,000	3	-	-	-	<b>30,000</b>	0
	8-hr	10,000	1	-	-	-	<b>10,000</b>	0
Lead	Annual	1.5 <sup>[2]</sup>	NA	-	-	-	<b>0.5</b>	NA

 Proposed new AQOs

<sup>[1]</sup> There is no existing 8-hour AQO for ozone in Hong Kong. The figure presented above is the 1-hour AQO.

<sup>[2]</sup> There is no annual AQO for lead in Hong Kong. The figure presented above is the 3-month AQO.

<sup>[3]</sup> The WHO accepts the need for governments to set national standards according to their own particular circumstances. The WHO guidelines therefore also suggest ITs on SO<sub>2</sub>, PM<sub>10</sub>, PM<sub>2.5</sub> and O<sub>3</sub> to facilitate a progressive approach for achieving the ultimate AQGs and provide milestones in achieving better air quality.

## **Air Quality Improvement Measures**

### **(A) Phase I Measures Recommended under the AQOs Review – Progress Report**

#### **1. Emission Capping and Control**

- (i) Increasing the ratio of natural gas in local electricity generation to 50% with additional emission abatement measures

*Progress: We have tightened the statutory emission caps on the power plants with effect from 2015. To comply with the emission caps, by 2015 the power sector will have to maximize the use of gas-fired generation equipment, thereby raising the ratio of natural gas in local electricity generation to 50%, and prioritize the use of coal-fired generation plants equipped with advanced emission control devices.*

- (ii) Early retirement of aged / heavily polluting vehicles

*Progress: We completed a subsidy scheme in March 2010 to encourage the early replacement of pre-Euro and Euro I diesel commercial vehicles. Under the scheme, 17,000 vehicles were replaced with the aid of the grant, representing about 30% of all eligible vehicles at the commencement of the scheme. Together with those vehicles which were replaced without joining the scheme or deregistered after expiry of the scheme, a total of about 33,000 pre-Euro and Euro I diesel commercial vehicles were de-registered (i.e. about 48% reduction) as at December 2011. There remain 18,300 pre-Euro and 12,900 Euro I vehicles still running on the road.*

*We launched another subsidy scheme for Euro II diesel commercial vehicles in July 2010. As at end January 2012, about 10% of the owners of Euro II commercial vehicles took up the incentive for replacing their aged vehicles. As in the case of pre-Euro II diesel commercial vehicles, we expect that a considerable number of Euro II diesel commercial vehicles will remain in operation after the expiry of the subsidy scheme.*

*As at end December 2011, 70% of commercial vehicles were pre-Euro III (i.e., of service life of 5 years or more). We would explore additional measures to expedite their replacement.*



- (iii) Earlier replacement of Euro III commercial diesel vehicles with models meeting latest Euro standards

*Progress: The oldest batch of Euro III vehicles will be more than 10 years old by 2012. We will consider the case for introducing suitable measures to accelerate their replacement.*

- (iv) Wider use of hybrid / electric vehicles or other environment-friendly vehicles with similar performance

*Progress: Government has launched incentive schemes through First Registration Tax (FRT) concession to encourage the use of electric vehicles (EVs), environment-friendly petrol private cars (including hybrid private cars) and environment-friendly commercial vehicles.*

*In respect of EVs, we have also been expanding the network of charging facilities and working closely with the manufacturers and dealers to encourage them to bring in their EVs into Hong Kong. As at end-November 2011, there are about 230 EVs in Hong Kong. By comparison, there were only 16 units of EVs by end 2009 and 74 by end 2010. We have also more than 330 standard charging facilities all over the territory, which are expected to increase to about 1,000 by mid-2012.*

*There are currently 34 hybrid vehicle models available on the local market.*

*Up to end February 2012, we have received 31,056 applications for environment-friendly petrol private cars (which represent 17% of all private petrol cars newly registered from April 2007) and 6,705 applications for environment-friendly commercial vehicles (which represent 32% of all commercial vehicles newly registered from April 2008)). In the six months to the end of February 2012, the number of newly registered Euro V commercial vehicles, which is currently the qualifying standards for environment-friendly commercial vehicles, represented about 49% of the newly registered vehicles in the corresponding vehicle classes.*

*As for franchised buses, CE has announced in the 2010-11 Policy Address the ultimate policy objective of having zero emission buses running across the territory. When the current bus franchises expire in the coming few years, we will impose additional requirements in the franchises for the bus companies to switch to zero emission buses or the most*

*environment-friendly buses when replacing existing ones, taking into account the feasibility and affordability for bus operators and passengers. To this end, Government has sought funding for franchised bus companies to procure six hybrid buses for trial along busy corridors. Allowing sufficient time for their delivery, we expect that the trial can start in 2013.*

*In the 2011-12 Policy Address, CE further proposed to fund the franchised bus companies to purchase 36 electric buses for trial to assess their performance in different conditions. We are discussing with the franchised bus companies on details of the trial.*

*In addition, Government has also set up since March 2011 the \$300 million Pilot Green Transport Fund to encourage the transport sector to test out green and low-carbon transport technology (including hybrid/electric vehicles). Up to end January 2012, 40 applications have been received, which cover trials of electric buses, electric and hybrid goods vehicles, and after-treatment emission reduction device. Of these, 24 applications (amounting to a total subsidy of almost \$61 million) have been approved and the rest are being vetted.*

- (v) 0.1% sulphur diesel for local vessels subject to confirmation of technical feasibility

*Progress: We completed a trial of local ferries using ULSD (i.e., diesel with a maximum sulphur content of 0.005%) in August 2010. The trial confirmed the technical feasibility of ULSD as fuel for local ferries but the increase in fuel cost of about \$0.9/litre, largely as a result of the extra handling cost of providing ULSD to a very small number of local ferries, could be a major obstacle. To reduce the cost implications and achieve greater environmental benefits, we have revised the proposal and are seeking the views and comments of the trades and relevant stakeholder to reduce across the board the sulphur content of marine light diesel sold in Hong Kong from the current maximum limit of 0.5% to 0.1% subject to confirmation of technical feasibility. Separately, a non-recurrent funding of \$37.2 million has been allocated to EPD to conduct a trial of local vessels using 0.1% sulphur diesel fuel for a maximum of 30 local vessels.*

- (vi) Government vessels adopt feasible measures to reduce nitrogen oxides emissions

*Progress: Upon further evaluation, we have found that it would be more cost-effective to replace the existing engines with new ones that comply with the more stringent emission limits for achieving similar or better emission reduction, particularly in respect of NOx. To ascertain the technical feasibility and better understand the technical implications, we are working on a trial to replace the existing engines of a few government vessels.*

(vii) Electrification of aviation ground support equipment (GSE)

*Progress: There are currently about 270 units of GSEs running on electricity at the Hong Kong International Airport. To facilitate the use of electric GSEs and vehicles in the coming years, the Airport Authority has installed additional electric charging stations and put in place new vehicle purchase policy which favours the use of electric vehicles. The speed of GSE replacement would however depend on factors such as the availability of electric alternatives, age and maintenance conditions of the GSE fleet, the financial position of operators and the business outlook.*

(viii) Emission control for off-road vehicles / equipment

*Progress: We have completed the stakeholder consultation on our revised control proposal and are preparing the necessary legislative amendments with a view to effecting the proposed control regime towards end 2013.*

(ix) Strengthening volatile organic compounds (VOC) control

*Progress: Legislation on tightened control enacted. The new statutory VOC content requirements of 14 types of vehicle refinishing paint, 36 types of vessel paint and pleasure craft paint and 47 types of adhesives and sealants has been implemented in phases with effect from 1 January 2010. The last phase will come into operation on 1 April 2012.*

## **2. Traffic Related Measures**

(x) Low emission zones

*Progress: We have identified three locations for establishing pilot low emission zones (LEZ) at the busy corridors in Causeway Bay, Central and Mong Kok. Starting from 2011, the franchised*

*bus companies have accorded priority to the deployment of low-emission buses (i.e. those meeting the emission level of a Euro IV or above bus) to routes serving the pilot LEZs as far as possible. Our target is to have only low-emission buses in these zones by 2015. The experience to be gained in designating pilot LEZs would provide useful reference for us to consider possible extension of the restriction to other vehicle types or busy areas and the appropriate mechanism.*

(xi) Car-free zone / pedestrianisation scheme

*Progress: As at December 2011, there are seven full-time pedestrian streets, 30 part-time pedestrian streets and over 40 traffic calming streets in Hong Kong. The introduction of further pedestrian streets is however becoming increasingly difficult due to limited road space against competing needs and street management considerations. Our initial consultations with District Councils show that they are not supportive of expanding the current pedestrianisation scheme. Some District Council members, however, are receptive to the option of adjusting the operation hours of the existing pedestrian streets to maximize the benefits of the scheme. Further engagement with District Councils is needed.*

(xii) Bus route rationalization

*Progress: It is an on-going plan of TD to review the route development programmes (RDPs) of franchised bus operators each year and rationalization is one of the major areas that needs to be tackled in consultation with the affected District Councils while balancing the public demand for bus services and the need to improve road traffic and the environment. The Government will continue to work with the District Councils and the franchised bus companies to pursue bus route rationalization so as to reduce the number of bus trips and bus stopping particularly on busy corridors.*

### **3. Infrastructure Development and Planning**

(xiii) Expand rail network

*Progress: Construction works have commenced for West Island Line, Hong Kong section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link, South Island Line (East) and Kwun Tong Line Extension. The planning and design of Shatin to Central Link is at the final stage, with a view to commencing*

*construction in the second half of 2012.*

(xiv) Develop cycle tracks in new development areas

*Progress: EPD's consultant recommends that a well-planned cycling track can serve not only the recreational purpose but also to connect to the public transport hub as well. The proposed measure is intended for new development areas.*

*The Government's long standing policy is to promote the use of public transport system as the main transport mode and to encourage the public to make use of the highly efficient mass transit transport systems and other public transport services. Due to safety considerations, the Government does not encourage the public to use bicycle as a transport mode in urban areas. Compared with urban areas, new towns in the New Territories or new development areas, where traffic density is relatively low, have better conditions for using bicycle for short-distance travel. If situation permits and subject to resource availability, we will provide cycle tracks and ancillary facilities in new towns and new development areas to enable the public to cycle safely for recreational purposes and short distance travel. CEDD is taking forward the development of a cycle track network in the New Territories by phased interconnection of the cycle tracks in various new towns between Ma On Shan, Sheung Shui, Yuen Long, Tuen Mun and Tsuen Wan. It is expected that the Sheung Shui – Ma On Shan section will be completed in 2013 onwards. Subject to Finance Committee's funding approval, CEDD will also commence detailed design and site investigation works for the proposed cycle track between Tsuen Wan and Ting Kau. For existing cycling facilities in new towns, TD commissioned a Consultant in May 2010 to carry out a study to examine measures to improve the existing cycle track networks and bicycle parking facilities. The study is expected to be completed by mid 2012.*

#### **4. Energy Efficiency Measures**

(xv) Mandatory implementation of the Building Energy Codes

*Progress: The Buildings Energy Efficiency Ordinance was enacted and shall take full effect on 21 September 2012. We would continue to keep under review technological developments and tighten the efficiency standards where appropriate.*

(xvi) Energy efficiency standards for domestic electrical appliances

*Progress: The Energy Efficiency (Labelling of Products) Ordinance has been implemented to cover compact fluorescent bulbs, air-conditioning units, refrigerators, dehumidifiers and washing machines. We would continue to keep under review the scope of the products under the Ordinance.*

(xvii) Light-emitting diode (LED) or equivalent alternatives for traffic signal / street lighting

*Progress: Replacement of all conventional traffic signal at 1,800 road junctions with LED light is underway and the works are expected to be completed by end 2012. Trial schemes of LED street lights for minor roads and light tubes at roadside and on footbridges are in progress to assess their cost/benefit and suitability in Hong Kong's outdoor environment. Their performance and cost-effectiveness will be reviewed after completion of the trial in 2012.*

(xviii) Tree planting / roof-top greening

*Progress: Government has all along been promoting new greening technologies such as skyrise greening (roof greening and vertical greening) for government premises. DevB will continue to formulate and promulgate standards, guidelines and best practices related to greening, landscape planning and design and tree management; and carry out public education and community involvement activities to enhance public awareness of greening, landscape and tree management issues.*

(xix) District cooling system for Kai Tak Development

*Progress: Construction works are underway for Phases I and II of the district cooling system for Kai Tak Development, which are expected to begin testing and commissioning from October 2012 onwards. Phase III of the district cooling system will be subject to the progress and development programme of the Kai Tak Development.*

**(B) Other Measures Identified outside the AQOs Review**

Taking advantage of the latest technological developments and to meet the public's aspiration for early improvement to the air quality, we have put forth the following additional air quality improvement measures-

- (i) Retrofit Euro II and III franchised buses with selective catalytic reduction (SCR) devices to reduce their NOx emissions

*Progress: Government and franchised bus companies commenced a trial in September 2011 to retrofit Euro II and III buses with SCR to reduce their nitrogen oxides emissions. Together with the diesel particulate filters already installed on the buses, this could upgrade the emission performance of the buses to the level of a Euro IV or above bus. We will review the initial trial results six months after the trial to assess the feasibility of the retrofit. Subject to satisfactory trial results, Government will fully fund the retrofit of the devices on Euro II and III buses.*

- (ii) Introduce a more stringent regime to control emissions from LPG and petrol vehicles through remote sensing equipment and dynamometer tests

*Progress: We completed the stakeholder consultation about our proposal in January 2012 and reported the consultation findings to LegCo in J 2012 with a view to implementing the proposed control regime towards mid 2013. In parallel, we are drawing up the arrangements for providing a one-off subsidy to owners of LPG taxis and light buses for replacing the catalytic converters in their vehicles to improve their emission performance.*

- (iii) Reduce emissions from the marine sector by adopting cleaner fuels for local vessels, requiring ocean-going vessels (OGV) to switch to cleaner fuels while berthing at PRD ports and setting up an Emission Control Area (ECA) in PRD waters over the longer term.

*Progress: We are discussing the proposals with the governments of Guangdong, Shenzhen and Macao. A Special Panel will be established under the Hong Kong-Guangdong Joint Working Group on Sustainable Development and Environmental Protection to draw up recommendations on the best way to take forward the proposed fuel switch at berth and setting up of an ECA in PRD waters. We are also consulting the local marine sector for conducting a demonstration trial on using light marine diesel with sulphur content of 0.1% by local vessels.*