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Legislative Council

Panel on Environmental Affairs

Report of the Subcommittee on Issues Relating to Air, Noise and Light Pollution

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Purpose

1. This paper reports on the deliberations of the Subcommittee on Issues Relating to Air, Noise and Light Pollution ("the Subcommittee") formed under the Panel on Environmental Affairs ("the Panel").

Background

2. Problems of air pollution and noise pollution have all along been of wide public concern in Hong Kong. In recent years, there has also been increased public awareness about the impact of external lighting, as reflected by the increasing number of complaints against light nuisance from advertisement signboards, decorative lightings, and spot lights on the external wall of buildings.

The Subcommittee

3. Given the public concern and the significant impact of air, noise and light pollution on public health, the Panel decided at its meeting on 26 November 2012 to appoint a subcommittee to study issues relating to air, noise and light pollution for better protection of public health. The Panel also agreed that the Subcommittee would focus its work on the following major areas –

- (a) examining and reviewing the Government's initiatives to address the air pollution problem, including measures to control emissions from motor vehicles, power plants, and local industrial and commercial processes, progress of the joint efforts with the Guangdong Provincial Authorities to tackle the regional air pollution problem, and implementation of the new Air Quality Objectives ("AQOs");
- (b) examining and reviewing the Government's initiatives to address the noise pollution problem, with particular focus on traffic noise from existing roads and railway and the related traffic noise abatement measures;
- (c) examining and reviewing the Government's initiatives to address public concern on light pollution, including the progress made in developing the technical standards and related parameters to tackle nuisance caused by and energy wastage of external lighting installations;

- (d) examining the possible impacts of air, noise and light pollution on public health; and
- (e) making recommendations on improvement measures for consideration of the Administration as and when necessary.

4. The terms of reference and membership of the Subcommittee are set out in **Appendices I and II** respectively. Pursuant to Rule 26(c) of the House Rules, the House Committee's approval was obtained on 15 November 2013 for the Subcommittee to continue its work until 11 March 2014.

5. Under the chairmanship of Hon Cyd HO Sau-lan, the Subcommittee held a total of 10 meetings. At three of the meetings, academics from The Chinese University of Hong Kong ("CUHK"), The University of Hong Kong ("HKU"), the City University of Hong Kong ("CityU") and The Hong Kong University of Science and Technology ("HKUST") were invited to share their expert views on the impacts of air, noise and light pollution on the health of Hong Kong people, and on air quality modelling in Hong Kong. A list of the academics who have attended the Subcommittee's meetings is in **Appendix III**.

Deliberations of the Subcommittee

6. The Subcommittee has studied the following major issues and the respective meeting dates are in **Appendix IV** –

- (a) impacts of air, noise and light pollution on public health and the associated medical costs;
- (b) air pollution control and the associated public expenditure;
- (c) the cost-benefit analysis of the measures to improve air quality;
- (d) air quality assessments under the environmental impact assessment ("EIA") mechanism;
- (e) noise pollution control and the associated public expenditure; and
- (f) light pollution control and the associated public expenditure.

7. Details of the Subcommittee's deliberations and recommendations are set out in the ensuing paragraphs.

Air pollution and public health

8. Air pollution is one of the major problems in Hong Kong. According to the World Health Organization, air pollution poses health risks to humans, causing respiratory and heart diseases and lung cancer. These adverse health effects will increase medical costs, lower workforce's productivity and undermine people's quality of life. Good air quality management is therefore essential for safeguarding and promoting people's well being.

9. In view of the significance of air quality management on public health, the Subcommittee has examined and reviewed the current legislation and administrative measures on the control of air pollution, in particular the effectiveness of different air improvement measures implemented by the Administration. To assist members in our deliberation, apart from meeting with the Administration, the Subcommittee has invited academics who are experts in the respective areas of our study to attend the relevant meetings and share their views with members.

Impacts of air pollution on public health and the associated medical costs

Current situation

10. At present, Hong Kong faces two major air pollution problems, namely the local street-level pollution problem and the regional smog problem. Air pollution at the street level is mainly caused by emissions from motor vehicles, especially aged diesel commercial vehicles ("DCVs"). Smog is caused by a combination of pollutants from motor vehicles, marine vessels, power plants and non-road mobile machinery in Hong Kong and emissions in the Pearl River Delta ("PRD") region. Smog can irritate human eyes, noses and throats, and affect heart and respiratory systems. It also impairs visibility.

11. The Administration acknowledges that air pollution has both short-term and long-term adverse health effects, particularly on the respiratory and cardiovascular systems. In view of the growing public concern over the worsening air pollution in Hong Kong and its adverse impacts on public health, the Subcommittee has enquired about the relationship between air pollutants and people's health problems, as well as the medical costs associated with air pollution.

12. In response, the Administration has provided the major health effects of common air pollutants (in **Appendix V**) to the Subcommittee and advised that –

- (a) it has since 1997 started engaging local academics and consultants to study the health impacts and costs associated with air pollution based on local data on air quality, hospital admission and mortality;
- (b) according to the study completed in 2002 by a team led by HKU, the economic losses (including consultation and hospitalization fees and productivity loss incurred) caused by respiratory and cardiovascular diseases possibly related to air pollution could reach \$1.7 billion each year, estimated on the basis of the air quality and population data of year 2000;
- (c) the study in 2002 estimated that air pollution could attribute to about 800 premature deaths owing to respiratory and cardiovascular diseases, and approximately 8 000 hospital admissions a year; and
- (d) the consultant engaged by the Environmental Protection Department ("EPD") to review AQOs in 2007 estimated 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 new AQOs. Other health benefits, such as less people contracting asthma or other respiratory diseases, would also be expected.

13. According to the Administration, the review team for developing the health-risk based Air Quality Health Index found that –

- (a) the risks of emergency hospital admissions for respiratory and cardiovascular diseases would increase by 0.45%, 0.51%, 0.28% and 0.14% for every 10 ug/m³ increase in the concentrations of nitrogen dioxide ("NO₂"), ozone, respirable suspended particulates ("RSP"), and sulphur dioxide ("SO₂") respectively for the general population; and
- (b) the health risk would be increased by about 1.14 times for the susceptible sub-population, i.e. those aged 65 and above and children under five years of age.

14. The Administration has also advised that to further understand the implications of air pollution on hospital admissions, mortality and the associated cost, it will have to identify, in consultation with the relevant bureaux and departments ("B/Ds") including the Department of Health as well as experts in the field, the knowledge gaps and how best they could be filled.

Expert views

15. To obtain a better understanding of the health effects of air pollution, the Subcommittee has invited Professor WONG Tsz-wai of CUHK and Professor Anthony Johnson HEDLEY and Dr LAI Hak-kan of HKU to give a presentation on their latest findings in the field. Professor WONG Tsz-wai briefed the Subcommittee on the findings of his study on the impacts of air pollution and environmental noise on public health and Professor HEDLEY gave a presentation on "Adverse health, effects of the urban Hong Kong environment – Protection of child and adult health from noise, nocturnal light and air pollution". Dr LAI Hak-kan also briefed the Subcommittee on the Hedley Environmental Index, which monitors and publishes in real time on the internet the economic cost of air pollution in terms of public health impacts (doctor visits, hospital admissions and deaths) and provides a monetized value of the lost productivity and health care costs and loss of lives to the whole community.

16. The Subcommittee has been advised that in 2012, based on the Hedley Environmental Index, the bad health outcomes and economic loss attributable to air pollution included: (a) Deaths: 3 069; (b) Hospital admissions: 151 300; (c) Doctor visits: \$7.167 million; and (d) Direct, indirect and intangible costs: \$39.4 billion.

Subcommittee's concerns

17. The Subcommittee is concerned about the significant economic losses caused by air pollution as revealed by the Hedley Environmental Index. They have enquired about the way forward to eradicate air pollution problems and whether a safe level of various air pollutants can be set.

18. The Administration has advised that –

- (a) as there is little evidence to suggest a threshold level of an air pollutant below which no adverse health effects would be

anticipated, it cannot recommend a safe level of pollutants in the air;
and

- (b) a cost-benefit analysis of improving air quality is required to help to make decisions on the way forward as there will be more and more debates about how the costs of implementing pollution reduction measures are to be shared in the community.

19. Given the public concern about the cost implications of pollution control, the Subcommittee considers that the Administration should –

- (a) engage experts and academics to undertake research to enhance community awareness of the benefits of environmental protection and to enlist public support for anti-pollution policies in the long run; and
- (b) include economic losses, such as decrease in foreign investments in the calculation of the costs of air pollution in Hong Kong.

20. Some other members are concerned about the Administration's funding support for research on the impacts of pollution. In response to the members' enquiry, Professor HEDLEY has urged the Administration to allocate adequate resources to local academics for conducting research to assist in the formulation of environmental policies and to adopt a new funding mechanism to support research in this respect. Professor WONG Tze-wai has expressed dissatisfaction that a significant portion of the funding of the Research Grants Council was granted to basic research and requested the Administration to strike a balance between basic and applied researches in funding allocation. In this connection, members consider that sufficient funding should be earmarked by the Central Policy Unit and various B/Ds, particularly the Environment Bureau ("ENB"), for local higher education institutions and other organizations to conduct applied research studies to assist the Administration in formulating environmental policies and initiatives.

21. Some members consider that pollution problems touch upon different policy areas and require cross-B/Ds efforts to tackle. However, there is at present a lack of coordinated efforts among different B/Ds in taking forward environmental and anti-pollution initiatives. They have urged the Administration to designate ENB and if necessary, to set up a higher level authority, to spearhead cross-B/Ds efforts in this respect with focus on the protection of public health.

Subcommittee's recommendations

22. In view of the foregoing, the Subcommittee recommends that the Administration should –

- (a) expeditiously engage experts and academics to undertake research to enhance community awareness of the benefits of environmental protection and to enlist public support for anti-pollution policies in the long run;
- (b) take into account other economic losses, such as decrease in foreign investment, in the calculation of the costs of air pollution in Hong Kong;
- (c) ensure that the Central Policy Unit and various B/Ds, particularly ENB, earmark sufficient funding for local higher education institutions and other organizations to conduct applied research studies to assist the Administration in formulating environmental policies and initiatives; and
- (d) designate ENB and if necessary, set up a higher level authority to spearhead cross-B/Ds efforts in taking forward environmental and anti-pollution and initiatives with focus on the protection of public health.

Air pollution control and the associated public expenditure

23. The Subcommittee notes that the Government has been implementing a wide range of measures through legislative and administrative means to improve ambient and roadside air quality. The Air Pollution Control Ordinance (Cap. 311) ("APCO") is the principal legislation for managing Hong Kong's air quality. It controls air pollution from power plants, motor vehicles, factories, polluting processes and products, asbestos, construction sites and other sources. There are also provisions in the Road Traffic Ordinance (Cap. 374), the Shipping and Port Control Ordinance (Cap. 313) and the Merchant Shipping (Local Vessels) Ordinance (Cap. 548) that tackle pollution from vehicles and vessels.

24. According to the Administration, the expenditure incurred by EPD in financial year 2011-2012 on air programme was about \$566 million, accounting for about 23% of the total expenditure of EPD. Besides providing expenditures on various air programmes, it has also funded various air quality improvement initiatives through revenue forgone and compliance by stakeholders concerned

(e.g. tax incentive for environment-friendly petrol private cars and commercial vehicles, and fuel duty foregone for supporting the use of Euro V diesel with virtually no sulphur content).

25. The Administration has stressed that the public expenditure reflects only a fraction of the total expenditures to clean up the air of Hong Kong. Most of the emission reduction efforts are made through the mandatory control programmes, e.g. the imposition of stringent emission caps on power sector, implementing various energy saving measures to reduce electricity demands, upgrading the emission limits on vehicles, tightening the fuel sulphur content of commercial/industrial diesel fuel, prohibition of the import and manufacture of commercial and consumers products with excessive volatile organic compounds contents.

Emissions from vessels

Current situation

26. According to the International Maritime Organization ("IMO"), air pollution from vessels is substantial and growing, causing serious and increasing public health and environmental impacts. Vessels are currently the largest local air pollution sources in Hong Kong. In 2011, emissions from vessels accounted for 54% of SO₂, 33% of nitrogen oxides ("NO_x") and 39% of RSP of the total emissions in Hong Kong.

27. The emissions of ocean-going vessels ("OGVs") while at berth account for about 40% of their total emissions within Hong Kong waters. OGVs are the Administration's primary targets as they are powered by heavy fuel oil with an average sulphur content of 2.8%, i.e. 2 800 times of that of motor diesel. Requiring OGVs to switch to cleaner fuel while at berth can improve the air quality around the port area.

28. The Subcommittee also notes that the first berth of the Kai Tak Cruise Terminal ("KTCT") has commenced operation in June 2013. Since marine vessels have become the largest source of local air pollution and KTCT is located near Kowloon Central, emissions from OGVs while berthing at KTCT will have negative impact on the health of the residents in the vicinity. To reduce emissions from vessels and improve air quality in the coastal areas, the Administration will install on-shore power ("OSP") facilities at KTCT to enable OGVs with such facilities to switch to electric power and virtually cut all

emissions while berthing. Space has been reserved for the installation of OSP supply system at KTCT.

Subcommittee's concerns

29. Given that the emissions of OGVs pose great health risk to the public, members are generally concerned about –

- (a) the low participation rate of the incentive scheme implemented by the Administration in September 2012 to encourage the use of cleaner fuels by OGVs at berth in Hong Kong waters by reducing half of their port facilities and light dues; and
- (b) the timetable for mandating the fuel switch for OGVs at berth in Hong Kong waters.

30. The Administration has advised that a number of leading shipping companies have signed up to the voluntary Fair Winds Charter¹, and committed themselves to switching to low sulphur fuel when at berth in Hong Kong. It is technically feasible for major ship liners to switch their OGVs to cleaner fuels when at berth in Hong Kong waters as their OGVs are operating in overseas Emission Control Areas ("ECAs") where even tighter emission control is in place. However, OGVs of small shipping companies may not be equipped for fuel switch at berth. The Administration is consulting the shipping sector in this respect.

31. Noting that the territory emissions of SO₂ and NO_x will be reduced by 14% and 0.2% respectively based on the emission levels in 2011 if all OGVs switch to low sulphur fuel while at berth in Hong Kong waters, members urge the Administration to expedite its consultation with the shipping sector with a view to implementing the requirement early. In response to the Subcommittee's request, the Administration reported to the Panel on 22 July 2013 on its proposal to introduce legislation to mandate all OGVs to use cleaner fuel while at berth in Hong Kong waters, together with the consultation outcome. The Subcommittee notes the Administration's aim to implement the new requirement from 1 January 2015.

¹ The Fair Winds Charter is an industry-led, voluntary, at-berth fuel switching initiative for OGVs calling at Hong Kong. It is the first initiative of its kind in Asia, and the only shipping-industry led fuel switching initiative in the world. Participating vessels switch to low sulphur fuel (i.e. 0.5% sulphur content or less) while at berth in Hong Kong.

32. Some other members are concerned about the Administration's effort in promoting the use of cleaner fuel in Hong Kong. They have therefore enquired whether the Administration would implement any short-term initiatives to encourage OGV operators to use cleaner fuel, such as biodiesel, before the implementation of the mandatory at-berth fuel switch. The Administration has advised that –

- (a) it would lower the sulphur limit of locally supplied marine light diesel, i.e. light diesel oil used by marine vessels, from the existing nominal value of 0.5% to 0.05%;
- (b) subject to the satisfactory outcomes of the trial being conducted with the marine sector on the use of 0.05% sulphur diesel, legislative proposals would be submitted to the Legislative Council ("LegCo"); and
- (c) in examining whether biodiesel can be used by local vessels, marine safety will be the prime consideration, given the busy traffic in Hong Kong waters.

33. In the above connection, the Subcommittee notes that the Air Pollution Control (Marine Light Diesel) Regulation has been gazetted on 17 January 2014 and tabled in LegCo for negative vetting on 22 January 2014. The Regulation aims to introduce regulatory control on the quality of marine light diesel which includes imposing a cap on its sulphur content in order to reduce emissions from vessels. The subcommittee which was formed to examine the Regulation has completed the scrutiny of the Regulation and will not propose any amendment to it. The Regulation will take effect on 1 April 2014.

34. Some members have asked about the feasibility of requiring all OGVs to switch to cleaner fuels when they enter Hong Kong waters, instead of at berth. The Administration has explained that –

- (a) as Hong Kong and the PRD region share the same air shed, implementing the proposal by Hong Kong unilaterally will not help to improve the ambient air quality of Hong Kong significantly. Instead, setting up an ECA in PRD waters to require OGVs to use cleaner fuels once they enter the region would be more conducive to improving air quality continuously;
- (b) to pursue the designation of an ECA within PRD waters, the agreement of the Central People's Government to submit a proposal to IMO will have to be sought in the first place and the application

to IMO has to be supported by scientific evidence demonstrating the need to prevent, reduce, and control emissions of NO_x or sulphur oxides or particulate matter or all three types of emissions from ships; and

- (c) given the enormity and technical complexity of the task, it has set the designation of PRD waters as an ECA to be its long-term goal. Its current priority is to pursue mandating OGVs to switch to cleaner fuel when berthing in Hong Kong ports while discussion is being held in parallel with the relevant Mainland authorities on taking the same approach in PRD ports for even higher emission reduction benefits.

35. As regards the installation of OSP facilities at KTCT, many members are concerned that since the installation of OSP facilities has not yet commenced, considerable quantities of pollutants emitted by OGVs while berthing at KTCT could be easily transmitted to Kowloon Central, thus posing a health threat to the public. Besides, neighbouring districts in Kowloon East such as Wong Tai Sin and Kwun Tong are also vulnerable to marine emissions.

36. The Administration has responded that –

- (a) there is already reserved space in KTCT for OSP facilities so that vessels equipped with the necessary devices can connect to the grid when at berth once the facilities are installed;
- (b) the Electrical and Mechanical Services Department will carry out a study to formulate an implementation strategy on the installation and operation of OSP facilities having regard to the relevant international standards and the management arrangements of KTCT; and
- (c) upon completion of the study, it would seek funding from the Finance Committee ("FC") for the installation works.

37. Given the health risk posed by OGVs berthing at KTCT, members have requested the Administration to expedite the supply of OSP at KTCT. The Administration should also take other measures, such as promoting the switching-off of idling engines and taking forward the rationalization of bus routes, to prevent deterioration of the air quality in the neighbouring districts of KTCT pending the commissioning of OSP facilities, so as to protect public health.

38. Some members have also requested the Administration to install OSP facilities at other existing cruise terminals, apart from KTCT. As advised by the Administration, it has requested the operator of the Ocean Terminal to examine the feasibility of providing OSP facilities at its terminal and its feedback is awaited.

Subcommittee's recommendations

39. In view of the foregoing, the Subcommittee recommends that the Administration should –

- (a) submit the legislative proposal to mandate all OGVs to use cleaner fuel while at berth in Hong Kong waters to LegCo as soon as possible to ensure that the new requirement will be implemented from 1 January 2015;
- (b) accord a higher priority to pursuing with the Central People's Government and other relevant authorities the designation of an ECA within PRD waters with a view to improving PRD regional air quality, and update the Panel on the progress made in due course;
- (c) expedite the installation of OSP facilities at KTCT and take other measures, such as promoting the switching-off of idling engines and taking forward the rationalization of bus routes, to prevent deterioration of the air quality in the neighbouring districts of KTCT pending the commissioning of OSP facilities, so as to protect public health; and
- (d) proactively explore the installation of OSP facilities at other existing cruise terminals apart from KTCT, including the Ocean Terminal.

Emissions from vehicles

Current situation

40. The Subcommittee notes that vehicles contributed 28% of NO_x and 16% of RSP of the total emissions in Hong Kong in 2011. Due to their proximity to receptors, vehicles pose greater air pollution impacts that threaten public health. As advised by the Administration, it has been implementing stringent control measures under APCO and the Road Traffic Ordinance (Cap. 374), which

include tightening the vehicle emission standards, controlling smoky vehicles, adopting higher vehicle fuel standards, banning idling engines, reducing emissions from franchised buses, encouraging green transportation technologies, offering incentives for replacement of old vehicles and use of environment-friendly ones, strengthening emission control on petrol and liquefied petroleum gas ("LPG") vehicles, and rationalizing bus routes.

41. As a very large number of people are exposed to vehicular pollution on a daily basis, roadside air pollution has posed the greatest public health risk in Hong Kong when compared with other emission sources, such as vessels and power plants. The Administration has admitted that roadside emissions are the major threat to public health because of their proximity and high population exposure. Hence, a three-pronged strategy targeting emissions from different types of vehicles in operation, including franchised buses, LPG taxis and light buses with dysfunctional catalytic converters, and DCVs, has been adopted to improve roadside air quality. It is expected that this would reduce the annual roadside level of NO₂ by about 40%.

Subcommittee's concerns

42. On the Administration's proposed scheme to phase out heavily polluting pre-Euro and Euro I to III DCVs and to limit the service life of newly registered DCVs at 15 years, members generally supported the scheme as it would significantly reduce the overall emissions of particulates and NO_x by 80% and 30% respectively. They have urged the Administration to consider offering extra financial assistance to vehicle owners who have difficulties in phasing out their polluting DCVs and to ensure that the government subsidies would benefit the vehicle owners rather than suppliers. In this connection, the Subcommittee notes that the Air Pollution Control (Air Pollutant Emission) (Controlled Vehicles) Regulation, which was gazetted on 25 October 2013 and tabled in LegCo for negative vetting on 30 October 2013, has been approved after amendment. The Regulation, which has commenced operation on 1 February 2014, specifies the retirement deadlines of pre-Euro IV DCVs. FC has also approved the funding proposal of \$11,444 million for providing ex-gratia payment to implement the phasing-out scheme at its meeting on 10 January 2014.

43. The Subcommittee has urged the Administration to enhance the checking of vehicles under the mandatory vehicle examination scheme to ensure that the vehicles concerned would comply with the emissions standards applicable to them.

44. Some members have expressed concern about the effectiveness of bus route rationalization in improving roadside air quality. The Administration has explained that although the major objective of bus route rationalization is not to reduce roadside emissions, the initiative would help to enhance bus operation efficiency and reduce traffic congestion, thereby lowering pollutant emissions at roadside. These members have suggested that the Administration should enhance communication with District Councils to secure their support for reducing the franchised bus routes that may overlap substantially or are not operating optimally, and in rolling out other transport-related environmental initiatives. The Chairman also opines that LegCo Members of different political parties/groupings should liaise with the District Council members belonging to their political parties/groupings to facilitate the implementation of bus route rationalization in various districts to help improve roadside air quality.

45. Some members have asked whether the Administration would designate low emissions zones at busy corridors, where only environment-friendly vehicles would be allowed to run, in an attempt to alleviate the problem of roadside air pollution. The Administration has advised that since 2011, franchised bus operators have been encouraged to use cleaner buses for running in pilot low emissions zones in Central, Causeway Bay and Mong Kok, with the target of having only buses that meet Euro IV or above emission standard in these three zones by late 2015.

46. The Subcommittee notes that the Administration is funding the purchase of six hybrid buses (at a total cost of \$33 million) and 36 electric buses (at a total cost of \$180 million) and related charging facilities for trial by franchised bus companies. The first batch of electric buses will arrive in late 2014. Some members have expressed concern about the slow progress of introducing different types of electric vehicles into Hong Kong. The Administration has responded that –

- (a) to boost the confidence of public transport operators in the use of electric vehicles, the Pilot Green Transport Fund was set up in March 2011 to provide subsidy to the trade to conduct trials on different types of electric vehicles. As of end April 2013, 44 approved applicants have commenced or were preparing the trials of a total of 79 vehicles and about \$76 million or 25% of the Fund have been committed for such trials. At present, nine electric goods vehicles and 18 hybrid goods vehicles approved by the Fund are on trial by various transport operators. Reports on the trial of the vehicles concerned will be made available on EPD's website for reference by the transport trades and the public; and

- (b) since the use of electric vehicles in Hong Kong is still at a very preliminary stage, it would study whether a comprehensive switch of different types of vehicles, including taxis, light buses and buses, to electric ones could meet their respective operational needs and work out the next steps.

47. Members consider that the Administration should make more effort to explore the use of cleaner fuel, such as biodiesel generated from food waste. They have therefore urged the Administration to encourage B/Ds to use cleaner fuel, including biodiesel, and promote its use as energy in the private sector through green procurement.

48. In response to some members' questions about the measures to encourage the public to use bicycle/electric bicycles as a means of transport in new development areas with a view to promoting low-carbon lifestyle, the Administration has advised that in considering whether bicycle can be adopted as the main transport mode, cycling safety is the prime concern. Compared with urban areas, some new towns in the New Territories, where road traffic is less busy and population density is relatively low, provide better conditions for cycling. ENB would further discuss with relevant B/Ds the planning and provision of cycle tracks and ancillary facilities in new towns and new development areas.

Subcommittee's recommendations

49. In view of the foregoing, the Subcommittee recommends that the Administration should –

- (a) enhance the checking of vehicles under the mandatory vehicle examination scheme to ensure that the vehicles concerned would comply with the emissions standards applicable to them;
- (b) enhance communication with District Councils and proactively solicit their support in rolling out transport-related environmental initiatives, such as bus route rationalization;
- (c) set up more low emissions zones at busy corridors where only environment-friendly vehicles will be allowed to run, so as to alleviate the problem of roadside air pollution;

- (d) expedite the study on the feasibility of switching various types of vehicles, including taxis, light buses and buses, to electric ones, with a view to promoting the use of electric vehicles on a wider scale to reduce vehicle emissions;
- (e) conduct more studies on the feasibility of using cleaner fuel, such as biodiesel, as energy with a view to promoting its wider use; and
- (f) expedite the planning and provision of cycle tracks and ancillary facilities in new towns and new development areas to promote the use of bicycles as a means of transport, thereby promoting a low-carbon lifestyle.

Emissions from the power sector

Current situation

50. The Subcommittee notes that power generation is a major emission source in Hong Kong. In 2011, emissions from power plants accounted for 44% of SO₂, 26% of NO_x and 17% of RSP of the total emissions in Hong Kong.

Subcommittee's concerns

51. Members are concerned about the high level of pollution caused by the power sector, and have enquired whether the Administration has any concrete plan to examine the feasibility of wide-scale application of renewable energy ("RE") (e.g. solar power and wind power) in Hong Kong as well as to engage the two power companies or other private investors in the development of RE technologies.

52. The Administration has responded that a study conducted by HKUST on the potential of various forms of RE for wider local use indicated that solar power and wind power might not have high potential for development in the territory, given Hong Kong's geographical constraints. Although both power companies are exploring the feasibility of developing large-scale offshore wind farms in Hong Kong waters, such wind farms require substantial investments. The wind farms are expected to meet 1% to 2% of the total electricity demand of Hong Kong if they are put to operation as planned. Members consider that the Administration should take more actions to encourage the power companies to develop RE.

53. The Administration has further advised that EPD is responsible for monitoring the emissions from power plants through a Technical Memorandum which caps the annual emissions of three air pollutants from the power sector. EPD will review the Technical Memorandum not less than once every two years to enable timely revision of the emission allowances for existing electricity works of the two power companies as stipulated in the Technical Memorandum.

54. Some members have expressed support for the Buildings Energy Efficiency Funding Schemes, which aim to promote building owners' awareness of the benefits of building energy efficiency and encourage them to take concrete action to seek improvements. These members consider that owners of buildings with strata titles have been well supported by the schemes in pursuing energy efficiency initiatives for their buildings. The Administration has responded that under the Buildings Energy Efficiency Ordinance (Cap. 610), with respect to a commercial building or the commercial portion of a composite building, the building owner is required to carry out energy audits for the central building services installations therein once every 10 years. The energy audits would help identify energy saving opportunities.

55. Some other members have enquired whether each of the five efficiency grades under the Mandatory Energy Efficiency Labelling Scheme ("MEELS") can be sub-divided into sub-grades so as to specify more precisely how much energy an electrical appliance is likely to consume, thereby facilitating the public in choosing energy efficient products. As advised by the Administration, a review is being conducted on MEELS with a view to expanding the coverage of the scheme and tightening the grading standards. In proposing refinements to MEELS, the Administration would be mindful of the need to ensure that the public would understand the energy efficiency performance of the prescribed electrical appliances.

Subcommittee's recommendations

56. The Subcommittee recommends that the Administration should take more actions to encourage the power companies to develop RE.

Cost-benefit analysis of the measures to improve air quality

Current situation

57. As requested by the Subcommittee, the Administration has briefed members on the cost-benefit analysis of the various measures taken to improve

air quality. According to the Administration, the consultant commissioned by EPD to review Hong Kong's AQOs in 2007 had proposed 36 emission control measures for improving air quality and achieving the recommended new AQOs for the Administration's consideration. The 36 proposed emission control measures were recommended to be implemented in three phases (i.e. Phases I, II and III). A crude cost-benefit analysis of the various emission control measures had also been conducted to provide a broad indication on their relative cost-effectiveness. The relevant analysis was published in Annexes E and F of the "AQO Review Public Consultation" document issued in July 2009 (in **Appendix VI**).

58. The Administration has informed the Subcommittee that the estimates on the costs and benefits of individual control measures are subject to various uncertainties and variations depending on the timing and details of implementation, market situations and community's response, etc.

Subcommittee's concerns

59. Some members have expressed concern about the relatively lower cost-benefit ratings of some of the proposed emission control measures in Phase III and asked whether those measures would be implemented. The Administration has explained that –

- (a) the cost-benefit analysis is only one of the criteria for assessing whether the proposed emission control measures should be implemented. Any decision on implementation of the proposed measures should be taken and balanced against different considerations, including the potential implications of such measures on relevant industries and trades; and
- (b) as announced in January 2012, it would step up the implementation of the 19 emission control measures proposed by the consultant under Phase I as well as three additional measures, e.g. retrofitting Euro II and III franchised buses with selective catalytic reduction devices. The Chief Executive also proposed in his 2013 Policy Address new initiatives to tackle air pollution on different fronts.

60. To obtain a clearer picture on the various measures implemented to improve air quality, the Subcommittee has requested the Administration to provide a progress report on the air quality improvement measures recommended by the consultant and the additional ones. The progress report has been issued vide LC Paper No. CB(1)1122/12-13(02). The Subcommittee

notes that a total of 25 initiatives are being implemented to improve local and regional air quality through legislative and administrative means.

61. In response to members' enquiry, the Administration has advised that it had not undertaken any analysis on the costs and benefits of individual control measures since the consultancy study. To better protect public health, it plans to conduct short, medium and long-term studies to evaluate the cost-effectiveness of the new air quality improvement measures in the pipeline and to review the findings on a regular basis. Meanwhile, it is discussing the details with some local universities, including the scope, framework and work schedule of the studies, as well as the level of resources required. Members are of the view that the Administration should conduct cost-benefit studies on the implementation of the measures annually and report the findings to the Panel and the public.

Subcommittee's recommendations

62. The Subcommittee recommends that the Administration should conduct studies on the cost-effectiveness of the various new air quality improvement measures annually and report the findings to the Panel. The findings should also be published for information of the public.

Air quality assessments under the environmental impact assessment mechanism

63. The Subcommittee has discussed the assessment of air quality under the EIA mechanism specified in the Environmental Impact Assessment Ordinance (Cap. 499) ("EIAO").

Environmental impact assessment mechanism

Current situation

64. The Subcommittee notes that the purpose of EIAO is to provide for assessing the impact on the environment of designated projects, for protecting the environment. The "Technical Memorandum on Environmental Impact Assessment Process" (EIA-TM) issued under section 16 of EIAO sets out the principles, procedures, guidelines, requirements and criteria for handling various EIA matters. According to EIA-TM, designated projects are to be assessed in accordance with the prescribed methodologies and the assessed environmental impacts have to meet the criteria and requirements as set out in the annexes of EIA-TM for various environmental issues and subject areas.

Subcommittee's concerns

65. Some members are dissatisfied that the Administration has not specified the circumstances under which the testing of toxic air pollutants ("TAPs") not established under APCO will be/will not be required during the EIA process. The Administration has explained that –

- (a) an air pollutant arising from a designated project may be required for assessment in the EIA process if it will have significant potential adverse impacts on sensitive receivers;
- (b) in deciding whether an air pollutant arising from a designated project is significant and should be assessed in the EIA study, major factors include: the nature, type, scale and location of the designated project; the technical particulars of the involved processes and their emissions; the sensitive receivers that may be affected; alteration or environmental changes that may result; existing statutory requirements controlling the pollutant at source, etc. All these relevant and project specific factors will be considered on a case-by-case basis during the EIA study scoping process; and
- (c) NO₂, instead of TAPs, is the major air pollutant in Hong Kong, particularly for road projects. Various measures targeting at the emission of NO₂ from motor vehicles have been implemented to improve roadside air quality.

66. Members do not accept the Administration's explanation for not mandating the testing of TAPs. As it is suspected that TAPs may cause cancer or pose other serious health risks and TAP assessment is mandatory in some overseas countries, members have urged the Administration to make the testing of TAPs mandatory for designated projects and explicitly specify the criteria for evaluating TAPs not established under APCO. Likewise, the Administration should also clearly set out the criteria for evaluating "hazard to human life" under Annex 4 of EIA-TM.

67. Some other members are concerned about the transparency of the EIA process and consider that the Administration should publish at the EIAO website those EIA reports that were found not suitable for public inspection and/or rejected by EPD, as well as the reasons for rejection. The Administration has responded that –

- (a) the EIA process is a statutory process to be implemented strictly in accordance with the provisions under the law. Under EIAO, only EIA reports that meet the requirements of study brief and EIA-TM shall be made available for public inspection. As such, EIA reports that were found not suitable for public inspection will not be uploaded onto the EIAO website; and
- (b) for EIA reports that were found suitable for public inspection but were subsequently not approved by EPD, the reports and the reasons for rejection will be made available at the EIAO website to enhance transparency of the EIA process.

68. Members are dissatisfied with the Administration's explanation. They consider that EIAO should be amended such that the EIA reports which are found not suitable for public inspection and the reasons for rejection will be made available on the EIAO website to further enhance the transparency of the EIA process.

69. Some members opine that the Administration should ensure that there are sufficient channels for the public to voice their concerns on implementation of large-scale development projects and monitor the EIA process. These members have asked whether the Administration will consider engaging green groups and non-profit-making organizations ("NPOs") with relevant knowledge and expertise in conducting EIA studies so as to enhance the credibility of the studies.

70. The Administration has responded that the existing EIA mechanism has been designed to enable and promote active public participation throughout the entire EIA process. Under EIAO, project profiles and EIA reports would be exhibited for public and the Advisory Council on the Environment ("ACE")'s inspection. Project proponents should take into account comments by the public and ACE in the conduct of EIA studies and to address the requirements set out in study briefs and EIAO-TMs in order to obtain environmental permits ("EPs"). In this way, the EIA mechanism has already required project proponents to take into account public concerns during the project planning stage. It is therefore considered not necessary to engage green groups and NPOs in conducting EIA studies.

71. Despite the Administration's above view, members consider that the Administration should proactively engage green groups with relevant expertise in conducting EIA studies, so as to enhance the credibility of the studies.

Subcommittee's recommendations

72. In view of the foregoing, the Subcommittee recommends that the Administration should –

- (a) given the serious health risks posed by TAPs, consider making the testing of TAPs mandatory for designated projects;
- (b) clearly specify the criteria for evaluating TAPs not established under APCO as well as the criteria for evaluating "hazard to human life" under Annex 4 of EIA-TM;
- (c) consider amending EIAO so that the EIA reports that are found not suitable for public inspection and the reasons for rejection will be made available on the EIAO website, so as to further enhance the transparency of the EIA process; and
- (d) proactively engage green groups with relevant expertise in conducting EIA studies so as to enhance the credibility of the studies.

Interface of EIAO with APCO

Current situation

73. The Subcommittee notes that in terms of air quality, the approaches and methodologies for air quality assessments are set out in Annex 12 of EIA-TM and the criteria for evaluating air quality impacts are set out in Annex 4. Meeting the AQOs established under APCO is a key benchmark requirement for deciding if an EIA report may be approved under EIAO. As and when the AQOs established under APCO are revised and come into effect, the corresponding decisions under EIAO will have to take the AQOs in force at the time of the decisions as the benchmark requirement.

74. As advised by the Administration, the adoption of the new AQOs in Hong Kong with effect from 2014 would require amendments to APCO. Subject to LegCo's approval of the Air Pollution Control (Amendment) Bill 2013 ("the APCO Amendment Bill"), the new AQOs would become statutory standards and hence the benchmark for conducting air quality impact assessment under the EIA studies. Designated projects subject to these new statutory standards would have to implement adequate and appropriate mitigation measures in areas of design, construction and other operation

standards, where necessary, to meet the new legal requirements. The APCO Amendment Bill also provides for a review mechanism under which the AQOs will be reviewed at least once every five years after the commencement of the new AQOs.

75. The Subcommittee notes that the APCO Amendment Bill was passed by LegCo on 10 July 2013.

Subcommittee's concerns and recommendations

76. Members have expressed concern about the provision of a transitional period of 36 months from the commencement date of the new AQOs in the APCO Amendment Bill, within which the new AQOs would not apply to an application for variation of an EP of the designated projects which had already been approved under EIAO prior to the coming into effect of the new AQOs. They have urged the Administration to ensure that the transitional period would not become a loophole allowing project proponents not to comply with the more stringent requirements under the new AQOs.

77. As for the Administration's undertaking to review the AQOs at least once every five years after the commencement of the new AQOs, members considers that the Administration should promote active public participation throughout the review process in reviewing the AQOs. Members have also expressed concern that the Administration has yet to work out the methodology for conducting the review. They have therefore urged the Administration to decide on the methodology expeditiously and report to the Panel on the progress made by the end of 2015.

78. The Subcommittee recommends that the Administration should decide on the methodology for conducting the review of the AQOs expeditiously and report to the Panel on the progress made by the end of 2015. In respect of the air quality impact assessment conducted on a designated project, the Subcommittee has recommended that the Administration should put in place a mechanism whereby a testing of the air quality of the area affected by the project will be carried out after completion of the project to ensure that the mitigation measures as set out in the relevant EIA report have been properly implemented.

Air quality modelling in Hong Kong

Current situation

79. Air quality modelling makes use of air quality models to estimate how a certain air pollutant emission would affect the air quality at a certain location, taking account of the characteristics of the relevant air pollutant emission, meteorological information, chemical reactions, topography and background air quality. An air quality model is essentially a mathematical formulation of the physicochemical processes that an air pollutant will undergo after its emission into the atmosphere. As requested by the Subcommittee, the Administration has briefed members on the air quality modelling practices adopted in Hong Kong and one of the most commonly used air quality models, i.e. "Pollutants in the Atmosphere and their Transport over Hong Kong" ("PATH") in particular.

80. The Subcommittee notes that PATH is an air quality model specifically designed to simulate air quality over the whole PRD region including Hong Kong. At present, the Administration is upgrading PATH by incorporating state-of-the-art modules, including WRF (Weather Research and Forecast) for meteorological simulation, SMOKE (Sparse Matrix Operator Kernel Emissions) for emission processing and CMAQ (Community Multiscale Air Quality) for physiochemical calculations. The Administration is also expanding the geographical coverage and refining the spatial resolution of PATH for enhancing its estimation on the background air quality. Upon completion of the validation of the new system, local and international experts will be invited to review the updated PATH model.

Expert views

81. In response to the Subcommittee's invitation, Dr Nicky LAM of CityU and Professor FUNG Chi-hung of HKUST have given a presentation on their respective views on air quality modelling in Hong Kong. They have also offered suggestions on the areas of improvement required.

82. Both Dr LAM and Professor FUNG have expressed the view that the Administration should enhance the transparency of the air quality modelling system and its applications in the EIA process, so as to allow the community to know more about the work of EPD in safeguarding public health and to gain public trust. Dr LAM has also recommended that the Administration should make the emission inventory of Hong Kong accessible and update it regularly to enable the public and academics to monitor the effectiveness of different emission control measures being implemented. Professor FUNG has

commented that if the public have better understanding and appreciation of the air quality modelling system, the credibility of EIA studies will be enhanced.

Subcommittee's concerns

83. Members generally support enhancing the transparency of the air quality modelling systems, including the data and the assumptions used in the models and have asked how improvements would be made. The Administration has advised that –

- (a) upon request, EPD has been providing local emission data to members of the public, including the air modelling experts, academics and environmental consultants for air quality modelling purposes;
- (b) in the EIA of any designated project, the emission assumptions are worked out by the project proponent to suit the year of assessment and are required to be documented in the study report;
- (c) the summary for key assessment assumptions and all related supporting documents are currently provided in the form of an Appendix to the EIA study reports;
- (d) in vetting the EIA reports, EPD will ensure that the assumptions on the air quality control policies and improvement measures used for estimating emission for future years are consistent with the Government's prevailing and committed policies; and
- (e) project proponents will be required to consolidate the assumptions/information related to emission estimation in a summary table in future EIA reports for easy reference.

84. Noting that the Administration is updating the PATH model, some members have enquired how the Administration will engage the academic sector and other stakeholders on the further development of air quality modelling and the enhancement of PATH. The Administration has stated that –

- (a) over the past years, EPD has been making exchanges with key stakeholders including local air modelling experts, academics, environmental consultants and green groups in respect of air quality modelling and its applications in the EIA process;

- (b) EPD will continue the exchanges and engage the experts in this highly specialized subject; and
- (c) it will consider setting up a working group comprising academics and experts in the field to review and refine Hong Kong's air quality modelling systems in due course. The working group could discuss the type of data that should be made public for the sake of enhanced transparency.

Subcommittee's recommendations

85. In view of the foregoing, the Subcommittee recommends that the Administration should –

- (a) take effective measures to enhance the transparency of Hong Kong's air quality modelling systems, including the data and assumptions used; and
- (b) proactively engage the academic sector and other stakeholders in the further development of air quality modelling and the enhancement of PATH, including expeditiously setting up a working group comprising academics and experts in the field to review the air quality modelling systems in Hong Kong.

Noise pollution and public health

86. While different people may respond differently to the same level of noise, noise above certain levels can affect everybody. It can lead to hearing loss, mental stress and irritation. It can also interfere with daily activities such as doing homework, watching television and talking on the telephone. Similar to other major metropolitan cities, noise is an issue in Hong Kong. It is also a common subject of complaint in the community.

Impacts of noise pollution on public health and the associated medical costs

Current situation

87. Environmental noise is defined as noise emitted from all sources except occupational and workplaces settings. Main sources of environmental noise include road, rail and air traffic, construction and commercial activities and the neighbourhood. According to the Administration –

- (a) the potential impact of environmental noise on public health is a subject still under research internationally;
- (b) it is generally agreed that noise may cause auditory effects and non-auditory effects on humans. Auditory effects include hearing impairment resulting from excessive noise exposure usually encountered in occupational and workplaces settings. Environmental noise seldom reaches levels that can induce hearing loss; and
- (c) potential non-auditory effects under research include stress, annoyance, social and behavioural effects, speech interference², sleep disturbance (such as difficulty in falling asleep; awakenings; and alterations of sleep stages or depth) and cardiovascular and physiological effects.

88. The Administration has further advised that EPD had completed a consultancy study on the health effects of transportation noise in Hong Kong ("the Study") in early 2012. The Study was conducted by a team of international and local experts in acoustic and medical science comprising professors and experts of CUHK, Griffith University of Australia and the National Institute of Public Health and the Environment of the Netherlands, and included a thematic survey of over 10 000 households on environmental noise issues. On direct health effects, the Study cannot draw any conclusion that physiological responses due to exposure to a high level of noise are associated with long-term risk of cardiovascular diseases. On noise annoyance and sleep disturbance, the response of the people in Hong Kong is not as strong as compared with that in developed economies. Also, while higher noise exposure would intensify annoyance, various factors like personal sensitivity to noise, satisfaction with the neighbourhood environment etc would also affect one's perception and response.

89. The Administration has pointed out that the possible effects or health problems associated with environmental noise are often multi-factorial. It is uncertain whether or to what extent they should be attributed to environmental noise. The number of hospital admissions attributable to environmental noise and the related health care cost cannot be established.

² Speech interference is basically a masking process, in which simultaneous interfering noise renders speech incapable of being understood.

Expert views and Subcommittee's concerns

90. Professor LAM Kin-che of CUHK, who is the Principal Investigator of the Study, and Professor CHAN Ying-keung of CUHK have briefed members on the major aspects of the Study as well as its findings and implications. Professor LAM has informed the Subcommittee that the Study was supported by a separate noise mapping exercise which assessed the noise exposure of the 10 000 households selected for interview. With the aid of noise exposure software, the level of noise exposure estimated for various areas were visualized in 3-dimensional figures.

91. Noting from the Study that the Hong Kong population is less sensitive to noise, some members consider that this may be attributed to Hong Kong people having adapted to the high-density living environment and become tolerant on this front. These members opine that better urban design and planning can reduce noise at its source and pre-empt noise problems. As advised by Professor LAM, he expects that innovative building designs would be the latest trend in noise mitigation. He also considers that the question of whether Hong Kong people's less strong reaction to noise problems is culturally related or associated with other factors, such as the length of residence at a particular location, habits of closing windows and having air-conditioning facilities in living quarters, merits further investigation.

92. Some other members have pointed out that as quite a sizeable proportion of the Hong Kong population had reported themselves to have been annoyed by environmental noise, the crowded living conditions and long working hours have taken their toll on people's health. Professor LAM has responded that the Study has not provided evidence of habituation to noise, but it has revealed that higher noise exposure would increase heart rate and awakenings.

Subcommittee's recommendation

93. Given that there has yet to be conclusive findings about the impact of environmental noise on health problems, the Subcommittee recommends that the Administration should allocate more resources and enlist the assistance of the Hospital Authority for the conduct of researches into this area to identify the health effects and the related medical cost.

Noise pollution control and the associated public expenditure

Current situation

94. The Subcommittee notes that most forms of environmental noise are under statutory control. The Noise Control Ordinance (Cap. 400) ("NCO") is the principal legislation for controlling noise from construction sites, industrial and commercial premises, residential premises and public places. Besides NCO, there are also other pieces of legislation, such as the Road Traffic Ordinance (Cap. 374), the Merchant Shipping (Local Vessels) Ordinance (Cap. 548), and the Civil Aviation (Aircraft Noise) Ordinance (Cap. 312) and/or their associated pieces of subsidiary legislation that have provisions to tackle noise pollution or nuisance from vehicles, vessels and aircrafts.

95. The Subcommittee further notes that noise problems are also prevented through the statutory EIA process. For designated projects listed in EIAO, project proponents are required to alleviate noise impact from the projects to comply with the noise standards stipulated in EIA-TM.

96. Apart from legislative controls, various administrative measures are implemented to control noise pollution. These include prevention of noise problem through inputs to the land use planning system, retrofitting noisy roads with noise barriers or low noise surfacing materials, as well as partnership with stakeholders to improve work practices.

97. According to the Administration, the expenditure incurred by EPD in financial year 2012-2013 on environmental noise control was about \$100 million, accounting for about 4% of the total expenditure of EPD. Expenses in relation to public works have been included in the respective projects where appropriate.

Subcommittee's concerns and recommendations on noise from construction sites

98. Some members are concerned about the impact of noise from construction activities on nearby residential accommodations or other noise sensitive receivers ("NSRs"), in particular the noise generated by percussive piling. The Administration has advised that –

- (a) noise from construction sites is controlled under NCO by means of construction noise permits ("CNP") and noise emission labels;

- (b) percussive piling is restricted to day time during weekdays and the operating hours may be limited to 12, 5 or 3 hours depending on the proximity of the nearby NSRs, such as schools and residential accommodations. A CNP is required for percussive piling;
- (c) a ban on percussive piling will not be practicable because of the technical limitations posed by the small size of some sites and particular geological conditions where percussive piling would be the only feasible piling option; and
- (d) the phasing out of particularly noisy percussive piling methods such as diesel hammer has helped to minimize the noise and vibration disturbance caused by percussive piling to the surrounding NSRs.

99. A member has relayed the repeated complaints by residents of Whampao Garden about the noise nuisance from the construction works of new railway projects which are located very close to residential blocks. As advised by the Administration, to reduce the impact on nearby residents, most of the major works of railway projects are conducted underground. Construction on ground level mainly involved works on stations and their entrances and exits. The MTR Corporation Limited has adopted various noise mitigation measures, including the use of noise insulating fabric, acoustic enclosures and quieter construction equipment when carrying out construction works of railway projects.

100. In view of member's concerns, the Subcommittee recommends that in carrying out construction works, the Administration should ensure that project proponents would, apart from implementing various noise mitigation measures, strengthen communication with local residents through District Councils with a view to enhancing residents' understanding of the construction works concerned and facilitating exchange of views amongst relevant parties.

Subcommittee's concerns and recommendations on noise from industrial and commercial premises

101. According to the Administration, noise from industrial and commercial premises is dealt with by EPD in response to complaints. Excessive noise, which is defined as that above the Acceptable Noise Level in the relevant Technical Memorandum issued under NCO, is controlled by means of Noise

Abatement Notice to require compliance of the relevant statutory limits or other requirements by certain date.

102. Some members have expressed concern about the noise nuisance generated by restaurants and bars and asked whether the Administration would consider restricting the business hours of restaurants and alcohol-related business located in residential areas to before a preset time, say, 11:00 pm or 12:00 midnight. The Administration has responded that –

- (a) while EPD is responsible for dealing with the problem of noise generated within a restaurant or bar, it cannot handle complaints involving patrons of such premises who made excessive noise at outdoor locations causing nuisance to nearby residents. Nevertheless, EPD would continue to work with relevant B/Ds to improve the situation; and
- (b) the Police would also follow up on noise complaints and take appropriate enforcement actions according to individual circumstances.

103. The Subcommittee recommends that the Administration should step up enforcement actions against noise nuisance generated by restaurants and bars and their patrons.

Subcommittee's concerns and recommendations on road traffic and vehicle noise

104. Noting that the existing traffic noise limit is 70 dB(A) L10(1 hour), members are generally concerned that although in most cases the average noise level is within 70 dB(A), there are intermittent noise levels which are high enough to wake residents from their sleep, such as the ambient noise caused by a passing heavy vehicle. They doubt whether the current statutory noise limit can adequately deal with the occurrence of single noise events which exceeded 70 dB(A) intermittently but not continuously. They have proposed the Administration to consider shortening the measuring period from one hour to, say, five minutes, and lowering the noise limit of 70 dB(A).

105. The Administration has explained that –

- (a) there is no uniform noise standard for traffic noise internationally. The planning standard of 70 dB(A) L10(1 hour) adopted in Hong

Kong is on par with those adopted by the United Kingdom and the United States as well as Korea in Asia;

- (b) meeting the current standard is already a challenge to the planning of new transport projects and other land use to meet the social needs, such as residential developments; and
- (c) taking into account Hong Kong's conditions and noting that the current statutory standards are on par with those adopted by the United Kingdom, the United States and Korea, it does not recommend tightening of the existing road traffic noise limit at this stage.

106. Despite the Administration's explanation, members opine that the Administration should keep the statutory road traffic noise limit of 70 dB(A) L10(1 hour) under constant review and consider tightening the limit where necessary. In conducting the review, the Administration should also consider disallowing heavy vehicles from running in those residential areas which are exposed to serious traffic noise problem during night time.

107. The Administration has further advised that –

- (a) to minimize the noise impact of existing roads on nearby residents, it has launched a programme to retrofit noise barriers on existing roads with a traffic noise level exceeding the limit of 70 dB(A)L10(1 hour) where practicable and resources available. In addition, the Administration has been resurfacing roads and flyovers with low noise materials to reduce road-tyre passing noise;
- (b) it will carefully examine the alignment of new roads during the planning stage to minimize the population that will be exposed to traffic noise; and
- (c) EPD is also closely working with the Housing Department to study the viability of installing "acoustic windows" to protect residents of building blocks close to busy road sections where space is inadequate for retrofitting barriers from excessive traffic noise.

108. Members have also asked about the latest developments of other innovative noise mitigation designs and measures against traffic noise. In response, the Administration has advised that –

- (a) to facilitate more use of innovative noise mitigation designs and measures against road traffic noise, EPD has collated examples on innovative building design forms and measures that are proven effective in mitigating traffic noise affecting residential developments, in the form of a web-based database; and
- (b) the database, which is available at the websites of EPD, Housing Department, Planning Department, Buildings Department and Lands Department, acts as a platform for information sharing among concerned professionals and interested parties.

109. In view of the foregoing, the Subcommittee recommends that the Administration should –

- (a) keep the statutory road traffic noise limit of 70 dB(A) L10(1 hour) under constant review and consider tightening the limit where necessary. In conducting the review, the Administration should also consider disallowing heavy vehicles from running in those residential areas which are exposed to serious traffic noise problem during night time;
- (b) expedite the programme to retrofit noise barriers on existing roads and resurfacing roads and flyovers with low noise materials to minimize the noise impact of existing roads on nearby residents; and
- (c) expedite the development and adoption of innovative noise mitigation designs and measures against traffic noise, including the installation of "acoustic windows".

110. Members generally are of the view that as the community aspire to a better living environment and have become more concerned about the problem of noise, the cost of measures taken to prevent and address noise problems will be increasing. As such, the Subcommittee recommends that the Administration should set out the financial resources required for implementing noise abatement measures, such as the cost of using low noise materials and changing the alignment of roads, in different public works and infrastructural projects when submitting funding proposals to LegCo for approval, so that Members will have a full picture of the total cost incurred in implementing the projects and can make informed choices in considering the funding proposals.

111. Some other members also consider it desirable to include in the town planning procedure and the planning process of infrastructural projects the requirement to assess the noise impact of a development or project, such as by mandating the conduct of a noise impact study during the planning process, so that noise problems can be prevented during the design stage.

112. The Subcommittee recommends that the Administration should consider including in the town planning procedure and the planning process of infrastructural projects the requirement to assess the noise impact of a development or project so as to prevent new noise problems.

Light pollution and public health

113. The Subcommittee notes that the discussion about light pollution is a relatively new issue. There has yet to be a universally accepted definition of and regulatory framework for "light pollution", and different places may define light pollution in different ways. According to the US Federal Government, light pollution is "the illumination of the night sky caused by artificial lighting sources", and hence pollution is the side effect of industrial civilization; and the amount of outdoor lighting increases as a result of increasing population. However, there has yet to be a universally accepted and well established threshold for determining the level of external lighting that is scientifically deemed as "pollution".

114. In Hong Kong, there have been increasing public concerns about the problem of light nuisance. According to the Document for Engaging Stakeholders and the Public issued by the Task Force on External Lighting ("the Task Force"), EPD has been receiving around 200 complaints against external lighting annually since 2009. A large proportion of complaints are about light nuisance, and the number of complaints that are related to energy wastage is much less significant, with details as follows –

Concerns of complaints	Number of complaints (%)	
	2011	2012
Light nuisance	194 (83%)	185 (82%)
Energy wastage	8 (3%)	13 (6%)
Light nuisance + energy wastage	24 (10%)	21 (9%)
Unknown	8 (3%)	6 (3%)
Total	234	225

Impacts of light pollution on public health and the associated medical costs

Current situation

115. According to the Administration, research studies conducted in different countries so far have not come to any conclusive view on any direct relationship between light exposure and health problems. The possible health effects of light pollution, if any, may include glare, nuisance and sleep problems, as follows –

- (a) glare is a visual sensation caused by exposure to excessive bright light, which may be disabling or cause discomfort. "Disability glare" leads to a transient reduction in visibility caused by intense light sources in the field of view, while "discomfort glare" causes annoyance or pain induced by overly bright sources. However, glare is a subjective sensation, and sensitivity to glare can vary widely among individuals; and
- (b) exposure to excessive light at night may disturb people's rest and sleep and may cause annoyance or nuisance in some individuals. Some individuals who are affected by excessive light for a prolonged period of time may also feel distressed. While some studies on experimental animals have indicated that excessive light exposure for a prolonged period of time may suppress secretion of melatonin and hence suggest that excessive light exposure may adversely affect biological rhythms in humans, an overseas study has concluded that light trespass through residential windows is an unlikely cause of melatonin suppression given its low light level, particularly with the eyes of the residents closed.

116. The Administration has advised that the possible effects or problems caused by light pollution are non-specific, and may be mitigated in most cases at a relatively low cost. The above health problems (e.g. sleep problem) in an individual are often multi-factorial, which may or may not be related to light pollution. It therefore does not have the number of hospital admissions attributable to light pollution and the related health care cost.

Expert views and Subcommittee's concerns

117. Professor HEDLEY has informed the Subcommittee in his presentation on "Adverse health effects of the urban Hong Kong environment – Protection of child and adult health from noise, nocturnal light and air pollution" that light pollution disrupts the human body clocks. According to Professor HEDLEY,

humans evolve with body clocks which are adjusted to light days and dark nights and recent publications, including those endorsed by the US Environmental Protection Agency, the American Medical Association and other authorities, clearly regard nocturnal lighting in the built environment as a public health issue.

118. The Subcommittee notes from Professor HEDLEY's presentation that –

- (a) many studies have shown that disruption of body clocks may be associated with changes in the function of the brain, heart and endocrine (hormone) glands, as well as sleep deprivation, depression, heart disease, and cancer in occupational groups working night shifts; and
- (b) disruption of body clocks affects the normal physiology of all species. It can affect 10% to 15% of human genes, so there is considerable potential for nocturnal lighting in the built environment to cause adverse health effects.

119. Apart from the possible direct effects of light on health, Professor HEDLEY has also stressed that excess and inefficient use of lighting is incompatible with energy conservation and contributes to air pollution with emissions from fossil fuel combustion.

120. Some members have asked about the feasibility of establishing a mechanism similar to the Hedley Environmental Index to assess the economic costs of noise and light pollution, in terms of impact on public health (including both physical and mental health). Professor HEDLEY has responded that in principle, it is technically feasible to estimate the costs of different kinds of pollution if relevant socio-economic and demographic variables can be identified. Dr LAI Hak-kan has pointed out that the nuisance caused by external lighting and noise is location-specific, largely depending on the exact location of the monitoring stations. As such, there may be difficulties in developing a system modelling on the Hedley Environmental Index to provide real-time measurement of external lighting and noise levels across Hong Kong.

121. Members have pointed out that as shown by Professor HEDLEY's presentation, light pollution has negative impact on people's health. Given that Hong Kong is small and densely populated, the impact of light pollution on people's daily life will be more serious than that in many overseas countries.

More studies on the local situation should be conducted to ascertain the extent of the problem in Hong Kong.

Subcommittee's recommendations

122. Given that there has yet to be conclusive findings about the impact of light exposure on health problems, the Subcommittee recommends that the Administration should allocate more resources and enlist the assistance of the Hospital Authority for the conduct of researches into this subject to identify the health effects and the related medical cost.

Light pollution control and the associated public expenditure

Current situation

123. Regarding the current legislation regulating light pollution, the Administration has advised that while there are some ordinances relevant to the issue of external lighting, they do not appear to be dealing specifically with light nuisance or energy wastage that may be caused by external lighting.

124. The actions taken by the Administration to ascertain the problems arising from external lighting and to identify possible measures to address the problems include –

- (a) the commissioning of a consultancy study on energy wastage and light nuisances of external lighting in 2009 ("the 2009 consultancy study");
- (b) the promulgation of the Guidelines on Industry Best Practices for External Lighting ("the Guidelines") in January 2012 to encourage early action to minimise light nuisance and energy wastage; and
- (c) the establishment of the Task Force in August 2011 to advise the Government on the appropriate strategy and measures for tackling nuisance and energy wastage problems caused by external lighting having regard to international experience and practices.

125. On the associated public expenditure, the Administration has advised that the total consultant fee for the 2009 consultancy study was \$3.15 million. The expenditure involved in the conduct of publicity and engagement activities to promulgate the Guidelines in January 2012 was around \$0.5 million. In

financial year 2013-2014, \$1 million have been earmarked for the stakeholder engagement activities relating to external lighting. Apart from these expenditure items, existing manpower resources have been deployed to support the commissioning of the 2009 consultancy study, the development and promulgation of the Guidelines, as well as the provision of secretariat support for the Task Force.

Subcommittee's concerns and recommendations on regulating excessive street lighting and reflected glare from glass curtain walls

126. Many members are concerned about the lack of legislative control on light nuisance to protect the daily life of the public, in particular that caused by excessive street lighting and reflected glare from glass curtain walls of buildings. The Administration has responded that –

- (a) the material, design and construction of glass curtain walls are subject to the control of the Building (Construction) Regulations ("B(C)R") (Cap. 123B). B(C)R, however, does not include regulation on reflected glare from glass curtains walls;
- (b) its preliminary study of the regulation of glass curtains walls in other jurisdictions has found that while there is no specific statutory control on reflected glare from buildings in the jurisdictions studied, some jurisdictions have statutory control on the external reflectance of glass, i.e. the percentage of daylight reflected from an external surface of glass; and
- (c) as reflected glare from glass curtain walls is a relatively new issue in Hong Kong, it will further find out the practices and experience of other countries and jurisdictions in handling reflected glare from buildings, and will take into account such findings in mapping out the way forward.

127. As regards streets lights, the Administration has advised that –

- (a) the road lighting standards being adopted by the Highways Department ("HyD") are based on the most widely adopted international lighting code at present;
- (b) HyD has promulgated internal guidelines that installing street lights on the external walls of buildings should be avoided as far as possible to minimize the impact on residents; and

- (c) in case street lights have to be installed near residential units on lower floors due to site constraints, HyD endeavours to take practical measures to reduce the impact on residents, such as using cut-off lanterns and light shields.

128. Some members are concerned that while the Buildings Ordinance (Cap. 123) ("BO") regulates the planning, design and construction of buildings and associated works on private land, there is no specific statutory control on external lighting. They have proposed that the Administration should consider extending the scope of BO to cover external lighting of buildings in order to regulate the lighting intensity and specify the operating hours of lighting installations. Likewise, the Administration should put in place control on lighting installations, such as advisement signboards with flashy lights.

129. Members have further suggested that a comprehensive approach should be adopted by the Administration in vetting and approving applications to carry out building works for erection of supporting structures for external lightings (e.g. advertisement signboards, decorative lightings, spot lights, video walls, display panel, etc) so that lighting intensity and flashy light etc, which can cause light nuisances to residents nearby, can be taken into account.

130. On members' suggestions, the Administration has responded that –

- (a) when considering applications to carry out building works for erection of supporting structures for the installation of external lights, the Building Authority ("BA") takes into account the building and structural safety of those building works. Matters relating to light nuisances are not relevant in the context of BO;
- (b) as regards building works associated with the erection of supporting structures for the installation of external lights requiring prior approval and consent from BA, the Buildings Department ("BD") will refer the building plans to relevant departments for comment on matters under their respective purview; and
- (c) should there be any relevant statutory requirements relating to light nuisances, BD is willing to explore the possibility of referring relevant cases to the responsible department for advice to facilitate the control of light nuisances.

131. In view of the foregoing, the Subcommittee recommends that the Administration should –

- (a) expeditiously study the practices and experience of other countries and jurisdictions in handling reflected glare from buildings and map out the way forward; and
- (b) adopt a comprehensive approach when considering applications to carry out building works for erection of supporting structures for the installation of external lights (e.g. advertisement signboards, decorative lightings, spot lights, video walls, display panel) so that lighting intensity and flashy light etc, which can cause light nuisances to residents nearby, will be taken into account, thereby facilitating the control of light nuisances.

Subcommittee's concerns and recommendations on the review by the Task Force on External Lighting

132. The Subcommittee has been advised that the Task Force, after reviewing the technical parameters adopted by overseas regulatory regimes to address the problem of external lighting, has concluded that the requirement to switch off external lighting after a preset time would be the appropriate way forward for Hong Kong.

133. Some members doubt the effectiveness of the various voluntary measures being implemented by the Administration to handle external lighting problems, and support the early introduction of legislation to regulate external lighting on account of its nuisance to the public. On the other hand, some other members are of the view that external lighting installations contribute to the safe environment of the city, promote tourism and help beautify Hong Kong which is a cosmopolitan city and the Pearl of the Orient. It is also necessary to strike a balance between the need to minimize the adverse impact of external lighting on the public's daily life and the operational needs of the business sector.

134. Given that different people will have different perception about what amounts to light nuisance, members urge the Administration to carefully work out the definition of light nuisance if statutory control on external lighting is to be introduced in future. As there is no legislative control on external lighting at present, they have also requested the Administration to proactively liaise with light owners to solicit their cooperation in minimizing the extent of nuisance caused by their lighting installations to nearby residents.

135. The Subcommittee notes that the Task Force has completed the engagement exercise on the specific implementation issues in relation to the switch-off requirement in November 2013. It will analyse the views collected and draw up recommendations on the way forward for submission to the Government.

136. In view of the foregoing, the Subcommittee recommends that the Administration should –

- (a) expeditiously decide on the way forward for controlling light nuisance and minimize the adverse impact of external lighting on the public's daily life;
- (b) carefully work out the definition of light nuisance if statutory control on external lighting is to be introduced in future, given that different people will have different perception about what amounts to light nuisance; and
- (c) as there is no legislation on external lighting at present, proactively liaise with light owners to solicit their cooperation in minimizing the extent of nuisance caused by their lighting installations to nearby residents.

Summary of recommendations

137. The Subcommittee's recommendations are summarized below.

138. On the subject of air pollution and public health, the Subcommittee recommends that the Administration should –

In respect of impacts of air pollution on public health and the associated medical costs

- (a) expeditiously engage experts and academics to undertake research to enhance community awareness of the benefits of environmental protection and to enlist public support for anti-pollution policies in the long run (paragraph 22 refers);
- (b) take into account other economic losses, such as decrease in foreign investment, in the calculation of the costs of air pollution in Hong Kong (paragraph 22 refers);

- (c) ensure that the Central Policy Unit and various B/Ds, particularly ENB, earmark sufficient funding for local higher education institutions and other organizations to conduct applied research studies to assist the Administration in formulating environmental policies and initiatives (paragraph 22 refers);
- (d) designate ENB and if necessary, set up a higher level authority to spearhead cross-B/Ds efforts in taking forward environmental and anti-pollution initiatives with focus on the protection of public health (paragraph 22 refers);

In respect of air pollution control and the associated public expenditure

- (e) submit the legislative proposal to mandate all OGVs to use cleaner fuel while at berth in Hong Kong waters to LegCo as soon as possible to ensure that the new requirement will be implemented from 1 January 2015 (paragraph 39 refers);
- (f) accord a higher priority to pursuing with the Central People's Government and other relevant authorities the designation of an ECA within PRD waters with a view to improving PRD regional air quality, and update the Panel on the progress made in due course (paragraph 39 refers);
- (g) expedite the installation of OSP facilities at KTCT and take other measures, such as promoting the switching-off of idling engines and taking forward the rationalization of bus routes, to prevent deterioration of the air quality in the neighbouring districts of KTCT pending the commissioning of OSP facilities, so as to protect public health (paragraph 39 refers);
- (h) proactively explore the installation of OSP facilities at other existing cruise terminals apart from KTCT, including the Ocean Terminal (paragraph 39 refers);
- (i) enhance the checking of vehicles under the mandatory vehicle examination scheme to ensure that the vehicles concerned would comply with the emissions standards applicable to them (paragraph 49 refers);
- (j) enhance communication with District Councils and proactively solicit their support in rolling out transport-related environmental initiatives, such as bus route rationalization (paragraph 49 refers);

- (k) set up more low emissions zones at busy corridors where only environment-friendly vehicles will be allowed to run, so as to alleviate the problem of roadside air pollution (paragraph 49 refers);
- (l) expedite the study on the feasibility of switching various types of vehicles, including taxis, light buses and buses, to electric ones, with a view to promoting the use of electric vehicles on a wider scale to reduce vehicle emissions (paragraph 49 refers);
- (m) conduct more studies on the feasibility of using cleaner fuel, such as biodiesel, as energy with a view to promoting its wider use (paragraph 49 refers);
- (n) expedite the planning and provision of cycle tracks and ancillary facilities in new towns and new development areas to promote the use of bicycles as a means of transport, thereby promoting a low-carbon lifestyle (paragraph 49 refers);
- (o) take more actions to encourage the power companies to use renewable energy (paragraph 56 refers);

In respect of cost-benefit analysis of the measures to improve air quality

- (p) conduct studies on the cost-effectiveness of the new air quality improvement measures and report the findings to the Panel annually. The findings should also be published for information of the public (paragraph 62 refers);

In respect of air quality assessments under the environment impact assessment mechanism

- (q) given the serious health risks posed by TAPs, consider making the testing of TAPs mandatory for designated projects (paragraph 72 refers);
- (r) clearly specify the criteria for evaluating TAPs not established under APCO as well as the criteria for evaluating "hazard to human life" under Annex 4 of EIA-TM (paragraph 72 refers);
- (s) consider amending EIAO so that the EIA reports that are found not suitable for public inspection and the reasons for rejection will be made available on the EIAO website, so as to further enhance the transparency of the EIA process (paragraph 72 refers);

- (t) proactively engage green groups with relevant expertise in conducting EIA studies so as to enhance the credibility of the studies (paragraph 72 refers);
- (u) decide on the methodology for conducting the review of the AQOs expeditiously and report to the Panel on the progress made by the end of 2015 (paragraph 78 refers);
- (v) in respect of the air quality impact assessment conducted on a designated project, put in place a mechanism whereby a testing of the air quality of the area affected by the project will be carried out after completion of the project to ensure that the mitigation measures as set out in the relevant EIA report have been properly implemented (paragraph 78 refers);
- (w) take effective measures to enhance the transparency of Hong Kong's air quality modelling systems, including the data and assumptions used (paragraph 85 refers); and
- (x) proactively engage the academic sector and other stakeholders in the further development of air quality modelling and the enhancement of PATH, including expeditiously setting up a working group comprising academics and experts in the field to review the air quality modelling systems in Hong Kong (paragraph 85 refers).

139. On the subject of noise pollution and public health, the Subcommittee recommends that the Administration should –

In respect of impacts of noise pollution on public health and the associated medical costs

- (a) given that there has yet to be conclusive findings about the impact of environmental noise on health problems, allocate more resources and enlist the assistance of the Hospital Authority for the conduct of researches into this area to identify the health effects and the related medical cost (paragraph 93 refers);

In respect of noise pollution control and the associated public expenditure

- (b) in carrying out construction works, ensure that project proponents would, apart from implementing various noise mitigation measures, strengthen communication with local residents through District Councils with a view to enhancing residents' understanding of the

construction works concerned and facilitating exchange of views amongst relevant parties (paragraphs 100 refer);

- (c) step up enforcement actions against noise nuisance generated by restaurants and bars and their patrons (paragraph 103 refers);
- (d) keep the statutory road traffic noise limit of 70 dB(A) L10(1 hour) under constant review and consider tightening the limit where necessary. In conducting the review, it should consider disallowing heavy vehicles from running in those residential areas which are exposed to serious traffic noise problem during night time (paragraph 109 refers);
- (e) expedite the programme to retrofit noise barriers on existing roads and resurfacing roads and flyovers with low noise materials to minimize the noise impact of existing roads on nearby residents (paragraph 109 refers);
- (f) expedite the development and adoption of innovative noise mitigation designs and measures against traffic noise, including the installation of "acoustic windows" (paragraph 109 refers);
- (g) set out the financial resources required for implementing noise abatement measures, such as the cost of using low noise materials and changing the alignment of roads, in different public works and infrastructural projects when submitting funding proposals to LegCo for approval, so that Members will have a full picture of the total cost incurred in implementing the projects and can make informed choices in considering the funding proposals (paragraph 110 refers); and
- (h) consider including in the town planning procedure and the planning process of infrastructural projects the requirement to assess the noise impact of a development or project so as to prevent new noise problems (paragraph 112 refers).

140. On the subject of light pollution and public health, the Subcommittee recommends that the Administration should –

In respect of impacts of light pollution on public health and the associated medical costs

- (a) given that there has yet to be conclusive findings about the impact of light exposure on health problems, allocate more resources and

enlist the assistance of the Hospital Authority for the conduct of researches into this subject to identify the health effects and the related medical cost (paragraph 122 refers);

In respect of light pollution control and the associated public expenditure

- (b) expeditiously study the practices and experience of other countries and jurisdictions in handling reflected glare from buildings and map out the way forward (paragraph 131 refers);
- (c) adopt a comprehensive approach when considering applications to carry out building works for erection of supporting structures for the installation of external lights (e.g. advertisement signboards, decorative lightings, spot lights, video walls, display panel) so that lighting intensity and flashy light etc, which can cause light nuisances to residents nearby, will be taken into account, thereby facilitating the control of light nuisances (paragraph 131 refers);
- (d) expeditiously decide on the way forward for controlling light nuisance and minimize the adverse impact of external lighting on the public's daily life (paragraph 136 refers);
- (e) carefully work out the definition of light nuisance if statutory control on external lighting is to be introduced in future, given that different people will have different perception about what amounts to light nuisance (paragraph 136 refers); and
- (f) as there is no legislation on external lighting at present, proactively liaise with light owners to solicit their cooperation in minimizing the extent of nuisance caused by their lighting installations to nearby residents (paragraph 136 refers).

Way forward

141. The Subcommittee agreed that it would conclude its work and submit a report to the Panel. The Panel would follow up any issues in relation to air, noise and light pollution in future.

Advice sought

142. Members of the Panel are invited to note the deliberations and recommendations of the Subcommittee.

Council Business Division 1
Legislative Council Secretariat
27 February 2014

Panel on Environmental Affairs

Subcommittee on Issues Relating to Air, Noise and Light Pollution

Terms of Reference

To monitor and review government policies on and initiatives to address problems of air, noise and light pollution for better protection of public health.

Appendix II

Panel on Environmental Affairs

Subcommittee on Issues Relating to Air, Noise and Light Pollution

Membership list

Chairman	Hon Cyd HO Sau-lan
Members	Hon Vincent FANG Kang, SBS, JP (<i>since 18 October 2013</i>) Hon WONG Ting-kwong, SBS, JP (<i>since 18 October 2013</i>) Hon Claudia MO (<i>since 29 January 2013</i>) Hon Frankie YICK Chi-ming (<i>since 18 October 2013</i>) Hon WU Chi-wai, MH Hon Gary FAN Kwok-wai Hon CHAN Han-pan (<i>up to 18 October 2013</i>) Hon Charles Peter MOK (<i>since 18 October 2013</i>) Dr Hon Kenneth CHAN Ka-lok Hon KWOK Wai-keung (<i>up to 5 October 2013</i>) Hon Dennis KWOK (<i>up to 18 October 2013</i>) Hon SIN Chung-kai, SBS, JP (<i>up to 22 February 2013</i>) Dr Hon Helena WONG Pik-wan Dr Hon Elizabeth QUAT, JP Hon Christopher CHUNG Shu-kun, BBS, MH, JP Hon Tony TSE Wai-chuen
Clerk	Ms Miranda HON
Legal Adviser	Miss Evelyn LEE

Appendix III

A list of the academics who have attended the meetings of the Subcommittee on Issues Relating to Air, Noise and Light Pollution

Meeting on 11 January 2013

The Chinese University of Hong Kong

Professor WONG Tze-wai
Research Professor
School of Public Health and Primary Care

The University of Hong Kong

Professor Anthony Johnson HEDLEY
Honorary Professor
School of Public Health

Dr LAI Hak-kan
Research Assistant Professor
School of Public Health

Meeting on 31 May 2013

The Chinese University of Hong Kong

Professor LAM Kin-che
Department of Geography and Resource Management

Professor CHAN Ying-keung
Department of Sociology

Meeting on 28 June 2013

City University of Hong Kong

Dr Nicky LAM
Visiting Assistant Professor
School of Energy and Environment

The Hong Kong University of Science and Technology

Professor FUNG Chi-hung
Professor
Institute for the Environment

Appendix IV

Major issues discussed by the Subcommittee on Issues Relating to Air, Noise and Light Pollution and respective meeting dates

<u>Issue</u>	<u>Date of meeting</u>
Impacts of air, noise and light pollution on public health and the associated medical costs	11 January 2013
Air pollution control and the associated public expenditure	29 January and 16 April 2013
The cost-benefit analysis of the measures to improve air quality	26 April 2013
Air quality assessments under the environmental impact assessment mechanism	25 February and 28 June 2013
Noise pollution control and the associated public expenditure	31 May and 28 June 2013
Light pollution control and the associated public expenditure	12 July 2013

Health Effects of Air Pollutants

(a) Sulphur dioxide

Exposure to high levels of sulphur dioxide (SO₂) may cause a wide variety of health impacts, including –

- impairment of respiratory function;
- aggravation of existing respiratory and heart illnesses; and
- increasing the risk of developing chronic respiratory diseases.

Particularly sensitive groups include people with asthma, lung or heart disease, children and the elderly.

(b) Nitrogen dioxide

Exposure to elevated levels of nitrogen dioxide (NO₂) can give rise to adverse health effects including –

- lowering a person's resistance to respiratory infections;
- aggravation of existing respiratory diseases; and
- damaging lung tissue and reduction in lung function.

People with asthma or lung disease and children are more susceptible to the adverse effects of NO₂ exposure.

(c) Ozone

Being a strong oxidant, ozone (O₃) can cause a variety of adverse health problems, including –

- irritation to the eye, nose and throat even at low concentrations;
- airway irritation, coughing, wheezing and breathing difficulties;
- increase of lung inflammation; and
- aggravation of asthma and increased susceptibility to respiratory illnesses like pneumonia and bronchitis.

People with lung disease, children and the elderly will be more seriously affected by elevated O₃ exposure.

(d) Particulate Matters

Particulate matters (PM) with particle sizes less than 10 microns, which are known as respirable suspended particulates or PM₁₀, can get deep into the lungs and cause a broad range of health effects, in particular, respiratory and cardiovascular illnesses, including –

- increasing respiratory symptoms, such as irritation of the airways, coughing, or difficulty in breathing;
- decreasing lung function;
- aggravation of asthma;
- development of chronic bronchitis;
- adverse effects on the cardiovascular system; and
- premature death in people with heart or lung disease.

People with heart or lung disease, children and the elderly are most likely to be affected by particulate pollution.

Recent medical researches show that the risk for various health impacts increases with exposure and there is little evidence to suggest a threshold below which no adverse health effects would be anticipated. It has also been shown that the health risks would be higher for those particles with particle sizes of 2.5 microns or less, which are commonly referred to as fine suspended particulates or PM_{2.5}.

(e) Carbon monoxide

Carbon monoxide (CO) can cause harmful health effects by reducing oxygen delivery to the body's organs, e.g. heart, brain and tissues. Symptoms due to CO exposures include –

- chest pain, headache, shortness of breath and loss of co-ordination;
- reduction of ability to exercise and contributing to other cardiovascular effects; and
- vision problems, reduced ability to work or learn, reduced manual dexterity and difficulty in performing complex tasks.

These health threats are more severe for those who suffer from heart disease. Also, at extremely high levels, CO is poisonous and can cause death.

(f) Lead

Lead (Pb), once taken into the body, may distribute throughout the body in the blood and accumulate in the bones. Depending on the level of exposure, Pb can cause the following adverse health effects –

- adversely affecting the nervous system, kidney function, immune system, reproductive and developmental systems and cardiovascular system;
- affecting the oxygen carrying capacity of the blood;
- neurological effects in children which may contribute to behavioural problems and learning deficits; and
- cardiovascular effects such as high blood pressure and heart diseases.

Proposed Phase I Emission Control Measures and Their Respective Emission Reduction Potential and Cost-Benefit Analysis

		Emission Reduction Potential (t)				Cost – Benefit Analysis[1]		
		SO ₂	NO _x	RSP / PM ₁₀	VOCs	Cost (\$M)	Benefit (\$M)	B/C Ratio[2]
Emission Capping and Control								
1.	Increasing the ratio of natural gas in local electricity generation to 50% together with additional emission abatement measures[3]	13,402	25,225	523	0	2,032 ^[4]	1,803	0.9 ^[4]
2.	Early retirement of aged / heavily polluting vehicles (pre-Euro, Euro I and Euro II commercial diesel vehicles and franchised buses)	0	3,102	300	184	3,882 ^[5]	24,344	6.3
3.	Earlier replacement of Euro III commercial diesel vehicles with models meeting latest Euro standards	0	743	75	24	2,668 ^[5]	6,134	2.3
4.	Wider use of hybrid / electric vehicles or other environment-friendly vehicles with similar performance (20% private cars and 10% franchised buses)	15	216	7	173	4,326 ^[5]	2,417	0.56
5.	Ultra low sulphur diesel (SCR) for local vessels	675	0	18	0	378	6,331	16.7
6.	Selective catalytic reduction for local vessels	0	304	0	0	249	74	0.30
7.	Electrification of aviation ground support equipment	85	759	21	67	1,449	3.8	0.003
8.	Emission control for off-road vehicles / equipment	4	950	239	326	845	2,123	2.5
9.	Strengthening volatile organic compounds control	0	0	0	700	18	124	6.9
Transport Management								
10.	Low emission zones	Note [6]	Note [6]	Note [6]	Note [6]	3,696	2,586	0.7
11.	Car-free zone / pedestrianisation scheme	Note [6]	Note [6]	Note [6]	Note [6]	42	400	10
12.	Bus route rationalization	4	156	7	9	14	548	39
Infrastructure Development and Planning								
13.	Expand rail network	17	501	46	207	Note [7]	3,850	Note [7]
14.	Cycling network to major public transport hubs	0.1	2.3	0.1	0.1	836	8	0.01
Energy Efficiency Measures [8]								
15.	Mandatory implementation of Building Energy Codes	151	256	8	3	95	2,634	28
16.	Energy efficiency standards for domestic electrical appliances	84	142	4	1	84	2,277	27
17.	Light-emitting diode or equivalent alternatives for traffic signal / street lighting	3	5	0.1	0	47	105	2.2
18.	Tree planting / roof-top greening [9]	Note [9]	Note [9]	Note [9]	Note [9]	6,357	1,603	0.3
19.	District cooling system for Kai Tak Development	6	16	0.5	0.2	2,788 ^[10]	4,047	1.5

Notes:

- [1] In its simplest form, the costs and benefits of each policy are quantified and valued in monetary terms. The cost-benefit analysis is subject to a wide range of assumptions used by the consultant for compiling the assessment of different proposed emission control measures. As these assumptions are subject to change, the findings of the cost-benefit analysis should be read with caution. Nonetheless, it provides a systematic framework to compare the potential cost-effectiveness of different measures.
- [2] A benefit-cost ratio above one indicates that the overall monetized benefits of the proposed measure are expected to be higher than the costs to be borne by the society. A ratio below one indicates the otherwise.
- [3] Possible additional emission abatement measures include enhancing the SCR systems of the existing coal-fired units. However, the technical feasibility and financial viability of retrofitting the existing coal-fired units with enhanced SCR systems are not yet established and subject to more detailed examination with the concerned power company.
- [4] The figure includes estimated costs due to increasing the ratio of natural gas in local electricity generation to 50%. It does not cover the costs of the additional emission abatement measures, such as enhancing the SCR systems of the existing coal-fired units, the technical feasibility and financial viability of which would be subject to further examination.
- [5] The cost of early retirement of the concerned vehicles is calculated based on the residual value foregone of these vehicles over the remaining period of their normal serviceable life. The upfront capital costs required for procuring the replacement vehicles would be higher than the figures set out in the table.
- [6] Emission reduction potential would not be substantial as it involves mainly transferring emission from one place to another.
- [7] The railway strategy includes the Express Rail Line, the Sha Tin to Central Link (the Tai Wai to Hung Hom section), the West Island Line, the South Island Line (East), the Kowloon Southern Link and the Kwun Tong Line Extension. The railway strategy will have additional ride-on effect on improvement of air quality. Only benefits are presented.
- [8] Benefits include material damage, energy saving as well as acute and chronic health benefits. For strategies 15, 16, 17 and 19, the majority of benefits are due to energy savings, not health benefits. Emission reduction of energy efficiency measures is generated from less electricity demand. To be conservative, they have not been included in the net total emission reduction.
- [9] The proposed measures help reduce urban heat island effect and improve air pollution dispersion. No local emission and cost data are available. Estimates are based on overseas data for roof top greening of 10% of the urban area.
- [10] The figure includes both the capital and operational costs of the plant for the coming 50 years.

Total Emissions (Tonnes) With and Without Proposed Phase I Emission Control Measures

Sector	Without Proposed Measures				With Proposed Measures			
	SO ₂	NO _x	RSP / PM ₁₀	VOCs	SO ₂	NO _x	RSP / PM ₁₀	VOCs
Power	25,120	42,600	1,260	420	11,718	17,375	737	420
Transport	5,706	43,832	2,407	6,705	4,910	38,048	1,933	6,040
<i>Vehicles</i>	299	14,075	1,697	5,854	263	9,354	1,262	5,257
<i>Marine (Figure in brackets for local vessels)</i>	4,938 (682)	21,684 (3,994)	676 (179)	436 (91)	4,263 (7)	21,380 (3,690)	658 (161)	436 (0)
<i>Aviation</i>	469	8,073	34	415	384	7,314	13	348
Industry and Others	16	4,608	624	24,131	12	3,658	385	23,104
Total	30,842	91,040	4,291	31,255	16,640	59,080	3,055	29,564

Proposed Phases II and III Emission Control Measures and Their Respective Emission Reduction Potential and Cost-Benefit Analysis

Proposed Phases II Emission Control Measures and Their Respective Emission Reduction Potential and Cost-Benefit Analysis

		Emission Reduction Potential (t)				Cost – Benefit Analysis[1]		
		SO ₂	NOx	RSP / PM ₁₀	VOCs	Cost (\$M)	Benefit (\$M)	B/C Ratio[2]
Emission Capping and Control								
20.	Increasing the ratio of natural gas in local electricity generation to 75% with additional abatement measures (Additional to Phase I measure)	5,163	5,761	178	0	1,702	383	0.2
21.	Increasing the ratio of renewable energy (2% wind energy)	502	852	25	8	13,069	206	0.02
22.	Wider use of hybrid / electric vehicles or other environment-friendly vehicles with similar performance [30% private cars, 15% buses (including franchised buses), 15% light goods vehicles (LGVs) plus 15% heavy goods vehicles (HGVs)] (Additional to Phase I measure)	40	849	79	174	9,026	14,447	1.6
23.	Ultra low sulphur diesel for ocean-going vessels and local vessels (Additional to Phase I measure)	2,392	1,145	15	0	4,563	15,087	3.3
24.	Selective catalytic reduction for ocean-going vessels and local vessels (Additional to Phase I measure)	0	7,153	0	0	1,333	1,173	0.9
25.	Electrification of on-shore power supply	377	2,361	297	404	1,579	6,243	4.0
26.	Tightening aviation emission standards	0	3,587	0	0	Note [3]	12	Note [3]
27.	Further strengthening volatile organic compounds control	0	0	0	4,870	37	634	17.2
Transport Management								
28.	Electronic road pricing (ERP) / congestion charging scheme for Hong Kong Island North	Note [4]	Note [4]	Note [4]	Note [4]	Note [4]	577	Note [4]
29.	Reduce parking provision (25%) to restrain car usage for Central	Note [5]	Note [5]	Note [5]	Note [5]	757	18	0.02
Energy Efficiency Measures [8]								
30.	District cooling system (35% in existing areas and 90% in other new development areas)	120	197	5.5	1.9	19,347	11,578	0.6

Proposed Phases III Emission Control Measures and Their Respective Emission Reduction Potential and Cost-Benefit Analysis

Emission Capping and Control								
31.	Increasing the ratio of natural gas in local electricity generation to 100% (Additional to Phase II measure) [7]	6,553	7,430	270	0	348	255	0.7
32.	50% nuclear power and 50% natural gas (Alternative Case compared to Base Case of 75% natural gas) [7]	6,554	8,422	381	210	-2,894	91	-
33.	Wider use of hybrid / electric vehicles or other environment- friendly vehicles with similar performance (50% private cars, 50% buses (including franchised buses), 50% HGVs plus 50% LGVs) (Additional to Phase II measure)	63	789	42	232	8,530	7,751	0.91
34.	Vehicle permit quota system (to reduce around 50% private cars and 50% motorcycles)	28	93	3	119	691	251	0.4
35.	Use of hydrogen fuel cell vehicles or equivalent alternatives (40% penetration)	140	2,778	94	1,453	Note [8]	10,420	Note [8]
Infrastructural Development and Planning								
36.	Rail for transport of cross-boundary goods	1	11	1	9	Note [9]	115	Note [9]

Notes:

- [1] In its simplest form, the costs and benefits of each policy are quantified and valued in monetary terms. The cost-benefit analysis is subject to a wide range of assumptions used by the consultant for compiling the assessment of different proposed emission control measures. As these assumptions are subject to change, the findings of the cost-benefit analysis should be read with caution. Nonetheless, it provides a systematic framework to compare the potential cost-effectiveness of different measures.
- [2] A benefit-cost ratio above one indicates that the overall monetized benefits of the proposed measure are expected to be higher than the costs to be borne by the society. A ratio below one indicates the otherwise.
- [3] Costs for this proposed measure will be borne by the aircraft industry (and hence consumers) worldwide and only air quality benefits to Hong Kong have been calculated.
- [4] The ERP strategy will have additional ride-on effect on improvement of air quality. The overall emission reduction potential would not be substantial. The ERP measure will have incidental improvements to air quality. Only these benefits have been calculated here. The estimated cost for the proposed ERP scheme is about \$1 billion (including the cost of in-vehicle units for existing vehicles) with an annual recurrent cost of about \$200 million.
- [5] Emission reduction potential would not be substantial as it involves mainly transferring emission from one place to another.
- [6] Emission reduction of energy efficiency measure is generated from less electricity demand. To be conservative, they have not been included in the net total emission reduction.
- [7] The “increase ratio of natural gas in local electricity generation to 100%” scenario and “50% nuclear power and 50% natural gas” scenario are either-or case. Adoption of only one of these proposed measures would be expected.
- [8] Fuel cell technology has not yet matured, and there are no local cost data. Hence only the likely air quality improvement benefits have been calculated.
- [9] Only the air quality improvement benefits have been calculated. The capital cost of the freight rail would be about \$5 billion to \$9 billion.

Total Emissions (Tonnes) With and Without Proposed Phase I and II Emission Control Measures

Sector	Without Proposed Measures				With Proposed Measures			
	SO ₂	NO _x	RSP / PM ₁₀	VOCs	SO ₂	NO _x	RSP / PM ₁₀	VOCs
Power	25,120	42,600	1,260	420	6,053	10,762	534	412
Transport	6,451	45,133	2,244	6,304	2,861	28,317	1,760	5,442
Vehicles	331	11,231	1,416	5,290	270	9,722	1,284	4,900
Marine (Figure in brackets for local vessels)	5,569 (682)	24,412 (3,994)	788 (179)	526 (91)	2,124 (7)	13,450 (3,690)	457 (161)	122 (0)
Aviation	552	9,490	40	488	466	5,145	19	421
Industry and Others	15	4,632	625	24,761	11	3,682	386	18,865
Total	31,586	92,365	4,129	31,485	8,925	42,761	2,679	24,719

Total Emissions (Tonnes) With and Without Proposed Phase I, II and III Emission Control Measures

Sector	Without Proposed Measures				With Proposed Measures			
	SO ₂	NO _x	RSP / PM ₁₀	VOCs	SO ₂	NO _x	RSP / PM ₁₀	VOCs
Power	25,120	42,600	1,260	420	0	2,340	153	202
Transport	7,734	49,154	2,438	6,501	3,952	29,515	1,894	4,000
Vehicles	353	9,797	1,388	5,306	101	5,466	1,195	3,276
Marine (Figure in brackets for local vessels)	6,829 (682)	29,866 (3,994)	1,010 (179)	707 (91)	3,385 (7)	18,904 (3,690)	680 (161)	303 (0)
Aviation	552	9,490	40	488	466	5,145	19	421
Industry and Others	14	4,720	629	25,980	10	3,770	391	20,083
Total	32,868	96,474	4,327	32,900	3,962	35,626	2,437	24,285

Acronyms and abbreviations

ACE	Advisory Council on the Environment
APCO	Air Pollution Control Ordinance
AQOs	Air Quality Objectives
B(C)R	Building (Construction) Regulations
B/Ds	Bureaux and Departments
BA	Building Authority
BD	Buildings Department
BO	Buildings Ordinance (Cap. 123)
CityU	City University of Hong Kong
CUHK	The Chinese University of Hong Kong
DCVs	Diesel commercial vehicles
ECAs	Emission Control Areas
EIA	Environmental impact assessment
EIAO	Environmental Impact Assessment Ordinance
ENB	Environment Bureau
EPD	Environmental Protection Department
EPs	Environmental permits
FC	Finance Committee
HKU	The University of Hong Kong
HKUST	The Hong Kong University of Science and Technology
HyD	Highways Department

Acronyms and abbreviations

IMO	International Maritime Organization
KTCT	Kai Tak Cruise Terminal
LegCo	Legislative Council
LPG	Liquefied petroleum gas
MEELS	Mandatory Energy Efficiency Labelling Scheme
NCO	Noise Control Ordinance
NO ₂	Nitrogen dioxide
NO _x	Nitrogen oxides
NPOs	Non-profit-making organizations
NSRs	Noise sensitive receivers
OGVs	Ocean-going vessels
OSP	On-shore power
PATH	Pollutants in the Atmosphere and their Transport over Hong Kong
PRD	Pearl River Delta
RE	Renewable energy
RSP	Respirable suspended particulates
SO ₂	Sulphur dioxide
TAPs	Toxic air pollutants