Wilson Acoustics Limited

Unit 601, Block A, Shatin Industrial Centre,
5 - 7 Yuen Shun Circuit, Shatin, NT
Tel: (852) 3188-1170, Fax: (852) 3422-8117
E-mail: who@wal.hk
Web: www.wal.hk

AGREEMENT CE 17/2016 (EP)

A STUDY ON CONSTRUCTION NOISE CONTROL IN HONG KONG – FEASIBILITY STUDY

FINAL REPORT

Report No.: 16296-15

For

Environmental Protection Department
6/F Chinachem Tsuen Wan Plaza,
455-457 Castle Peak Road,
Tsuen Wan, Hong Kong

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Prepared by		Checked by		Approved by	
Name & Position	Signature	Name & Position	Signature	Name & Position	Signature
Morgan Cheng *Quiet Construction Technologies Review Team Leader*		YT Tang *Deputy Project Team Leader*		Wilson Ho *Project Team Leader*	
Peter Wong *Regulations and Practices Review Team Leader*					
Max Yiu *Stakeholders Survey Team Leader*		Richard Kwan *Project Manager*			

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Glossary of Abbreviations

ABN	Air-borne Noise
BD	Buildings Department
BEAM	Building Environmental Assessment Method
CIH	Chartered Institute of Housing
CNMP	Construction Noise Management Plan
CNP	Construction Noise Permit
DA	Designated Area
DMC	Deed of Mutual Covenant
DP	Designated Project
DR	Domestic Renovation
EIA	Environmental Impact Assessment
EIAO	Environmental Impact Assessment Ordinance
EP	Environment Permit
EPD	Environmental Protection Department
GW	General Construction Work
HK	Hong Kong
HKAPMC	Hong Kong Association of Property Management Companies
HKCA	Hong Kong Construction Association
HKCIC	Hong Kong Construction Industry Council
HKGBCA	Hong Kong General Building Contractor Association
HKIH	Hong Kong Institute of Housing
LandsD	Lands Department
NCO	Noise Control Ordinance
PCW	Prescribed Construction Work
PM	Property Management
PME	Powered Mechanical Equipment
PN	Practice Note
PP	Project Proponents
QPME	Quality Powered Mechanical Equipment
REDA	Real Estate Developer Association
SCC	Self-compacting Concrete
SBN	Structure-borne Noise
SPL	Sound Pressure Level
SPME	Specified Powered Mechanical Equipment
SWL	Sound Power Level

Notes for Specific/Scientific Terms

Sound Pressure Level (SPL) and A-weighting

Decibel (dB) is the standard logarithmic scale unit of instrument-measured Sound Pressure Level (SPL), with reference to 20 μPa. In the context of the Study, which focuses on construction noise received by human ears that have different sensitivity to different sound frequencies between 20Hz and 20,000Hz compared to instrument-measured SPL, all dB noise level presented throughout the Study would be A-weighted (dB(A)) to account for the relative loudness perceived by the human ears defined in the International standard *IEC 61672:2013 - Electroacoustics - Sound level meters - Part 1: Specifications*.

Sound Power Level (SWL)

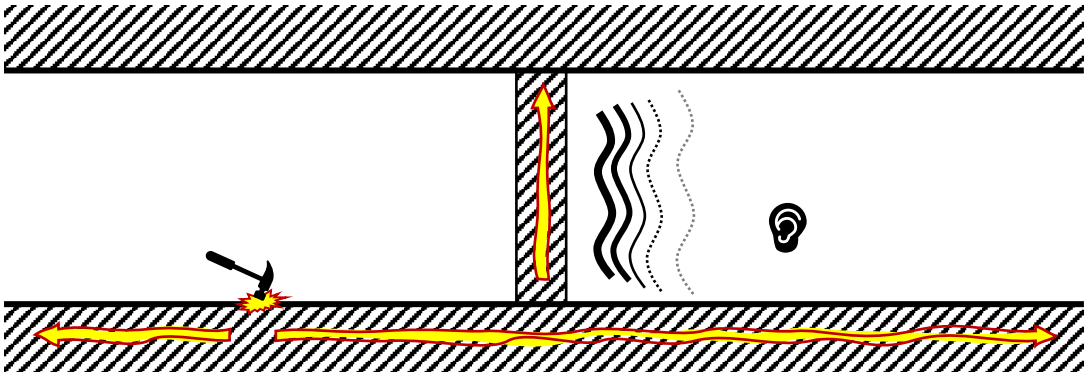
Sound Power Level (SWL) is a quantitative description of loudness, in dB(A), of a sound source, i.e. construction equipment, in the context of the Study. Definition and one of the methods on determining SWL of a noise source could reference to *ISO 3746:2010 - Determination of sound power levels and sound energy levels of noise sources using sound pressure — Survey method using an enveloping measurement surface over a reflecting plane*.

Air-borne Noise (ABN) and Structure-borne Noise (SBN)

Air-borne noise (ABN) is noise that mainly propagated through the air. While structure-borne noise (SBN) is mainly propagated through solid medium by force excitation and then radiated into sound energy (**Figure A & B**).

Figure A Air-borne Noise Propagation

Figure B Structure-borne Noise Propagation



Noise Reduction due to Barrier Effect

Air-borne noise could be attenuated when solid material of sufficient mass and area interferes the direct transmission path between the source and receiver, i.e. barrier, which would dampen, deflect or absorb the sound energy reaching the receiver.

Decibel (dB) is the standard logarithmic scale unit of measurement for noise reduction due to barrier effect.

Perceived Annoyance Level in the Public Survey

Noise annoyance is defined as an individual's adverse reaction towards noise according to *ISO/TS 15666 – 2003 Acoustics - Assessment of noise annoyance by means of social and socio-acoustic surveys*. It is alternatively referred to as dissatisfaction, nuisance, bother, or disturbance due to noise. The responses of the scale ranged from 0 to 10, where 0 was not at all annoyed, and 10 was extremely annoyed.

As regards the 0 to 10 numerical scale, "highly annoyed" refers the sum of 8, 9 and 10 on the 0 to 10 numeric scale according to *Miedema & Oudshoorn (2001)*. Hence the responses of 8, 9 and 10 were combined to form a category of "highly annoyed" for analysis in the Study, where the responses of 4 to 7 being "annoyed", 1 to 3 being "slightly annoyed" and 0 being "not annoyed".

1. INTRODUCTION

1.1 Background

Wilson Acoustics Limited (the consultant) is commissioned by the Environmental Protection Department (EPD) of Hong Kong to:

- Study the scale of noise concerns arising from different construction activities at construction sites and renovation at domestic premises;
- Conduct a feasibility study of different quiet construction technologies and management practices for tackling noise from construction including renovation;
- Collect and review the noise control or management measures adopted in other metropolitan cities similar to Hong Kong;
- Explore possible options, or a combination of options, in addressing the concerns, by collecting information from the public and the industry; and
- Discuss the practicability of individual noise control options together with views collected from the public and various stakeholders in Hong Kong.

The formal title of this study is "A Study on Construction Noise Control in Hong Kong – Feasibility Study" (the Study).

1.2 Objectives

This Final Report outlines the general approaches adopted to conduct the Study, reviews the current Hong Kong position (government approaches, successes, and concerns), summarizes the key findings from different information collection exercises and technical feasibility studies, highlights the views collected from the various stakeholders, and describes the key deliberation outcome. Possible noise control and management options together with proposed implementation timetable are also presented.

1.3 General Approaches

Even though the Study is feasibility in nature, it takes on a holistic look at the issues associated with perceived construction noise disturbance in Hong Kong. A five-pronged approach, with specific targets and focal points, has been adopted for the effective execution of the Study:

1. Knowing the extent of the issues:

   Primarily through the conducting of a large scale territory-wide survey exercise to gather public views from over 5000 households.

2. Knowing how other cities are handling the issues:

Generally through an extensive research on relevant information from twelve (12) overseas metropolitan cities / places.

3. Knowing available technologies that may be useful in tackling the issues:

   Broadly through technical feasibility studies on quieter construction equipment and methods, and exchanging with leading industry experts and suppliers.

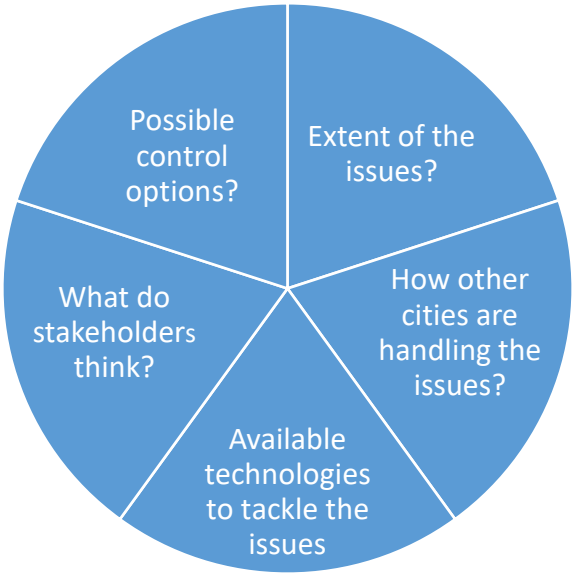
4. Knowing what industry stakeholders think:

   Mostly via the arrangement of face-to-face dialogs, as well as through the focus group meetings with diversified stakeholders, for seeking views on construction noise control / management.

5. Devising possible control and management options:

   Mainly through deliberation and analysis of information obtained via the first four prongs, and consideration of Hong Kong specific constraints and opportunities.

Figure 1.1 Approaches of the study



1.4 The Different Prongs

1.4.1 Public Survey

A large scale public survey exercise was designed to cover the whole of Hong Kong. The consultant approached a comprehensive list of scientifically selected households chosen to represent the entire Hong Kong population. More than 5000 households were successfully enumerated in this extensive territory-wide exercise. Their perception on construction noise and related issues were collected and analysed.

Prior to conducting the full public survey exercise, a pilot survey covering 50 households was conducted leading to the refinement the questionnaire (**Appendix A**) and the fieldwork procedures.

The survey had been conducted in accordance to *ISO/TS 15666:2003, Acoustics — Assessment of noise annoyance by means of social and socio-acoustic surveys.* It is designed to avoid pre-assumption. In order to obtain a higher response rate and credibility, the consultant had commissioned public survey specialist, MOV Data Collection Center Limited. With extensive experience in conducting social surveys with sample size greater than 5000 in Hong Kong Special Administrative Region within the past 3 years.

The survey is to collect views and information from the public on the degree of annoyance about various types of noise in the place where they resided in, mainly including: (i) noise of domestic renovation; and whether had carried out domestic renovation work in existing or previous premises and willingness to consider renovation methods that could cause less noise nuisance to neighbours; and (ii) noise of general construction works (including construction / demolition, road maintenance works, and renovation / maintenance works for building /shopping mall), as well as on how the daily life was affected by such noise, if any. Information on the general health status and sleeping condition were also collected.

The survey covered the land-based non-institutional population aged 18 and over of Hong Kong. It did not cover hotel transients, inmates of institutions, and persons living on board vessels.

The frame of quarters maintained by the Census and Statistics Department was used for sample selection. The sample was selected from records of all permanent and temporary structures in Hong Kong in accordance with a scientifically designed sampling scheme.

All households in the sample were approached for interview. A total of 5,066 households were successfully enumerated. Within each of these 5,066 households, a household member aged 18 and over was randomly selected by Kish grid method for interview. In other words, the defined population of the survey refers to all land-based non-institutional population aged 18 and over.

The face-to-face interview of the survey were conducted via electronic devices where data is input directly to a database to improve reliability and efficiency on fieldwork and analyses of data.

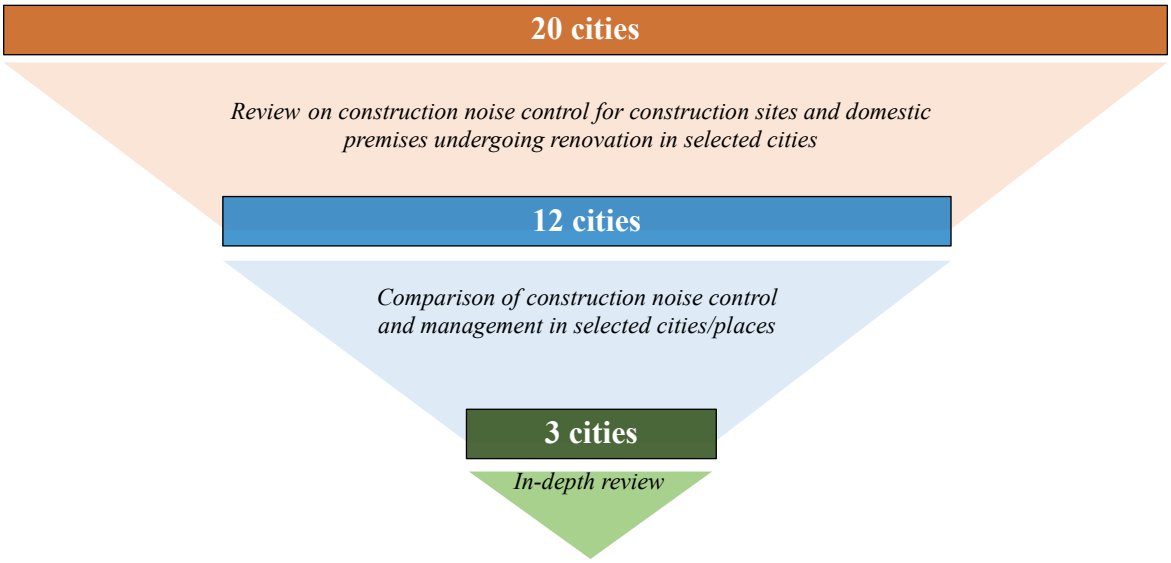
1.4.2 International Experience

A review of management and control of noise arising from construction sites and domestic renovation premises in other metropolitan cities is conducted to identify possible areas for improvement in Hong Kong.

Relevant cities are selected from United Nations Report "*The World's Cities in 2016*" and top 100 cities are examined to identify the most suitable 20 cities for the Study.

Upon screening of each of the 20 cities, twelve (12) cities with the more relevant management and control practices are selected for review. Afterwards, three (3) cities are selected for in-depth review. This methodology is graphically presented in **Figure 1.2** below.

Figure 1.2 Approach for selection of cities for screening, review and in-depth review



The consultant approached the respective regulating authorities in these metropolises to learn about their various ways and means of handling general construction and renovation noise. The 12 cities that have been selected are shown in below.

Each of the 12 selected cities has some unique noise management and control practices which may be good references for Hong Kong. The following information in terms of management or control of construction noise mechanisms, were collected:

- Time restriction of general or particular construction or renovation activities;
- Type of equipment permissible at a given place for particular activities;
- Number of equipment at a given place;
- Noise control zones (e.g. designated areas);
- Permit system;
- Label system;
- Enhancement of good practice guide;
- Incentive or deterrent schemes;
- Noise criteria.

To move into another deeper level of understanding, the following three cities:

- Sydney, Australia
- New York City, United States
- Westminster (London), United Kingdom

were further chosen, amongst the 12 selected cities, for deeper review through in person visits to the respective cities, and face-to-face interviews with the authorities. These three cities were chosen primarily because of the maturity and apparent effectiveness of their adopted noise control and management practices. Their noise policy framework, rationale behind the polices, noise control mechanism and achievements had been studied extensively.

Figure 1.3 Twelve (12) international cities selected for review

1.4.3 Available Technologies

Owing to the increasing awareness among general public regarding noise pollution, stronger regulatory framework and stricter occupational safety and health standards, various quiet construction technologies and practices have been developed that are less noisy than conventional methods. The consultant considered the following factors on selecting quiet technologies to control construction noise.

- Align with preventive approach
- Applicable to typical construction projects and noisy activities
- Maximise noise reduction and likelihood of the technology being applied to Hong Kong's situation
- Gain popularity in places of metropolitan setting
- Minimum practical constraints that are reasonably resolvable

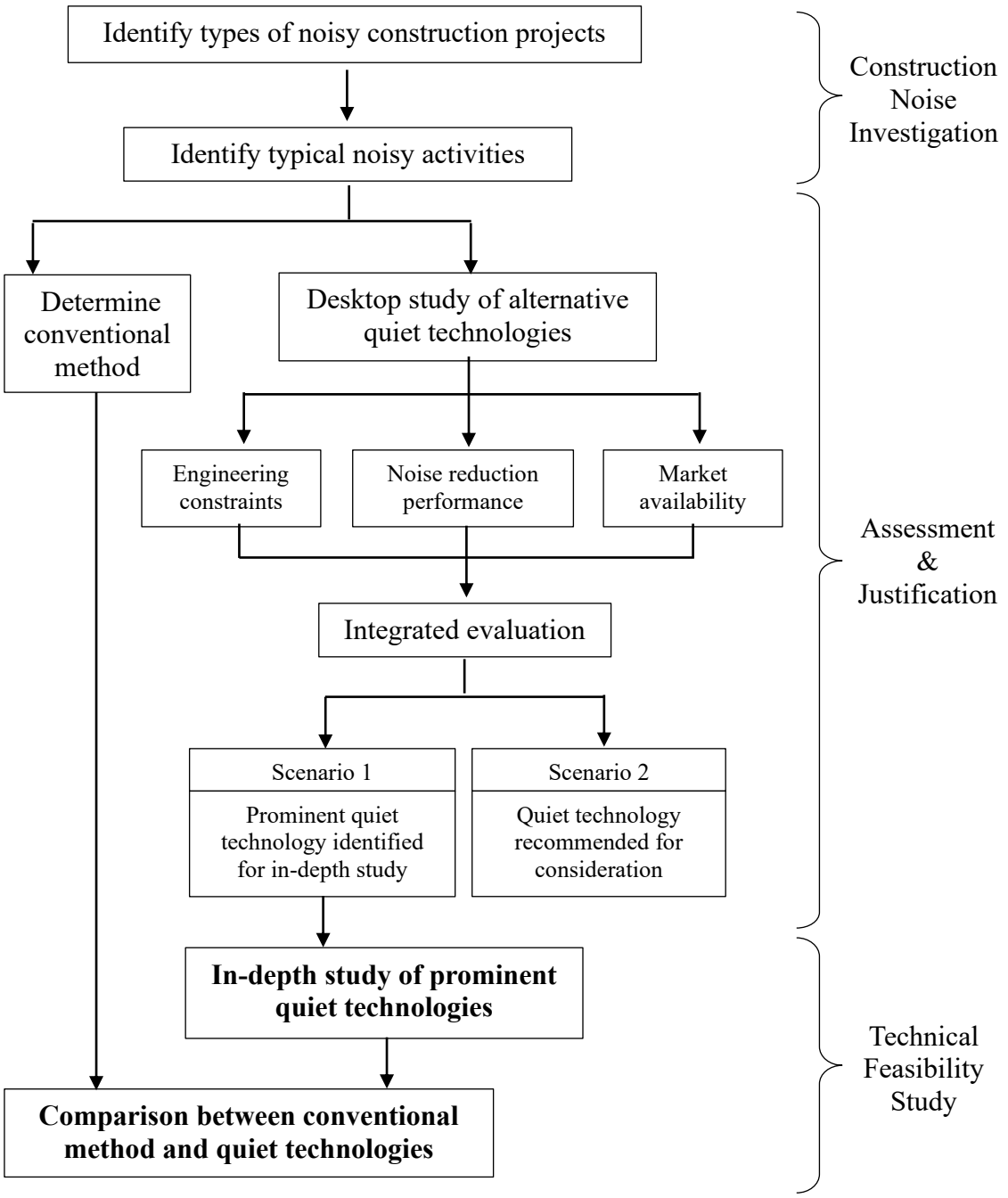
- Offer added benefits other than noise reduction
- Market Availability
- Incorporate innovative features that may attract new blood to the construction industry

Considering the factors as mentioned above, a methodology had been established as shown in **Figure 1.4Error! Reference source not found.**. The consultant has also examined the various kinds of construction activities in Hong Kong and the typical noisy activities that commonly lead to intrusive noise disturbance. The classification of noisy activities is shown in **Table 1.1**.

Table 1.1 List of typical noisy activities

Type of Noisy Construction Projects	Typical Noisy Activities
Site Formation	Rock breaking
Infrastructure Developments and Maintenance (Transportation and Utilities)	Road surface excavation for pipe installation
	Road maintenance of road surface breaking
Building Construction	Percussive Piling
	Concreting
	Formwork (Hammering and drilling)
Building Structure Demolition	Top-down method (Concrete breaking)
	Concrete demolition / removal
Interior Renovation Works	Plaster or tile removal works (Breaking)
	Wall breaking
	Channel making for pipe or conduit installation
	Drilling
	Predrilling and fastening

Figure 1.4 Methodology for technical feasibility study of quiet technologies and practices



Based on the aforesaid factors and the methodology, the consultant conducted extensive research in both local and overseas markets. Key information of potentially applicable quieter construction equipment and methods were gathered and studied.

Quiet technologies were evaluated based on whether they can replace the conventional work procedures which are predominantly percussive construction works or noise-intrusive machines. A review and research of quiet and/or new construction technologies and practices in metropolitan cities were conducted based on the preventive approach. The research included collection of operation data, noise data, advantages and practical

constraints through literature, market research and direct contact with relevant suppliers, agents, contractors and consultants.

An integrated evaluation of the alternative quiet technologies and practices was done for each noisy activity. Prominent quiet technologies and practices were selected based on noise reduction performance, benefits other than noise reduction, practical constraints, and other factors. Subject experts for general construction sites and domestic renovation were brought in to review the quiet and/or new construction technologies and practices. Subject experts justified the technical feasibility and potential in Hong Kong based on engineering procedure, practical constraints, planning, design, construction, and current legislation on the use of the technology, practices of the industry including culture, marketing matter, clients' requirements, resources, and professional judgement.

These were subsequently categorized and analysed according to the specific noisier construction activities. A list of more than 10 quieter technologies with the potential of local utilization in Hong Kong from technical feasibility studies.

1.4.4 Stakeholders Engagement

In addition to gauging public views as described in Section 1.4.1, the consultant initiated extensive dialogs with industry representatives in the construction and property management sectors in terms of the need of construction noise control enhancement, the views on possible control options and collect any views to tackle the construction noise issue.

Construction Sector

Initial view collection exercise was conducted to collect preliminary views from relevant trade associations and statutory body which are concerned with interests from a wide range of operators / sectors in terms of types of construction activities and scale of operations.

Preliminary views were collected from relevant trade associations and statutory bodies which are concerned with interests from a wide range of operators / sectors in terms of types of construction activities and scale of operations.

Their concerns and views had been used to form a basis for formulating various discussion topics and focus group meetings for collecting views related to the following main categories or sources of construction noise concerns:

- General Construction
- Piling Works
- Demolition
- Domestic Renovation

The consultant had arranged 4 focus group meetings for the respective topic zeroing in on various key construction activities.

More than 20 number of trade associations and 1500 number of individual companies in the construction field were approached and invited to the focus group meetings. In addition, a tutor from the Hong Kong Institute of Construction was also invited to share views and experience from the education / training perspective.

Property Management Sector

Initial view collection exercise was conducted to collect preliminary views from relevant trade associations and professional institutes.

Their concerns and views had been used to form a basis for formulating various discussion topics in focus group meetings for collecting views.

A questionnaire was also issued to all property management companies within the domestic residential market to further collect their views.

Their views were collected and analysed. This was an important step in understanding the positions and constraints of the practitioners in the industries, as well as learning the opportunities which might be available for developing and capturing. These were conducted amid the backdrop of continuously evolving aspirations of the general population. Subsequently, the opinions of the industries were reviewed with the assistance from the independent industry experts.

1.4.5 Possible Options

In the context of consolidating and considering the public perceptions, industry views, available technologies, as well as the experience drawn from overseas cities, the consultant derived and mapped possible options for the better control and management of construction and domestic renovation noise. This was done while deliberating the above key parameters together with the local Hong Kong situations in mind. Again, the independent industry experts rendered their assistance in this particular task.

Identifying the Issues

Due to the unique nature of various construction processes, different types of construction equipment are often used giving rise to varying degree of noise annoyance. Particularly noisy construction activities had been identified for each construction process as discussed briefly in Section 1.4.3.

Views from Stakeholders

For project proponents, the consultant understands that they are responsible for formulating the contract requirements and setting targets in terms of construction quality and

programme. The contract requirement determined during the tender stage is the source of information and obligation for the contractors, and therefore somehow set a boundary for the choice of construction methods / procedures to be adopted within a competitive contract sum. The consultant appreciated the general concern of project proponents in pursuing for minimal construction time and budget, and that any additional requirements (e.g. noise mitigation measures) springing out during the construction phase should be avoided. Concerns from the construction industry would be addressed during the processes in identifying the issues and proposing possible options.

Proposing Schemes for Noise Reduction

The consultant analysed the technical aspect and the channel of implementation of the technological solutions for proposing the potential schemes by considering the above key parameters to address the issues identified. Technical aspects would be considered for the generation of schemes with reference to the findings from technical feasibility studies. Both local and overseas practices or tools would also be considered to explore the means of implementation, while the findings or views collected through various engagement exercises would be used to cross-check if the concerns from various stakeholders have been adequately addressed.

The technical aspect of the solutions will focus on providing noise reduction for the noisy construction machines or procedures. The consultant would consider the solution based on basic principles of acoustics related to noise propagation as below. The principle for solution adoption would mainly be the noise reduction to be achieved and its practicality, by considering what could effectively be done for the following typical elements in noise propagation.

- Source
- Transmission path
- Receiver

To promote the adoption of the technical solutions, the consultant would explore different channels for implementation and other relevant means that would accelerate the change of culture within the construction industry while enabling the technical solutions to be implemented progressively to prove its effectiveness and practicality. The consultant would explore the most appropriate means of implementation for the technical solutions generated from the Study.

The approaches for exploring channels and schemes for construction noise control (general construction and domestic renovation) will be:

(i) an examination of the application and limitation of technological solutions for each issue identified;

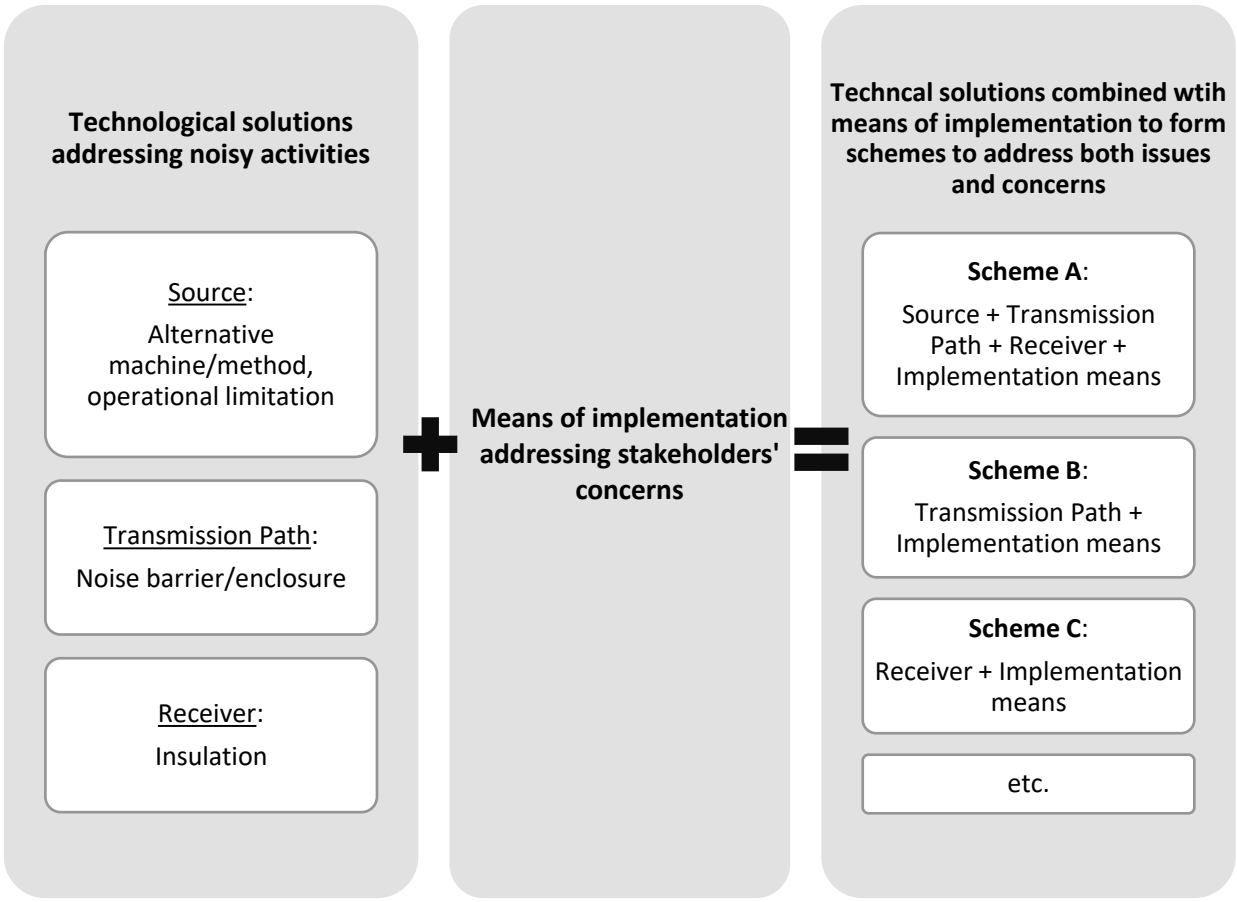
(ii) a collection of possible means or tools that might be useful for the implementation of those technological solutions;

(iii) an identification of important views collected during the stakeholder engagement exercises that should be addressed for any scheme; and,

(iv) a generation of channels and schemes by combining the technical solutions and possible means of implementation that could primarily address or balance the views and concerns of different stakeholders.

The channels and schemes would then undergo analyses of its practicality for selection, prioritization or rejection. **Figure 1.5** below shows the schemes generation process.

Figure 1.5 Illustration of schemes generation process



Scheme Analyses and Prioritization/Selection

The proposed schemes would very likely tackle the noise issues while addressing stakeholders' concern. Each scheme would be analysed based on the following considerations:

- Noise benefits
- Constraint
- Cost analysis
- Benefits other than noise

Noise reduction as an outcome of a scheme would primarily be the results from the findings in technical feasibility studies which can be viewed as a databank for the new quiet technologies. There are also noise benefits from technical means other than the new quiet technologies investigated and the consultant would also suggest those means as complementary measures based on experiences gained from construction noise management. The consultant would estimate the number of populations that would be benefited from respective schemes.

Cost analysis of each scheme would include cost for implementation, e.g. equipment and material / labour costs under a typical or chosen scenario as a common of representative operational situation which are included in the findings of technical feasibility study or estimated from consultant's experiences.

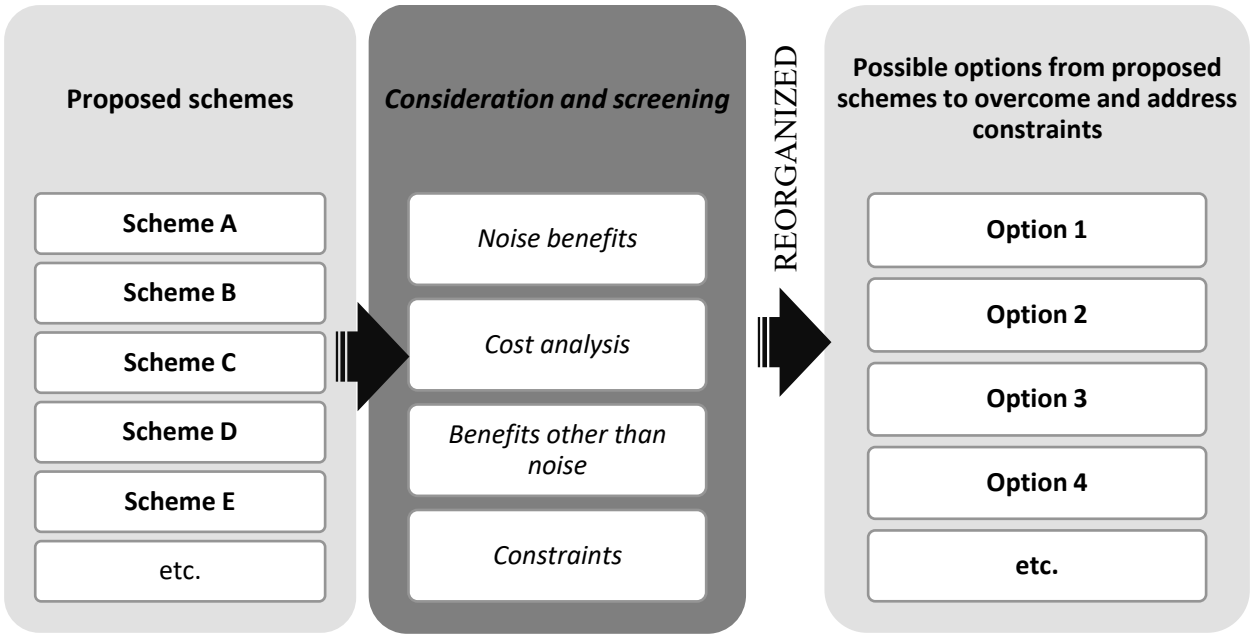
Benefits other than noise, e.g. occupational safety & health, good working culture development and increased work efficiency, and other environmental benefits (such as reduction in air pollution or construction waste) etc., would also be considered along the analytical process. Overseas reference might also be drawn to when appropriate to illustrate the benefits identified in other areas.

The schemes will then be recommended and prioritized in terms of the implications, easiness of implementation and effectiveness. If a scheme provides certain noise reduction with no significant constraints, the consultant will consider the scheme as possible for implementation unless there is evidence that the advantage in construction noise reduction should be offset by other benefits or concerns in the long-term. Constraints associated with each scheme will also be identified and suggestion on how to address those constraints will also be made. The proposed scheme will be considered as possible options for further recommendation.

Options Recommendation

With consideration in addressing the constraints and for easy reference from the perspective of different channels and means of promotion which the stakeholders are familiar with, the possible options will be reorganized and include various recommendation for adoption. **Figure 1.6** below illustrate the process of analysis and selection for further recommendation on possible options.

Figure 1.6 Illustration of analysis and selection process, options recommendation



2. EXISTING GOVERNMENT APPROACHES FOR THE PREVENTION, MINIMIZING AND CONTROLLING OF CONSTRUCTION NOISE

Hong Kong, like most developed cities and jurisdictions, has relatively comprehensive statutory provisions, as well as non-statutory platforms and initiatives to control and manage construction noise. The aim is to reduce the disturbance associated with construction activities.

On the statutory side, the *Noise Control Ordinance (Laws of Hong Kong, Chapter 400)*, and the *Environmental Impact Assessment Ordinance (Chapter 499)* provide the primary framework of regulating construction noise in the territory.

In addition to the broad legislative framework of the *Noise Control Ordinance (NCO)* and the *Environmental Impact Assessment Ordinance (EIAO)*, there are other non-statutory avenues in place in Hong Kong. These are meant to further reduce construction noise and the associated disturbance, as well as to supplement the bridging of certain gaps or missing links.

2.1 Policy Objectives

Of the many policy objectives under the larger construction noise control and management umbrella, it is apparent that the following inter-related focal points are key and prominent elements:

- Adopting a preventive approach
- Encouraging early focus
- Protecting the public while addressing the need to carry out works
- Utilizing proactive planning and decision tools
- Making positive influence at an early opportunity
- Seeking practical environmental outcomes for the community

These key and prominent elements are making distinct and visible footprints in Hong Kong's interactive journey to tackle construction noise.

2.2 Intervention in the Planning Process

This is actualized primarily through a preventive approach.

Implementation of the *EIAO*

The *EIAO*, which came into operation in 1998, requires project proponents of Designated Projects (DPs) to follow and implement the statutory Environmental Impact Assessment (EIA) process and comply with all requirements for the projects' construction and operation. The *Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM)*, promulgated under the *EIAO*, provides construction guidelines for DPs. The 75 dB(A) non-restricted hours limit for domestic premises and 70/65 dB(A) for educational institutions have been known to the

construction industry and major project proponents for over two decades. While these apply only to DPs, some non-DP construction projects, both in the public and private sectors, are also drawing reference to these well-known guidelines.

2.3 Enforcement of the Noise Control Ordinance

The Key relevant *NCO* provisions

The *NCO*, enacted in 1988, is by far the most comprehensive legislation currently in force to control many noise types. The key *NCO* provisions cover neighbourhood noise, construction noise, industrial noise, and noise from specific products. Road traffic noise and noise from aircraft are not within the ambit of the *NCO*.

Sections 6, 7 and 8 of the *NCO* are applicable to construction noise.

Hong Kong implements a restricted hours concept. The restricted hours are between 19:00 to 07:00 on weekdays, and all day on Sundays and General Holidays.

Generally speaking, the managing mechanism is:

- Percussive Piling – Prohibited during the restricted hours. Allowed outside of the restricted hours only with a valid Construction Noise Permit (CNP) for a specific number of hours per day
- General Construction Works – In broad terms, no control is exercised outside the restricted hours. A valid CNP is required for the use of Powered Mechanical Equipment (PME) during the restricted hours. In densely developed localities (called Designated Areas), there is an additional layer of control whereby the carrying out of Prescribed Construction Work (PCW) would also require a valid CNP during the restricted hours
- More stringent standards for 5 Specified PMEs (SPMEs) in Designated Areas

The above controls targeting construction sites are also applicable to renovation works in domestic premises during the restricted hours.

The neighbourhood noise provisions (Sections 4 and 5 of the *NCO*) are intended to protect the general tranquillity of dwellings, among others. For the exercising of controls, generally speaking, a "reasonable man" approach for annoyance assessment is adopted. It is to consider the particular context and circumstances rather than using pre-set criteria as the yardstick.

There is also a "flexibility provision". Section 6(6) provides an escape whereby the CNP requirement during the restricted hours could be side-lined if the owner, tenant, or occupier is only using one portable item of PME. However, this is balanced by Section 4 which requires that the noise is not causing any annoyance between the hours of 11 p.m. and 7 a.m., or at any time on a general holiday, thus safeguarding the possibility of abuse.

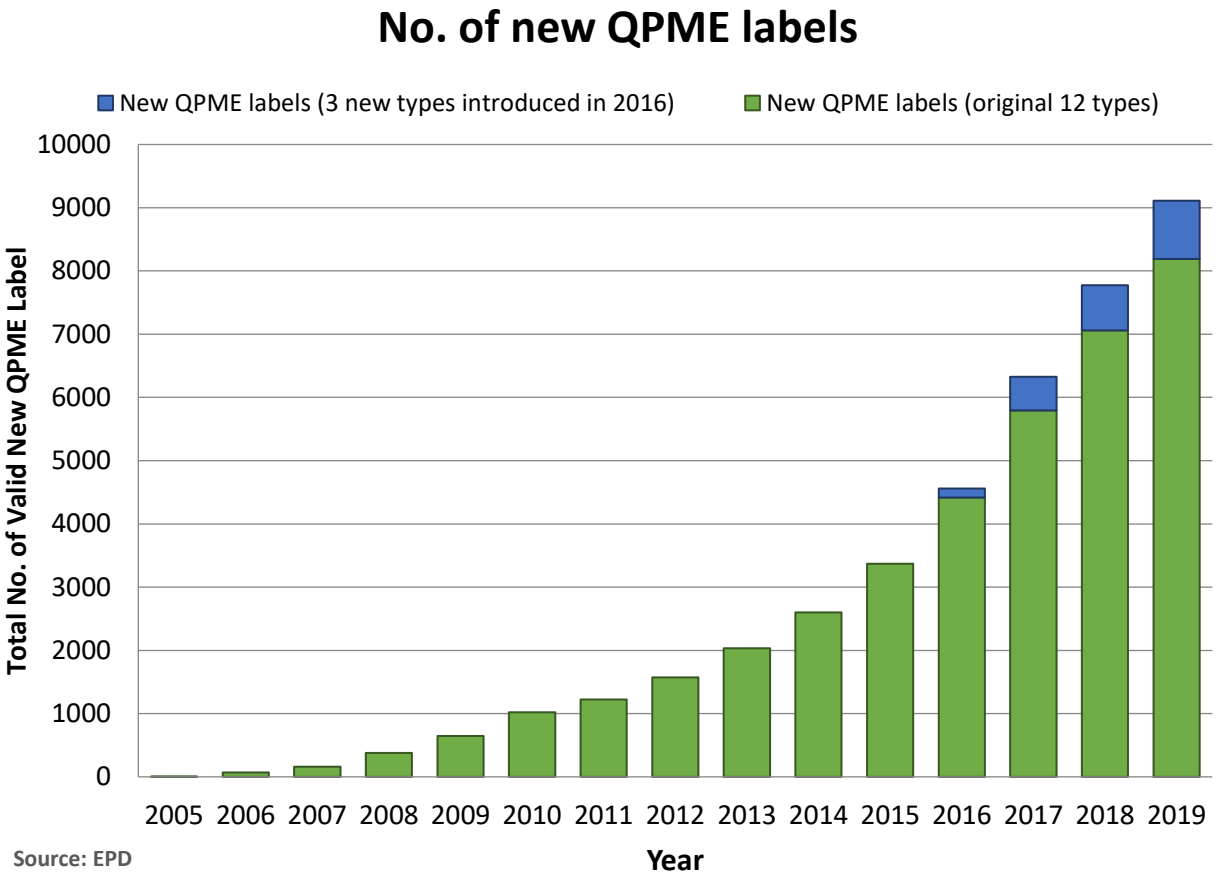
2.4 Introduction of Quality Power Mechanical Equipment

The Quality Powered Mechanical Equipment (QPME) label was introduced in 2005 by the EPD as an administrative labelling system to complement statutory Noise Emission Label (NEL) system by benchmarking construction powered mechanical equipment that are new, notably quieter, more environmentally friendly and efficient.

The QPME system is to reflect the state-of-the-art construction equipment. The target is to provide incentives to the equipment suppliers to import more types and models of quieter equipment into Hong Kong, leading to better quality products and a more competitive pricing for the QPME in general. More specifically, the Sound Power Levels (SWL), attested to each of the QPME, would be recognized by the Environmental Protection Department (EPD) for purposes of noise assessment in the Environmental Impact Assessment of Designated Projects and a higher successful rate in Construction Noise Permit application, in which the SWL of the QPMEs are generally lower that of its non-QPME counterparts. From the communities' point of view, the wider use of QPME would help reducing the noise from construction works at all times.

Since its introduction, the popularity of QPME is keep on raising as the number of PME with new QPME label that are circulating in the market increased exponentially over the years as shown in **Figure 2.1**.

Figure 2.1 Number of PME with new QPME label



2.5 Engagement and Partnership Programs

In addition to tackling construction noise from the planning and enforcement perspectives, a broad range of engagement and partnership programs is also available and being widely utilized. For example, the government on its own and also co-working with relevant trade and professional bodies, publish codes of practices, technical circulars, practice notes, as well as organizing trainings, seminars, conferences, and workshops to promulgate and promote good practices. It is worthwhile to note that in recent years, a lot of joint functions have been organized with the construction industry such as symposia, site demonstrations and exhibitions on quiet construction equipment to share expertise in quiet construction. Collaboration with training bodies in conducting courses for site supervisors or even trainers has also been strengthened.

3. SUCCESS OF THE CURRENT PRACTICES IN CONTROLLING & MANAGING CONSTRUCTION NOISE

The many government and non-government initiatives on construction noise control and management, be it statutory, administrative, or otherwise, are well established and continuously providing healthy dividends. This is not to say that the Hong Kong situation is already 100% totally satisfactory, to all people at all times under all situations. It is, however, reasonable to claim that Hong Kong is among the front runners in the worldwide scene.

While there certainly exists various aspects or areas that could be further improved upon, Hong Kong is enjoying reasonable successes in the journey to contain the noise disturbances associated with general construction and domestic renovation.

3.1 Intervention in the Planning Process

Since the 1998 enactment of the EIAO, all Designated Projects (DPs), primarily major infrastructure or larger scale construction projects, have been under the jurisdiction of the EIA process. Regulating the noise impacts associated with these DPs has always been an important element in the consideration of granting Environmental Permits (EP) for these projects, many of which are prominently visible or high profiled. DPs constructed under their respective EPs are continuously being monitored. While this would not be equivalent to issues free construction at all times, it is a good assurance that things happening on sites are being scrutinized in a competent and professional manner in most circumstances.

In cases whereby issues surfaced or complaints lodged, the respective mechanisms under the EIA process are prompting the early resolving of such issues or complaints.

Since the implementation of EIAO, the contractors are becoming aware of the livelihood of the surrounding residence as various noise mitigation measures (**Figure 3.1**), most notably in the form of well-designed noise enclosure, are becoming a popular sight within the construction site of the DPs. Millions of dollars would be spent on these noise mitigation measures, not to mention the time and effort on designing as an effective measure, to protect the serenity of the nearby residence from their construction activities.

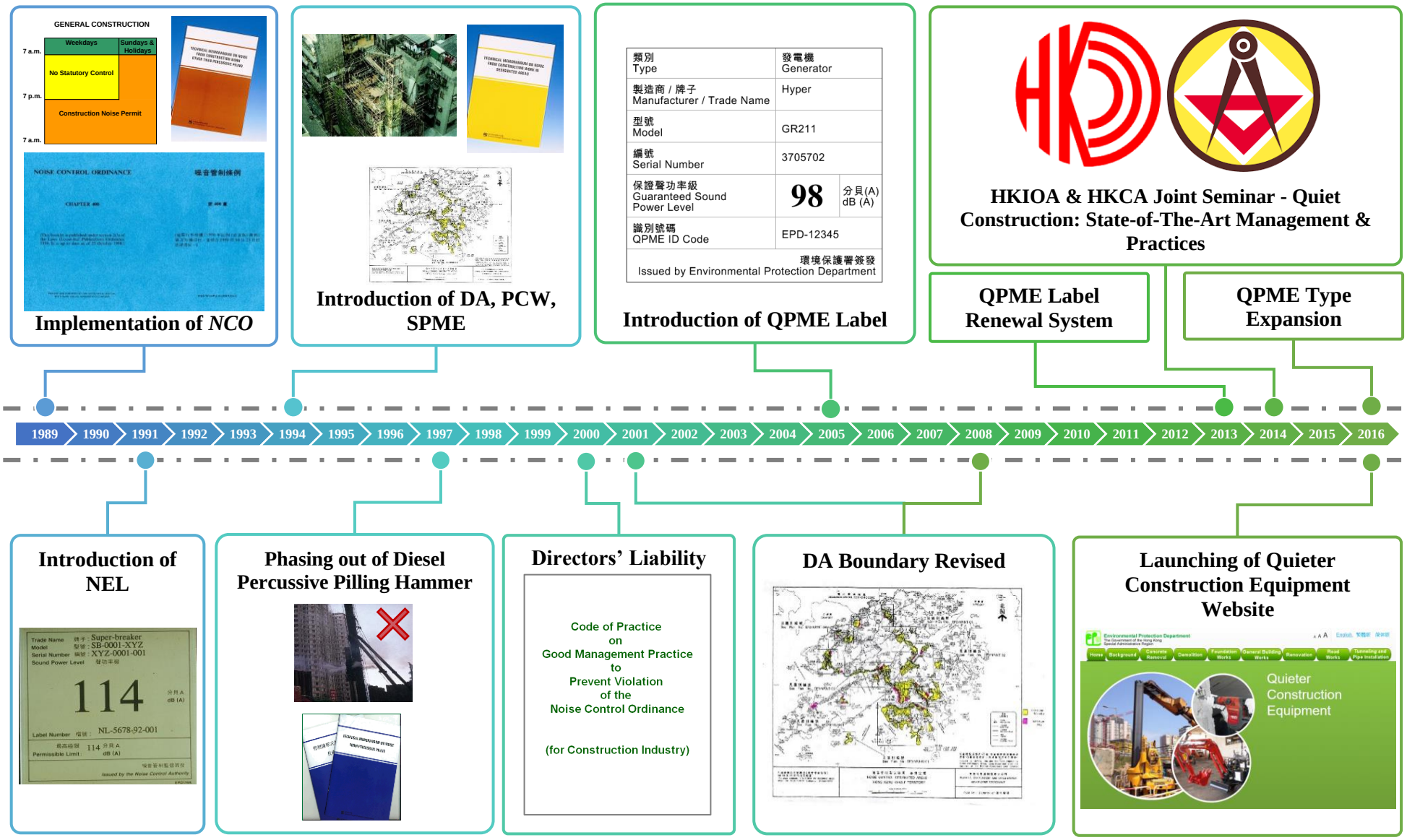
The successful implementation of the Hong Kong EIA process is a clear indication that construction noise for DPs is attended to in an early stage of the respective project cycle. Planning away the problems as a preventive measure is actively being pursued. Positive results are continuously being witnessed.

Figure 3.1 Examples of noise mitigation measures adopted in Designated Projects

3.2 Development of Construction Noise Control and Management

The CNP provisions as mentioned in Section 2.3 are key elements under the *NCO* construction noise control regime. Both the daytime percussive piling controls, or the regulating of works within the restricted hours, have been widely accepted by the respective trades and the city's residents. The CNP provisions, which have a legacy of more than 30 years, are being adhered to carefully and enforced sensibly. The introduction of the QPME label system (Section 2.4) and the strengthening of partnership programmes (Section 2.5) also contributes to the protection of our noise environment. This is achieving a fine balance in the preventing of excessive noise exposure, and the city's needs to progress with construction works. **Figure 3.2** shows the development of construction noise control and management timeline.

Figure 3.2 Development of construction noise control and management



3.3 Good Practices and Community Relations

Practice Notes and Best Practices

The government has throughout the years promulgated many Practice Notes (PNs) for the construction industry and related trades and professions. Some of these PNs are applicable to noise control and management purposes. A few examples are:

- *Code of Practice for Demolition of Buildings* published by Buildings Department
- *Practice Notes for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers* published by Buildings Department
- *Professional Persons Environmental Consultative Committee Practice Notes* published by Environmental Protection Department
- Technical Circulars of Development Bureau
- *Building Environmental Assessment Method* (BEAM)

Over the past 20-plus years the industry has also developed many viable and tested best practices (which are continuously evolving). The adoption of such proven practices, while not universal for all construction works in Hong Kong, is nonetheless producing positive effects on the noise control scene. One notable example is:

- *Best Practice Guide for Environmental Protection on Construction Sites* published by The Hong Kong Construction Association

Administrative Measures

Certain small-scale administrative measures, be it location specific or process specific, are quite effective in limiting noise disturbance. For example, some property management companies implement time restriction for renovation works in the residential estates under their jurisdiction. Some proven practices are:

- Restricting works to non-holiday Mondays through Fridays (thereby giving residents quieter Saturdays)
- Prohibiting works during certain non-restricted hours, say, before 09:00 or after 18:00 (intended not to annoy the non-early-risers in the morning, or disturb the evening family hour before dinner)

There are also other administrative systems adopted within the construction industry. For example, some contractors use an internal "permit to work" system to ensure CNP provisions are closely adhered to by their staff and/or their sub-contractors. Some contractors, through internal liaison, manage different sub-contractors and related activities (with or without noise management plans) to avoid excessive noise emission from their sites.

Incentives

Some project proponents have put incentive schemes (awards and extra payments) in place to encourage contractors to strive for improvement in noise management. Different organizations are also promoting such initiatives through environmental performance awards, considerate contractor awards, etc. For example, the Hong Kong Construction Association and the Business Environment Council both hold regular competitions to recognize and award contractors with good environmental performances or records.

The government is also taking another step forward in encouraging and cultivating new and more proactive attitudes by providing subsidies to the construction industry, and these could be good references in case some new noise initiatives require similar government incentives. One of the examples is the aforementioned QPME scheme. The purchase of QPME could not only provide profit tax concession to the purchaser, but also enable noise assessments based on the lower sound power levels of QPME to facilitate a successful CNP application.

Caring for the Affected Residents

In recent years there has been an emerging trend of project proponents and contractors, particularly those working on major projects, enhancing the communication with local residents. Such communication improves information flow and has a positive effect on understanding the perceived noise disturbance.

Some project proponents and contractors set up complaint and enquiry hotlines or operate community liaison offices to quickly respond to site noise related issues, among others.

Under specific circumstances some project proponents would consider compensating residents affected by excessive construction noise for extended duration. These may be in the form of upgrading the window façade for better noise insulation or providing air conditioning so that windows could be closed when required.

4. EXTENT OF CONSTRUCTION NOISE CONCERNS

4.1 Hong Kong's Situation

According to official statistical data for mid-2018, the number of construction sites rose to 1,489. [Ref.1] Understood the extent of the noise generated by a construction site affecting surrounding residence would subject to the population density where the site is located. As 70% of the construction sites are building site, the consultant expects those construction site would be located in a more densely population area where 4 residential towers of 25 storey high would surround the construction as a simulated case. Given only a single façade would face the construction site, 4 units per floor will be directly expose to the construction with a typical residential building of 8 units per floor. The consultant estimates there are 595,600 households in 2018 had subject to various degree of noise from construction site activities.

On the domestic renovation aspect, as of 2017, the revenue of domestic renovation market is estimated to be 16.4 trillion Hong Kong Dollar. From the subject expert of the consultant, it is assumed that a household would spend HK$300,000 for domestic renovation, it is estimated the number of renovation conducted in 2017 was 54,700 cases. With considering the number of affected households that are adjacent to the source from different directions that would be up to 8 households for mega development for each case, it is estimated there are 437,000 household in 2017 had subjected to various degree of noise form domestic renovation activities.

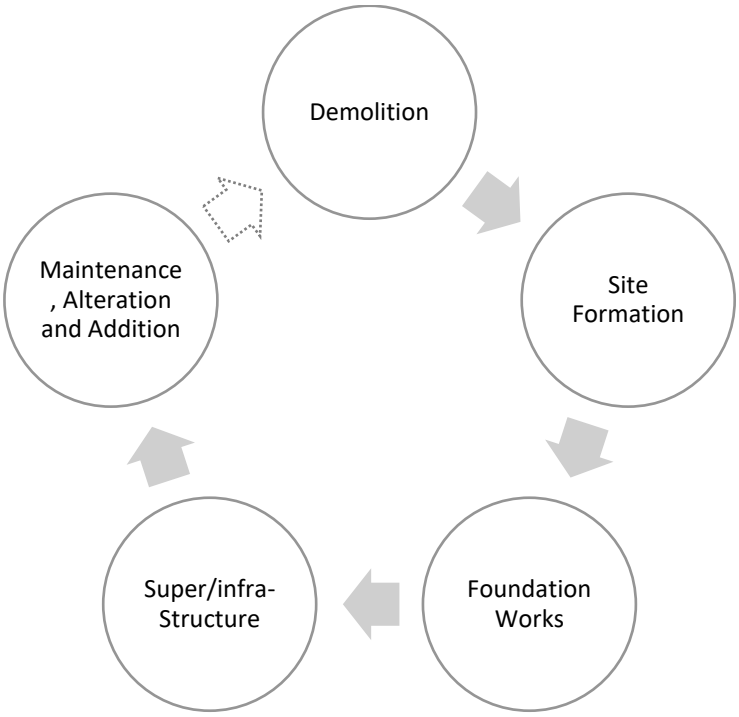
4.2 General Construction Activities

It is important to note that daytime works are generating the largest extent of disturbance. In comparison, night works are relatively better controlled and managed as perceived by the public.

The consultant has attempted to examine holistically the different construction processes and suggested that these processes could in general be categorized in terms of a construction cycle in a developed or developing site as follows and **Figure 4.1**:

- Demolition of existing structures
- Site Formation for redevelopment or development on a piece of virgin land
- Foundation Works for redevelopment or new development
- Infrastructure and Super Structure including buildings, elevated or underground structures, railways, motorways, etc.
- Addition & Alteration, Maintenance & Repair of existing structures or facilities

Figure 4.1 Illustration of a typical construction cycle



When looking at the control or management schemes, the consultant is particularly aware of an apparent and yet important phenomenon. While all construction activities would generate noise in one way or another, the perceived disturbance may not be caused by each and every construction activity. The key is to correctly identify the "major noise contributors or triggers" under the most common circumstances, so that appropriate focus and efforts could be devoted to more effective tackling of the root of the problem leading to the noise disturbance. The characteristics of these "major noise contributors or triggers" may be due to the production of intrusive noise, extensive working hours required or/and the sensitive time of working hours that attract annoyance, e.g. night-time.

This adopted approach of bearing in mind the "major noise contributors or triggers" while considering the options, is in synchronization with an important mandate, i.e. to provide an understanding of the most critical situation and appreciating the best way forward.

The consultant has identified that percussive operations (such as the use of percussive machines for breaking up rocks during site formation in a piece of hard ground, pile driving during foundation works, or demolishing concrete structures during building demolition or refurbishment, etc.) are the "major noise contributors or triggers" of construction noise disturbance in most cases, because those percussive operations usually involve high energy impacts or blows for breaking up the rocks or concrete, and high levels of intrusive noise are inevitably generated from such impacts or blows. Such an identification is based on the consultant's technical knowledge and professional judgement from a wide range of site and long-standing experience as well as substantiation from the dialogs with industry partners, stakeholders and regulating authorities. The major noise contributors or triggers are summarized in **Table 4.1**.

Table 4.1 List of major noise contributors and triggers for general construction

Cycle	Major Construction Activities	Common PMEs Used / Activities	Typical SWL, dB(A)
Demolition	Structure breaking	Excavator-mounted percussive hydraulic breakers	122
	Rubble handling and transport	Crane and road-legal dump trucks	95-112
Site Formation	Rock breaking	Excavator-mounted percussive hydraulic breakers	122
	Rock crushing	Rock crusher	118-120
	Soil excavation	Excavators	112
	Rubble transportation	Excavators and road-legal dump trucks	105-112
Foundation Works	Percussive pile driving (H-beam or sheet pile)	Percussive pile driving machines	126
	Bored pile construction	Oscillator Mobile crane Reverse circulation drilling machines	100-115
Infrastructure / Superstructure Works	Formwork assembly	Handling of steel bar and wooden board Hammering	106
	Concrete filling	Concrete lorry mixers Concrete pump Crane	95-112
	Concrete consolidation	Vibratory poker	102-113
Building Addition and Alteration	Wall or ground slab trimming	Percussive breakers	108
	Wall or ground slab drilling	Percussive drills	103
	Wall or ground slab opening	Percussive breakers	108
	Wall or ground slab groove opening	Percussive breakers	108
	Tile Removal	Percussive breakers	108
Road Maintenance / Repair	Road Surface breaking / opening	Percussive breakers	122
	Asphalt laying	Asphalt paver	109
	Consolidate the asphalt	Road roller	108
Utilities Maintenance / Repair	Road Surface breaking	Percussive breakers	122
	Trench opening	Excavator Vibratory hammer for sheet pile retaining wall	112-115
	Pipe laying, rehabilitation	Mobile crane	112
Railway Track and Facilities Maintenance / Repair	Rail track and overhead line maintenance	Rail grinding vehicle Rail milling vehicle Steel cutter	108 - 112
	Logistic, inspection	Locomotive as hauling vehicle	108

4.3 Domestic Renovation

Domestic renovation is basically alteration, additions, maintenance and repair work specific for residential units or flats in buildings, and therefore of relatively smaller scale compared with the renovation of those common parts of a building such as podium, common halls / lobbies / corridors or external facades. However, due to the neighbourhood nature of the noise issues with a residential flat under renovation being a noise producer at one time might itself being affected by a neighbouring flat undergoing renovation. The noise problem is generally resolved through communal approach.

Technological solution is also important in relieving the noise disturbance, in particular, to address the unique noise transmission mechanism through structural elements of a multi-flatted high-rise building. Hence, domestic renovation will be looked into as a separate category for tailored solutions to tackle domestic renovation noise. Typical noisy activities in domestic renovation are listed in **Table 4.2**.

It is difficult to mitigate domestic renovation noise since it is transmitted and radiated via solid structural medium, while the noise transmitted through an air medium could be mitigated by substantial screening from structural partition such as walls, floor slabs and closed doors. Any activities, especially of impact nature, that directly excite the structural elements would potentially produce noise to a distant. Hence, commonly used percussive breakers and drills would readily induce high impact force on the structural elements and transmit intrusive noise from the percussive actions to even few units away or few storeys apart with minimal attenuation. Hence the consultant considers all the percussive means for domestic renovation activities mentioned in **Table 4.2** are the major noise trigger for noise nuisance.

One other difficulty in reducing domestic renovation noise is that it is impractical to mitigate structure borne noise via transmission path control, not to mention mitigation at the receiver end, as extensive internal alteration as well as space is required for effective vibration dampening or isolation, which is almost not practical in existing apartment typed dwelling.

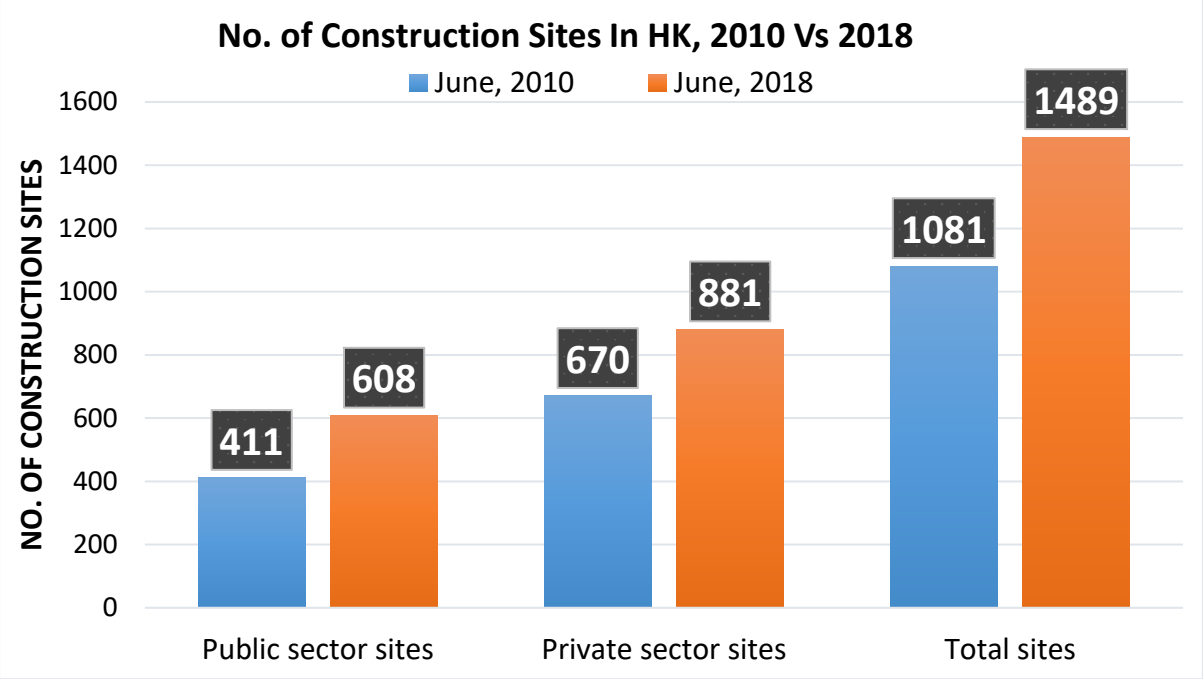
Table 4.2 Major noisy activities for domestic renovation

Major Construction Activities	Common PMEs Used	Typical SWL, dB(A)
Wall opening/breaking	Percussive breakers	108
Wall groove opening	Percussive breakers	108
Concrete drilling	Percussive drills	103
Tile removal	Percussive breakers	108

4.4 The Trend and its Significance to Hong Kong's Development

The construction industry in Hong Kong is getting busier and busier. According to official statistical data, there is a more than 40% increase as compared to the situation from mid-2010 when there were around 1,100 sites [Ref.2], and to around 1,500 sites in mid-2018 [Ref.1] (**Figure 4.2**) which was a high number already when considering the compact size of Hong Kong and the corresponding population density.

Figure 4.2 Number of construction sites - 2010 vs 2018



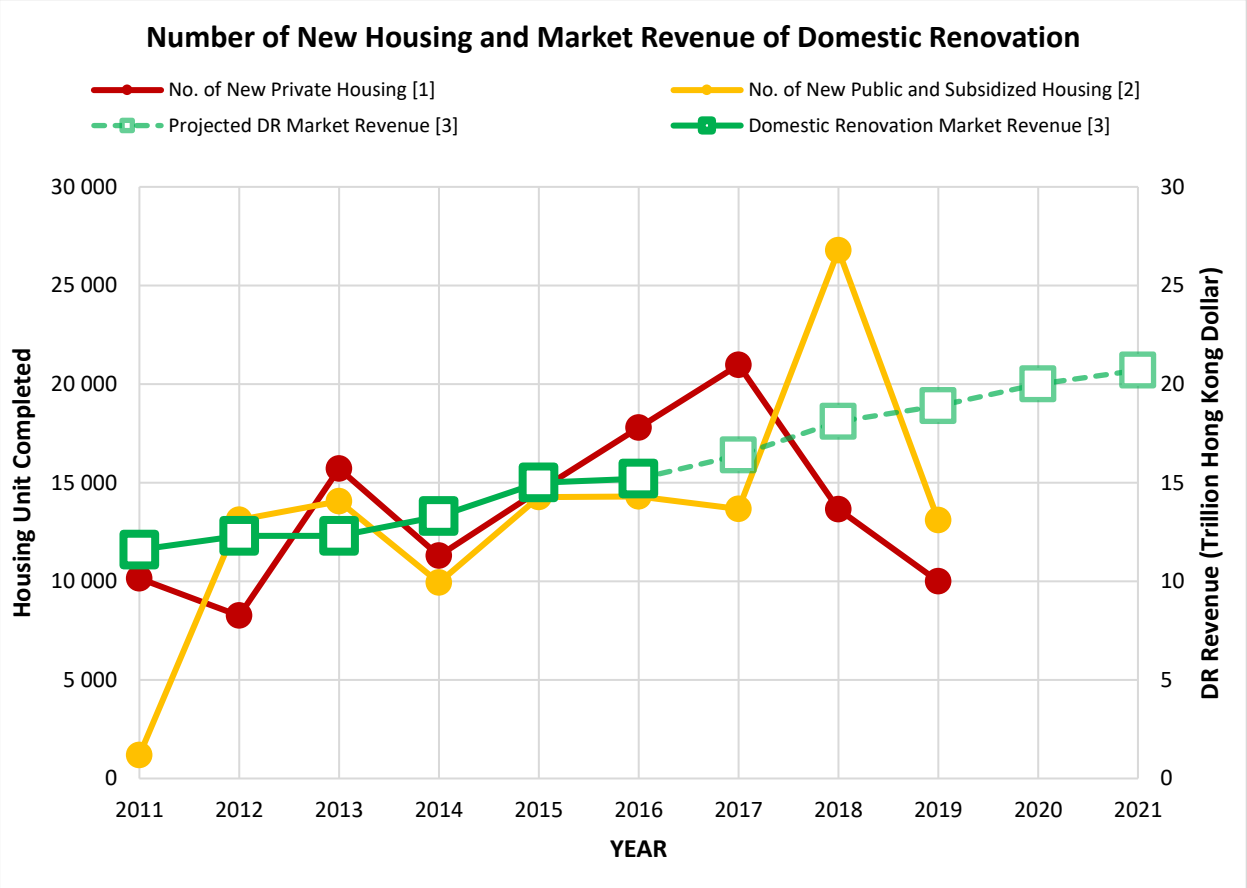
On the domestic renovation side, the number of permanent housing had increased over the past years and the market size of the domestic renovation is expected to grow further (**Figure 4.3**), the number of domestic renovations is expected to follow which the number of household that will be affected by noise from domestic renovation activities will increase in the future.

Based on the *Long Term Housing Strategy Annual Progress Report 2019* by the Legislative Council, the housing supply target is set to 430 000 units over the next 10 years (2019 to 2029) with the public/private split of 70:30 as target, i.e. 301 000:129 000 units. [Ref.3]

From the perspective of general construction, governmental involvement of building site, which was usually dominated by private sector, is estimated to be double of the private sector in the next 10 years. In combination of civil construction site and infrastructure projects, the consultant anticipates that governmental construction site will dominate the market of construction industry in the upcoming years.

Hence over the next 10 years, in average, it is estimated 43 000 of new units of housing will be completed and supply to the housing market per year. With such increase in housing supply, the consultant anticipates the number of domestic renovations will follow.

Figure 4.3 Number of new housing unit and domestic renovation revenue



[1] Private Domestic - Completions, Stock, Vacancy and Take-up by Rating and Valuation Department [Ref.3][Ref.4]
[2] Actual Public Housing Production by Housing Authority [Ref.3][Ref.5]
[3] Investigation Report of Hong Kong Domestic Indoor Design Market by HKEXnews [Ref.6]

5. STUDY FINDINGS

5.1 Overseas Experience and Practice

Each of the 12 selected cities has some unique noise management and control practices which may be good references for Hong Kong. Many of them manage or control construction noise through a variety of mechanisms (e.g. legal status) were examined and categorized as follows, and further discussed in Section 5.1.1 and 5.1.3:

- Management at Source, e.g.:
    - Individual machine type noise control (e.g. labelling system)
    - Restriction on machine operation
    - Best practicable means
    - Noise limit at a distance
    - Other measures e.g. site management
- Management along Transmission Path, e.g.:
    - Enhancement of good practice guide;
    - Incentive or deterrent schemes;
- Management at Receiver, e.g.:
    - Time restriction of general or particular construction or renovation activities
    - Noise control zones (e.g. designated areas);
    - Noise criteria at receiver.

In addition, the consultant has also identified in Section 5.1.4 and 5.1.5 useful practices in:

- Pre-empting noise problems through early planning; and
- Stakeholder management through community liaison.

Besides, the consultant has acquired some distinct observations from face-to-face interviews conducted with authorities in City of Westminster, Sydney and New York City, as reported in Section 5.1.6.

The consultant also observed that overseas practice does not deliberately categorize domestic renovation as an individual issue. Although overseas cities generally defined as general construction, they are given the impression that domestic renovation noise are mainly managed via community approach.

5.1.1 Management at Source

5.1.1.1 Individual Machine Noise Control (e.g. Labelling System)

5.1.1.1.1 Labelling System

Labelling system generally requires the application of a label for different type of machine to display its SWL for identification. Measurement shall be conducted by a certified body. Regulatory labelling system would usually require certain type of machine to comply criteria otherwise it will be forbidden to use and sale.

Administrative labelling generally serves to promote the industry to adopted quieter machines by provide incentive.

Both regulatory and administrative labelling system were being implemented in Hong Kong.

5.1.1.1.2 Other than Labelling System

5.1.1.1.2.1 *Melbourne*

The statutory noise control in Melbourne does not include a labelling system, instead it includes a Designated Sound Level (DSL) system which requires all machines to comply with a definite noise level.

5.1.1.1.2.2 *Toronto*

The statutory noise control in Toronto includes a general machine noise control system in which all machines at construction site must not emit higher than L_{eq} 85dB(A) noise when measured at a distance of 20m for 5 minutes. This system, as discussed with the authority's representative in Toronto, is used as the last resort to handle noise complaints. It is different compared to all other cities under consideration in the Study.

5.1.1.1.2.3 *New York City*

The statutory noise control in New York City is based on a specific machine noise limit system in which a list of machines is provided with corresponding noise limits that must not be exceeded. It is similar to the DSL system of Melbourne.

Table 5.1 shows the summary of individual machine noise control.

Table 5.1 Source control summary

	Regulation		Administration	
	Description	**No. of PME type**	**Description**	**No. of PME type**
Hong Kong	NEL (Label)	2	QPME (Label)	15
City of Westminster	Best Practicable Means; and EC Directive 2000/14/EC (Label)	53	-	-
Sydney	Labelling (Label)	7	-	-
Berlin	EC Directive 2000/14/EC (Label)	53	Blue Angel (Label)	33
Tokyo	-	-	"Low Noise" and "Super Low Noise" (Label)	22
Seoul	"Noise Inspection" (Label)	6	Eco-label (Label)	30
Melbourne	Designated Sound Level (noise limits for respective machines)	-	-	-
Guangzhou	-	-	-	-
Taipei	-	-	Construction Noise Control Project	-
Singapore	-	-	Quieter Construction Fund	-
Toronto	General machine noise limit (a noise limit for any machines)	-	-	-
San Francisco	-	-	-	-
New York City	Specific machine noise limit (noise limits for respective machines)	-	-	-

5.1.1.1.3 *Summary of Regulatory Labelling System*

When compared with Hong Kong's system, Sydney and Seoul use similar legal mechanism of listing machines that must obtain a visual symbol of compliance before use. The noise levels listed for each product are comparable with that of Hong Kong, but there are more products included in Sydney and Seoul some of which are not commonly used in Hong Kong.

5.1.1.1.4 *Summary of Control through Administration*

The summary of the noise criteria for administrative machine labelling is shown in **Table 5.2.**

Table 5.2 Summary of noise criteria for administrative machine labelling

Type of PME	Hong Kong (QPME)	Berlin / City of Westminster	Japan	Seoul
Hand-held breaker	105	104	100	105
Air compressor	97	95	95	97
Tracked Bulldozer	103	101	96	103
Wheeled Bulldozer	101	99	96	101
Tracked Loader	103	101	96	103
Wheeled Loader	101	99	96	101
Excavator	95	93	95	95
Generator	95	91	92	91
Mobile Crane	101	99	94	101
Vibration Roller	101	103	95	105
Road Roller	101	99	95	101
Asphalt Paver	101	99	95	N/A
Vibratory Compactor	105	103	N/A	108
Power Rammer	105	103	N/A	N/A
Concrete Crusher	99	N/A	93	99

Remarks:

1. The noise criteria for administrative machine labelling is represented by the upper limit of Sound Power Level (SWL).

5.1.1.2 Restriction on Machine Operation

In some situations, certain machines and their use may be restricted or even prohibited in certain areas of the city or during certain times. The distinction between machine labelling system and restrictions on machine operation is that a machine may be labelled (or not require any label) and allowed to be used in the city, but it may require a permit or otherwise may not be permitted at a specific time or place.

Table 5.3 Summary of restriction on machine operation

Cities	Restriction on Machine Operation
Guangzhou	There are demarcated noise control areas in Guangzhou where percussive piling is completely prohibited.
Hong Kong	The percussive piling machines operation in Hong Kong requires a permit in advance. Subject to the assessment results, the working period could be granted for 3, 5 or 12 hours at specific time frame. At minimal operation, one percussive machine could be operated for 3 hours.
New York City	There is no restriction on the use of a specific machine in New York City. A list of machines (including Percussive piling machines, breakers and other impact tools) shall fulfil certain criteria. But there are no definite criteria for accumulative noise level.
San Francisco	Similar to Toronto, machines that emit more than L_{eq} 80dB(A) at a distance of 100ft are not allowed to be used at any time and place in the city except for percussive machines which can be used if a muffler of 5dB(A) or higher noise reduction capability is installed.
Singapore	Singapore does not have a restriction on machine operation system for general construction works, but they do have a system to restrict use of machines during domestic renovation works. The contractors are restricted to use maximum 2 machines in a domestic premise during renovation works at the same time. This regulation does not consider the individual sound levels of each machine, instead the number of machines is considered.
Taipei	In Taipei, a contractor is required to submit the list of powered mechanical equipment to be used during the construction of the project. The contractor can only use these machines after approval from the authority based on overall noise criteria from construction site.

Tokyo	Several works have been classified as specified construction works by the Tokyo authority depending on the machines being used and the level of noise being generated from the works. A contractor must obtain permit from the authority before commencement of such works.
Toronto	Machines that emit more than $L_{eq\ 5mins}$ 85dB(A) at a distance of 20m are not allowed to be used at any time and place in the city. For machines that generate louder noise, the authority requires placement of noise mitigation measures around the machine to comply with the regulation.

5.1.1.3 Best Practicable Means

Table 5.4 shows the summary of the cities studied that adopted best practicable means in terms of construction noise management.

Table 5.4 Summary of best practicable means

Cities	Best Practicable Means
City of Westminster	Best Practicable Means (BPM) is a distinct feature of the noise policy in City of Westminster such that there are no explicit criteria specifying what mitigation measures and noise limit are acceptable for a noise consent application. It is hereby highlighted that in the City of Westminster, there are sets of agreed standards and guidelines to follow for implementation of BPM, such as *BS5228-1:2009 Code of practice for noise and vibration control on construction and open sites*, and *Best Available Technology not Exceeding Excessive Cause (BATNEEC)*. These standards and guidelines provide an objective framework for BPM implementation.
Hong Kong	BPM is required for construction works that must be operating during restricted hours of 1900 to 0700 due to unavoidable constraints, e.g. road works, where prior assessment is required for permit application. During early planning process of Environmental Impact Assessment stage of Designated Project, BPM will also take into account.
Sydney	Weekend work is allowed if it meets the weekend work noise criteria. In cases where the criteria are not met, the contractor is required to obtain permission from the authority in advance. The permission may only be granted if the contractor provides a strong justification to the authority for weekend work, proves that the community has been satisfied and, importantly, proves that the best possible mitigation measures have been used. Only when these three steps are taken, the authority would allow the contractor to work on weekends with exception towards the requirement.

5.1.1.4 Noise Limit at a Distance from Machine

Table 5.5 shows the summary of the cities studied that has noise limit at a distance from machine.

Table 5.5 Summary of noise limit at a distance from machine

Cities	Noise Limit at a Distance from Machine
San Francisco	According to their *San Francisco Police Code*, it is unlawful for any construction company to operate any powered construction equipment if the operation of such equipment emits noise at a level in excess of 80 dB(A) when measured at a distance of 100 feet from such equipment, or an equivalent sound level at some other convenient distance. The following equipment, recommended by the manufacturers thereof and approved by the Director of Public Works or the Director of Building Inspection as best accomplishing maximum noise attenuation, are exempted from this regulation: • Impact tools and equipment with intake and exhaust mufflers • Pavement breakers and jackhammers equipped with acoustically attenuating shields or shrouds • All construction equipment used in connection with emergency work which is define as any work made necessary to restore property to a safe condition following a public calamity or work required to protect persons or property from an imminent exposure to danger or work by private or public utilities when restoring utility service.
Singapore	Contractors are required to submit noise management plan to the authority and obtain advance permission before construction at sites which are within 150m distance of residential premises. In this plan, appropriate noise mitigation measures have to be installed in discussion with the authority. These may include perimeter noise barriers, noise enclosures, etc.
Toronto	According to *Toronto Municipal Code*, sound emitted from any equipment shall not exceed an Equivalent Sound Level (L_{eq}) of 85 dB(A) when measured 20 metres from the source over a five-minute period. Upon discussion with the representative of the authority, it was found that this provision is used only in special circumstances where multiple complaints from the same construction site have been received.

5.1.1.5 Site Management

Site management is a form of overall control over the type and duration of works being conducted on a construction site to achieve some specified noise requirement. This is usually applied to satisfy certain conditions under either a licence / permit system or as a necessary requirement subsequent to a prior noise impact assessment.

Table 5.6 Summary of site management

Cities	Site Management
City of Westminster	Prior consent must be obtained for Level 1 and Level 2 projects, as described below, as well as for all construction outside core working hours. The contractor shall conduct baseline monitoring and submit noise assessment results, together with proposed noise mitigation measures in the application. The consent will specify the plants which are or are not to be used, the hours during which the works may be carried out and the level of noise which may be emitted. • Level 1 projects: involving the creation of 100 or more new or additional residential units or the creation / change of use of 10,000m^2 or more floorspace • Level 2 projects: involving the creation of 10 or more new build residential units, or buildings where the new build floorspace to be created is 1000m^2 or more, or any basement developments
Guangzhou	In Guangzhou, prior registration is required for construction, demolition and renovation works using PMEs. The contractor is to register the said works 15 days prior to works commencement with the local noise control authority. In addition, the noise criteria in Guangzhou is based on overall noise measurement at site boundary.
Hong Kong	Some construction projects may be classified as Designated Project (DP) under the *EIAO* and Environmental Impact Assessment (EIA) is required to be conducted for the application of Environmental Permit (EP). EP conditions may be imposed regarding the construction method, number of PMEs, construction time and regular environmental monitoring and auditing requirements, etc. General construction works at night-time and general holidays are regulated through the Construction Noise Permit (CNP) system in which a contractor's choice of machines is limited by the applicable noise criteria for the cumulative noise level from all the machines. This means that a contractor can only use machines in accordance with the CNP conditions.
Melbourne	All contractors in Melbourne engaged in construction works valued more than Australian $5,000 or demolition and removal of buildings and structures (regardless of the work value) are required to submit and get approval for Construction Management Plan, which contains Noise and Vibration Mitigation Plan, from the Melbourne City Council at least 48 hours before construction work begins. The plans include expected data for noise production during construction work. If the authority deems any machine or process too noisy, they can instruct the contractor to not proceed with the machine/process or comply with limited number of hours as directed by the authority. Once Noise and Vibration Mitigation Plan is approved, authority expects the contractor to submit periodic noise data voluntarily but if there is a complaint then this becomes a compulsory requirement.

Seoul	In Seoul, contractors are required to submit a prior notification of all construction works to the authority 3 days before the commencement of works. This measure is a grey area and difficult to be classified as a site management system because it is not a permit system, however, it is important because this notification system is compulsory.
Singapore	Since 2012, Singapore's National Environmental Agency (NEA) has required builders of construction/demolition projects located within 150m of residential and sensitive premises, and above S$50 million in project value, to submit their Noise Management Plan to improve their noise monitoring programme, check for proper locations of noise monitoring system, sitting of noisy equipment, public engagement programme and provide advice on noise mitigation measures. The Noise Management Plan includes controlling the noise source with the use of newer machines and properly maintained machines; proper scheduling of work with restricting the duration of noisy activities and factor work no to be conducted on Sunday and public holiday; place stationary noise sources, e.g. generators, further away from noise sensitive premises; employing noise barrier and enclosure; and remind or educate workers on good practices.
Sydney	Any construction or demolition work undertaken in Sydney pursuant to any development consent, building approval or Civic Works approval issued by the Environmental Protection Authority (EPA) and the local council. Both authorities have the same approach to approve the permit. They will request an impact assessment where deemed necessary. The impact assessment will propose mitigation to minimize impact to the surrounding. The authority could impose further mitigation after the permit has been issued which they deemed necessary. In addition, permit from local council of the City of Melbourne is necessary before commencement of construction works. To get the consent from local council, the applicant is required to negotiate the terms of the planning agreement with the council. The draft planning agreement would be exhibited to public for submissions when necessary. The public submissions would be considered in the application assessment to form a development consent with conditions. The condition of consent usually required an approved construction methodology report prepared by acoustics consultant and construction professional to suggest all reasonable and feasible measures to reduce the environmental noise impact. Respite period may be applied to the noisy equipment such as pile driver and hydraulic hammer.

5.1.2 Management along Transmission Path

The transmission path is defined as area from outside the site boundary to façade of the residential premises.

While noise control or management practices along the transmission path is not uncommon within the acoustics and related professions, the consultant has found relatively few examples of control along the transmission path among the various cities under review. The most distinct case being Seoul, where contractors are required to put up noise barriers around construction site boundaries. This is in effect inserting a control element between the source and receiver.

Table 5.7 Summary of transmission path management

Cities	Transmission Path Management
Guangzhou	Guangzhou has site boundary noise criteria. It is applicable on all construction works conducted at a construction site.
Seoul	Seoul's noise control system is unique among other cities as it has a control system for noise in transmission path. This is achieved by making it compulsory to erect noise barriers around construction sites employing mobile noise meters that measure noise levels between construction site and residential buildings to ensure that the law is properly followed. Different types of noise barriers (not necessarily vertical) are made compulsory for each site based on area. If a site covers 1000m^2 or more, it must erect aluminium or polypropylene soundproof wall (effective in reducing 26 to 30dB) before applying for a construction permit. Furthermore, for processes that cause heavy noise pollution such as drilling and blasting, all construction sites must be equipped with double soundproofing with an additional removable or sealed soundproof wall. On the other hand, construction sites that cover less than 1000m^2 of total ground area are exempted from preliminary register requirement but are obliged to install sheath plastic steel (effective in reducing 25dB) when applying for a construction permit. In addition, the city government conducts proactive noise management activities throughout the city also. 4 mobile noise meters are used to proactively measure noise emissions from construction sites on a random basis and noise measuring networks are installed at various locations to periodically record and report data to the Korean Ministry of Environment.
Singapore	Contractors are required to submit noise management plan to the authority and obtain advance permission before construction at sites which are within 150m distance of residential premises. In this plan, appropriate noise mitigation measures have to be installed in discussion with the authority. These may include perimeter noise barriers, noise enclosures, etc. A funding scheme called Quiet Construction Fund also provides incentive to constructing noise barriers along the site boundary.

Tokyo	The site boundary criteria in Tokyo is applicable upon 9 types of construction works including: piling, hammering, crushing, excavation, air compressor, compacting, concrete plant, concrete polishing, and demolition work. In case of complaint, the authority may measure noise levels at the site boundary to check whether a site is in violation of these criteria. The decision to conduct such a measurement is made by the authority.

5.1.3 Noise Management at Receiver

In this section, the noise control regulations and practices related to noise management at receiver in different cities would be examined.

The consultant will cover the following items across jurisdictions:

- Restricted hours
- Noise control zones
- Noise criteria
- Early planning stage measures
- Community liaison / complaint handling
- Public relationship
- Acoustic treatment at receiver

5.1.3.1 Restricted Hours

Following is a summary of restricted hours for general construction and renovation works across all cities. During these hours, construction work is allowed. In some cities, domestic renovation works are included in the definition of general construction works and it is mentioned “same as general construction”.

Restricted hours in each city are based on lifestyle of people and social norms. While this is the case is out of scope for this paper, an important point to note, however, is that only 2 out of the 12 cities have established special restricted hours for renovation noise and the other 10 cities have defined renovation work as part of general construction works.

Table 5.8 Summary of restricted hours

City	Restricted Hours	
	General Construction	**Domestic Renovation**
Hong Kong	**Allowed:** Monday to Saturday 07:00 to 19:00 (percussive piling requires permit)	Same as general construction

	Otherwise not allowed (unless exceptional cases/permit for works other than percussive piling)	
Tokyo	**Allowed:** Monday to Saturday 07:00 to 19:00 **Not allowed** (unless exceptional cases): Sunday all day.	Same as general construction
Guangzhou	**Allowed:** Monday to Saturday 06:00 to 22:00 **Not allowed** (unless exceptional cases): Sunday all day.	No restricted hours. Practice is to stop work from 12:00 to 14:00.
Seoul	**Allowed:** Monday to Friday 07:00 to 18:00 **Not allowed** (unless exceptional cases): Saturday and Sunday all day.	Same as general construction
Taipei	**Allowed:** Monday to Saturday 08:00 to 22:00 **Not allowed** (unless exceptional cases): Sunday all day.	Same as general construction
Singapore	**Allowed:** Monday to Saturday 07:00 to 19:00 **Not allowed** (unless exceptional cases): Sunday all day. Friday 19:00 to Monday 07:00 prohibited for construction sites within 150m distance of residential premises	Same as general construction
Berlin	**Allowed:** Monday to Friday 07:00 to 18:00 **Not allowed** (unless exceptional cases): Sunday all day.	Same as general construction
Melbourne	**Allowed:** Monday to Friday 07:00 to 19:00 Saturday 07:00 to 13:00 **Not allowed** (unless exceptional cases): Sunday all day.	**Allowed:** Monday to Friday 07:00 to 19:00 Saturday 08:00 to 18:00 Sunday 09:00 to 18:00
Toronto	**Allowed:** Monday to Friday 07:00 to 19:00 Saturday 09:00 to 19:00 **Not allowed** (unless exceptional cases): Sunday all day.	Same as general construction
San Francisco	**Allowed:** Monday to Saturday 07:00 to 20:00 **Not allowed** (unless exceptional cases): Sunday all day.	Same as general construction

City of Westminster	**Allowed:** Monday to Friday 08:00 to 18:00 Saturday 08:00 to 13:00 **Not allowed** (unless exceptional cases): Saturday all day restriction on earthwork, piling & demolition. Sunday all day.	Same as general construction
Sydney	**Allowed:** Monday to Saturday 07:00 to 19:00 **Not allowed** (unless exceptional cases): Sunday all day.	**Allowed:** Monday to Saturday 07:00 to 20:00 Sunday 08:00 to 20:00 **Not allowed** (unless exceptional cases):
New York City	**Allowed:** Monday to Saturday 07:00 to 18:00 **Not allowed** (unless exceptional cases): Sunday all day.	Same as general construction

5.1.3.2 Noise Control Zones

Noise control zones are established in many cities as geographical administrative units comprising buildings of various types. These zones are usually established in city planning stage where clusters of similar buildings are established. Many cities have outlined special noise criteria for each zone. It is to be noticed here that not having a zone does not mean that there are no distinctions of applicable noise law among different building types. In cases where noise zones are not available, the authorities may have different mechanisms to manage noise impact.

Table 5.9 Summary of noise control zones

Cities	Noise Control Zones
Hong Kong	During CNP application for restricted hours construction work, the authority will establish the criteria (or Allowable Noise Level, ANL) for a noise sensitive receiver (NSR). It is based on the type of area that a NSR is located, e.g. urban or rural areas, and surrounding factors, e.g. highway and industrial area, that would influence the background noise at the NSR façade. An Area Sensitive Rating (ASR), in the form of A, B and C, for the NSR will be determined by a matrix of considerations given under the relevant technical memorandum (TM). Further to the ASR, Designated Areas (DAs) were established for built-up areas where specified PMEs would require complying lower noise criteria and managing manual construction works, or Prescribed Construction Works (PCW), e.g. hammering handling of rubble, wooden board and steel bar, during restricted hours.

Tokyo	In Tokyo, 4 types of areas have been defined for noise control purpose and only the first two are relevant to construction noise control. Type 1 areas are defined as low rise residential areas and Type 2 areas are defined as middle to high rise residential areas or quasi-residential areas i.e. areas where there are predominantly residential buildings but also some presence of non-residential premises. The restricted hours for construction work and the maximum number of hours allowed in one day are the same for both types. Special allowances are made for construction sites with no school and/or hospital within 80m radius.
Guangzhou	The noise control zones in Guangzhou are demarcated for environmental noise control for daytime and nighttime. The zones are established based on sensitivity of nearby premises. However, these environmental noise regulations are a secondary tool for noise control such that site boundary noise criteria take precedence as they are more specific. In addition, there are demarcated zones within Guangzhou where use of percussive piling is completely prohibited. These zones are specified by the authority and are different from the 4 zones mentioned above. This is quite special for Guangzhou, as no other city has such a complete prohibition of percussive piling within given area/zone inside the city.
Taipei	There are 4 noise control zones (known as *classes*) in Taipei that are divided based on noise sensitivity. Areas with highest sensitivity such as hospitals, nature reserves, etc. are grouped into Class 1 and other areas with decreasing sensitivity are arranged in descending order. The noise criteria are respectively more stringent in more sensitive areas. This zoning system is complemented by a special zoning mechanism in which the authority can designated any location, property or group of properties as special class zone with 5dB lower criteria applicable than the originally applicable criteria within maximum radius of 50m from the location.
Singapore	The Singapore government has adopted a different approach in terms of noise control zones. There are no noise control zones, instead the criteria applicable upon a construction site is determined by the nearby buildings and the noise impact on them. As the measurement point of these criteria is 1m away from the façade of a building, the criteria are different for different types of buildings. Thus, the criteria applicable on a construction site is dependent upon the distance of the site from the most sensitive building in its vicinity. This system may not be applicable in other parts of the world as usually the local authorities establish noise control zones to reduce ambiguity in determining applicable noise criteria. In the case of Singapore, it is expected that the contractor would have to consider multiple factors such as the types of buildings nearby, their height and heights of other buildings nearby (line of sight), the types of machines to be operated at a given time and identification of the most severely affected building when engaging in construction works.

Berlin	Noise control zones in Berlin are established in four categories starting from the least sensitive to the most sensitive in descending order. The division in Berlin is unique in the sense that where other cities establish zones based on residential and highly sensitive areas, Berlin has divided residential areas into 3 sub-categories, namely commercial facilities and residential, predominantly residential and only residential. The decision to categorize an area has been left in the hands of authority and no maps are provided such that liaison with the authority is expected to be necessary. The difference in allowed noise level is 5dB per level which means that if an area is classified as commercial facilities with residential and another area is classified as predominantly residential, there will be a difference of 5dB in allowed noise level between the two.
Melbourne	The noise control zones in Melbourne are based on a very different criteria compared to all other cities. Melbourne's noise criteria are based on DSL system which is the maximum noise level allowed at 1.5m distance from a building façade that is closest to a construction site. But the zoning system of Melbourne is interesting such that an area is considered to be within the sensitive zone based on certain pre-specified types of building within specified radius of the construction site *in a specified time range*. The consultant has seen other cities establishing a noise control zone based on the types of buildings and also based on a building's distance from construction site, but never seen a control zone system based upon time of the day. In this system, a building or a group of buildings will be considered within a noise sensitive zone based on the "typical sensitive periods" established by the authority and DSLs will be enforced within the "likely area for consideration". For example, if there is a residential premise within 200m radius of a site boundary, the authority would enforce 75dB(A) $L_{eq,30mins}$ criteria at the façade of this residential premises. For all other buildings outside this radius, there would be no DSL applicable.
Toronto	Toronto defines two noise zones – quiet zone and residential area. The main difference in regulations applicable in these noise zones lies in neighborhood noise matters outside the scope of the Study, and there are no notable points for these two zones related to construction noise. Apart from the city noise zones, the noise zones established by province of Ontario are also applicable to Toronto and this is the reason why Toronto city does not need to establish any further zones as these are adequate. There are 4 classes defined by the Ontario noise law out of which only the first two are relevant to the Study. The interesting aspect of this zone definition is that it is a qualitative description with a lot of room for interpretation which is different compared to other cities where more details are provided. Toronto does not have a delineated noise zone and it is expected that this is because of the common domestic practice in Toronto in which all homes are multiple paned for heat preservation. The multiple paned structure of the houses together with closed windows may provide additional acoustic insulation too.

5.1.3.3 Noise criteria

A summary of the noise criteria is provided in **Table 5.10** below. It is an overview summary only for review purposes and not intended to provide a detailed comparison.

Table 5.10 Summary of noise criteria in overseas cities

Cities	Noise Criteria			
	Daytime - weekdays	**Evening- weekdays**	**Night-time - weekdays**	**General Holiday**
Hong Kong	65-70 dB(A)	45-70 dB(A)	35-55 dB(A)	Day: 60-70 dB(A) Evening & night: 45-55 dB(A)
Tokyo	80-85 dB(A)*	Not specified		
Guangzhou	55-70 dB(A)*		45-55 dB(A)*	Same as weekdays
Seoul	60-65dB(A)	60dB(A)	50dB(A)	Not specified
Taipei	67-80dB(A)	47-70dB(A)	47-65dB(A)	Same as weekdays
Singapore	60-90dB(A)	50-70dB(A)		Same as weekdays
Berlin	45-75dB(A)	35-70dB(A)		Same as weekdays
Melbourne	75 dB(A)	Prohibited		
Toronto	50dB(A)		45dB(A)	Prohibited
San Francisco	No criteria			
City of Westminster	No criteria, based on machine noise limit			
Sydney	Background noise level (BG) + 5dB(A)	BG + 3dB(A)	BG + 0dB(A)	Day: BG + 3 dB(A) Evening & night: BG + 0 dB(A)
New York City	No criteria, based on machine noise limit and noise mitigation plan			

**measured at site boundary*

5.1.4 Noise Planning / Preventive Measures

The consultant has identified useful practices in pre-empting noise problems through early planning and a summary is given in **Table 5.11**.

Table 5.11 Summary of noise planning / preventive measures

Cities	Planning / Preventive Measures
Hong Kong	Early planning or preventive measures existed mainly in the form of regulatory permit. The permit system in Hong Kong for general construction works is based on two ordinances: *a) Noise Control Ordinance (NCO)* *b) Environmental Impact Assessment Ordinance (EIAO)* The *NCO* stipulated the restricted hours period to be 1900 to 0700 of all days and 0700 to 1900 of general holidays including Sundays for all general construction activities, and 0700 to 1900 of weekdays for percussive piling activities (percussive piling is forbidden in other period) whereby relevant, Construction Noise Permit (CNP) shall be obtained in advance if any construction works are to be conducted during restricted hours. The CNP would specify the numbers and the types of PME could be used. Certain operational conditions will also be listed as CNP requirements which the contractors must be fulfilled. For major projects that come under the ambit of Designated Projects (DPs) under the *EIAO*, the proponent are required to conduct Environmental Impact Assessment (EIA) for the application of Environmental Permits (EP), similar to CNP, that stipulate noise control requirements, such as noise levels, among others before any work commenced during non-restricted hours (0700 – 1900 hours of weekdays). For the majority of public works projects, including non-DP projects, preliminary environmental review (PER) will be conducted during planning stage as an administrative means to identify environmental issues of the project and to determine if a comprehensive EIA would be needed under the *EIAO*. For private projects, land lease condition could impose environmental considerations to the development.

Tokyo	In Tokyo, contractors are required to obtain a permit from Tokyo Metropolitan Government for daytime and nighttime operations of all construction projects regardless of their size. The Tokyo Metropolitan Government has provided a list of works which constitute Specified Construction Works (SCW) with corresponding allowed noise levels. Any contractor engaged in SCW must obtain a permit from the authority and prove that the works are in compliance with the criteria as measured on site. The other type of permit is the permit to work after allowed construction hours. It does not allow construction for 24 hours and total number of hours allowed at any construction site are limited based on the noise control zone except for emergency situations or unavoidable constraints.
Guangzhou	There is a compulsory registration system in Guangzhou with local noise control authority for all construction, demolition and renovation works using powered mechanical equipment. The registration system requires details about operation period of specific types of machines to be used, the purpose of the works and their locations within the construction site. There are certain areas in Guangzhou where percussive piling is strictly prohibited. This shows that there is no permit system used for reducing the use of percussive piling and, instead, a complete ban is placed.
Seoul	Seoul's Seocho-gu adopts a notification system for specified construction works instead of a permit system. It requires notification of specified construction works only and not all types of works. This notification system is applicable for both daytime and nighttime works. The difference between notification and registration systems is that notification is a one way communication in which contractor only sends the information and can start working without expecting a response, whereas in a registration system the contractor is expected to complete registration with the government department and cannot initiate the work unless the registration is acknowledged. The Seoul government uses this information provided in the notification to map all construction works throughout the city on an interactive online map where public can see the location and duration of construction works. The notification system of Seoul has a set format which requires consideration of various aspects of noise mitigation by the contractor. One of the reasons why Seoul does not have a permit system and only requires a notification system could be that they have a very strong policing system in which the local authority uses mobile noise meters to measure noise impact from various sites throughout the city. In addition, the authority maintains a close relationship with general public through social media such that noisy incidents can be addressed swiftly.

Taipei	All construction activities involving PMEs are required to obtain a noise permit from the authority, including for daytime works. The permit application requires a noise assessment and noise mitigation plan. There is no permit system for activities that do not involve PMEs such as hammering, handling of steel bars, rubble, etc. and a periodic noise measurement is required only. In addition to these regulations, the authority conducts monthly noise monitoring to ensure that the regulations are being followed by contractors properly. In past decade, statistics show that noise complaints from general construction and renovation works have experienced a downward trend which can be attributed to this proactive attitude. Another important feature of Taipei is the periodic noise assessment that must be conducted by contractor and submitted to the authority.
Singapore	Singapore adopts daytime noise criteria like other cities, however, the city does not have a permit system for daytime works of project value less than Singaporean $50 million. Contractors are expected to self-regulate based on the active noise monitoring data available for contractors and authority. The active noise monitoring is conducted through the noise meters placed by authority on facades of nearby buildings. In addition, the authority enforces a complaint driven control system in which noise control is initiated after a complaint has been received. For projects larger than Singaporean $50 million and located within 150m distance of a residential building, the contractors need to submit a Noise Management Plan to the authority and obtain approval before construction begins. Although there is nighttime noise criteria in Singapore, the contractors are prohibited to work at nighttime by default and a permit is required in advance to start overnight work. The authority considers these cases based on their compliance with nighttime noise criteria and decision to grant the nighttime permits are made on case by case basis - usually emergency cases - as, in practice, nighttime work is usually avoided by contractors in Singapore. Regarding domestic renovation works, Singapore has made it compulsory for renovation contractors to obtain a permit from the Housing and Development Board before commencing any demolition or hacking of walls. In addition, a neighbourhood notification system is established in which at least 2 neighbours have to be informed about the renovation works 3 days in advance. Although this is not a statutory system, it serves to improve communication among residents which is one of the most critical factors in neighbourhood noise control. A disadvantage of including domestic renovation works in general construction works could be that some important details are left unaddressed. Singapore addresses those details by establishing special restricted hours and permit system.

Berlin	In Berlin, it is compulsory for contractors to obtain permit from national noise control authority before commencing work on infrastructure projects such as construction of railroads, public roads, railways, magnetic suspension railways and tramways, etc. Berlin does not have a permit system for regular construction works in daytime. The law has established a daytime noise criteria and allowed all construction activities that are within 5dB(A) of the criteria, however, because there is no permit system, the regular practice of the authority is to allow construction works no matter their noise production. This has been verified in communication with the authority which explained that due to cultural norms, the Berlin population is used to noisy environments and would not usually complain for heavy noise in daytime. The public expects a quiet environment in nighttime and thus the authority puts more effort in reducing nighttime works. The regular practice of the authority is that nighttime works are not allowed by default. For any work that has to be done at night, contractors are required to prove to the authority that the work involved is unavoidable and all work scheduling measures have been exhausted in which case the authority insists on using noise mitigation measures. Then only the authority permits nighttime work and these permits are issued on case by case basis.
Melbourne	In Melbourne, contractors involved in any construction work valued more than Australian $5,000 (roughly equal to HK$30,000) or demolition and removal of buildings and structures (regardless of the work value) are required to submit and get approval for Construction Management Plan, which contains Noise and Vibration Mitigation Plan, at least 48 hours before construction work begins. This control philosophy seems to be similar to Singapore but the threshold cost is much lower such that virtually only DIY projects can escape this legal requirement, however, these works can too be subject to noise control laws if complaints are received based on the noise control officer's judgement. This grants a free hand to the contractors who can conduct whatever works they plan to do without considering the noise production, except for percussive piling. In addition, Melbourne considers general construction works and road works separately because of the noise produced and schedule of construction. The restricted hours of these two types of works are different as road works are usually required to be conducted in non-peak hours due to traffic congestion. It must be noticed that the restricted hours for road works are 1 hour less on weekdays and 5 hours less on Saturdays as compared to general construction works. Also, road works are prohibited on Sundays and public holidays while general construction works are allowed for a definite time period. This distinction in restricted hours is important because any work done within the restricted hours must be done with a valid permit from the government which naturally means that road works are more likely to need a permit than general construction works. It is evident that the Melbourne authority encourages road works contractors to complete the work

	within allowed working hours, and given the urban setting of Melbourne in which the population density is much lower outside the Central Business District (CBD, i.e. the city centre) so traffic diversions may not be too difficult and inconvenient. For works in the densely populated CBD, only those works which either have a permit or are unavoidable can be completed outside allowed hours. In addition to the permit system for general construction works, Melbourne is the only city that has clearly established different restricted hours for renovation works and any works outside these restricted hours can only be done with a valid "out of hours" permit from the authority. Any renovation works that are conducted by someone other than the owner at a fee are regarded as general construction works and must satisfy the permit requirements stated above. This is a very clear definition of domestic renovation works. Most other cities (not all) in the Study either include renovation works in general construction works or do not clearly define when a renovation work will become a construction work. It is expected that because some renovation works cannot be done by senior citizens or people with disabilities, the escape provision is provided that even if a work is paid but does not exceed Australian $5,000 total value it will still be considered as renovation work. Another important point about Melbourne is that renovation works involving demolition or external works are not exempted from a permit application which means that it is the owner's responsibility to obtain a permit before starting these activities. During the application process, the authority may direct the owner to send a letter to neighbours or erect a sign on-site to advertise the permit application such that neighbours can have the opportunity to object. Melbourne City Council will decide permit conditions, provide a Notice of Decision to Grant a Planning Permit with conditions or provide a notice of refusal. A Notice of Decision is not a planning permit. It is a legal notice that is issued when the City of Melbourne supports the planning application. The notice may include conditions. At this point the applicant has the right to request a review of the conditions, alternatively neighbours also have the right to object to the conditions set in the Notice of Decision. Once a decision has been made and the review period has expired, Melbourne City Council will issue a permit. This system is also very clear and unique for Melbourne.
Toronto	Toronto has a Preliminary Plan Review (PPR) system for projects involving use of pile drivers, hoe rammers and/or percussive piling machines such that any projects using these equipment must submit a PPR to the authority and obtain approval for use in advance. The PPR requires contractors to prove that no other method is applicable on this site and that adequate measures have been adopted to ensure minimal disturbance to nearby public. It is evident from this law that Toronto is specifically targeting percussive machines The approval is not based on duration of use, but the use for any given duration.

	Toronto also has a nighttime construction permit system but it is mainly for emergency work or unavoidable constraints. For other projects, the decision to grant a permit to work outside allowed hours is made on a case by case basis and contractors have to submit an application beforehand. Contractors are required to prove that the sound emitted by all construction equipment employed on site does not exceed L_{eq} 85dB(A) when measured 20m from the source over 5 minutes. In certain cases as deemed necessary by the authority, active real time noise monitoring would be conducted by a competent officer of the authority who would be physically present on site and CAD60 per hour would be charged from contractor. In order to get the permit, a contractor has to prove that this is the case and may need to use mitigation measures. An important distinction made in Toronto between general construction works and renovation works is that a renovation project with total project cost including labour and material exceeding Canadian $50,000 or more is considered a general construction work. A unique feature of Toronto is that there is an appeal system for permits such that a contractor has the right to appeal when a permit application is rejected by the authority. The appeal hearing is held to gather views from general public within 100m radius of the site. The public can attend the appeal hearing and share their views about the project, and have a possibility to reach an agreement with the contractor based on certain conditions. This would result in a successful permit grant, otherwise, the decision of not granting permit will be upheld. This system does not exist in any of the cities being studied. The advantage of this system may be that it provides a framework for discussion between public and contractor under the supervision of authority in order to make sure no one's rights are violated. In cases where such a system does not exist, either party may gain too much power which results in failed negotiations or rights violation.
San Francisco	San Francisco does not have daytime noise criteria so there is no daytime permit system. For nighttime works, there are two considerations. The first consideration is that any nighttime work with noise production less than 5dB(A) above ambient noise level is allowed to continue by default i.e. as long as the 5dB(A) plus ambient noise level is not exceeded the contractor can continue to work without a permit. This is a self-regulated default permit system and only checked by authority once a complaint is received. Second type of permit is for nighttime works with unavoidable constraints and noise production higher than 5dB(A) plus ambient noise level.

London/ City of Westminster	In the City of Westminster (London), Level 1 and 2 projects are required to submit Site Environmental Management Plan (SEMP) and an application for consent to the authority. The works can only continue after the authority has approved these two documents and allowed construction activities. In addition, the authority requires contractor to submit noise and vibration monitoring data at regular intervals in order to keep track of the environmental impact. This system seems to be designed for prevention and requires contractors to convince the authority that all practicable measures have been considered for noise and vibration reduction. It is different from Singapore and Seoul where the authority does not ask for periodic data but measures it by itself. The control philosophy of City of Westminster may not be compliance with a criteria but to make sure that best possible noise mitigation measures have been employed even for daytime works. In addition, a separate permit for nighttime works is required in Westminster. Any works outside the allowed construction hours would require the contractor to request a permit from the authority and prove that the work is not possible at other times.
Sydney	Sydney has a permit system for all construction and demolition works. The contractors are required to apply for permit with project details and, if deemed necessary, the authority instructs an impact assessment in which a contractor has to propose suitable noise mitigation measures to minimize the impact to surroundings. Although this system is quite similar to many of the cities discussed above, the main differentiator for Sydney is that, as per regulation and practice, the authority can request changes in permit even after its issue in order to amend the permit conditions. Since Sydney's noise criteria is relative, projects that exceed background noise level + 10dB(A) criteria are required to obtain prior approval from the government. The permit for such activities include respite periods such that the machine can only be used for a specific duration in the day. Sydney control mechanism is not specific for a certain machine and, instead, concerns the noise level only. However, because of this, it might not be clear for contractors when a permit must be applied as the difference between background noise level + 8dB(A) and background noise level + 10dB(A) is not that easily noticeable. This is why active noise monitoring is necessary and it is not clear how Sydney government ensures that.
New York City	The permit system in New York City (NYC) is based on Noise Mitigation Plan which is a document that must be filled by contractors and clearly displayed on site before construction work begins. It is not submitted to the authority and there is no need to obtain a permission before commencing the work, but the authority can come to check it at any time and hence it must be properly completed and followed. The Noise Mitigation Plan is a unique feature compared to other cities

	because in cities such as Westminster and Melbourne the authority requires contractors to submit the plan and obtain prior approval, but in NYC the authority is using the ears of public to monitor noise levels. The Noise Mitigation Plan is usually checked upon a complaint and, if proven insufficient, the authority would instruct changes to be made in the plan.

5.1.5 Community Liaison / Complaint Handling

In addition to above technical aspects of noise management at the receiver, some cities also have non-technical management methods such as community liaison. The consultant has found that these measures are mostly early interventions to address public concerns. It may include facilitation of dialog between community and construction contractors for better understanding, or providing useful information to contractors and members of public.

Table 5.12 Summary of community liaison / complaint handling

Cities	Community Liaison
Hong Kong	It is a common practice that the contractors would setup hotlines for the public to handle enquiries and complaints directly to improve their public relationship. One of the major project proponent, MTRC, would even organize various meetings with the community to seek our views and concerns to improve public relationships. For restricted hours works due to unavoidable constraints, e.g. road works, the contractors are required to notify the authority before work commence and they are strongly advice to also notify nearby residents as well for improving public relationship. For designated project, Environmental Monitoring And Audit (EM&A) at the identified critical noise sensitive receivers are required to be conducted at a specified interval, commonly 5-6 days. The monitoring party is responsible for notifying the Engineer Representative of the project on any noise exceedance and corresponding corrective measures are required to be committed until compliance of the noise criteria. Monthly EM&A report is required to be submitted to an independent environmental checker (IEC) for approval.
Tokyo	Citizens of Tokyo can register their complaints with the representative offices of Tokyo Metropolitan Government in each ward through direct approach, telephone call or emails provided on the website. Upon receiving the complaint and understanding the details provided by complainant, the location, type and source of noise are determined, possible improvement measures are evaluated, responsible parties at noise source are instructed some steps for improvement of the situation, a report is sent to the complainant after the improvements are completed, further follow up checks and verifications are conducted on noise source site to ensure that the problem is fixed, and finally the complaint data with relevant improvement actions are recorded in the government database.

Seoul	The consultant has found that the community liaison system in Seoul is perhaps the most active and comprehensive system among other cities in terms of two way communication between the authority and community. Firstly, a noise monitoring network is established throughout the city and locations are informed to the public. Public access is also allowed to the data obtained from these measurement stations through a website. The mayor is also required to submit yearly report on progress of noise management measures in each Gu and disclose it to public through the internet. To provide most up to date information on construction works, the Seoul Metropolitan Government maintains an interactive website where all construction works in each Gu are updated on a map of Seoul. This provides the citizens a chance to know the duration of construction works and access site specific information such as starting date, target end date, type of work and exact location of the work which can help to understand the impact of noise from construction works on the citizens nearby. It must be noted that the website does not provide any information regarding the noise emission from the site. Also, the city government engages in effective communication campaigns with the public to ensure that views and grievances related to noise complaints are swiftly handled. Various media, Facebook, Twitter, telephone line, etc. are used to disseminate useful information to the public and collect feedback.
Singapore	The Singapore's NEA has established a 24 hour online chatting service on its website for citizens of Singapore to have live chat with an officer if needed. However, the complaints can be made to the police directly for urgent matters such that the police can visit the premises and take any necessary action.
Melbourne	Public in Melbourne can register noise complaints with the Melbourne City Council and the police depending on the situation faced by complainant. Non-emergency complaints can be made by calling Melbourne City Council's designated complaint hotlines during office hours or by submitting an online form, whereas, emergency complaints can be made by calling the police emergency hotline at any time. It is also possible for a resident to obtain a copy of the Construction Management Plan of any site from the Melbourne City Council upon request.
Toronto	If noise exemption permit for work outside allowed working hours in Toronto is rejected, applicant contractor is allowed to appeal to a community council. Residents from 100m area surrounding the construction site are sent a notice of hearing and the council has final say over the application. In such a case, the council may allow or not allow the construction work and neither contractor nor public has the right to appeal further.
City of Westminster	The 24 hour – 7 day noise team of Westminster is quite unique in UK and within London. It is considered necessary due to compact population and high level of

	economic activities. It is also the largest noise team within London, comprising of 16 officers. The Westminster Council currently let out a third party tender contract to provide a call centre facility for its "Environmental Action Line". This is a 24 hour service for its residents / business to report any problems with noise, litter or waste. The call centre staff takes details and inform the appropriate team. For noise complaints, the council sets a target that the enquiry must be responded to within 45 minutes and at least 60% of calls are visited.
Sydney	In case of complaints in Sydney against a particular construction site, the appropriate regulatory authority can issue a 'noise control notice' to the occupier or operator of any premises which prohibits that person from causing noise in excess of a specified level on specified days and at specified times. A person who receives a noise control notice can appeal against the notice to the Land and Environment Court within 21 days after service of the notice. An authorised person, including police officer, council officer and any person appointed by the EPA, can issue a noise abatement direction to stop a person from making offensive noise. The authorised person can issue the notice if it appears that offensive noise has been emitted at any time within the past 7 days. The appropriate regulatory authority can issue a 'noise control notice' to the occupier or operator of any premises which prohibits that person from causing noise in excess of a specified level on specified days and at specified times. It is an offence to fail to comply with a noise abatement direction or to emit offensive noise within the 28 days following the direction (or such shorter time as specified in the direction). Once a warning has been issued to cease continued use of equipment, police have the power to seize equipment from a person who is breaching a noise abatement direction. A person who is affected by offensive noise within their own house (or while occupying other premises) can apply to the Local Court for a noise abatement order. If the Local Court is satisfied that the alleged offensive noise exists, or that it is likely to recur, it can order the noise to stop during specified times and order the person responsible for the noise to prevent a recurrence of the noise. In addition to above system, Sydney has weekend noise criteria as well which allows weekend construction work as long as the criteria is met. In cases where the criteria cannot be met, the contractor is required to obtain permission from the authority in advance. The permission may only be granted if the contractor provides a strong justification to the authority for weekend work, proves that best possible mitigation measures have been used and, importantly, proves that there has been successful negotiation with the community. Only when these three steps

	are taken, the authority would allow the contractor to work on weekends with exception towards the requirement. The guidelines of negotiating with the community are provided in document *"Our approach to engaging the community"*. According to the community engagement framework, there are three levels of community engagement. One way to understand different types of engagement with the community is through a continuum from informing (reflecting a low level of engagement) through to active participation (reflecting a high level of engagement). *Informing* takes place when a decision has already been made or action is required, and the City of Sydney needs to make sure that those affected are aware of the facts. *Consulting* takes place when a project requires some input, feedback or advice before part of the project or decision is progressed. *Active participation* takes place when the City of Sydney collaborates with specific stakeholder groups or the community to work out what needs to be done and to develop solutions that are incorporated into decision making. All engagement processes need to inform, most will have some level of consultation and some will include active participation. Engagement activities include: • a dedicated online consultation portal - sydneyyoursay.com.au which includes surveys, polls, mapping, and online forum workshops and community meetings, stakeholder meetings and roundtables • deliberative processes including 21st century town hall meetings and citizens' juries • public seminars including CityTalks • creative workshops with children • community and stakeholder reference groups • interagency forums • public exhibitions and submissions • wellbeing survey of residents every four years • random selection surveys • Advisory panels and groups including the Aboriginal and Torres Strait Islander Advisory Panel; Inclusion (Disability) Advisory Panel; Public Art Advisory Panel; Design Advisory Panel; Retail Advisory Panel; Better Buildings Partnership –information on the City of Sydney websites and disseminated through traditional and social media channels • 101 workshops for strata communities and businesses • site inspections and walk through opportunities • construction liaison groups • drop-in sessions and pop-up stalls • door-knocking, signs, letters and notices • customer services, neighbourhood service centres and community centres These activities are evaluated on the following criteria:

	• Process – how well was the engagement was designed and implemented? • Appropriateness – was the engagement appropriate and how well did the public and stakeholders accept the process? • Reach – were the people being reached representative of those affected by the decision? • Outcomes – were the intended outcomes of the engagement process achieved? The evaluation results are used to inform recommendations for the next stage of the process and future projects.
New York City	One of the main responsibility of the Community Boards (CB) office is to receive complaints from community residents including noise complaint. Although CBs are not legally binding, it has persuading power in handling noise complaint. When the NSR gets affected by the neighbour, the NSR could ask CB for assistance via chairperson of environmental protection committee, community board meetings or even CB's District Manager. CB will assign their members to follow the renovation and contact the neighbour. The CB member will launch meeting with both parties. In the meeting CB member will request the neighbour to schedule the renovation work to fit for the lifestyle of the affected NSR. Finally, both parties need to sign agreement or contract with legal power. This is the most effective way to control noise from domestic renovation in NYC. It is important to note that while community boards serve as advocates for their neighbourhood, they do not have the ability to order any City agency or official to perform any task. Despite this limitation, boards are usually successful in resolving the problems they address.

5.1.6 Distinct Observations on Three Selected Cities

5.1.6.1 Early Planning

One common element that threads through all three visited cities is the concept of early planning. Right from the conceptual or seeking approval stage, attention from the contractors is required explicitly to identify and address potential noise issues. No matter it is the preparation of a document to be submitted to the authority, or guidelines for the contractor's own internal reference primarily, all three cities are taking a proactive rather than reactive approach in the early stage of project conception.

According to §24-219 to 220 of *the Noise Code* in New York City, Contractors need to adopt and implement a Noise Mitigation Plan for each construction site. The Noise Mitigation Plan shall provide the detail of noise mitigation methods and procedure and it shall be adopted prior to the commencement of construction work at the site. The Noise Mitigation Plan shall be posted conspicuously for inspection and review for the purpose of enforcement.

This early planning rationale, however, is being exemplified in varying forms and intensities in the three visited jurisdictions. New York City comes first in terms of giving the contractors greater flexibility while exercising "control only when and where necessary". There are no particular formal nor official submission requirements on noise control prior to works commencement. The relevant documented assessment required to be prepared is referred to when a question or issue arises, say, a complaint is received. In the absence of such, the assessment is not to be rigorously scrutinized repeatedly. In other words, the New York City approach is described as below:

- The contractors are required to pay prior attention to the need and extent of noise control in the first instance.

- If there are no concerns or problems during the course of project execution, the contractors are left alone to proceed with the works.

- If there are certain concerns or problems, the authority would step in at this juncture and look at the effectiveness and adequacy of the contractors' self-assessments conducted earlier.

This is not to be mistakenly regarded as laissez faire implementation and enforcement. The New York City way is to give the flexibility to the contractors while the authority is always retaining the easily enforceable ultimate grip, to be exercised only when are where required. A substantial amount of trust and goodwill is in the picture, backed up by legislative authority and clarity. The consultant would term the New York City approach as an alternative active way of regulating and controlling construction noise.

Sydney and the Westminster are generally at par with each other in terms of taking an even more active step in addressing potential construction noise concerns. Contractors executing assignments in Sydney and Westminster are required to make relevant formal submissions to the authorities seeking approval prior to works commencement. This approach is for the authorities to take up a more visible role and position up front in the project cycle.

This very early and more visible role comes with the shouldering of substantial responsibilities. The authorities are to allocate the resources to scrutinize if the contractors' approval seeking submissions are fit for purpose, adequate, and generally in order. In the course of reviewing these submissions, the authorities are also investing time and efforts in discussing and influencing the multiple elements of construction methodologies, equipment selection, program and sequence of work, mitigation options, among others.

Open discussions, trust, and goodwill all have its place in the Sydney and Westminster approaches and regimes of control.

The consultant picked up one sentiment that is common among the different contacts at the authorities of all three cities. They regard their respective approaches and platforms very useful and effective in addressing potential construction noise concerns in the content of their respective jurisdictions. They are by and large satisfied with the implementation results.

Amid the very busy construction activities, the three cities all appear to have well and comfortably aligned the aspirations of the public for reasonable noise protection and the local development needs.

Even though domestic renovation activities are classified as construction activities, most of the cities do not deliberately manage via regulations or laws but rather resolved within the community or neighbourhood. The following section described such approach which are mainly for managing domestic renovation activities.

5.1.6.2 Neighbourhood / Community Approach

In terms of noise from renovation of domestic premises, all three cities do not have pre-set technical or objective criteria as a form of action triggering threshold. This widespread trend is really signifying the collection of corporate wisdom and experience in handling many community or neighbourhood issues (not just those related to noise from domestic renovation).

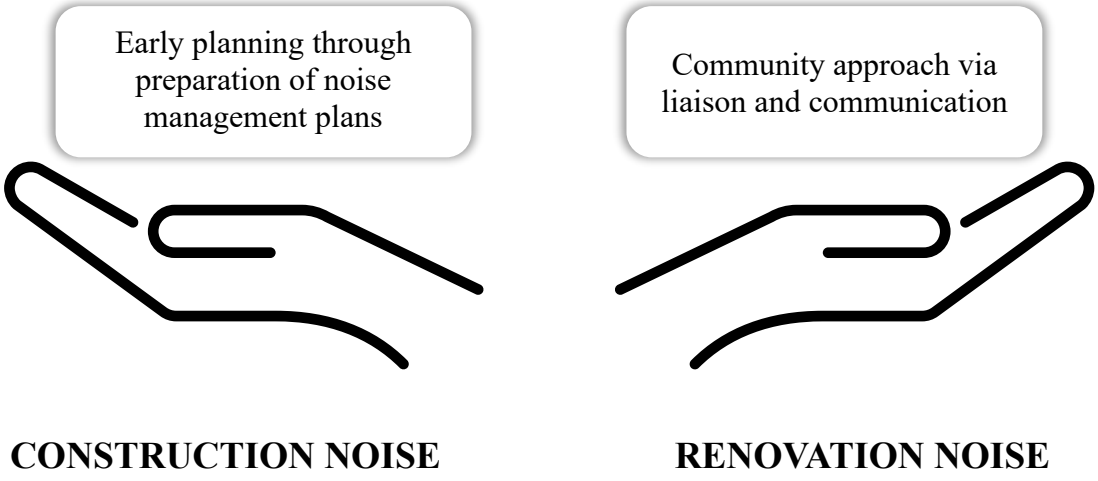
Community or neighbourhood situations are generally not static but dynamic, continuously evolving, brewed in varying contexts with different intensities, and sometimes involving a host of stakeholders with diversified interests and agendas. There is usually no absolute right or wrong. For example, the renovation noise that is by and large regarded as acceptable within a particular residential block at 10:30 in the morning may not necessarily be considered as generating a similar degree of disturbance at 18:30 in the early evening. One may then follow up and ask how about a similar situation arising at 14:30, or 16:30, both in the afternoon. To complicate the matter further, what is deemed reasonable or acceptable in one residential development may be different from the norm in another residential estate. It is observed in the respective jurisdictions the policy maker or technocrat is to resist the temptation for him / her to push towards clearly defining or prescribing everything for every scenario. Such absolute boundaries, even if they could be defined, are by nature not in sync with the exercising of discretion in handling community / neighbourhood matters.

One may also question who should be the authority to make a common sense judgement in hearing and attending to community or neighbourhood cases involving noise from renovation of domestic premises. In some parts of the world there is always a notion of easy upward delegation that the government should be responsible for everything, every time, and everywhere. In the Hong Kong context, this upward delegation of responsibility would warrant serious challenges and thorough deliberations. However, there is one certainty. There must be an independent and creditable third party in the picture when handling noise from renovation of domestic premises.

5.1.6.3 Overseas Successful Practices

The consultant noted the widespread trend of adopting the elements of “Early Planning” and “Community / Neighbourhood Approach” in overseas jurisdictions. While these two elements would not necessarily address all cases at all times 100% successfully, they could however attend to a large proportion of cases involving noise from daytime general construction activities and renovation of domestic premises, respectively.

Figure 5.1 Significant international trends in addressing construction noise and renovation noise



5.2 Technical Feasibility Studies

It is encouraging to note that technologies and equipment are continuously evolving and improving to better serve the users and the community. The consultant researched, reviewed, and distilled a list of quieter technologies / equipment that appears to have useful local applications here in Hong Kong. While it is not unusual to note there are constraints associated with such technologies / equipment, as with any technologies / equipment, the general impression is that there are quieter choices or alternatives available in the market.

While many construction and renovation activities generate noise, the consultant focused on those which are intrinsically more intrusive and disruptive in nature. The consultant has identified that percussive operations are by and large the main contributor to perceived noise disturbance.

5.2.1 Quiet Technologies

The consultant examined the noisier percussive activities, and at the same time reviewed those more prominent quiet technologies and practices. These quiet methods were compared with conventional methods in terms of noise reduction and other operational indicators. These quiet technologies and practices are receiving successful adoption and applications in overseas projects. They bear the likelihood of being suitable for the Hong Kong market having regard to local site conditions and constraints. The consultant is recommending these for the industry to consider as viable alternatives to conventional technologies. These 13 candidates are:

1. pulse plasma rock fragmentation technology,
2. hydraulic press-in piling,
3. hydro demolition,
4. vibro ripper,
5. pipe jacking,
6. hat-down method,

7. self-compacting concrete,
8. modular lightweight formwork,
9. mini air hammer,
10. brick wall cutter,
11. wall chaser,
12. hand-held coring machine, and
13. battery-actuated direct fastening tool.

As percussive operations were identified as the "major trigger" due to their intrusiveness and impulsive nature, the mechanism of these quiet technologies is to even out the percussive force of conventional methods. The corresponding conventional activities that these quiet technologies could substitute are shown in **Table 5.13**. A brief description of their working principles is given in **Table 5.14**.

Table 5.13 Thirteen (13) quiet construction technologies and practices

Type of Work	Noisy Activities	Conventional Technologies and Practices	Quiet Construction Technologies and Practices	Reference of Country/Region (Partially listed)
General Construction Work in Construction Sites	Rock breaking	Drill and break	Pulse plasma rock fragmentation technology	Korea
	Piling	Earth augering method	Hydraulic press-in piling method	Japan and USA
	Concrete demolition	Excavator mounted breaker	Hydro-demolition	Sweden
General Construction Work in Construction Sites	Road maintenance of road surface breaking	Excavator mounted breaker	Vibro ripper	UK, Mexico and Korea
	Road surface excavation	Open trench method	Pipe jacking	USA, Europe, China
	Building demolition	Top-down method	Hat-down method	Japan, Italy
	Concreting	Concrete works with vibratory poker	Self-compacting Concrete (SCC)	Japan, North America and Europe
	Formwork (hammer and drilling)	Conventional formwork	Modular lightweight formwork	Korea, USA, Germany, China
Renovation Work in Domestic Premises	Plaster or tile removal works	Demolition hammer	Air hammer	Japan, Taiwan
	Wall breaking	Demolition hammer	Brick wall cutter	USA, Europe
	Channel making for pipe or conduit installation	Demolition hammer	Wall chaser	UK, USA and China

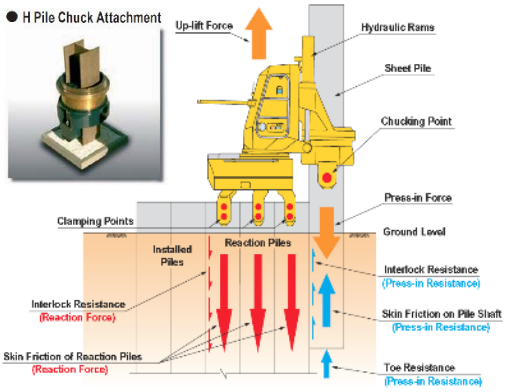
	Drilling	Hammer drill	Hand-held coring machine	Germany, Japan, USA
	Predrilling and fastening	Hammer drill	Direct fastening tool	Germany, Japan, Australia

Table 5.14 Brief description of the quiet construction technologies

Quiet Technologies or Alternatives	Brief Description of Working Principles (Relevant figures shown in Figure 5.2)
Pulse Plasma Rock Fragmentation Technology	Non-explosive rock blasting using chemical cells and an Electro Pulse Injector (EPI)
Hydraulic Press-in Piling	A pile penetration method which accurately installs pre-formed piles through static loading piling
Hydro-demolition	Breaking concrete with the high-pressure water jet. On-site wastewater treatment systems are normally accompanied with the machine.
Vibro Ripper	A new chiselling technology that utilizes high-frequency vibration and low-impact force for ripping of soil, rock and road surface
Pipe Jacking	Installs underground concrete pipes, by a pushing or jacking frame installed in the launching shaft
HAT-down Technology	A noise enclosure to screen topmost portion of a building and be jacked down during top-down demolition
Self-compacting Concrete	A highly fluid, non-segregating concrete that can spread into place, fill the formwork, and encapsulate the steel bar reinforcement without any mechanical consolidation
Modular Lightweight Formwork	Reusable light weight formwork coupled with screws or panel coupler
Mini Air Hammer	Use of low impact hammering force produced by compressed air for breaking tiles.
Brick Wall Cutter	An electric hand tool for cutting works of brick and mortar
Wall Chaser	A cutting tool for chasing narrow channels or grooves on walls or slabs for pipes and cable laying, with multiple circular blades
Hand-held Coring Machine	A concrete corer with lubrication and dust control system capable of smaller diameter coring
Battery-actuated Direct Fastening Tool	Punch of a fastener directly on concrete wall / ceiling by spring loading mechanism

Figure 5.2 Thirteen (13) quiet technologies

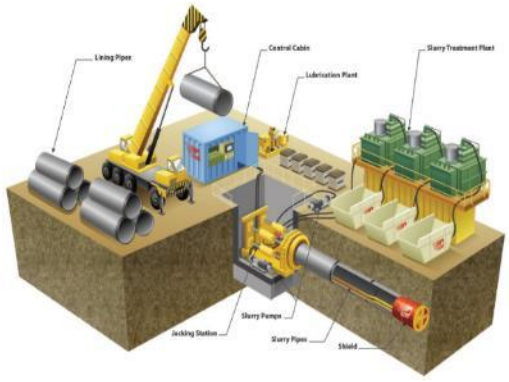
Pulse Plasma Rock Fragmentation Technology



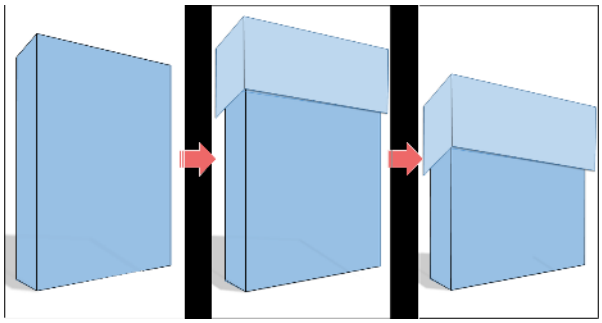
Hydraulic Press-in Piling Method

Hydro Demolition

Vibro Ripper



Pipe Jacking



Hat-down Method

Self-compacting Concrete

Modular Lightweight Formwork

Mini Air Hammer

Brick Wall Cutter

Wall Chaser

Hand-held Coring Machine

Battery-actuated Direct Fastening Tool

5.2.2 Anticipated Benefits

When considering the comparison of newer quiet technologies to conventional construction methods, the consultant found that: –

The time and cost required to perform the work with the newer technologies is generally comparable to those associated with conventional methods, subject to various factors such as project nature and site conditions. The consultant is fully aware that engineering and site constraints would be crucial factors that might determine or even dictate the choice of construction methods for different types of applications.

The number and quality of skilled labour required to perform the work with the newer technologies is similar to that of conventional methods. Noise reduction performance ranges from 8 dB(A) to 35 dB(A), which could be regarded is a noticeable or appreciable difference. This information is summarized in **Table 5.15**.

The adoption of quiet technologies would increase the awareness of the noise producer. Continuous exposure, promotion and adoption of quiet technologies would develop green culture not only to the contractors and workers, but also for the general public to empathize the cause of adopting quiet construction technologies.

Engineering practical constraints have been identified with regard to the unique Hong Kong situations. The 13 items of quiet technologies recommended are all considered practical.

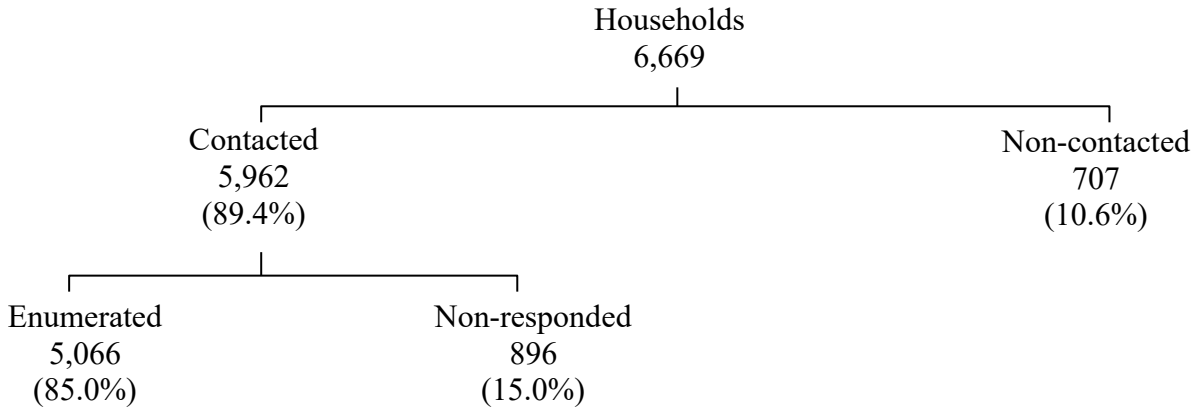
Table 5.15 Benefits of quiet construction technologies and practices

Quiet Construction Technologies and Practices	**Noise Reduction over Conventional Technologies and Practices, dB(A)**	***Other benefits***
Pulse plasma rock fragmentation technology	23	Production rate varies when compared to traditional drill and break method, subject to different scenario Improves occupational environment, health and safety
Hydraulic press-in piling method	22	More catering for restricted hours operations Improves occupational environment, health and safety
Hydro-demolition	20	Reduce dust generation Improves occupational environment, health and safety
Vibro ripper	8	Has a higher production rate is certain geology
Pipe jacking	34	More catering for restricted hours operations Reduce site area leads to less disturbance to traffic Improves occupational environment, health and safety
Hat-down method	17-23	Reduce dust spreading outside the site area.
Self-compacting Concrete (SCC)	12	Provide denser structure due to more compacting composition Improves occupational environment, health and safety from eliminating vibratory poker
Modular lightweight formwork	15	More catering for restricted hours operations Reduce dust generation from wooden board cutting Reduce training requirement in terms of workmanship
Air hammer	35 (SBN)	Improves occupational environment, health and safety
Brick wall cutter	12 (SBN)	Improves occupational environment, health and safety
Wall chaser	9 (SBN)	Higher production rate than traditional breaking method Improved workmanship Improves occupational environment, health and safety
Hand-held coring machine	15 (SBN)	Improves occupational environment, health and safety
Direct fastening tool	9 (SBN)	Higher production rate than traditional drilling method Improves occupational environment, health and safety

5.3 Stakeholders Survey Results

Fieldwork was carried out between 5 February 2018 and 1 May 2018. A total of 6,669 households were found in the sample of 6,622 occupied quarters. In the 6,669 households, 5,962 households were successfully contacted. Among them, 5,066 were successfully enumerated while 896 were non-responded. The response rate was 76%, which was satisfactory and similar to the similar survey conducted in 2009-2010. Details of the enumeration results are given below: –

Survey data were collected through the use of a structured questionnaire to gauge the annoyance level from various types of construction noise including domestic renovation noise in the past 12 months (Feb 2017 to Feb 2018) and for those who are not annoyed by general construction noise or domestic renovation noise in the 12 months, they would be further asked if they were annoyed by such noise over the past 10 years (Feb 2008 to Feb 2018), i.e. the extent of annoyance experienced from around February 2017 to May 2018 for past 12 months period or around February 2008 to May 2018 for past 10 years period given the interviews were conducted from Feb 2018 to May 2018. Hence the consultant could analyse the results of the two timeframes, during a more recent period in the past 12 months, and a broader timeframe of past 10 years.



Overall response rate : 76%

The coefficient of variation and margin of error at 95% confidence level of the estimates of the selected variables presented in this report are given as follows: –

Table 5.16 Estimates of the selected variables

Variable	Estimate	Coefficient of variation	Margin of error at 95% confidence level
Percentage of persons aged 18 and over who were annoyed by domestic renovation noise at home in the past 10 years	74.3%	1.1%	± 0.8.%
Percentage of persons aged 18 and over who were annoyed by general construction noise at home in the past 10 years	48.1%	1.7%	± 0.8.%
Percentage of persons aged 18 and over who reported to have problems or difficulties with sense of hearing among all persons aged 18 and over in Hong Kong	1.8%	7.8%	± 0.1.%

5.3.1 Public Perceptions

The consultant considers that the following findings from the public survey of particular value in deriving options for improvement of construction noise control in Hong Kong.

Construction noise annoyance during daytime and nighttime has been separately analyzed. Noise annoyance from different types of construction work would be analyzed from the survey result data and correlation would be made to the relevant construction processes or equipment. The consultant would also attempt to gauge the priority of concerns. As the consultant cannot expect the general public have full stake and technical knowledge on the terminologies related to construction work, views from the public on what quiet measures are acceptable to them were not sought, but it is always true that they wish to be relieved of excessive noise annoyance or disturbance in terms of noise level by whatever means or shorter duration of noisy activities, or even an advance notification of the noisy events. Public perception and views would be addressed during the processes in identifying the issues and proposing possible options.

The major observations from the survey data are:

- Almost 60% of the population either not annoyed by construction or did not heard any construction noise in the past 12 months (**Figure 5.3**).
- Construction noise generally perceived as less annoying to domestic renovation noise (**Figure 5.4**).
- Percussive Piling, General Site Activities, and Road Maintenance are “Top 3” in terms of general construction works generating annoyance (**Figure 5.6**).
- The majority of the noise annoyance from construction is concentrated at 0900 to 1900 (**Figure 5.7**).
- The complaint rate is 4% for general construction (**Figure 5.8**).
- The majority of the population are served with property management companies (**Figure 5.9**).
- When affected by domestic renovation noise, residents would usually turn to the property management companies to voice their concerns (**Figure 5.10**).
- Majority of the respondents are unwilling to pay extra cost for quieter renovation of their own flats (**Figure 5.11**).

Figure 5.3 Annoyance level of domestic renovation (DR) and general construction works (GW)

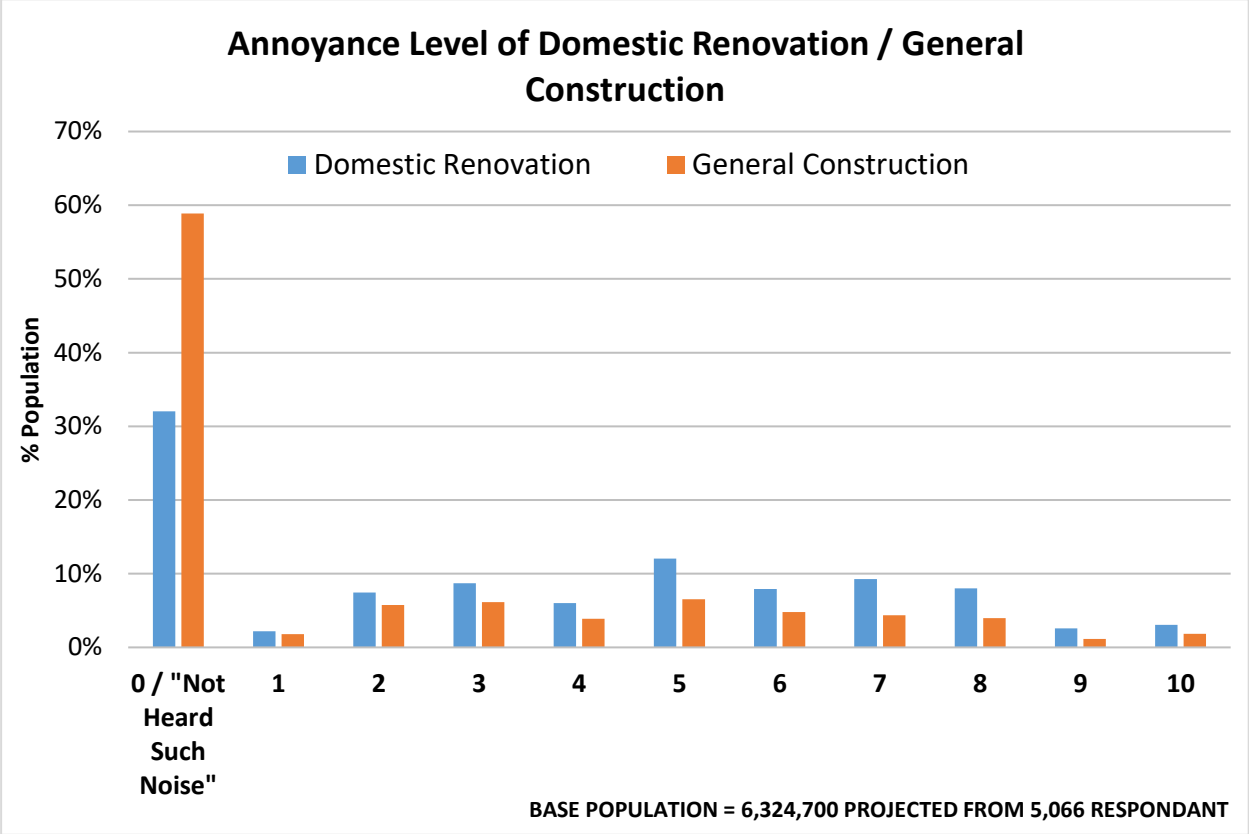


Figure 5.4 Annoyance level of DR and GW (annoyance scale)

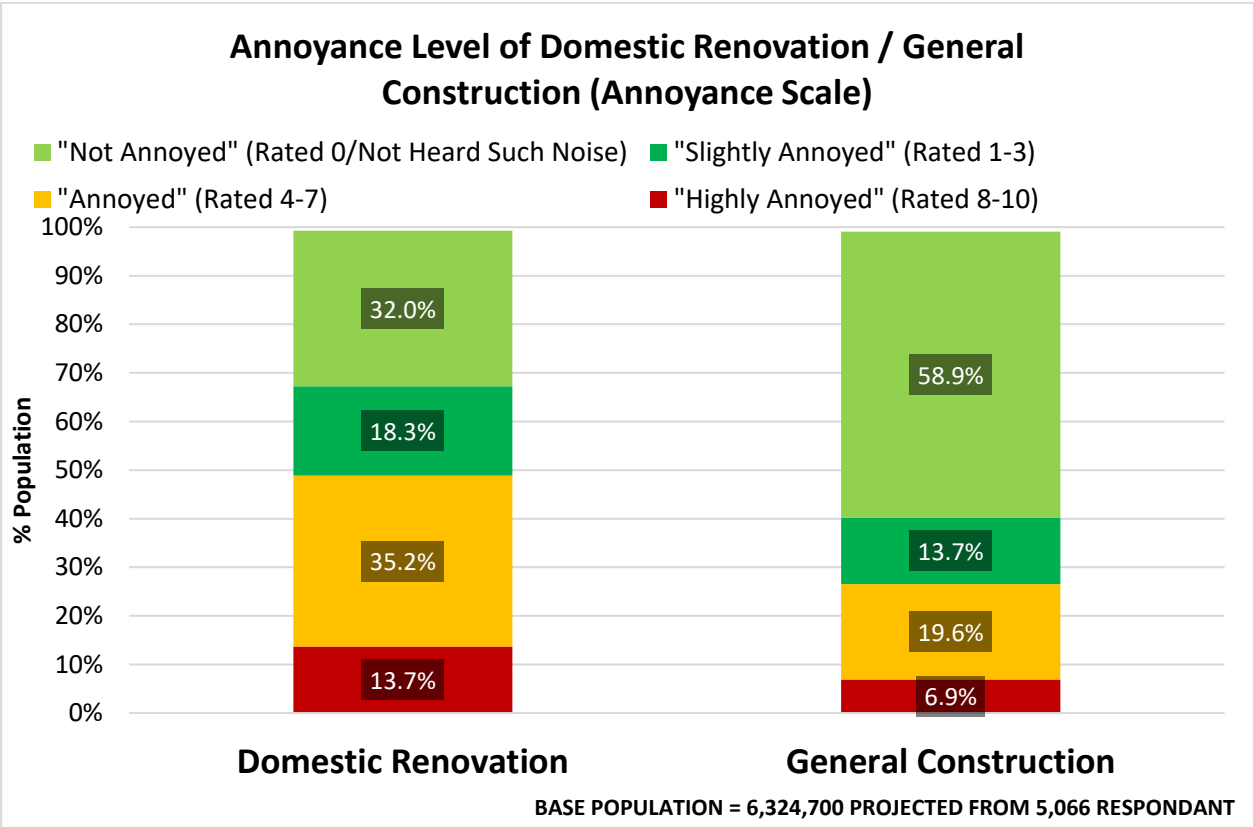


Figure 5.5 Annoyance level of different construction activities in past 10 years

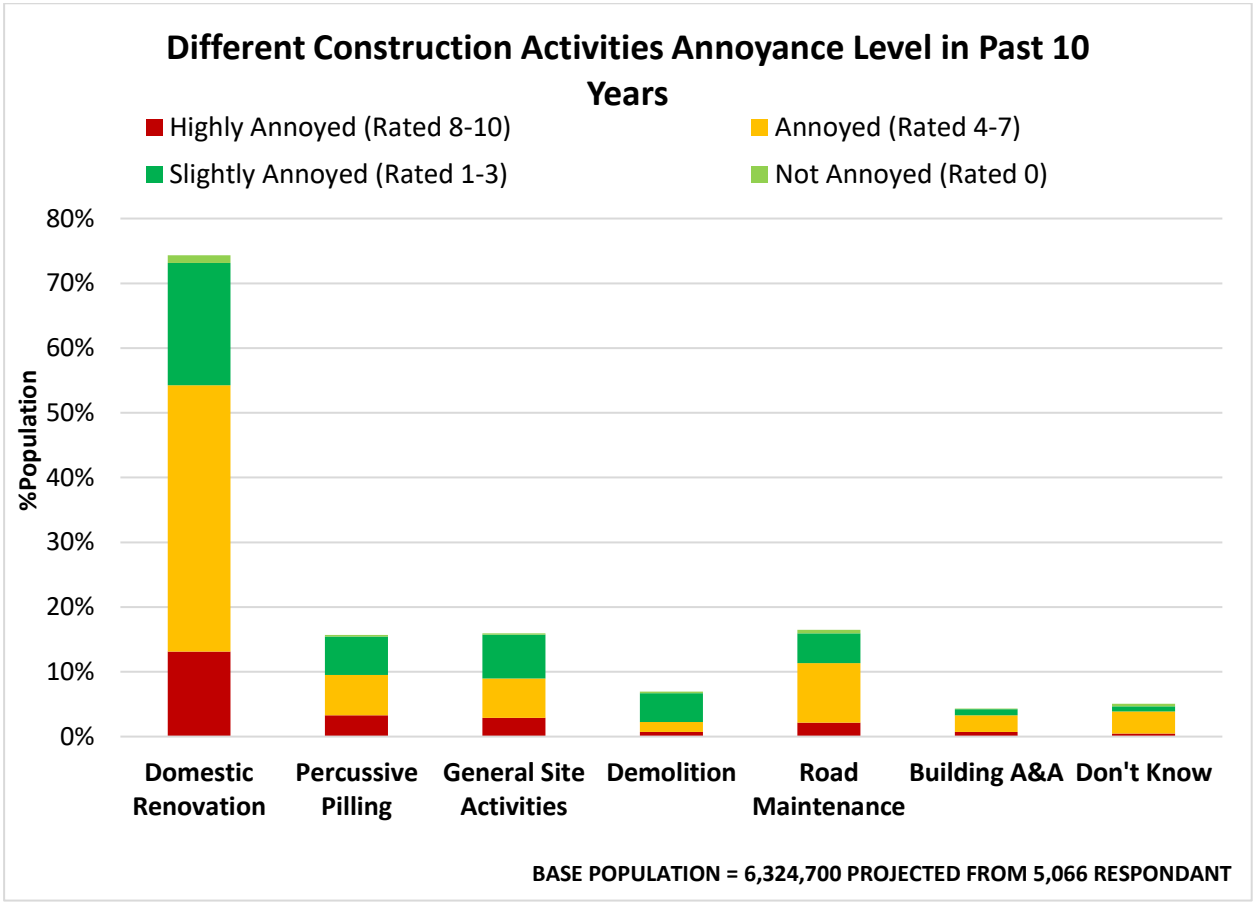


Figure 5.6 Annoyance level of different construction activities in past 10 years

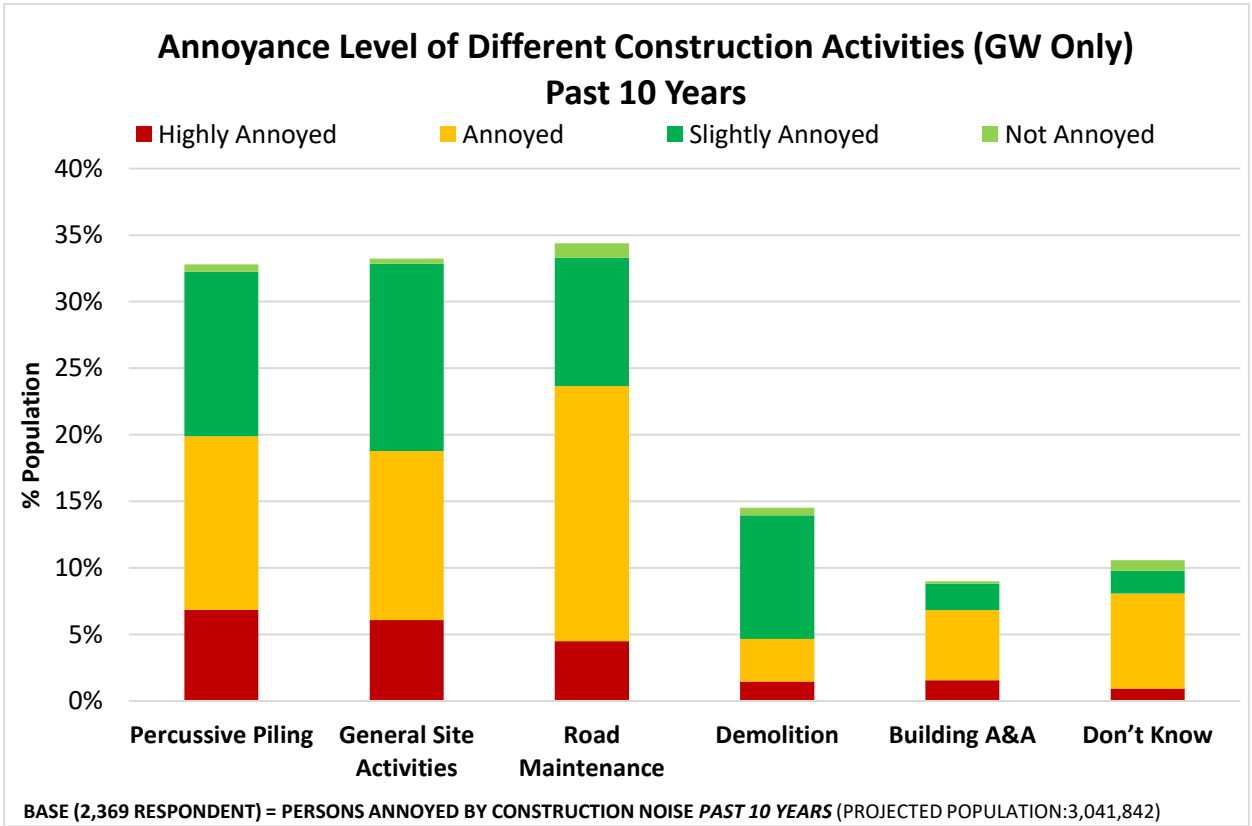


Figure 5.7 Construction noise annoyance - time of day (weekdays)

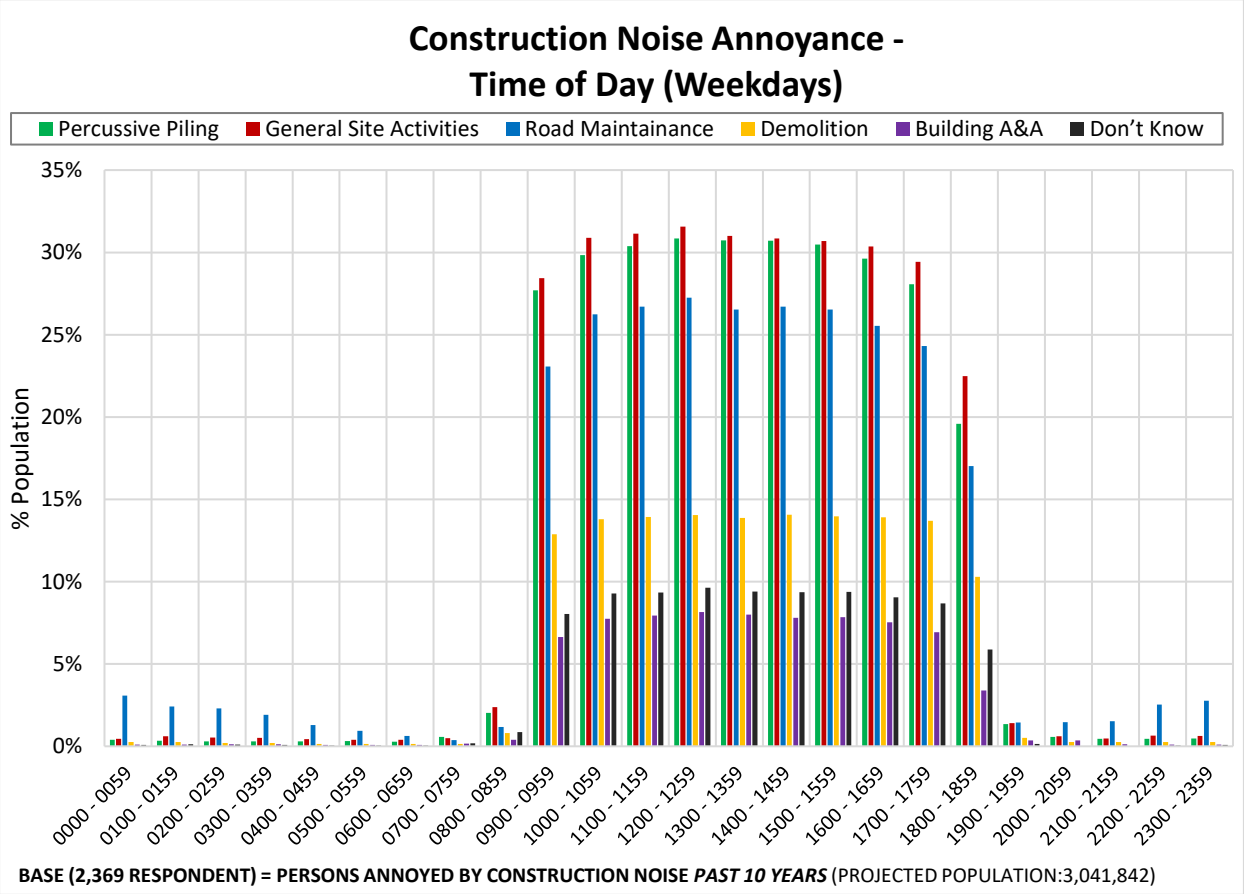


Figure 5.8 Complaint rate for general construction noise

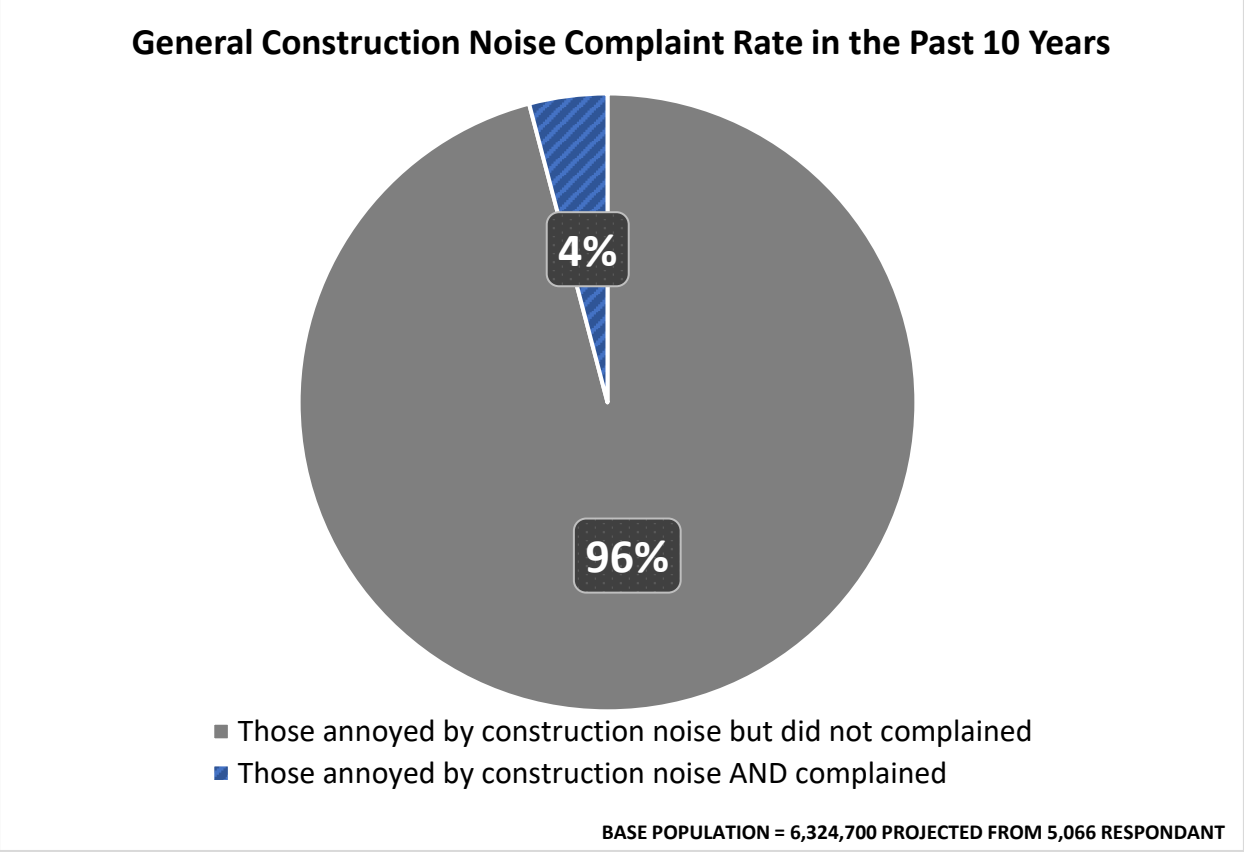


Figure 5.9 Population served by property management (PM)

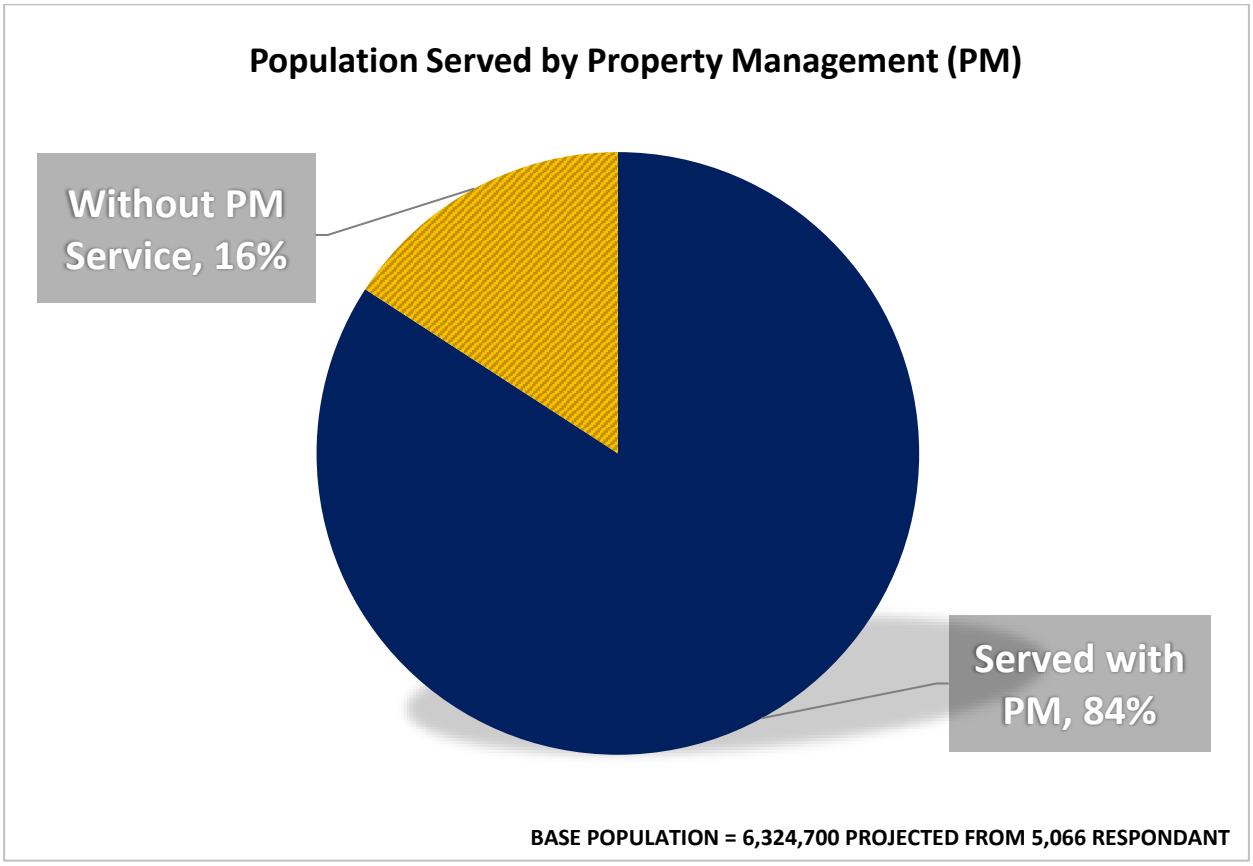


Figure 5.10 Domestic renovation noise complaint channels

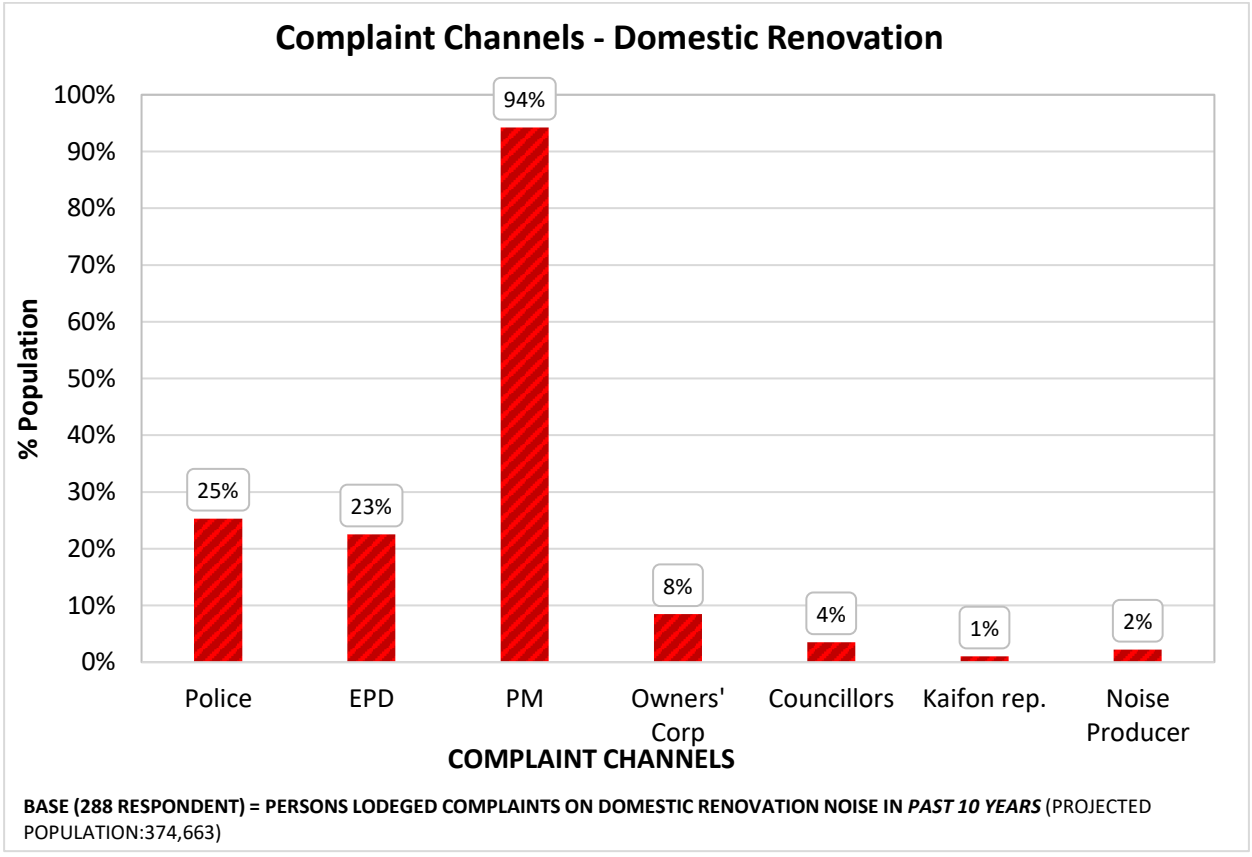
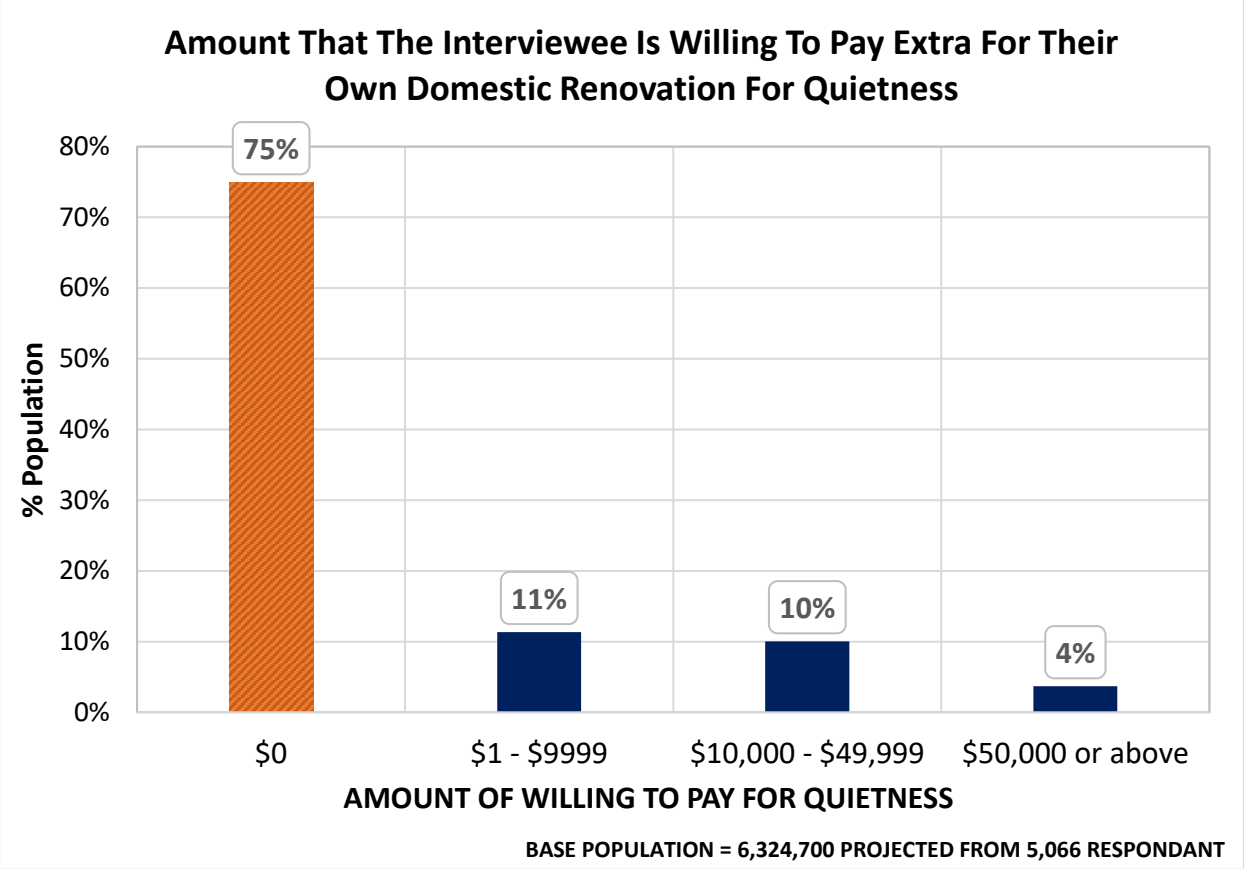


Figure 5.11 Amount that the interviewee is willing to pay extra for their own domestic renovation for quietness



5.3.2 Industry Views – Construction Sector

The consultant understands that the construction industry is experiencing tight work programme in order to deliver their contractual obligations with the project proponents. Furthermore, there are practical financial and time constraints for the contractors to implement additional noise mitigation that are not originally included as contract requirements, in particular for any change of construction method or addition of noise mitigation measures which could induce additional cost / time implications that are not priced for during tender stage. Concerns from the construction industry would be addressed during the processes in identifying the issues and proposing options.

Engagement Exercises

Collection of preliminary views from relevant trade associations and statutory bodies which are concerned with interests from a wide range of operators / sectors in terms of types of construction activities and scale of operations

Representatives from the following bodies were engaged:

- Hong Kong Construction Association (HKCA)
  - HKCA is comprised of over 300 construction companies as members.

- Construction Industry Council (CIC)
  - CIC is led by the Council which comprises of a chairman and 24 members representing various sectors of the industry including employers, professionals, academics, contractors, workers, independent persons and Government representatives.

- Hong Kong General Building Contractor Association (HKGBCA)
  - HKGBCA is comprised of over 130 construction companies as members.

The consultant successfully sought preliminary views from the above bodies on different areas of concern related to construction noise, including:

- Technical and financial aspects of addressing noise concerns
- Constraints in fulfilling non-contractual requirements (e.g. budget and work programme)
- Feasibility of adopting non-conventional but quieter methods
- Overseas practices in managing and mitigating noise

Their concerns and views had been used to form a basis for formulating various discussion topics and focus group meetings for collecting views related to the following main categories or sources of construction noise concerns:

- General Construction
- Piling Works
- Demolition
- Domestic Renovation

More than 20 trade associations and 1500 individual companies in the construction field were approached and invited to the focus group meetings. In addition, a tutor from the Hong Kong Institute of Construction was also invited to share views and experience from the education / training perspective.

From the various contacts and face-to-face meetings with a wide range of stakeholders within the construction industry, the consultant had gathered the following views regarding control and management of noise from general construction works.

There were different focal points when the consultant met and discussed the construction industry stakeholders. In addition to hearing their views on the current noise control measures and controls, the stakeholders also expressed their views on possible ways and means to progress with time, and to align and respond to community expectations and aspirations. Their views on using and adopting quieter construction equipment and methods were also sought areas such as practicability and experience, local applicability and cost, competition and fairness, constraints in the industry, etc.

Key and mainstream views

General Construction:

- Early planning is supported.
- Contractors have no insurmountable technical difficulties in adopting quieter technologies.
- Maintaining a levelled playing field among contractors is important – the proposed adoption of various technologies should be spelled out upfront, not after tender has been awarded, or works already in progress.
- There is an expectation for the Government to take lead in implementing additional noise control and management measures in the projects.
- The most prominent considerations are time, cost, and quality of works.
- Time given to contractors to complete their works are often too short to be realistic in the existing business environment.

The consultant, together with the subject experts on the team, have reviewed the key and mainstream views (as mentioned above). The following impressions were arrived at after deliberations.

- Contractors are not particularly resisting to changes that bring about quieter construction progress.
- Contractors want fair and open competition, so it is imperative to spell out upfront what exactly are the noise control requirements, or the methods/equipment to be adopted.
- Employers or project proponents are recommended to factor in quieter construction methods or equipment in the time and cost budget.

Regarding noise from domestic renovation activities, the consultant has gathered the following views:

Domestic Renovation:

- Early planning is supported.
- Contractors have no major resistance to using alternative tools which are quieter in renovation works.

The consultant, together with the subject experts on the team, have reviewed the key and mainstream views (as mentioned above). The following impressions were arrived at after deliberations:

- Contractors are not particularly resisting to changes that bring about quieter renovation.

- Most domestic renovation works are carried out by small companies with limited capital investment and more time is required to promulgate the availability and the use of quieter gears in order to precipitate a gradual cultural change in the industry.

5.3.3 Industry Views – Project Proponents

The consultant has approached major project proponents including the MTR Corporation (MTRC), Real Estate Developer Association (REDA), Urban Renewal Authority (URA). From the various contacts and face-to-face meetings with different project proponents, the consultant had gathered the following views regarding control and management of noise from general construction works:

There were different focal points when the consultant met and discussed with the project proponents. In addition to hearing their views on the current noise control measures and controls, the project proponent also expressed their views on possible ways and means to progress with time, and to align and respond to community expectations and aspirations. Their views of using and adopting quieter construction equipment and methods were also sought in areas such as local applicability and cost, competition among contractors, government taking the lead, constraints in the industry, etc.

Key and mainstream views

- Early planning is supported.

- Levelled playing field is an imperative. Government is expected to spell out the intention upfront.

- There is an expectation for the Government to take lead in implementing additional noise control and management measures in the projects.

- Some major project proponents (for example, URA and MTR) are going beyond the current statutory requirements to seek construction noise reduction. They are in support of advance planning for identification of practical quiet measure.

The consultant, together with the subject expects on the team, have reviewed the key and mainstream views (as mentioned above). The following impressions were arrived at after deliberations:

- Apart from a few keen entities, project proponents are not particularly enthusiasts in more controls on the industry, including the noise dimension.

- However, they are not totally against changes to bring about quiet construction.

- There is an expectation for the Government to provide incentives and take the lead.

5.3.4 Industry Views – Property Management Sector

One of the duties of property management companies is to mediate different issues among owners / tenants, including domestic renovation noise complaints lodged against renovation activities in the neighbourhood. Concerns from the construction industry would be addressed during the processes in identifying the issues and proposing options.

With the noisy activities identified for each construction process, the consultant made a correlation with the views of different stakeholders and concluded on those critical issues for attention.

Engagement Exercises

Initial view collection exercise was conducted to collect preliminary views from relevant trade associations and professional institutes.

Representatives from the following bodies were engaged:

- Hong Kong Association of Property Management Companies (HKAPMC)
  - HKAPMC consist of 99 property management companies as member which covers over 70% of resident units in Hong Kong.
- Chartered Institute of Housing (CIH)
  - CIH is a professional organisation in property management with over 500 members.
- Hong Kong Institute of Housing (HKIH)
  - HKIH is the professional body which has over 3,000 members who are engaged in the co-ordination and execution of housing services incorporating design, provision, improvement, rehabilitation, management and administration of all types of housing.

The consultant successfully sought preliminary views from the above bodies on different areas of concern related to construction noise, including:

- Difficulties on managing noise concerns
- Feasibility of adopting non-conventional but quieter methods
- Overseas practices in managing and mitigating noise

Their concerns and views had been used to form a basis for formulating various discussion topics in focus group meetings for collecting views.

From the various contacts and face-to-face meetings with different members within the property management sector, the consultant has gathered the following views regarding control and management of noise from domestic renovation activities:

Spectrum of views

There were different focal points when the consultant met and discussed with the property management sector. In addition to hearing their views on the current noise control measures and controls, the stakeholders also expressed their views on possible ways and means to progress with time, and to align and respond to community expectations and aspirations. Their views on using and adopting quieter renovation equipment were also sought. The consultant also examined with the stakeholders the pros and cons of some of the self-developed house rules, constraints and dilemma faced by the industry, need for client satisfaction, etc.

Key and mainstream views

- Early planning and notification to put appropriate focus on domestic renovation noise is supported.
- Property management companies are under pressure to serve not just a sector but all clients (the whole spectrum of residents of their respective managed properties) thereby facing apparent competing loyalty and priorities. Both the noise producer (unit undergoing renovation) and noise receivers (the affected residents) are their clients to be served.
- Many property management companies have already adopted some house rules specific to their own properties to manage renovation activities.
- Property management companies welcome the idea of empowering them via technical and administrative means to better manage renovation noise.

The consultant, together with the subject expects on the team, have reviewed the key and mainstream views (as mentioned above). The following impressions were arrived at after deliberations:

- The property management sector welcomes more information for enhancing quiet renovation.
- Practitioners in the sectors are not endowed with detailed engineering knowledge on renovation. Simple and implementable guidelines are preferred.

5.3.5 Analysis and Observation

Looking beyond the very surface of the survey data, the consultant picked up several important themes:

- While the population is generally tolerant towards construction noise and domestic renovation noise, they are being annoyed by it to varying extent.

- Daytime works are generating relatively more disturbance. In comparison, night works appear to be relatively better controlled and managed as perceived by the public.

- Property management companies, being the "handy man" close-by and readily available, are being loaded with the lion's share of help seeking requests from residents, even many circumstances are beyond their control or sphere of influence.

- A minority of the population are willing to pay, in terms of prolonging the works period or spending more money, to make their own domestic renovation works quieter in order to reduce the disturbance to others.

The following sub-sections are intended to present some related commentary and observations.

Considering the above themes together with the more salient impressions picked up after meeting with the industries the consultant is moving towards the following conclusive observations:

- Addressing noise from general construction and domestic renovation would bring about welcomed reduction in environmental noise annoyance as perceived by the population.

- Early planning is one of the tools to put appropriate focus on construction noise.

- While not all project proponents are particularly enthusiastic, there is an expectation that the government could consider providing incentives and taking the lead.

- Contractors are not resisting changes, provided the competition is fair and open.

- The property management sector welcomes more assistance and empowerment for enhancing their role in tackling domestic renovation issues.

5.4 Schemes for Tackling the Noise Concerns

5.4.1 Approaches and Methodologies

Technical Aspect

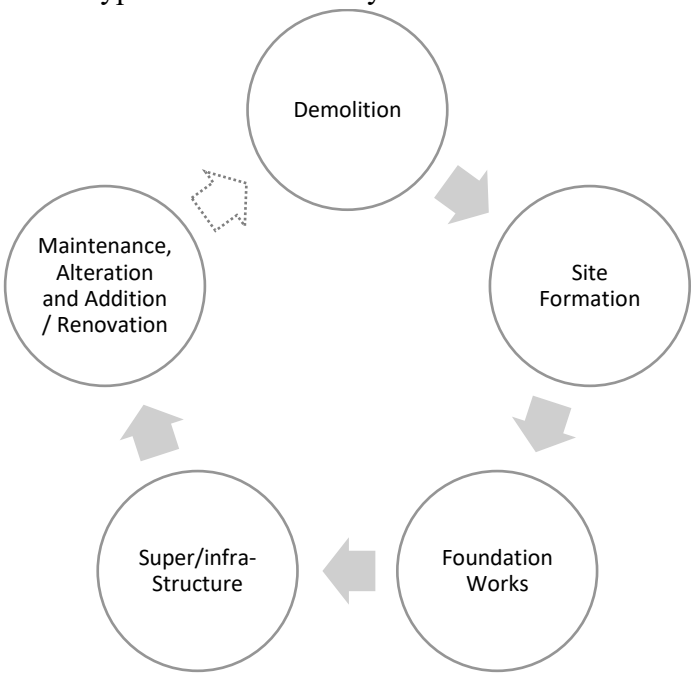
The consultant has attempted to examine holistically the different construction processes and suggested that these processes could in general be categorized in terms of a construction cycle in a developed or developing site as follows and **Figure 5.12**. The consultant had identified 13 quiet alternative technologies and practices were considered as prominent candidates for alleviating the impact from noisy construction works including domestic renovation works. Noise reduction performance of these technologies ranges from 8 dB(A) to 35 dB(A) when compared with some

conventional noisier methods. Engineering practical constraints have been identified with regards to Hong Kong's situations, though none of the quiet technologies were considered impractical in meeting the typical geological or engineering requirements in Hong Kong.

1. Demolition
2. Site formation
3. Foundation works
4. Super/Infra-structure
5. Alteration and Addition, maintenance & repair / renovation

Due to the unique nature of these processes, different types of construction equipment are often used giving rise to varying degree of noise annoyance. Particularly noisy construction activities will be identified for each construction process.

Figure 5.12 Illustration of a typical construction cycle



Means of Implementation – General Construction

Administrative means could provide a fast and flexible channel to implement due to the only requirement for the readiness or willingness of project proponents to adopt the technical solutions within an existing framework to achieve quiet construction. Statutory means would involve more effort and time for evaluation of various implications including economic impacts and business impacts. The consultant would explore the most appropriate means of implementation for the schemes generated from the Study.

Means of Implementation – Domestic Renovation

Domestic renovation noise issues would usually involve the use of a communal approach with property management company's mediation, as both the NSRs and noise producers are the owners / tenants within the same neighbourhood, and the two roles might interchange since this is a

possibility that the owners / tenants being affected by renovation noise would also renovate their own flats and affect others. The consultant would investigate the issues that property management companies are facing and explore relevant channels to enhance the tackling of domestic renovation noise.

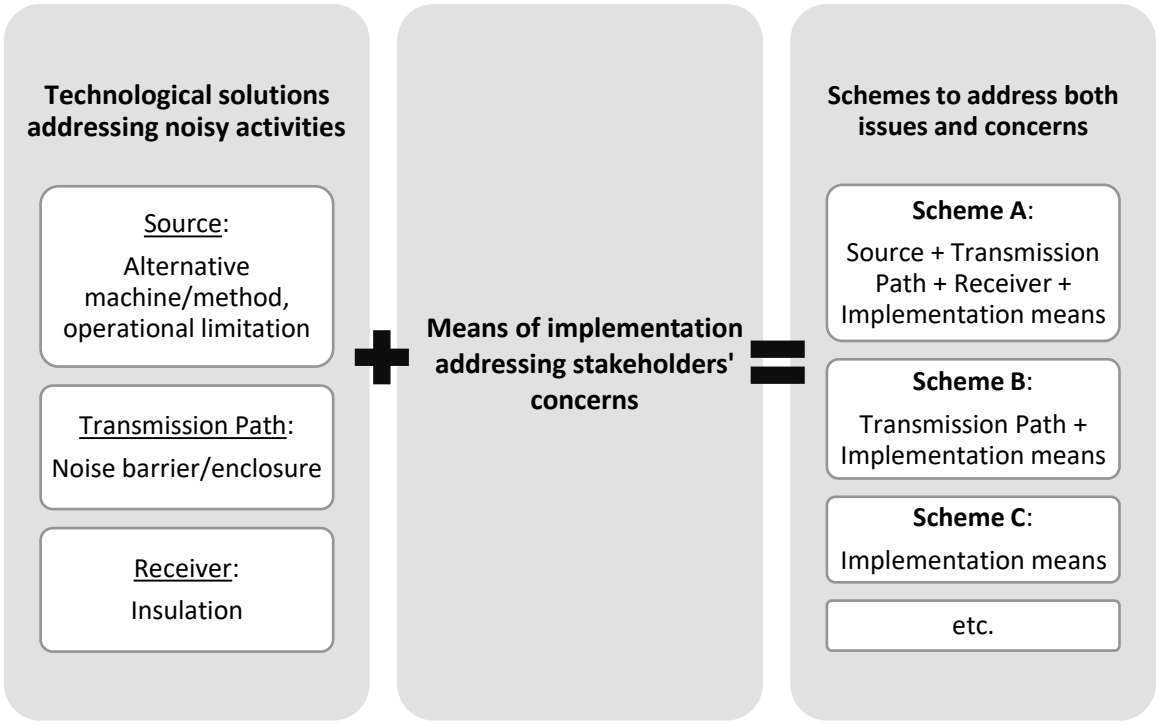
The consultant would consider the technical aspect and the channel of implementation on proposing the schemes. Technical aspects would be considered with reference to the findings from technical feasibility studies. While means of implementation would reference both local and overseas practices or tools. The stakeholders' engagement exercise would be used to cross-check if the concerns from various stakeholders have been adequately addressed.

5.4.2 Schemes Generation

The approaches for generating schemes for analyses (general construction and domestic renovation) are illustrated in **Figure 5.13**. In summary, it involves:

(i) an examination of the application and limitation of technological solutions for each issue identified;
(ii) a collection of possible means or tools that might be useful for the implementation of those technological solutions;
(iii) an identification of important views collected during the stakeholder engagement exercises that should be addressed for any schemes; and
(iv) generating schemes by combining the technical solutions and possible means of implementation that could primarily address or balance the views and concerns of different stakeholders.

Figure 5.13 Illustration of schemes generation process



5.4.2.1 Technological Solutions Identified for Consideration in Generating Schemes

5.4.2.1.1 General Construction

5.4.2.1.1.1 *Control at Source*

As identified in previous sections, percussive means for construction works are in most of the cases the origin of intrusive noise due to the impulsive nature of the operation of percussive machines. From the consultant's experiences, mitigation at source would be the most effective and direct in reducing noise and in some situations the most cost-effective as well because of the elimination of additional measures at source or along the noise propagation path. Adoption of non-percussive machines would be the logical approach in reducing construction noise. A technical feasibility study was dedicated for exploring the feasibility of new quieter alternative technologies. **Table 5.17** and **Figure 5.14** show the list of possible quiet technologies or alternatives.

Apart from adopting specific non-percussive machines as alternative to percussive means, other source control method would also be introduced such as a complete change in the work process instead of specific machine, and good site management practices for reducing construction noise.

The application of hand-held tools for building A&A and domestic renovation is virtually the same in respect of small-scale alteration or renovation works. Since the quiet technical solution for domestic renovation, which mainly involves the use of hand-held tools, would be covered in Section 4.2, this section will focus on quiet technologies for general construction works and bigger scale A&A only.

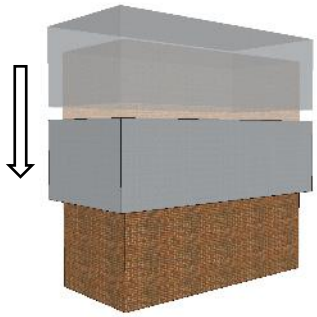
Table 5.17 List of possible quiet technologies or alternatives (general construction)

Quiet Technologies or Alternatives	Applicable Fields	Applicable Construction Processes	Conventional Machines / Practices	Brief Description (Photo 4.1 to 4.13)
Circular Saw	Building A&A Demolition Road Works	Concrete structure removal, trimming and alteration	Excavator-mounted / Hand-held breaker	Cutting action by abrasive force generated by the spinning of a large diameter blade, instead of percussive actions
HAT-down Technology	Building Demolition	Concrete breaking and removal	Protective silt curtain	A noise enclosure to screen topmost portion of a building and be jacked down during top-down demolition
Hydro-demolition	Building A&A Demolition	Concrete structure removal, trimming and alteration	Excavator-mounted / Hand-held breaker	Breaking concrete with the high-pressure water jet. On-site wastewater treatment systems are normally accompanied with the machine.

Jaw Crusher	Building A&A Demolition	Concrete structure removal, trimming and alteration	Excavator-mounted / Hand-held breaker	Breaking force provided by hydraulic via clamping action, instead of percussive actions
Modular Lightweight Formwork	Super / Infrastructure	Concrete casting	Hammering of wooden formwork	Reusable light weight formwork coupled with screws or panel coupler
Non-explosive expansion agent	Site Formation	Concrete and rock breaking	Excavator-mounted / Hand-held breaker	Slow-acting chemical compound that would expand then cracks the structure from within
Pipe Jacking	Utilities	Road opening for utilities placement	Excavator-mounted breaker	Installs concrete pipes, by a pushing or jacking frame installed in the launching shaft
Press-in Piling	Foundation Utilities	Retaining wall installation for shaft/trench	Vibratory hammer Percussive driver Earth auguring	A pile penetration method which accurately installs pre-formed piles through static loading piling
Pulse Plasma	Site Formation	Rock breaking	Excavator-mounted breaker	Non-explosive rock blasting using chemical cells and an Electro Pulse Injector (EPI)
Rock Splitter	Site Formation	Concrete and rock breaking	Excavator-mounted / Hand-held breaker	Exert force from the inside of structure by expansion of splitting wedges
Self-compacting Concrete	Super / Infrastructure	Concrete casting	Vibratory poker	A highly fluid, non-segregating concrete that can spread into place, fill the formwork, and encapsulate the steel bar reinforcement without any mechanical consolidation
Vibro Ripper	Road Works Site Formation	Soft rock removal Asphalt removal	Excavator-mounted breaker	A new chiselling technology that utilizes high-frequency vibration and low-impact force for ripping of soil, rock and road surface
Wire Saw	Building A&A Demolition	Concrete structure removal, trimming and alteration	Excavator-mounted / Hand-held breaker	A quiet cutting technology using abrasive force of a wire running through

Figure 5.14 List of possible quiet technologies or alternatives (general construction)

Circular Saw



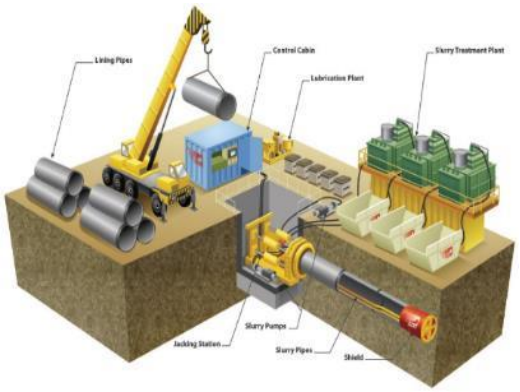
HAT-down Demolition

Hydro-demolition Machine

Jaw Crusher

Modular Lightweight Formwork

Non-explosive Expansion Agent



Pipe Jacking

Press-in Piling Machine

Pulse Plasma

Rock Splitter

Self-compacting Concrete (Courtesy of Gammon Construction)

Vibro Ripper

Wire Saw Machine

5.4.2.1.1.2 *Control Along Transmission Path*

Means of blocking the noise transmission and / or absorbing the noise could be effective noise mitigation along the noise transmission path to reduce noise from reaching noise sensitive receivers. Noise barriers and enclosures are common installation constructed within the construction site to contain, block, absorb or deflect the noise energy being propagated along transmission path. Noise barriers and enclosures could also be constructed with high mobility and recyclability depending on site circumstances. See **Table 5.18**, **Figure 5.15** and **Figure 5.16**.

Transmission path control are generally practical methods and the common technical constraint is space availability within the site. It could provide excellent performance if well-designed and could be applied together with other source control methods.

Table 5.18 List of transmission path control solutions

Transmission Path Control Solutions	Applicable Fields	Applicable Construction Processes	Brief Description (Figure 5.15 and Figure 5.16)
Noise barrier	All	All	A vertical screening structure constructed between noise source and noise sensitive receivers to deflect and absorb noise energy along the noise propagation path
Noise enclosure	All	All	A structure constructed around the noise source to contain and absorb noise energy and block the noise propagation path in all directions

Figure 5.15 Noise barrier (modular reusable, curtesy of Acoustics Innovation)

Figure 5.16 Noise enclosure

5.4.2.1.1.3 *Control at Receiver*

While window insulation at the receiver appears to be a means of construction noise reduction, the consultant is aware that, as with other environmental noise such as transportation noise, and industrial noise, it should only be regarded as a last resort in noise mitigation as it would deprive users of the freedom in enjoying an open window life-style and compel them to adopt forced ventilation or air-conditioning. Moreover, unless a particular building is designed with a package of noise mitigation measures including window / façade designs that commensurate with its uses, subsequent alteration work for addition of noise insulation in existing buildings would not only require time for prior consultation and coordination, but also inevitably cause disturbance to the existing users' livelihood, not to mention whether the whole insulation programme could tie in with the site construction programme.

5.4.2.1.2 Domestic Renovation

Technological solutions for domestic renovation are focused on solutions that effectively could provide noise reduction to the surrounding by means of non-traditional quieter construction methods or other technical means through specific management or control of construction activities. According to basic principles of acoustics, noise reduction could be achieved through intervention or control on the following three elements in noise propagation: source, transmission path and receiver. It is a sensible way to apply

technological solutions which could achieve this purpose. These technological solutions are not mutually exclusive to each other, and multiple solutions could also be adopted when necessary. As regards to how technological solutions are reasonably promoted and implemented in practice for the generation of possible schemes the following considerations should be further taken into account: possible means of implementation as discussed in Section 4.2.2; and the views from stakeholders as addressed in Section 4.2.3. The following sub-sections give an account of the application of different technological solutions identified in the Study.

5.4.2.1.2.1 *Control at Source*

Although percussive machines are also the main source of noise nuisance in domestic renovation, unlike general construction noise, it is mainly transmitted via structural vibration generated by impact force of percussive machine in form of repetitive blows striking on the structure. And solid structural materials, e.g. concrete, is a very effective vibration transmission medium, the vibration energy would effectively radiate into sound with minimal attenuation along the structure and could be heard from distant units. The consultant considers mitigation along the transmission path to be impractical as vibration isolators are required to be retrofitted within or around the existing structure at each residential unit, and there would be obvious constraints on the approval process, time / cost required and possible additional disturbance to the residences' livelihood. Moreover, from the consultant's experiences, mitigation at source would be most effective in reducing domestic renovation noise. Adoption of non-percussive machines would be the logical approach in reducing domestic renovation noise. A technical feasibility study was dedicated for exploring the feasibility of new quieter alternative technologies.

Table 5.19 and **Figure 5.17** show the list of possible quiet alternatives for domestic renovation noise. As typical small-scale building A&A works are very similar in nature to domestic renovation, with the noise transmission mechanism and mitigation constraints rather similar, the quieter solutions proposed in this section are equally applicable to those A&A works.

Apart from adopting specific non-percussive type of machines, other source control method would also include limiting the number and operating time for percussive machines, introducing good management practices and promoting better work planning for reducing domestic renovation noise.

Table 5.19 List of possible quiet technology or alternatives (domestic renovation)

Quiet Technologies or Alternatives	Applicable Fields	Applicable Construction Processes	Conventional Machines / Practices	Brief Description (Photos 4.16 to 4.20)
Brick Wall Cutter	Domestic Renovation Building A&A	Brick wall alteration / removal	Hand-held breaker	An electric hand tool for cutting works of brick and mortar

Direct Fastening	Domestic Renovation Building A&A	Accessory fixation	Percussive drill	Punch of a fastener directly on concrete wall / ceiling by spring loading mechanism
Hand-held Corer	Domestic Renovation Building A&A	Hole opening	Percussive drill	A concrete corer with dust control system capable of smaller diameter coring
Mini Air Hammer	Domestic Renovation Building A&A	Tile removal	Hand-held breaker	Use of low impact hammering force produced by compressed air for breaking tiles.
Wall Chaser	Domestic Renovation Building A&A	Wall channel opening	Hand-held breaker	A cutting tool for chasing narrow channels or grooves on walls or slabs for pipes and cable laying, with multiple circular blades

Figure 5.17 List of possible quiet technology or alternatives (domestic renovation)

Brick Wall Cutter

Direct Fastening Tool

Hand-held Corer

Mini Air Hammer

Wall Chaser

5.4.2.1.2.2 *Control Along Transmission Path and at Receiver*

As renovation noise is transmitted via structural elements, typical barriers or window insulation at the domestic flat undergoing renovation would be ineffective as they only screen noise transmitted via air medium. Similar to the constraints discussed in Section 4.1.1.3, insulation at the receiver end is not considered practical for combating renovation noise from the neighbourhood.

5.4.2.2 Means of Implementation for Consideration in Proposing Schemes

5.4.2.2.1 General Construction

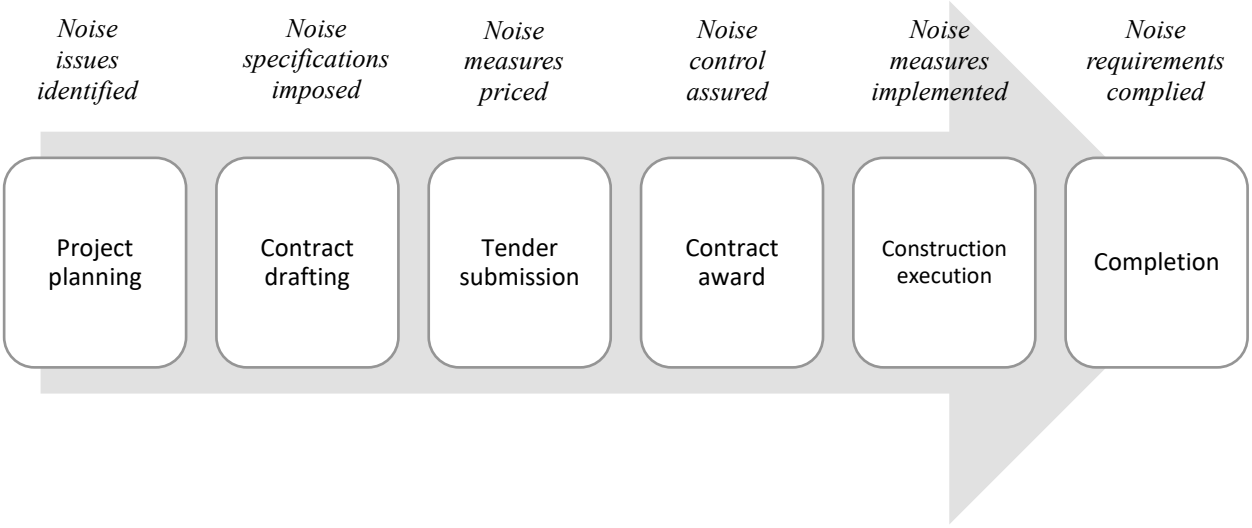
There are many existing frameworks and tools that have already been applied to the management and control of construction noise. The consultant has consolidated these means for implementation from different perspectives in the following sub-sections.

5.4.2.2.1.1 *Administrative Means Through Contractual Requirements*

There are different stages of a typical construction project in which different parties play different roles from the perspective of noise management and control:

- Project planning (major contribution from project proponent)
- Drafting of contract specification for tender (major contribution from consultant)
- Tender submission (by contractors)
- Contract award (to the successful contractor)
- Work commencement (by the contractor)
- Project completion (by the contractor)

Figure 5.18 Overall programme of a construction project



Noise Issues and Advance Planning

Unless a potential construction noise problem is brought to the attention of the project proponent at the outset of a project, the noise requirements for the construction phase are usually generic specifications related to compliance with known legal requirements or standard conditions concerned with overall noise performance targets. To the consultant's understanding there was usually very little penalty under the contract associated with non-compliance unless it would also lead to other failure in contractual performance, and almost no incentive for projects to adopt quiet construction method or noise mitigation measures. As such, when any construction noise problem occurred, it usually happened during construction, and if the problem was due to an overlook of any specific measures or special design feature to cater for prevention of the problem, it would be very difficult for the contractor to rectify the problem under the budget and time constraints, particularly when the measures are costly, difficult, time-consuming and not priced for during the tender stage. Advance planning could be useful for early identification of different technological solutions so that adequate preparation could be made as a preventive means for solving the potential noise problem. As such, both planning tools and execution tools are required to ensure that contractual requirements are well defined and followed.

Planning Support/Guidance for Noise Awareness

As a backbone for providing enough technical support and guidance so that any necessary technological solutions could be well planned and executed, the consultant also suggests EPD providing technical suggestion in enhancing different Technical Circular, Practice notes, Guidelines for raising noise awareness at the conceptual stage of a project, and facilitating the introduction of quiet construction through contractual requirements.

Administrative means often got the advantage over statutory means by providing a relatively quick implementation. It basically relys on a social responsibility system under the "polluter pays principle" for the party causing the pollution to be conscientiously responsible for noise disturbance from its construction activities through good design and implementation. In the context of the Study, it is considered to be fair and reasonable for the project proponent to pay not only for the construction costs, but also for tackling the noise pollution problems arisen from the construction activities under the polluter pays principle.

5.4.2.2.1.2 *Planning Tool*

To facilitate the identification of potential noise problems and proposing adequate preventive solutions during project planning, an instrument to address the potential noise problem would be helpful to draw the owner's attention to the cause of the problem. To achieve such purpose, the consultant has found very useful overseas experience in the Study.

Reference from Overseas Jurisdiction

The consultant had an in-depth study on the construction noise policy of New York City (NYC), which is also being a densely populated city as Hong Kong with construction sites close to noise sensitive receivers. Construction noise complaints in NYC significantly raised since 2003 which triggered NYC to amend the 30-year-old noise code to cope with construction noise issues. The new noise code responds to the need for peace and quiet environment with consideration of inhabitation by introduction of Noise Mitigation Plan.

The NYC Noise Mitigation Plan is a standardized form for filling in the information on noise mitigation methods and procedures prior to the commencement of construction work at the site. This aids the responsible party e.g. contractors to easily identify and be aware any potential noise issues; and plan in advance for any necessary noise mitigation measures as early as when the Noise Mitigation Plan form is being completed. The NYC Noise Mitigation Plan shall be posted conspicuously for inspection and reviewed and for the purpose of enforcement. Compliance inspection of such Noise Mitigation Plan will be done by an inspector from Department of Environmental Protection once a complaint had been filed against the responsible party.

The consultant noted from a paper: "*Understanding and Complying with the New York City Construction Noise Regulation*" [Ref.7] co-published in 2012 by Charles Shamoon of NYC Department of Environmental Protection that since the new *Noise Code*, which introduced the Noise Mitigation Plan, was implemented in July 2007 at NYC, the number of construction noise complaints has steadily decreased. There were 9% fewer complaints in 2008, 35% fewer complaints in 2009, and 44% fewer construction noise complaints in 2010 relative to those received in 2007. Construction noise complaints keep lowering since Noise Mitigation Plan was introduced in NYC during the reported years in the paper.

The consultant considers that similar planning instrument resembling the NYC Noise Mitigation Plan could help in pre-empting potential noise issues and be a very useful noise planning tool at the outset of a construction project in Hong Kong to identify suitable measures through advance planning. Such an instrument could also include a checklist of noise mitigation measures so that verification could be made during the project implementation stage.

Environmental Impact Assessment Ordinance (EIAO)

The *EIAO* defines projects of constructing certain facility/infrastructure as "designated Project" (DP) subject to Environmental Impact Assessment (EIA). The *EIAO* indeed provides room for demanding a noise management system for tackling construction noise from a DP.

Under this statutory framework, all DPs are legally bound to undertake appropriate level of EIA, one of which is the construction noise assessment aspect. In addition, the project proponent is required to apply for an Environmental Permit (EP) which lays down the

prevention and mitigation measures to be complied with during construction stage. A potential tool for enhancing better planning against excessive construction noise could be through the EP conditions which demand a more realistic noise assessment (as a verification of the assessment made during the EIA stage) when the DP is close to its implementation stage with all designs being finalized.

For non-DP Public Works Project (PWP) including roadworks, Preliminary Environmental Review (PER) would be conducted as suggested by the technical circular *ETWB(W) 271/32/103* issued by Development Bureau in September 2003 which proponents should refer to the following guidelines regarding noise emission:

1. *"Recommended Pollution Control Clauses for Construction Contracts"* by EPD
2. Chapter 9 of the *"Hong Kong Planning Standard and Guidelines"* by Planning Department

Noise Control Ordinance (NCO)

The *NCO* currently stipulates controls during restricted working hours for General Construction Works (GW) and Percussive Piling (PP). Restricted hours being 1900 to 0700 of next day of everyday and 0700 to 1900 of general holidays (including Sunday). A Construction Noise Permit (CNP) shall be obtained for GW work during restricted hours and PP work at any time. The authority has the power to stipulate conditions when the CNP is issued. Offenders would be prosecuted upon failure to comply with the CNP conditions.

The current system only allows CNPs be granted if the stipulated noise criteria could be met, this could promote the adoption of quieter technologies and alternative construction method, owning to their lower noise emission. Since the authority is able to specify the type of PMEs to be used, as the applicant proposed, with legal obligations in the existing framework, the consultant considered that it is not necessary that the CNP system should be tightened in terms of noise compliance situations. However, for those CNPs issued under unavoidable circumstances, i.e. essential work that could only be conducted during restricted hours, e.g. utilities and road works on heavy traffic roads, the noise levels for those essential work would generally exceed the noise criteria, and EPD would exercise its discretion to specify the use of "quiet construction method" (i.e. the use of specially silenced items of PME as provided for in the relevant Technical Memoranda) as CNP conditions under unavoidable circumstances. The findings from the Study could provide even more choices for quieter machineries when conducting these types of construction work.

In the context of domestic renovation, as discussed in Section 5.4.1, the consultant considers enhancing the existing communal approach and channels as more effective and practical to reduce domestic renovation noise.

Buildings Ordinance, Building (Administration) Regulations Part 4

Under this regulation, the consent of the Building Department is required for the commencement of demolition works. A demolition plan, with PMEs list, shall be provided for the application. After consulting the Buildings Department, it is considered not feasible to impose noise control enhancements into the conditions of the demolition consent since the ambit of *the Building Ordinance* is for the enforcement of the safety and health standards for the planning design and construction of buildings and associated works on private land.

5.4.2.2.1.3 *Execution Tool*

Normally, a construction project is executed through the employment of contractors who would enter into a construction contract with the project proponent or its agent. Contractors are obliged to execute the contract requirements during construction phase. If the noise mitigation measures could be identified in advance and incorporated as contract requirements, that would make sure that those measures would be priced for implementation thus creating a levelled playing field during tender stage which would allow the planned noise mitigation requirements to be well aware of and precisely priced for.

To ease the formulation of such contract requirements, sample contractual clauses could be produced for project proponents' references, while specific clauses to tailor for specific projects could be also formulated to suit individual circumstances. Examples of sample clauses, subject to individual project constraints, are given below:

The Contractor shall adopt the following noise abatement practices:

a) Use non-percussive pile driving methods such as hydraulic press-in method for installing or extracting sheet piles;
b) Use non-percussive demolition equipment such as hydraulic crusher, sawing, coring machines etc. for demolition and concrete breaking work;
c) Close all hoods, cover panels and inspection hatches of powered mechanical plant such as generators, air compressors etc. during operation;
d) Provide noise dampening materials inside and outside refuse chutes used for handling construction rubbles or debris;
e) Use non-percussive rock excavation methods such as pulse plasma technology, non-explosive chemical agent, or hydraulic rock splitter for rock breaking activities; and
f) Use Quality Powered Mechanical Equipment (QPME) recognized by the Environmental Protection Department (EPD) as far as practicable. Details of QPME can be found in EPD website at http://www.epd.gov.hk/epd/english/environmentinhk/noise/qpme/index.html. Where a QPME is used, the plant shall be registered with EPD through a QPME label system.

The consultant would suggest EPD providing technical suggestion for different government departments or bureau to incorporate similar sample clauses in Government tenders, Technical Circulars (TC), Practice Notes (PN) and Guidance Notes (GN), etc. As these documents have currently been serving as useful reference materials for both contractors and project proponents including non-government bodies, enhancement of these materials would benefit the construction industry as a whole. A list of Government published documents that could be considered for potential enhancement are shown in **Table 5.20**.

Table 5.20 List of Government published documents for potential enhancement

Department/ Association	Title of the Document	Date of Issue	Type of Construction Work
Development Bureau	*Technical Circular (Works) No. 19/2005 Environmental Management on Construction Sites*	2018	All
	Technical Circular (Works) No. 13/2003 Guidelines and Procedures for Environmental Impact Assessment of Government Projects and Proposals	2003	All
Buildings Department	Code of Practice for Demolition of Buildings	2004	Demolition
	PNAP ADV-4 / PRNC 17 Control of Environmental Nuisance from Construction Sites	Aug-97	All
	Joint Practice Note No.1 Green and Innovative Buildings	Jan-11	All
	Joint Practice Note No.2 Second Package of Incentives to Promote Green and Innovative Buildings	Jan-11	All
Highways Department	*RD/GN/021 Guidelines on Traffic Impact Assessment & Day-Time Ban Requirements for Road Works on Traffic Sensitive Routes*	Jul-95	Road Works Utilities
Lands Department	*Joint Practice Note No.1 Green and Innovative Buildings*	Jan-11	All
	Joint Practice Note No.2 Second Package of Incentives to Promote Green and Innovative Buildings	Jan-11	All
Planning Department	*Joint Practice Note No.1 Green and Innovative Buildings*	Jan-11	All
	Joint Practice Note No.2 Second Package of Incentives to Promote Green and Innovative Buildings	Jan-11	All
	HK Planning Standards & Guidelines	Mar-14	All

Architectural Services Department	https://www.archsd.gov.hk/ archsd/html/teachingkits/TK1/ construction_noise_management.html	-	Site formation Building Foundation
Drainage Services Department	*Practice Note No. 1/2018 Night Work by Contractors*	2018	Utilities
Water Supplies Department	*Manual of Mainlaying Practice*	2012	Utilities
Civil Engineering and Development Department	*General Specification for Civil Engineering Works*	2006	Site formation Foundation
Housing Authority	https://www.housingauthority.gov.hk/mini-site/greenliving/en/common/noise-control.html	Aug-18	Building Demolition Foundation
Environmental Protection Department	*Practice Note for Professional Persons Use of Quiet Construction Equipment for Road Opening Works during Non-Sociable Hours*	-	Road Works Utilities
	Practice Note for Professional Persons Noise from Construction Activities - Non-statutory Controls	-	All
	Recommended Pollution Control Clauses for Construction Contracts	-	All
	Good Practices on Mitigating Construction Noise (web page)	-	All
Hong Kong Green Building Council	*BEAM Plus Assessment*	-	All

5.4.2.2.1.4 *Possible Enhancement*

From the public survey result, it is noted that the number of responses on annoyance due to construction noise during restricted hours was significantly less than that for non-restricted hours. This probably suggests that the *NCO* and the CNP system are protecting the serenity when the population needed most while daytime construction activities contributed the major noise nuisance. There was a small percentage of people being annoyed during the restricted hours possibly due to unavoidable works such as repair and maintenance of road / rail / public utilities that must be conducted during restricted hours to avoid traffic disturbance to the public. As discussed in above Section 4.1.2.2.1, further enhancement could be considered to minimize the noise from essential works during restricted hours, by introducing the new technological solutions in the form of "quiet construction method" as requirements under the CNP conditions.

Daytime noise annoyance caused by general construction works could be addressed by taking advantage of the current EP system under the *EIAO* through further enhancement of the EIA process, by considering the quiet technological solutions found in the Study not only during the EIA stage, but also imposing an additional noise planning requirement as an EP condition to demand a noise management plan before a DP is implemented.

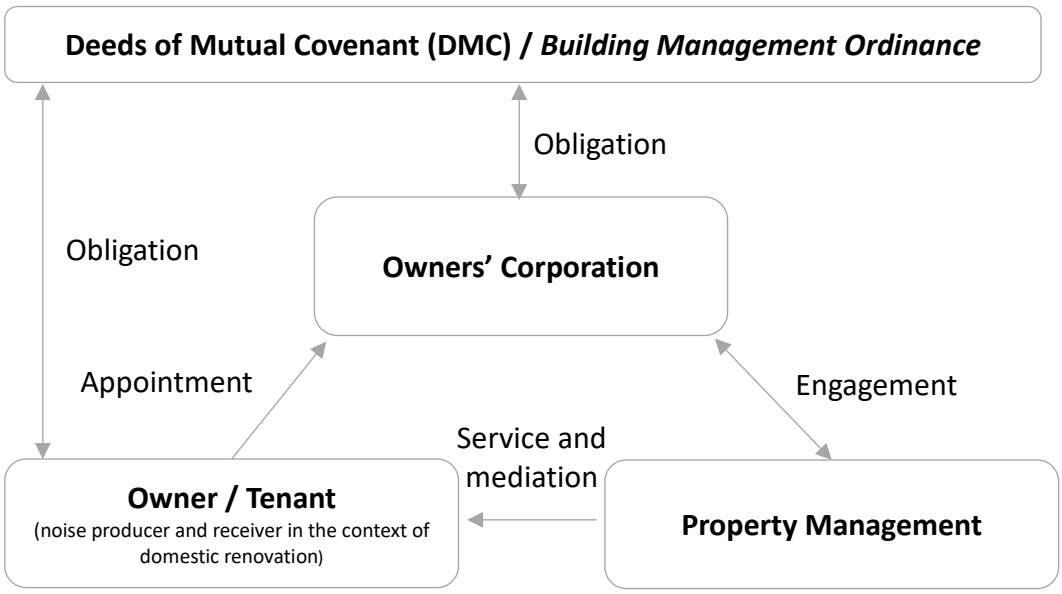
5.4.2.2.2 Domestic Renovation

The consultant had gathered from various stakeholder engagement exercises that for domestic renovation, the focus would be empowering property management company in the mediation process on resolving disputes among tenants. There are technical solutions at source. By looking into the management structure of a typical property management (**Figure 5.19Error! Reference source not found.**), there are existing frameworks and tools that could be applied to the management and control of domestic renovation noise. The consultant has consolidated these means for implementation from different perspectives as discussed in the following sub-sections.

5.4.2.2.2.1 *Deeds of Mutual Covenant (DMC)*

The management structure shows the Deeds of Mutual Covenant (DMC) converge the obligations for both the property management company and the co-owners. The DMC is a contractual framework among co-owners, the building management and the developer regarding property management and maintenance, with the management of a building to be done in accordance with the DMC and respective building management practices. The DMC could empower the property management to effectively mediate, prevent and resolve domestic renovation noise issues among co-owners / tenants that could be noise producers themselves when they renovate and noise sensitive receivers when they are the ones being annoyed by renovation noise.

Figure 5.19 Typical management structure of a residence served with property management



It is understood that amending DMCs that are currently in power would require the agreement of all owners, which could be challenging if a development has fallen into multiple ownership. However, consideration could be made to provide sample terms for new DMCs so as to clearly state the formation of house rules for domestic renovation.

The consultant suggests that EPD exploring with the Lands Department on whether the term "noise reduction" could be incorporated a guideline under Clause 18 - Environmental protection measures of *LACO CM No. 79 Standard Clauses and Revised Guidelines* for new DMCs of residential buildings. If such revision of guideline could be made, and subsequently adopted for new developments, prospective co-owners and the building management could then be made aware of their rights and obligations in respect of domestic renovation noise.

As the consultant understood from the engagement exercises, that the property management sector welcomes a quick-fix solution to help mediate disputes arisen from domestic renovation noise.

5.4.2.2.2.2 *House Rules*

The formation of house rules is within the role of property management normally provided under the Deeds of Mutual Covenant (DMC) and subject to approval by Owners' Committee. A DMC is a contractual document that defined the power, obligation, duties and responsibility of the owners, developers and property management. Non-compliance of DMC would potentially lead to civil lawsuit.

A property management framework could be the backbone to promote and enforce quiet renovation. The making of house rules is an existing practice but with limited rules for

quiet domestic renovation. However, house rules could be enhanced by producing a modified set of rules for domestic renovation to provide a basis to manage and make resolutions on matters concerning domestic renovation. Deposit deduction rules could further be considered for being included in the house rules as a deterrent to ensure better compliance of the rules.

5.4.2.2.2.3 *Renovation Guidelines*

Renovation guidelines are effective tools for providing technical support and management guidance so that any useful technological solutions and good practices could be introduced to the renovation trade and property management. By way of proposing possible schemes in tackling renovation noise in Section 4.2.4, the consultant suggests those possible schemes be considered in formulating domestic renovation guidelines and house rules for implementation.

5.4.2.3 Views Collected from Stakeholders

5.4.2.3.1 General Construction

While the views collected from the 4 types of stakeholders have been discussed previously, the consultant would make some supplementary points here related to the technical solutions and means of implementation.

Contractor in most cases is the execution party if the technical solutions mentioned in Section 5.4.2.1.1 are to be implemented. The consultant acquired much useful views as the quiet solutions were introduced to the construction industry in various engagement exercises. The consultant understands that the industry supports the idea of quiet construction and most of the technological solutions had been tested or adopted to a certain extent and they are confident that the solutions could be applied in Hong Kong with only little limitation such as difficult geological condition or space constraints for small sites.

Noise barriers and enclosures are very popular measures, used and proven extensively in many construction sites of different scales. No technical problem should be encountered by the construction industry.

As previously mentioned, project proponents in the private sector in general have reserved views in adopting the new technologies due to business consideration and expect the government to take the first step to set an example for the construction industry in terms of technical optimization and expanding equipment inventory in the market. The consultant has also obtained a very encouraging feedback from large developers such as the MTRC and the Urban Renewal Authority that had expressed positively to the concept of noise management plans as a good planning step. Given the government and their related parties constitute over 50% of the construction project market, the consultant considers that adopting quiet construction by the majority of the market could be the driving force for cultural changes.

To further assist the industry in familiarizing with the new quiet technologies, the consultant considers that education for the industry, perhaps in collaboration with Construction Industry Council (CIC) and Hong Kong Institute of Construction (HKIC), could accelerate the wider application of quiet construction. Indeed, the consultant obtained very encouraging feedback from these education partners as well.

5.4.2.3.2 Domestic Renovation

While the views collected from concerned stakeholders have been discussed in Section 5.3.2, the consultant would make some supplementary points here related to technical solutions and means of implementation.

The technological solutions mentioned in Section 5.4.2.1.2 had been introduced to the construction (domestic renovation) industry and property management representatives in various occasions during the engagement exercise and the consultant gained positive support on the idea of adopting quiet construction technologies. The consultant noticed however that some renovation contractors got limited experiences and information on those new technologies, and both the industry and the property management sector suggested the provision of more guidelines, training and education as technical assistance.

Collaboration with CIC and HKIC on training programme could be a channel to further promote quiet domestic renovation, and familiarize newcomers with the skill and knowledge in the use of those quiet technologies.

There may be a concern from some renovation workers about the extra burden in carrying different tools for different purposes as that would increase their encumbrance when compared with the conventional way of using a single, multi-purpose hand-held percussive breakers. A very good suggestion made by the property management sector during the engagement exercise is that stocking, renting or borrowing of the quiet tools at their local management office to address the above concern.

<u>Support to Property Management Company</u>

As mentioned in previous sections, Property Management (PM) service covered 84% of the total population and 94% of the domestic renovation noise complaints were lodged via PM. Hence the consultant considers property management companies being in a very capable and helpful position in handling renovation noise. It would be useful to give more support to them and bring the benefits from quiet renovation solutions to a significant population coverage served by them.

The consultant understands from the engagement exercise with the property management industry that resolving domestic renovation noise complaints is a complicated issue as both noise producers and receivers in the same residential building are their clients. They

generally would prefer resolving the conflicts with a mutually agreed mechanism to resorting to legal procedures.

The consultant hence deduced that the schemes should be based on the use of house rules and technical guidelines for alleviating domestic renovation noise. It is expected that the property management would also welcome this solution as this would provide a good basis for establishing house rules which are considered by the OC to be mutually acceptable for the specific domestic setting.

5.4.2.4 List of Schemes Proposed

The consultant had evaluated the following schemes (**Table 5.21** and **Table 5.22**) with the criteria of previous sections with reference to some common or typical operation scenarios and it is understood that there could be circumstances which may give a different evaluation result due to specific geological, engineering or site conditions.

Table 5.21 List of schemes studied and analysed – general construction

Schemes for General Construction Works		**Type of Control**	**Proposed Implementation Means**
A)	Explore Non-percussive Means of Piling	Source	Administrative - Contractual Requirements
B)	Explore Non-percussive Means of Rock Breaking	Source	Administrative - Contractual Requirements
C)	Explore Non-percussive Means of Concrete Breaking	Source	Administrative - Contractual Requirements
D)	Explore Non-percussive Means of Building Demolition	Source	Administrative - Contractual Requirements
E)	Minimize the Number of Percussive Breakers Operating Simultaneously	Source	Administrative - Contractual Requirements
F)	Minimize the Time of Percussive Breakers Operation	Source	Administrative - Contractual Requirements
G)	QPME Adoption	Source	Administrative - Contractual Requirements
H)	Noise Barrier and Enclosure Construction	Transmission Path	Administrative - Contractual Requirements
I)	Insulation at Receiver	Receiver	Administrative - Contractual Requirements
J)	Construction Noise Management Plan (CNMP)	Source Transmission Path Receiver	Administrative - Contractual Requirements

Table 5.22 List of schemes studied and analysed – domestic renovation

Schemes for Domestic Renovation		Type of Control	Proposed Implementation Means
K)	Deeds of Mutual Covenant (DMC) Enhancement	Source	Guidelines through LACO
L)	House Rules for Domestic Renovation	Source	Administrative means empowered under DMC
M)	Renovation Time Limitation	Source	Administrative Means through House Rules
N)	Non-percussive Machines Usage	Source	
O)	Limiting Number of Percussive Machines Operating Simultaneously	Source	
P)	Limiting Percussive Machine Operation Time	Source	
Q)	Limiting Consecutive Number of Days for Percussive Machine Operation	Source	
R)	Renovation Plan for Prior Consent	Source	
S)	Advance Notice to Neighbourhood	Source	

5.4.3 Analyses and Prioritization/Selection

The schemes proposed would directly tackle the noise issues while addressing stakeholders' concern. Each scheme would be analysed based on the following considerations:

- Noise benefits
- Benefits other than noise
- Cost analysis
- Constraint

Noise Reduction and Population Benefited

Noise reduction as an outcome of a scheme would primarily be the results from the technological findings in the Study which can be viewed as a databank for the new quiet technologies. There are also noise benefits from technical means other than the new quiet technologies investigated, and the consultant would also suggest those means as complementary measures based on experiences gained from construction noise management. The consultant would estimate the number of populations that would be benefited from respective schemes.

Benefits other than Noise

Benefits other than noise, e.g. occupational safety & health, good working culture development and increased work efficiency, and other environmental benefits (such as reduction in air pollution or construction waste) etc., would also be considered along the analytical process. Overseas reference might also be drawn to when appropriate to illustrate the benefits identified in other areas. **Appendix B** shows summary of the noise benefits as well as other benefits for each scheme.

Cost Analysis

Cost analysis of each scheme would include cost for implementation, e.g. equipment and material / labour costs under a typical or chosen scenario as a common of representative operational situation which are included in the technological findings or estimated from consultant's experiences.

Constraint

Constraints associated with each scheme will also be identified and suggestion on how to address those constraints will also be made. **Appendix C** is a summary of the identified cost implications as well as constraints for each scheme.

Analysis and Selection Process

After the above analyses and evaluation of different schemes, possible options will then be recommended and prioritized in terms of the implications, easiness of implementation and effectiveness. If a scheme provides certain noise reduction with no significant constraints, the consultant will consider the scheme as possible for implementation unless there is evidence that the advantage in construction noise reduction should be offset by other benefits or concerns in the long-term. **Figure 5.20** below illustrates the process of analysis and selection.

5.4.4 Possible Options

The following tables (**Table 5.23** and **Table 5.25**) shows the list of possible options and their respective justifications for general construction and domestic renovation while **Table 5.24** and **Figure 5.21** show the respective summary of recommended means for implementation of the possible options.

The consultant understood there are different limitations and constraints in adopting different construction methods be it conventional or non-percussive means in different settings. While the non-percussive means machines and method could not be universally applicable in all settings and circumstances, the consultant would suggest that project proponents could consider quiet construction method other than those noisy conventional means, preferably during planning stage, and adopt non-percussive means machines or method as far as practicable.

Figure 5.20 Illustration of analysis and selection process, options recommendation

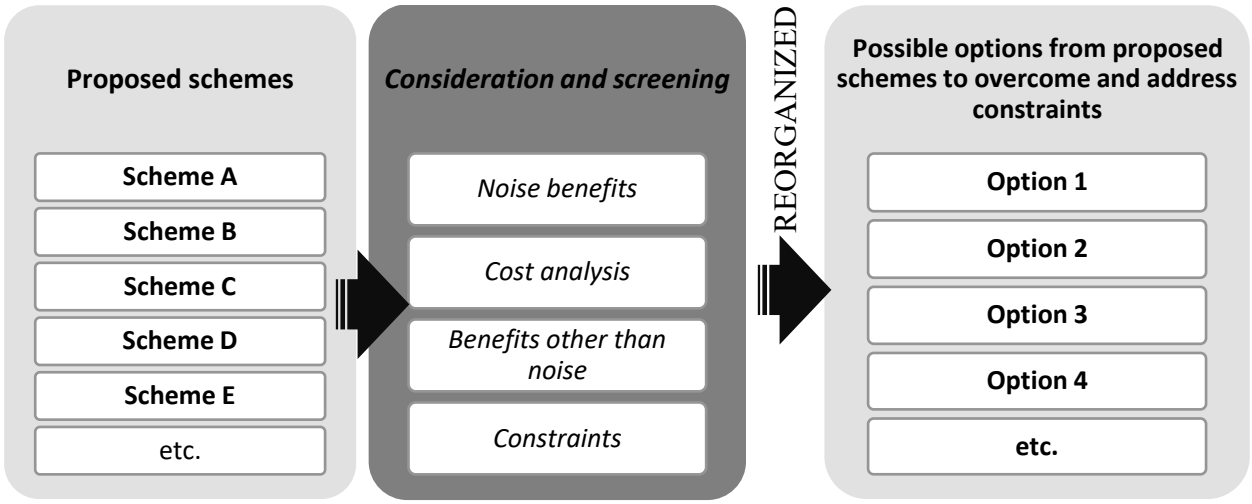


Table 5.23 List of possible options for general construction

Proposed Schemes		The consultant's Evaluation	Justification	Promotion Method / Means of Implementation
A)	Explore Non-percussive Means of Piling	**Possible for Implementation**	• Comparable cost-effectiveness for the same noise reduction over conventional method • Constraints could be identified and addressed through by advance planning.	• Advance planning via CNMP • Public projects as pioneer • Education and Training • Expansion of QPME list
B)	Explore Non-percussive Means of Rock Breaking	**Possible for Implementation**		
C)	Explore Non-percussive Means of Concrete Breaking	**Possible for Implementation**		
D)	Explore Non-percussive Means of Building Demolition	**Possible for Implementation**		
E)	Minimize the Number of Percussive Breakers Operating Simultaneously	**Possible for Implementation**		
F)	Minimize the Time of Percussive Breakers Operation	**Possible for Implementation**		
G)	QPME Adoption	**Possible for Implementation**	• Comparable cost-effectiveness for the same noise reduction over conventional method • Possible substitute as their non-QPME counterparts	
H)	Noise Barrier and Enclosure Construction	**Possible for Implementation**	• Adoption whenever extra noise reduction is needed • Alternative to constraint on source control • Constraints could be identified and addressed through advance planning	
I)	Insulation at Receiver	**Impractical**	• Deprive the rights of the receivers • More effective solutions exist for the similar cost (noise enclosure) and unrealistic time required for implementation	-
J)	Construction Noise Management Plan (CNMP)	**Possible for Implementation**	• Promote quiet construction culture • Prevent irreversible consequence or costly subsequent remedial actions	• Public projects as pioneer

Table 5.24 Summary of recommended means for implementation of the possible options for general construction

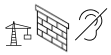
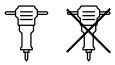
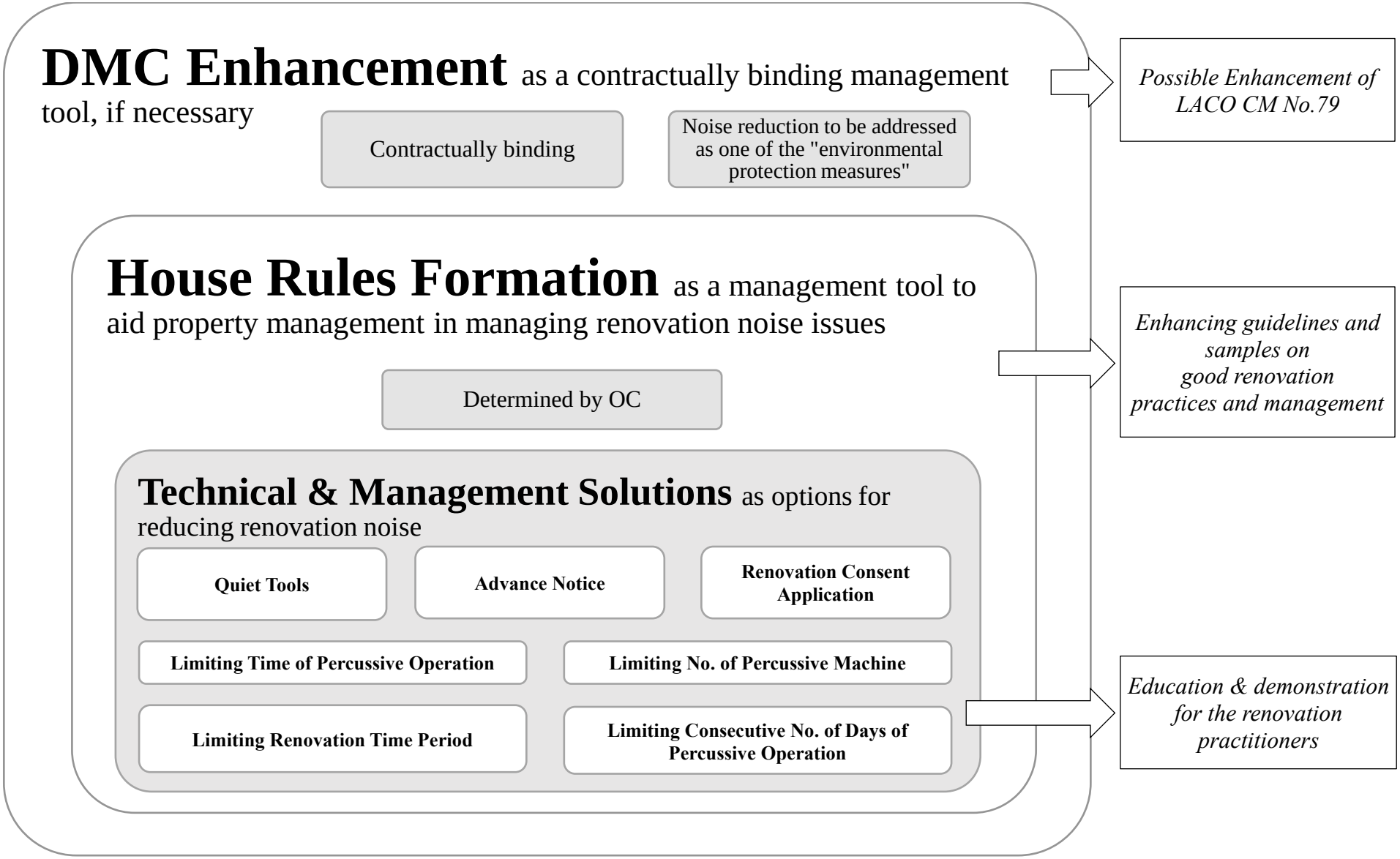
Recommended Means for Implementation / Type of General Construction Activities				 Site Formation	 Foundation	 Super/Infra Structure	 Repair & Maintenance	 Demolition
Technical Solutions			QPME Expansion / Adoption	✓	✓	✓	✓	✓
			Noise Barrier / Enclosure	✓	✓	✓	✓	✓
			Minimizing No. of Percussive Machine	✓	✓	✓	✓	✓
			Minimizing Time of Percussive Operation	✓	✓	✓	✓	✓
			Quiet Alternatives	✓	✓	✓	✓	✓
Planning Tool			Construction Noise Management Plan (CNMP)	✓	✓	✓	✓	✓
Execution Tool			Contract Requirement	✓	✓	✓	✓	✓
Means of Implementation	**Administrative**		Practice Note	✓	✓	✓	✓	✓
			Technical Circular	✓	✓	✓	✓	✓
			Guidance Note	✓	✓	✓	✓	✓
			Incentive (e.g. BEAM Plus)	✓	✓	✓	✓	✓

Table 5.25 List of possible options proposed for domestic renovation

Proposed Schemes		The consultant's Evaluation	Justification	Promotion Method
K)	Deeds of Mutual Covenant (DMC) Enhancement	**Possible for Implementation**	• Freedom of implementation while provide contractual binding with minimal cost	• To liaise with LandsD on opportunity of revising CM79 • Seminar for property management and developer
L)	House Rules for Domestic Renovation	**Possible for Implementation**	• Effective tool for noise reduction • Flexible for specific domestic setting	• To promote sample house rules • Seminar for property management and developer • Education and Training
M)	Renovation Time Limitation	**Possible for Implementation**	• Existing practice for some buildings • Flexible for specific domestic setting	
N)	Non-percussive Machines Usage	**Possible for Implementation**	• Excellent noise reduction with minimal cost • Source mitigation is the only practical solution could be implemented by the noise producers • Implementation could be further facilitated through renting / borrowing service by property management	• To enhance guidelines • Rental or borrow service from property management • Seminar for property management and developer • Education and Training
O)	Limiting Number of Percussive Machines Operating Simultaneously	**Possible for Implementation**		
P)	Limiting Operation Time of Percussive Machine	**Possible for Implementation**		
Q)	Limiting Consecutive Number of Days for Percussive Machine Operation	**Possible for Implementation**		• To enhance guidelines • Seminar for property management and developer • Education and Training
R)	Renovation plan for prior consent	**Possible for Implementation**	• Flexible for specific domestic setting • Suitable for estate that seeks tighter management on renovation	
S)	Advance Notice to Neighbourhood	**Possible for Implementation**	• Existing practice for some buildings • Improving surrounding units' livelihood if precise information provided	

Figure 5.21 Summary of recommended means for implementation of possible options for domestic renovation



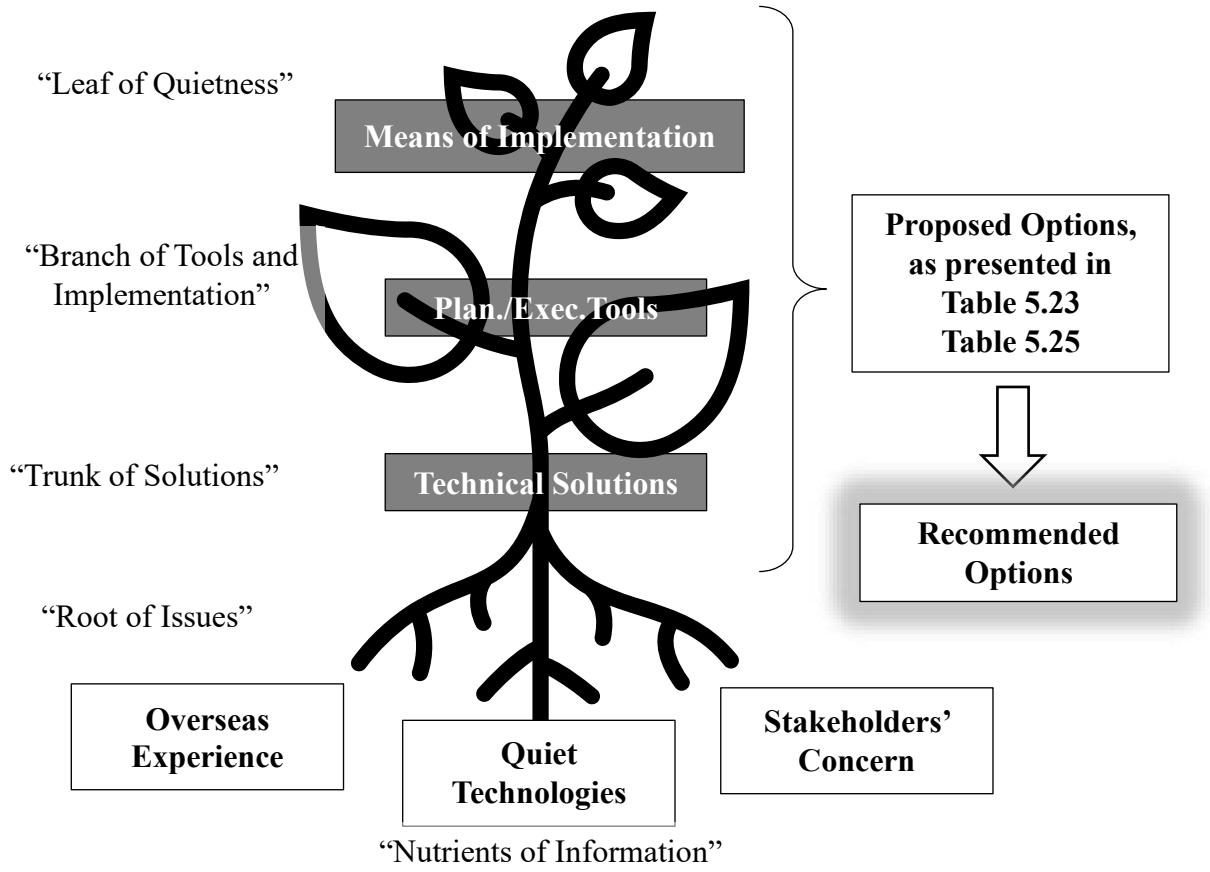
5.5 Key Recommended Options

Throughout the Study, the consultant had conducted extensive investigation to propose enhancement options for better management of construction noise and domestic renovation noise in Hong Kong based on three aspects: overseas practices, new technologies and stakeholders' views.

Combining the technical aspects of the solutions and their respective possible implementation channels, a pool of schemes had been evaluated. The consultant had suggested 10 possible options for general construction and 9 possible options for domestic renovation to implementation. Apart from reviewing the possible options on technical grounds, the consultant well understood that those are proposed in the perspective of technical specialist which dwell on the noise receivers' side and should be balanced with more wholesome solutions with the perspective of overall management of a construction project to give a more comprehensive approach for implement.

Hence the consultant had attempted to re-package the proposed possible options into different key recommended options to be implemented in terms of different execution channels and means of promotion which the stakeholders are familiar with. **Figure 5.22** illustrates the conceptual development of an implementation package of recommended options from different stages and considerations throughout the Study.

Figure 5.22 Development of implementation package from different recommended options



5.5.1 General Construction Works

5.5.1.1 Upstream Planning Enhancement

5.5.1.1.1 Addressing Stakeholders' Concerns

Contractors are the execution parties adopting quiet construction methods, practices and constructing noise mitigation measures (NMM) during actual construction work. From the stakeholder's engagement exercise, the consultant understands the following critical issue that concerns with quiet construction:

- Cost and time implication for adopting quiet methods and NMM are not accounted for during tender stage.

To overcome the issue, the consultant considered planning upstream is critical in promoting quiet construction by identifying the constraints, proposing quiet construction method and designing noise mitigation measure at the tender stage so that the contractors could precisely account for the time and project sum required. Hence it is important to facilitate upstream planning and competition on a levelled playing field.

5.5.1.1.2 Instrument

The selected **Option J: "Construction Noise Management Plan" (CNMP)** in **Table 5.23** is suggested to be introduced during the planning of a construction project before tender notice to identify possible sources of intrusive construction noise, the constraint, extent of quiet methods and NMM required and reserve budget.

The CNMP could be refined by contractors before tender submission. It is understood that a project proponent might only state "non-percussive means" as a contract requirement in broad terms to encourage creativity and give flexibility. The refinement would allow the contractors to propose and plan which "non-percussive means" to be adopted as far as practicable, precisely priced for and compete to achieve the same objective. Such refinement shall precisely formulate the details of noise mitigation measures for contractors to commit on after work commenced if the contract is awarded. Approval shall be sought from the project proponent for implementation of the CNMP and its refinement, and advance approval for any changes shall also be sought if the contractors wish to revise the CNMP after work commenced.

Please note that the options are not proposed to be mandatory or statutory in nature, and the consultant has no intention to do so. The consultant understood there may be different site or engineering constraints associated with the quiet technologies as well as variation in cost (cheaper or more expensive) and time (quicker or slower) depending on circumstances. Adoption of non-percussive means operation would subject to the investigation results, preferably during project planning stage by project proponents, in terms of time, cost and site-specific constraints.

The direction and main finding derived from the Study would be promoting advance project planning to see if any quiet technology could be identified and adopted as early as possible and as far as practicable at different construction stages. The CNMP is a tool to cater for such purpose and for easy reference as a project proceeds. The project proponent has the liberty in choosing specific quiet methods, or not adopting any quiet methods due to specific constraints or implications, at the outset of a project or allowing a contractor to suggest during tender stages any innovative alternatives, having regard to the prevalent constraints and other implications.

The details of CNMP could be drawn from **Options A to G** in **Table 5.23** as the means of source control if non-percussive quieter alternatives construction method and machines are to be adopted; and **Option H** as transmission path mitigation for additional noise reduction or when encountered with source mitigation constraints as far as practicable. Once the NMM had been decided during upstream project planning, those could be incorporated as the contract requirements for tender bidding on a level field and as contractual obligations for future work.

The cost of formulating the CNMP is considered to give minimal burden to the financial requirements of a construction project, as it could often absorbed into many current requirements for environmental assessment, planning and monitoring activities at the outset of a project.

5.5.1.2 Government Initiation

As previous sections suggested, upstream planning allows contractors to reserve and propose budget and time for actual implementation of quiet construction during tender stage when the quiet methods and NMMs are included as contract requirements. However, different profit-orientated project proponent, i.e. the private sector, would be very cautious about the success of the construction project in terms of cost and time and have suggested government as a pioneer to set examples for the construction industry.

Unlike the private sector, the public sector is not profit-orientated but rather to provide service to the public. Expanding the budget for quiet construction could be considered as providing services to the public by enhancing serenity to the general public. As public sector includes government related parties, e.g. URA, MTRC, contributes 50% of the construction market, their initiative would likely promote changes for over half of the construction projects in Hong Kong. This could also be seen as providing capital investment to the construction industry with not only the public's serenity as the return, but the creation of a green market that helps the growth and sustainability of quiet practices for the construction industry.

The consultant suggests the increase in equipment inventory and familiarization with the quiet practices by the construction industry would create a territory-wide culture to all other sectors in adopting quiet construction.

There is a very unique set of policies and procedures for government projects. A suggested flowchart for implementation of CNMP in Public Works Project is shown in **Appendix D**.

5.5.1.3 Reference Materials to Support Stakeholders

5.5.1.3.1 Sample Contract Clauses

In the previous section, upstream project planning before tender notice was suggested to identify the noise reduction required and the constraints that may experience. Once the plan is formulated, those items would require to be included as the contract specifications for execution. This section attempts to illustrate with examples for consideration on how the contract specifications could be formulated or adapted to incorporate the quiet construction element and what channels of promotion could be used.

Technical Circular (Works) No. 19/2005 Environmental Management on Construction Sites issued by Development Bureau emphasized on the contract specification of construction contracts for environmental management including noise issues which the target user is the project proponent.

Revising this document could lay down the framework for considering quiet construction during formulation of contract specification. This could promote the adoption of quiet technologies and upstream planning while creating levelled playing field for contractors' competition. The revision may include the following, as examples for consideration:

- During project planning, conduct noise assessment and determine the noise reduction required, or if best practicable means required to overcome constraints
- Consider noise mitigation measures: limiting no. of PMEs, alternative construction method, noise barrier / enclosure etc., possibly by referencing the noise assessment methodology for Designated Projects according to the *EIAO*.
- Construction machines of percussive means shall be avoided or minimized
- Information on non-percussive means of construction method by making reference to corresponding guidelines from different government departments
- Should noise barrier is required, site constraint shall be identified, define exact location and technical specifications of the barrier
- Summarize the findings and noise mitigation proposal in the Construction Noise Management Plan (CNMP) before tender stage for future references
- Refined CNMP submission along with tender documents, with specific requirements on quiet construction method and NMM
- Incentive/deterrent clauses for compliance/non-compliance of CNMP

Depending on the merits of each project, the contract requirements could specify the specific type of quiet construction technologies to be adopted, or a general prohibitive clause of "no percussive machine" (**Option A to D**) or limiting its number and time (**Option E and F**). If necessary, the contract document could also demand more technical

information about the quiet construction technologies and/or NMM to be included in the tender submission.

5.5.1.3.2 Technical Information in Government TC, PN and GN

To provide technical assistance to the formulation, refinement and revision of CNMP throughout a construction project, Technical Circular, Practice Note, etc., issued by different government departments, as shown in **Table 5.20**, could provide reference to the construction industry and project proponent. These documents could be enhanced by including different combination of quiet construction method and practices as well as the noise reduction expected. These combinations are based on **Option A to G**.

The combination could provide basic information for considering the adequate noise mitigation required for protecting nearby noise sensitive receiver. It is understood that there would be site or time constraints over different construction situation, e.g. confined working space, unavoidable working hours. For these cases Best Practicable Means shall be adopted to minimize the noise generation.

5.5.1.4 Collaboration with Different Stakeholders

It is encouraging to know that some big developers such as URA and MTRC have already expressed their wish to collaborate in pursuing for quiet construction. Apart from project-based collaboration, another type of cooperation could be joint efforts with different trade and professional associations to jointly publish guidelines on quiet construction and organizing different seminar, workshop, etc.

The consultant would suggest the government could further engage and collaborate with the associations of the minor works and machinery supplier sectors in terms of training, promotion of the proposed options and establish the availability and supply of the quiet technologies proposed in the Study to the construction industry.

5.5.1.5 Incentives

5.5.1.5.1 QPME Expansion

Currently, profit tax concession is associated with the purchase of QPME. Expansion of PME types to QPME could promote import of quiet construction machines and should be welcomed by the industry. The following additional PMEs could be considered to be included in to QPME scheme:

- Vibratory hammer
- Oscillator for bored pile metal casing
- Earth auger
- Concrete saw

- Silent piler

5.5.1.5.2 BEAM Plus Scheme

Conversation with BEAM society could also be initiated for promoting the quiet construction method. For building construction, the consultant considered that BEAM Plus could provide a platform for implementing quiet construction. The incentive provided by BEAM Plus scheme could be considered as a motivation for the industry if it includes more green construction element into the accredit list, e.g. adopting QPME.

5.5.1.5.3 Environmental Award

Incentive could be provided in the form of award for recognizing their effort and boost the image of contractors. Current award that are related to construction noise are provided by different trade associations and companies including HKCA Hong Kong Construction Environmental Awards, CIC Sustainable Construction Award, Hong Kong Awards for Environmental Excellence (HKAEE), MTR Project Division Q.S.E. and Stakeholders' Engagement Award, etc.

There are also awards that promote construction innovation, as adopting quiet construction method could be considered as innovation, including CIC Construction Innovation Award, Hong Kong Green Innovations Awards by HKAEE, etc.

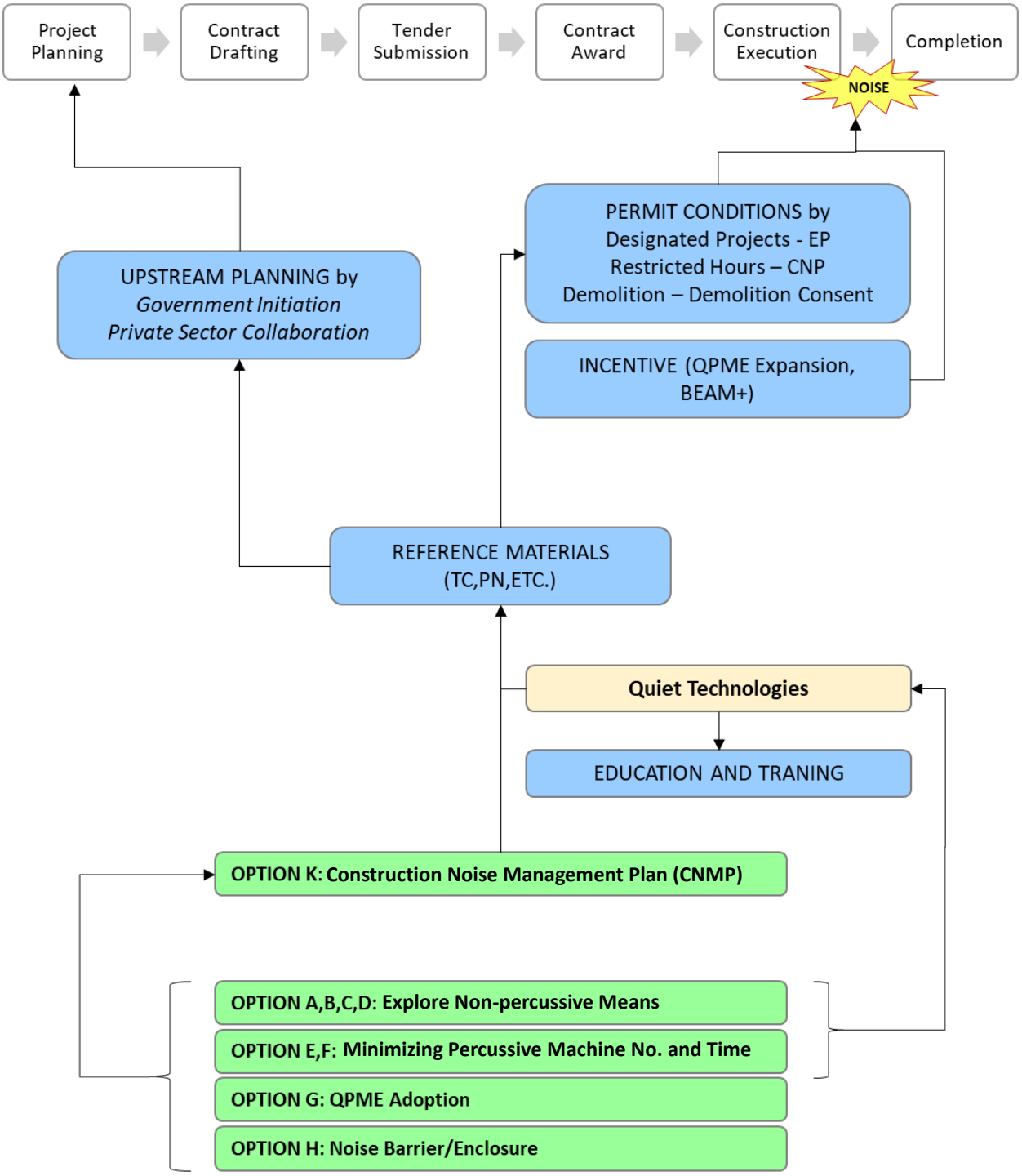
However, there is no award specifically for quiet construction. It is worth pursuing the collaboration with trade associations, e.g. HKCA, REDA, and project proponents, e.g. MTRC, URA, to create an award specifically for quiet construction to recognize the effort from the construction industry in promoting quiet construction.

5.5.1.6 Education and Training

Continuous education and training shall be provided to the work force to promote quiet construction. CIC would continue to be a good channel for training, and they welcome the idea of quiet construction as the new quieter alternatives method may attracts newcomers to the industry by improving work environment which aligns with CIC's mission. Workshop and seminar could be organized for different quiet construction technologies to get familiarized and increase exposure with the construction industry.

By developing from the above considerations given in Section 5.5.1.1 to 5.5.1.5, an implementation package in form of a flow chart is given in **Figure 5.23** for general construction.

Figure 5.23 Implementation package for general construction noise reduction



5.5.2 Domestic Renovation

5.5.2.1 Enhancement of DMC Guidelines for Developers

The Deed of Mutual Covenant (DMC) is a contractual binding document that defines the duties, obligation of different parties. The enhancement of DMC, as proposed as **Option K**, that could further elaborate noise reduction as an environment protection measures for managing domestic

renovation noise and the formation of house rules for such matter as proposed in **Option L**. The following clause is suggested to be included in the guidelines for new DMC:

- Include "noise reduction" as an item under Clause 18 regarding "Environmental Protection Measures" (subject to the jurisdiction of Lands Department)

It is understood that amending DMCs that are currently in power would require the agreement of all owners, which could be challenging if a development has fallen into multiple ownership, however, DMC enhancement could still be suggested and implemented independently upon the decision of respective estate if stronger means of management is necessary.

As a preventive measure for future development's DMC, the consultant suggests EPD to explore the feasibility of revising the above clause in *LACO CM No. 79 Standard Clauses and Revised Guidelines* by Lands Department.

With the contents included into DMC, the OC, PM and Tenants have the duty to protect the serenity of Tenants. Property management would welcome this solution as they expressed that they need empowerment as well as legal basis on managing renovation noise.

5.5.2.2 Management Tools for Property Management

Environmental Protection Department (EPD) had produced guidelines for property management regarding domestic renovation noise. As new technologies had been introduced, an enhanced guideline is suggested to be revised as a yardstick for property management companies as well as the general public. During stakeholders' view collection exercise, most property management companies' welcome EPD publishing guidelines as it shall receive better recognition by the public.

The consultant suggests the following contents to be included in the guidelines:

- House rules formulation (**Option L**), example is shown in **Appendix E**
- Introduction of quiet renovation practices, i.e. **Option M to S**
- Introduction of quiet renovation tools
- Set up a dedicated hotline for domestic renovation inquires
- Posting notice regarding existing domestic renovation at affected levels
- Potential DMC enhancement if stronger means of noise management is required

5.5.2.3 Incentives

With the introduction of 5 new quiet renovation tools proposed in the Study, contractors could acquire the new quiet tools or, as suggested by a property management company in focus group meetings, to lend or borrow from property management, when contractors express their concern on carrying multiple tools for different purpose instead of a typical multi-purpose breaker.

Currently purchase of QPME could provide profit tax concession to the company. Expansion of PME types to QPME could promote quiet construction. Property management companies could also benefit from this scheme if they wish to purchase the tools for rental/borrow in their respective estate as proposed by property management during focus group meetings.

To expand the incentives, the consultant suggests the following new quiet renovation tools might be considered to be included in the QPME list:

- Air hammer
- Wall chaser
- Hand-held coring machine
- Direct fastening tool
- Brick wall cutter

The incentive would hopefully benefit all domestic renovation contractors. Once the adoption of quiet technologies has been popularized by means of house rules and incentives, it is highly possible that the quiet practice would extend to the remaining 16% population that are currently not served with property management companies.

5.5.2.4 Seminars and Workshops

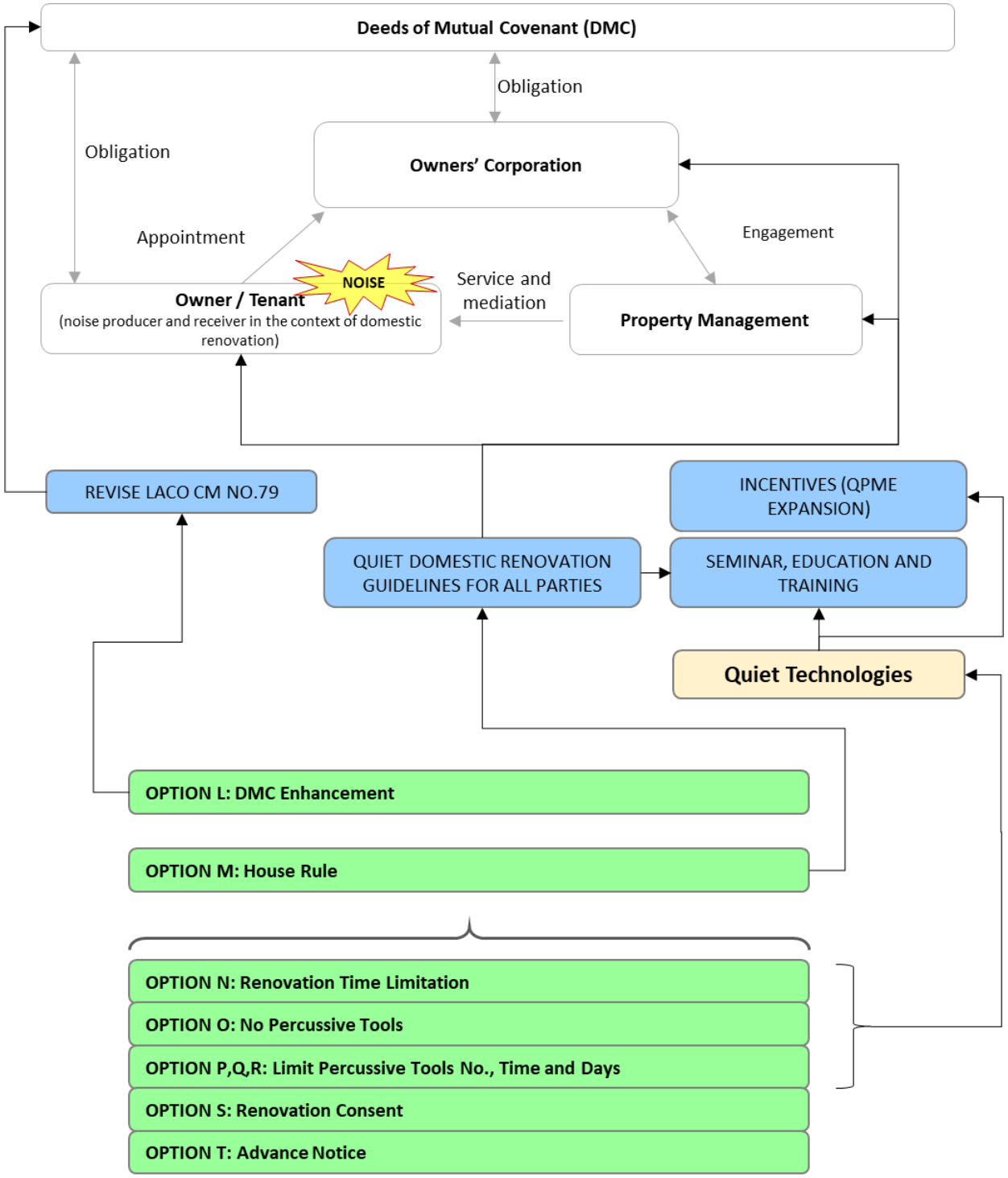
Seminars and workshops are suggested to be organized to introduce the quiet tools, DMC enhancement, house rules and renovation guidelines for developers and the property management sector to assist their adoption of quiet domestic renovation. Collaboration with different trade association and professional institute, e.g. Real Estate Developer Association (REDA), Hong Kong Association of Property Management (HKAPMC), Hong Kong Institute of Housing (HKIH), Chartered Institute of Housing (CIH), etc., to organize those section would be an effective channel.

5.5.2.5 Partnership in Education and Training

The quiet renovation tools included in the Study could be familiarized by the workforce through education and training to promote quiet renovation and prepare for the introduction of house rules. Education and training programme shall proceed first to allow sufficient time for the industry to familiarize the quiet tools.

There are various channels for promotion of quiet renovation tools, including existing ones through CIC and HKIC. Those skills and knowledge could be introduced in vocational course for workers and supervisors. The quiet renovation tools would also improve the working environment and health which could be an attractive feature for new blood joining the industry and is consistent with the industry's need. By developing from the above considerations given in Sections 5.5.2.1 to 5.5.2.5, an implementation package in the form of a flow chart is given in **Figure 5.24** for domestic renovation.

Figure 5.24 Flowchart of recommended options for domestic renovation noise reduction



5.6 Estimated Benefits

Some anticipated benefits of adopting the options have been mentioned earlier and quantified in a preliminary manner. As a logical and immediate follow up, it would be helpful and appropriate to highlight the benefits, both directly noise related and otherwise, in the following paragraphs. The intention is to provide the readers with an overview and appreciation of the many anticipated and potential gains in an overall context.

5.6.1 General Construction

According to official statistical data for mid-2018, the number of construction sites rose to 1,489. [Ref.1] It is understood that the extent of the noise generated by a construction site affecting surrounding residence would subject to the population density where the site is located. As 70% of the construction sites are building site, the consultant expects those construction site would be located in a more densely population area where 4 residential towers of 25 storey high would surround the construction as a simulated case. Given only a single façade would face the construction site, 4 units per floor will be directly expose to the construction with a typical residential building of 8 units per floor. The consultant estimates there are 595,600 household in 2018 had subject to various degree of noise from construction site activities.

5.6.2 Domestic Renovation

As of 2017, the revenue of domestic renovation market is estimated to be 16.4 trillion Hong Kong Dollar [Ref.2]. While a household would spend HK$200,000 to HK$500,000 for domestic renovation in 2017 0, it is estimated the number of renovation conducted in 2017 is ranged from 32,800 to 82,000 cases. Consider the number of affected households that are adjacent to the source, from different directions, that would range from 5 households for small development like village house, to 8 households for mega development for each case, it is estimated there are 164,000 to 656,000 household in 2017 had subjected to various degree of noise form domestic renovation activities.

5.6.3 Benefits other than Noise

As the quietness of the technologies recommended in the Study is rooting from the reduction in impact force generation which results in lower reaction force. While some could be operating by remote control, flying debris as well as exposure to dust is expected to reduce as well. Combined with the noise reduction, the implementation of the options is expected to improve occupational health and safety for the construction industry.

The adoption of quiet technologies would increase the awareness of the noise producer. Continuous exposure, promotion and adoption of quiet technologies would develop green culture not only to the contractors and workers, but also for the general public to empathize the cause of adopting quiet construction technologies.

With the number of workforces in tight demand within the construction sector, improvement in working environment would help much in attracting new blood to join the industry.

6. RECOMMENDATIONS

The consultant is aware that there are different ways and means to bring about a quieter environment. To fulfil the mandate of the Study and more importantly, for the benefit of Hong Kong residents, the following approaches were adopted in the deliberation process, in particular, the formulation of recommendations:

- Will bring about improvements in a relatively immediate manner. In other words, these are "quick wins".
- Will provide relief to the majority of the population.
- Will meet with general support and less resistance from stakeholders.
- Will pave the way for possible subsequent changes and further improvements.
- Will involve the government in a leading position, to be a role model.

Having due regard to the ingredients (Sections 5.1 to 5.3), and careful consideration of the approaches (preceding paragraph), the consultant is putting forward the following recommendations. These recommendations are the options suggested for on the enhanced management of general construction and domestic renovation noise.

6.1 Recommendations for Managing Noise from General Construction

6.1.1 Major Theme

To initiate and better capture the benefits of early planning, the promotion of Construction Noise Management Plans, or similar, is to be made to the construction sector, and where opportunities arise, such Construction Noise Management Plans could be implemented as a leading phase in government and quasi-government projects.

6.1.2 Sub-themes

To support and supplement the above major theme, the following sub-themes are also proposed. These sub-themes could be introduced in phases.

- Recruit project proponents such as the Urban Renewal Authority and MTR Corporation to introduce Construction Noise Management Plans in their projects
- Collaborate with industry stakeholders to further promote good site practices and quiet technologies
- Liaise with relevant government departments and stakeholders on the possibility and practicality of providing sample contract specification clauses and checklists etc. for facilitating the implementation of Construction Noise Management Plans and associated noise management measures
- Expand the QPME label system to cover more equipment types, drawing the experience from the European counterparts

- Explore incentive schemes to quicken the introduction of quieter construction machineries
- Review if and how the Construction Noise Management Plans could be better integrated in the EIA implementation process of Designated Projects and other planning mechanisms
- Review if and how new and quiet site practices could be transplanted and adopted in night-time and restricted hours works
- Monitor the effectiveness of adopting Construction Noise Management Plans

6.1.3 Rationale

The consultant has come up with the recommendations through careful, informed, fact-based, and professional deliberations. For example, the extensive territory-wide household survey gave a very clear picture that the public concerned much more about daytime construction noise as compared to those in the restricted hours. The consultant therefore focused the efforts on identifying the noisiest sources and finding ways and means to tackle daytime construction noise more effectively.

A second example is the recognition of the widely applauded adoption of the Construction Noise Mitigation Plan for tackling construction noise in New York City, together with the successful track records of Sydney and City of Westminster (London). These international findings gave incentives to the consultant to consider if a simple tool or platform similar to the Construction Noise Management Plan, designed to engage the project proponents during the early stage of the project cycle, would be beneficial for Hong Kong.

Yet another example is the utilization of the findings of the stakeholders' engagement as the backdrop of formulating the recommendations. The consultant picked up a very clear notion that the construction industry practitioners are in general not resisting to changes, support early planning, look towards the government for leadership, and value highly fair and open competition. These important pointers were all included in the formulation process of the recommendations.

6.1.4 Benefits

Early planning is not just for the sake of conducting a planning exercise. The real essence is to assign early attention to potential noise disturbance issues, if any, and to try to address that proactively in a preventive manner. As demonstrated by relevant international experience, the careful preparation of Construction Noise Management Plans, or similar, prior to project commencement would enable designers and engineers to have a realistic grasp of the upcoming noise situations as the project move and progress in different stages. Having such a grasp will position the concerned parties to devise practicable plans to avoid, minimize, or mitigate the potential noise disturbance. Taking this step proactively could avoid late focus on the issues. It is common knowledge that late focus might affect project program and induce additional cost, while making neighbours unhappy.

6.1.5 Cost and Competition

The consultant could look at the cost element of Construction Noise Management Plans from two perspectives. The first one is the cost of preparing the plans. The second element is the cost associated with implementing the measures or methods mentioned in the plans.

Based on the experience of predicting the construction noise in the preparation of EIA reports, the professional fee for the preparation of Construction Noise Management Plans may range from several hundred thousand dollars in the high end for large scale or very complicated projects, to thirty or forty thousand dollars for simple projects. Such costs are relatively insignificant in the overall project design fee, not to mention the overall project cost.

The second element is the cost associated with implementing the measures or methods mentioned in the plans. Experienced professionals may say that, by adopting early planning, construction methods and costs could be better pre-arranged and rationalized. Depending on the circumstances, early planning may give rise to the opportunity of reducing overall construction costs in certain instances rather than increasing it. However, if the consultant is to look at the hypothetical "worst case scenario" whereby the use of certain equipment or methods are restricted, and particular alternatives are recommended, it is possible that construction costs may increase by a few percentage points. Experienced project managers are saying that it would be difficult if not impossible to give a definite number here, as different circumstances and requirements all lead to different financial situations.

Project proponents and contractors all stress the importance of levelled playing field, for fair and open competition. As long as the requirements are promulgated clearly in advance, the minimal cost of preparing Construction Noise Management Plans, and the potential increase in construction costs, if any, would not unfairly affect the competition. This would apply to both the project proponents competing openly with each other, and contractors competing fairly with each other.

6.1.6 Constraints

As with other early planning tools, Construction Noise Management Plans would not, and could not predict what would happen in the future with 100% accuracy. Designs may modify to suit evolving needs and wants, site conditions may change along the way, and new or different ideas may surface thereby affecting the choice of equipment or construction methods. However, Construction Noise Management Plans are not intended to be something chiselled in stone permanently and could not be changed. Construction Noise Management Plans could certainly move and adapt to new or changing situations.

While changing situations are certainly constraints to Construction Noise Management Plans, it would not overly affect the overall usefulness. A key factor being the maintaining of appropriate flexibility in the design and use of the Construction Noise Management

Plans itself. A good example is the preparation of EIA reports under the *EIAO*. The reports are prepared before projects commencement. If there are substantial or material changes to the Designated Projects, the relevant reports would be changed or varied to capture the new conditions.

6.1.7 Supportiveness from Stakeholders

Project proponents and contractors all support early planning. The key consideration is the requirement of Construction Noise Management Plans are spelled out upfront, rather than imposing it late. There may be some initial reluctance at the first introduction stage. However, such initial inertia would probably diminish relatively quickly as designers and engineers are up to speed with the preparation of Construction Noise Management Plans.

The consultant has deliberated if it is reasonable, logical, and effective (in terms of bringing about the desirable end results) for the government to take the lead in introducing and implementing the initiatives. Understandably the government is a massive organization. This massive organization, once mobilized and the move, would generate a very substantial amount of momentum. Such momentum would be clearly advantageous in influencing and fostering a cultural change (or paradigm shift) among stakeholders in the construction and associated industries.

The government holds many diversified roles - for example, project proponent, consumer, key opinion leader, technical authority, among others. According to official figures, the ratio between completed public housing units and private housing units would be around 70:30, in the coming 10 years. Coupled with the fact that the government is the key to most infrastructure projects, it is without debate that initiatives on construction noise control and management to be implemented in government projects would bring forth a very sizable "first wave" of positive effects.

6.1.8 Other Side Benefits

The adoption of Construction Noise Management Plans in government and quasi-government projects would be an important first step in nurturing a new culture in the construction industry. It will be a culture of enhanced environmental awareness, fresh alertness on the aspirations of stakeholders, and would facilitate the industry practitioners to better position themselves in the ever-changing business climate.

There are also many side benefits associated with the sub-themes proposals. For example:

- The introduction of quieter and smarter equipment may project a modern and progressive image for the construction industry, thereby making it easier to attract new blood, especially younger people, to seek entry into the industry.
- The further promotion of good site practices may also enhance the overall effectiveness of the many continuous site safety efforts.

- The use of quieter and smarter equipment will improve the working environment of the operators, thereby reducing the risk of occupational hearing damage.
- Expanding the QPME label system would foster a quicker metamorphosis of the industry in terms of both awareness and adoption of more updated or modern tools and equipment.
- While most measures are designed with daytime construction works in mind, the beneficial noise effects would also be actualized in construction works during night-time or restricted hours.

6.2 Recommendations for Managing Noise from Domestic Renovation

6.2.1 Major Theme

To empower the property management companies and enhance their capability in both the technical and administrative areas via the provision of practical guidelines and training.

6.2.2 Sub-themes

To support and supplement the above major theme, the following sub-themes are also proposed. These sub-themes could be introduced in phases.

- Collaborate with the property management profession for developing applicable house rules
- Explore incentive schemes to quicken the introduction of quieter tools
- Collaborate with training bodies to organize seminars and workshops for the renovation trade to familiarize them with quieter tools and alternatives
- Monitor the effectiveness of the much wider adoption of different house rules

6.2.3 Rationale

Similar to the formulation of recommendations to tackle general construction noise, the consultant has taken on board the key findings and notions obtained from the public household survey, the engagement of the stakeholders, and professional judgement and experience, among others while coming up with the recommendations on managing noise associated with domestic renovation.

For example, results from the public household survey indicated that a large proportion (over 90%) of the population would turn to the property management companies for help when being annoyed by renovation noise. Such an overwhelming indication steered the consultant to dwell more deeply and widely on the possible role of property management companies in handling renovation noise issue.

Another example is from the views collected from the property management companies during the engagement exercise. They expressed very clearly that they are not just open,

but are actually longing for more assistance in better serving their clients (the residents) while tackling renovation noise complaints. The consultant noted this important client-oriented element while formulating the key recommendations.

Examples are abound related to the taking on board of most updated international trends, which were picked up during the multiple rounds of dialogs with leading overseas authorities conducted in the earlier part of the Study. The consultant noted the widely promoted practice of adopting a neighbourhood or community approach in dealing with renovation noise through liaison and communication. Such a pragmatic approach has been transferred into the final recommendations of the Study with a distinct local flavour.

6.2.4 Benefits

Most residents would choose to voice their concerns on domestic renovation noise to their respective property management companies. Further equipping and empowering the property management sector would enable the agents to more effectively and sensitively handle the situations, no matter it is with the noise producer, or the noise receiver.

It is unrealistic to expect that by equipping and empowering the property management sector, all domestic renovation noise issues would be resolved 100% in entirety immediately. However, it would be very reasonable to expect all three parties (noise producer, noise receiver, and the property management company) would enjoy a higher degree of satisfaction.

6.2.5 Cost and Competition

There will be some minor administrative and professional costs associated with, for example, the preparation of guideline templates and the provision of training to property management companies, if these are to be initiated by government. The government may choose to employ consultants or engage training bodies to perform certain tasks.

In another dimension, the empowering and equipping of property management companies would not negatively affect the competition among industry practitioners. It would only enhance the overall professional competency of the agents, thereby benefitting both the professionals and the many residents whom they are serving.

6.2.6 Constraints

Empowering and equipping the property management sector is an all-positive move. The only practical constraint would be how fast or how aggressive the government could take steps to progress this initiative.

6.2.7 Supportiveness from Stakeholders

The property management sector welcomes the idea of empowering and equipping them to better handle domestic renovation noise.

6.2.8 Side Benefits

There are also certain side benefits associated with the sub-themes proposals. For example:

- Incentive schemes, if employed, to quicken the introduction of quieter tools will gradually transform the renovation trade into a more modern setting, thereby making the trade easier to attract both new blood and customers.
- The organizing of seminars and workshops to familiarize the renovation trade with quieter tools and alternatives will also project a more positive image for the trade, making it easier to recruit new workers.

6.3 Suggested Implementation Arrangement

6.3.1 Basic Considerations

With the intention of bringing about quick wins to benefit a relatively large proportion of the general population in a more tangible manner, the consultant is putting forward the following possible implementation program for the different proposed options.

Taking notice that each of the options could bring forth a certain degree of improvement to the noise disturbance situation, it is not realistic to introduce them all at once. This is primarily due to practicability and resources reasons. The consultant is therefore devising a progressive program consisting of short term, medium term, and longer-term timelines. Each time period would generally consist of two to four years in duration. The consultant is of the view that two to four years would be a reasonable period to introduce different measures, as well as having the time to observe the initial effectiveness of such control and management measures.

6.3.2 Implementation Program

General Construction

Short term –

- Promote and enhance the concept of Construction Noise Management Plans to the construction sector
- Recruit project proponents such as the Urban Renewal Authority and MTR Corporation to introduce Construction Noise Management Plans in their projects

- Collaborate with industry stakeholders to further promote good site practices and quiet technologies
- Liaise with relevant government departments and stakeholders on the possibility and practicality of providing sample contract specification clauses and checklists, etc. for facilitating the implementation of noise management measures

Medium term –

- Explore incentive schemes to quicken the introduction of quieter construction machineries
- Review if quiet technologies and measures could be effectively explored in the Environmental Impact Assessment process and other planning mechanisms
- Review how new and quiet site practices could be adopted for tackling intrusively noisy activities in night-time and restricted hours works

Longer term –

- Monitoring the effectiveness of adopting quiet construction technologies in Hong Kong
- Explore the opportunity of expanding the list of Quality Powered Mechanical Equipment (QPME) in the current QPME system

Domestic Renovation

Short term –

- Collaborate with the property management profession via workshops or training to enhance their role in tackling domestic renovation issues more effectively
- Provide draft guidelines to the property management profession for developing or enriching applicable house rules for addressing renovation noise issues

Medium term –

- Explore incentive schemes to quicken the introduction and wider application of quieter tools
- Collaborate with training bodies in devising occupational programmes for the renovation trade on the skills and knowledge related to quieter tools and alternatives

Longer term –

- Monitor the effectiveness of the much wider adoption of quiet renovation practices

As a general comment and effective management, it is suggested that each of the above possible options (covering both for "General Construction" and "Domestic Renovation"), the effectiveness of implementation should be reviewed regularly. The reviews are to cover all short term, medium term, and longer term proposals. The intention is not just to

"know the position", but to examine if mid-course fine tuning is to be made, whether the speed of introduction is adequate, or if enhancements are required.

6.3.3 Specific Implementation Set-up

Most of the proposed options are administrative and non-statutory in nature. These would enable the bringing of quicker relief to the residents of the city.

In terms of the key proposal of preparing Construction Noise Management Plans, the consultant is suggesting (in the interest of minimizing workloads on all parties concerned) that there is no need to seek formal approval from the authority on the respective Construction Noise Management Plans. The relevant templates or plans, after being carefully prepared by the project proponent or contractor, are to be deposited with the authority. These templates or plans would be retrieved and examined only when an issue arises, or if there are substantial complaints. The main thrust is not to find faults, but to find ways to better the situation.

In terms of the key proposal of preparing draft guidelines and sample house rules for managing domestic renovation noise, the consultant is suggesting stronger collaboration with both the property management sector and relevant training bodies, so that practical and useful house rules could be furnished and conscientiously followed by a work force familiar with quiet renovation techniques.

7. CONCLUSIONS

7.1 Key Study Parameters

EPD commissioned the Study to examine the scale of noise concerns from general construction and domestic renovation, having regard to views expressed by members of the public and relevant stakeholders. Possible options are explored.

7.2 Success Actualized So Far

Hong Kong is among the front runners worldwide in terms of comprehensiveness of noise control legislation, and adequacy of non-statutory provisions and associated practices. By and large, noise issues from general construction and domestic renovation are perceived by members of the public as widespread concerns, but are not particularly acute in most situations. Such a perception, however, is still forging a very clear mandate for the government to find additional ways and means to more effectively tackle the relevant annoyance.

7.3 Key Findings and Observations

A large-scale territory-wide survey covering more than 5,000 households was successfully conducted to gather information on public response to different types of construction noise including noise from domestic renovation. Of those various sources of construction activities given to construction noise annoyance as perceived by members of the public, domestic renovation was considered by most people to have generated high annoyance when they were at home. Other sources that annoyed people but to a lesser extent include general site activities, percussive piling, road maintenance, demolition and building addition & alteration.

It is clear from the Study that further improvements are needed to address domestic renovation noise as a priority and other particularly intrusive construction noise. Equipment or tools which are operated with an impact or percussive type of working mechanism are common sources of noise intrusiveness that lead to high annoyance.

Industry stakeholders are generally not resisting changes. The consultant's understanding is that they all support early planning in order to give appropriate focus to the noise issues.

7.4 Key Recommended Options

<u>General Construction</u>

To initiate and better capture the benefits of early planning, the promotion of Construction Noise Management Plans, or similar, is to be made to the construction sector, and where opportunities arise, such Construction Noise Management Plans could be implemented as a leading phase in government and quasi-government projects.

Domestic Renovation

To empower the property management companies and enhance their capability in both the technical and administrative arenas via the provision of practical guidelines and training.

The consultant is also proposing a series of other control and management options to support and supplement the key recommendations.

7.5 Proposed Time Frame

The two key recommendations, which are both administrative in nature, could be considered for immediate adoption. The other supporting and supplementary options could be implemented in stages, starting anytime, to tie in with and enhance the positive effects of introducing the key recommendations.

Appendix A: Chinese and English Version of Public Survey Questionnaire

MOV Data Collection Center Ltd. 米奧特資料搜集中心

電話號碼：3900 1271

填入數據後即成 **限閱文件**
只有獲授權人士可閱讀本文件內容

|EDIT ________ |CARD 1 .... (1)
|CODE ________ |JOB NO .... (2-5)
|CHECK ________ |Q'NAIRE NO. (6-9)
| ____________________

H17189864 香港建築噪音的研究 - 住戶統計調查

單位 聯絡人姓名：______________ (成員編號 ____) 聯絡電話號碼：____________________

到訪次數	1	2	3	4	5	6
訪問員號碼						
日期						
開始時間						
結束時間						
訪問形式: 上門........ 電話........	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐
訪問結果						

單位 聯絡人姓名：______________ (成員編號 ____) 聯絡電話號碼：____________________

到訪次數	1	2	3	4	5	6
訪問員號碼						
日期						
開始時間						
結束時間						
訪問形式: 上門........ 電話........	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐
訪問結果						

單位 聯絡人姓名：______________ (成員編號 ____) 聯絡電話號碼：____________________

到訪次數	1	2	3	4	5	6
訪問員號碼						
日期						
開始時間						
結束時間						
訪問形式: 上門........ 電話........	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐
訪問結果						

訪問結果：

(1) EN = Enumerated (完成整個訪問)
(2) NC = Non-Contact (無人應門)
(3) NR = Refusal (拒絕訪問)
(4) ND = Non-Domestic (非住宅用途)
(5) MER = MERged (合併單位)
(6) DEM = DEMolished (已拆卸)
(7) MP = Military Personnel (軍方人員)
(8) PE = Partially Enumerated (部分完成)
(9) UN = Unoccupied (空置)
(10) INS = Institution (院舍)

填入數據後即成 **限閱文件**
只有獲授權人士可閱讀本文件內容

檔案編號:

引言： 早晨／午安／晚安，我姓 (講出姓氏及出示證件)，係米奧特資料搜集中心嘅訪問員。我 受政府環保署委託進行一項統計調查，目的係搜集有關公眾對環境嘅意見，所得資料對政府制訂有關政策非常重要。你所提供嘅資料會絕對保密。多謝你嘅合作。

A. 住戶資料

A1 [直接記錄屋邨／大廈／住宅有否**業主立案法團／互助委員會或物業管理公司**。如有需要，可在訪問之前／之後向相關人士或戶主確認] (可複選)

有： 業主立案法團／互助委員會	1 ☐
物業管理公司	2 ☐
兩者都沒有	3 ☐

A2 **就「公屋」，問：**
請問你呢個單位係租抑或買呢？若「買」，追問：咁補咗地價未呢？

就「居屋」，問：
請問你呢個單位補咗地價未呢？

就「其他屋宇單位類型」：
[直接記錄單位所屬分類，如有需要，向戶主詢問或確認]
[若單位屬分間樓宇單位(即劏房)，請註明]

公屋	
公營租住房屋（包括房屋委員會及房屋協會租住單位）	1 ☐
未補地價嘅房屋委員會「租者置其屋」單位	2 ☐
已補地價嘅房屋委員會「租者置其屋」單位（包括免補地價已可自由出售單位）	3 ☐
居屋	
未補地價嘅房屋委員會／房屋協會／市區重建局資助出售單位（包括居者有其屋計劃／私人參與計劃／中等入息家庭房屋計劃嘅屋宇單位等）	4 ☐
已補地價嘅房屋委員會／房屋協會／市區重建局資助出售單位	5 ☐
其他屋宇單位類型	
私人住宅單位 [訪員在外觀察及記錄]	
- 10層樓或以下的住宅大廈	6 ☐
- 11層樓或以上的住宅大廈	7 ☐
- 別墅／獨立屋／平房	8 ☐
村屋／丁屋	9 ☐
其他永久性建築物（包括在酒店、旅舍、宿舍及其他非住宅建築物內嘅住宿地方及員工宿舍）	10 ☐
臨時房屋（包括天台建築物、流動居所、臨時建築物及寮屋）	11 ☐
公共機構／社團院舍 **→結束訪問**	12 ☐
其他（請註明）：	13 ☐

若A2=「3／5-11／13」，續問A3；否則跳問A4。

A3 請問而家呢個單位係你哋買嘅、租嘅、抑或其他呢？

買	1 ☐
租	
- 全租	2 ☐
- 合租	3 ☐
- 二房東	4 ☐
- 三房客	5 ☐
僱主提供	6 ☐
免租 (例如單位是親屬物業，並不用支付任何租金或生活費用；單位屬代為看管而不用付租等)	7 ☐
其他（請註明）：	

A4 呢度總共有幾多伙人住呢？一伙人係指一班住 同一個單位，同食同住嘅人士。佢 哋唔一定有親戚關係。自己單獨安排生活所需嘅人士亦算係一伙。

伙數..... 伙

每伙人分別填問卷 - 伙 I／II／III／IV／V

A5-A6由各伙戶主或最清楚住戶情況的住戶成員作答。若轉換了訪問對象，重覆引言。
讀出： 而家我想知道關於你(屋企／呢伙人)嘅一 哋資料。

A5 唔計留宿嘅外籍家庭傭工，你(屋企／呢伙人)總共有幾多位住戶成員呢？只計過去6個月總共有1個月或以上，或者未來6個月總共有1個月或以上喺香港，同埋以呢個單位為常住居所嘅人士。

住戶成員人數(不包括留宿嘅外籍家庭傭工)..... 人

A6 當中，有幾多位係18歲或以上呢?

18歲或以上住戶成員人數..... 人

冇..... 99 ☐ - 結束訪問

若多於1位18歲或以上住戶成員 (A6 > 1)，續問A7；若只有1位18歲或以上住戶成員，邀請該住戶成員接受訪問並跳至B部分。

A7	我哋會喺你(屋企／呢伙人) 18歲或以上嘅住戶成員中隨機抽選一位接受訪問。 請問嗰(讀出18歲或以上住戶成員人數)位18歲或以上嘅住戶成員中，邊一位係最近過咗生日嘅呢？ (如受訪者不明白：即係今日係_____月_____日，咁對上係邊位生日呢？)	
	本人→ 續問B部分	1 ☐
	其他人→ 邀請該成員接受訪問，並重覆引言	2 ☐

B(I). 居住環境情況

讀出：首先想同你傾吓有關居住環境嘅情況。

B1	你喺呢個單位住咗幾多年呢？	
	居住年期→B3	☐☐年
	少於12個月→B2	999 ☐

若少於12個月(B1=999)，續問B2；否則跳至B3。

B2	**示咭** 請問喺搬入呢個單位之前，你係住喺邊一類型嘅房屋呢？	
	公屋	
	公營租住房屋（包括房屋委員會及房屋協會租住單位）	1 ☐
	未補地價嘅房屋委員會「租者置其屋」單位	2 ☐
	已補地價嘅房屋委員會「租者置其屋」單位	3 ☐
	居屋	
	未補地價嘅房屋委員會／房屋協會／市區重建局資助出售單位（包括居者有其屋計劃／私人參與計劃／中等入息家庭房屋計劃嘅屋宇單位等）	4 ☐
	已補地價嘅房屋委員會／房屋協會／市區重建局資助出售單位	5 ☐
	其他屋宇單位類型	
	私人永久性住宅單位	6 ☐
	村屋／丁屋	7 ☐
	其他永久性建築物（包括在酒店、旅舍、宿舍及其他非住宅建築物內嘅住宿地方及員工宿舍）	8 ☐
	臨時房屋（包括天台建築物、流動居所及臨時建築物）	9 ☐
	公共機構／社團院舍	10 ☐
	其他（請註明）：	

B3	你認為你而家居住嘅(呢個屋邨／呢條街附近)嘅居住環境係寧靜抑或嘈吵呢？（追問程度）	
	非常寧靜	1 ☐
	幾寧靜	2 ☐
	普通	3 ☐
	幾嘈吵	4 ☐
	非常嘈吵	5 ☐
	冇意見／唔知道	9 ☐

B4	咁，對於香港整體嘅居住環境，你認為係寧靜抑或嘈吵呢？（追問程度）	
	非常寧靜	1 ☐
	幾寧靜	2 ☐
	普通	3 ☐
	幾嘈吵	4 ☐
	非常嘈吵	5 ☐
	冇意見／唔知道	9 ☐

B(II). 噪音來源

B5 我想知你喺過去12個月內，當你喺屋企嘅時候，以下嘅噪音對你嘅打擾、干擾或煩擾程度有幾大。

(i) 示咭

首先，我想請你用0至10嘅尺度嚟表示噪音對你嘅打擾、干擾或煩擾嘅程度。如果你完全唔受煩擾，請揀0；如果你極之受煩擾，請揀10；如果你覺得所受嘅影響介乎兩者之間，請喺0至10之間揀一個恰當嘅數字嚟表示你受打擾、干擾或煩擾嘅程度。[示咭,並讀出噪音來源]

(ii) 示咭

跟住我想請你用另一個尺度嚟表示噪音對你嘅打擾、干擾或煩擾嘅程度。

喺過去12個月內，當你喺屋企嘅時候，以下嘅噪音有幾大程度打擾、干擾或煩擾你呢？[示咭，並讀出噪音來源]

a. 道路交通															
(i).....	完全唔煩擾										極之煩擾		沒回答	聽唔到／唔覺有	
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐		88☐	99☐	
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾					- skip to b(i)	
	1☐		2☐		3☐		4☐		5☐				8☐		
b. 地鐵、火車或輕鐵															
(i).....	完全唔煩擾										極之煩擾				
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐		88☐	99☐	
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾					- skip to c(i)	
	1☐		2☐		3☐		4☐		5☐				8☐		
c. 工商業活動															
(i).....	完全唔煩擾										極之煩擾				
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐		88☐	99☐	
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾					- skip to d(i)	
	1☐		2☐		3☐		4☐		5☐				8☐		
d. 家居裝修															
(i).....	完全唔煩擾										極之煩擾				
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐		88☐	99☐	
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾					- skip to e(i)	
	1☐		2☐		3☐		4☐		5☐				8☐		
e. 建築／拆卸地盤(包括：建築地盤撞擊式打樁工程、建築地盤一般工程、拆卸地盤／樓宇工程)、道路維修工程，以及大廈／商場翻新／維修工程															
(i).....	完全唔煩擾										極之煩擾				
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐		88☐	99☐	
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾					- skip to f(i)	
	1☐		2☐		3☐		4☐		5☐				8☐		
f. 鄰居															
(i).....	完全唔煩擾										極之煩擾				
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐		88☐	99☐	
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾					- skip to g(i)	
	1☐		2☐		3☐		4☐		5☐				8☐		
g. 公園／運動場(包括播放音樂及唱歌嘅聲)															
(i).....	完全唔煩擾										極之煩擾				
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐		88☐	99☐	
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾					- skip to h(i)	
	1☐		2☐		3☐		4☐		5☐				8☐		
h. 街道播放音樂及唱歌嘅聲															
(i).....	完全唔煩擾										極之煩擾				
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐		88☐	99☐	
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾					- skip to i(i)	
	1☐		2☐		3☐		4☐		5☐				8☐		
i. 街市或店鋪叫賣嘅聲															
(i).....	完全唔煩擾										極之煩擾				
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐		88☐	99☐	
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾					- skip to j(i)	
	1☐		2☐		3☐		4☐		5☐				8☐		
j. 學校															
(i).....	完全唔煩擾										極之煩擾				
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐		88☐	99☐	
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾					- skip to Part C	
	1☐		2☐		3☐		4☐		5☐				8☐		

C. 家居裝修噪音

C(I). 家居裝修噪音煩擾情況

讀出：而家我哋會傾吓有關「家居裝修」產生嘅噪音。喺問完有關「家居裝修」嘅題目之後，我哋會問另一啲有關「建築／拆卸地盤、道路維修工程，以及大廈／商場翻新／維修工程」產生嘅噪音嘅題目。

若過去12個月內不曾受「家居裝修」噪音煩擾 (B5d(i)=88／99／B5d(ii)=8／9)，續問C1；否則跳至C3。

C1 喺過去10年內，你喺屋企有冇曾經受「家居裝修」噪音煩擾呢？

有 →**C2** ..... 1 ☐

冇 →**C(II) 部分** ..... 2 ☐

若過去10年內曾受「家居裝修」噪音煩擾 (C1=1)，續問C2；否則跳至C(II) 部分。

C2 諗番過去10年，你記得喺屋企最受「家居裝修」噪音煩擾係幾耐之前呢？

最受「家居裝修」噪音煩擾 ..... ____年____月前

C3 咁（喺過去12個月／讀出C2答案）受「家居裝修」噪音煩擾咗你幾耐呢？

受煩擾日子長度 ..... 月／ 星期／ 日

C4 咁喺邊啲日子（平日，即星期一至五 、 星期六 、 星期日或公眾假期）邊段時間受「家居裝修」噪音煩擾呢？(可複選) [請以24小時制記錄時間]

	時	分		時	分
1. 平日，即星期一至五			至		
2. 星期六			至		
3. 星期日或公眾假期			至		

C5 (i) 示咭
以下尺度入面0至10之間邊個數字最能夠表示嗰次「家居裝修」噪音對你嘅打擾、干擾或煩擾程度呢?

(ii) 示咭
跟住我想請你用另一個尺度嚟表示噪音對你嘅打擾、干擾或煩擾嘅程度。
嗰次「家居裝修」噪音有幾大程度打擾、干擾或煩擾你呢？

(i) .....

完全唔煩擾										極之煩擾
0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

(ii) .....

完全唔煩擾	有啲煩擾	煩擾	好煩擾	極之煩擾
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

若 C4 受噪音煩擾時段只涵蓋19:00至06:59，問C6；否則跳至C8。

C6 請問你喺**日間**時間（即早上7點至晚上7點）有冇曾經喺屋企受到「家居裝修」噪音煩擾呢？

有→**C7** ..... 1 ☐

冇→**C8** ..... 2 ☐

若喺日間時間曾經喺屋企受到「家居裝修」噪音煩擾 (C6=1)，續問C7；否則跳至C8。

C7 (i) 示咭
以下尺度入面0至10之間邊個數字最能夠表示喺**日間**時間嘅「家居裝修」噪音對你嘅打擾、干擾或煩擾程度呢?

(ii) 示咭
跟住我想請你用另一個尺度嚟表示噪音對你嘅打擾、干擾或煩擾嘅程度。
喺**日間**時間嘅「家居裝修」噪音有幾大程度打擾、干擾或煩擾你呢？

(i) .....

完全唔煩擾										極之煩擾
0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

(ii) .....

完全唔煩擾	有啲煩擾	煩擾	好煩擾	極之煩擾
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

C8 示咭
當你喺屋企受到「家居裝修」噪音煩擾嘅時候，你有幾經常會作出以下相應嘅對策呢？
[示咭，並讀出下列對策]

對策	從來都冇	有時有	好多時有	差唔多所有時間都有	沒回答
a. 就有關噪音作出投訴	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
b. 關閉窗戶	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
c. 關閉門戶	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
d. 開啟冷氣機	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
e. 喺屋企戴上耳塞	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
f. 開大屋企嘅影音器材音量／配戴耳筒使用影音設備.....	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
g. 施工期間短暫離開屋企	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
h. 其他 (請註明): _____	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐

若曾經就有關噪音作出投訴(C8a=2-4)，續問C9；否則跳至C12。

C9	示咭 以下邊一句句子最能夠形容你曾經作出投訴嘅原因呢？	
	噪音水平難以容忍	1 ☐
	噪音影響咗我嘅睡眠	2 ☐
	噪音影響咗我的日常生活	3 ☐
	噪音持續咗好長時間，冇任何改善	4 ☐
	其他 (請註明): _____	
C10	示咭 你期望作出投訴可以達到乜嘢結果呢？仲有呢？仲有冇呢？(可複選)	
	立即停止進行裝修工程／噪音	1 ☐
	改善發出噪音情況	2 ☐
	改變發出噪音嘅時間	3 ☐
	工程承建商／噪音製造者／源頭受到懲罰	4 ☐
	其他 (請註明): _____	
C11	示咭 你曾經向邊啲部門或單位作出投訴呢？仲有呢？仲有冇呢？(可複選)	
	警方	1 ☐
	環保署	2 ☐
	管理處或物業管理公司	3 ☐
	業主立案法團／互助委員會／業主委員會	4 ☐
	議員／地區關注組織	5 ☐
	街坊代表／地方代表／村長(或村代表)	6 ☐
	工程承建商／噪音製造者／源頭	7 ☐
	其他 (請註明): _____	
跳至C13。		
C12	示咭 以下邊一句句子最能夠形容你冇作出投訴嘅原因呢？	
	噪音冇影響我日常生活	1 ☐
	噪音只持續咗好短時間	2 ☐
	事先有通知我呢項工程	3 ☐
	我知道呢項工程有噪音舒緩方案同管制	4 ☐
	我唔知道有邊啲投訴渠道	5 ☐
	投訴後需要好長時間先可以改善噪音情況	6 ☐
	其他 (請註明): _____	
C13	整體1講，對於喺屋企受到「家居裝修」噪音嘅煩擾，你覺得你曾經作出嘅相應對策能唔能夠有效減少噪音對你個人所造成嘅煩擾呢？（追問程度）	
	完全冇效 → C14	1 ☐
	唔係幾有效 → C14	2 ☐
	幾有效 → C(III)部分	3 ☐
	非常有效 → C(III)部分	4 ☐
	冇意見 → C(III)部分	9 ☐
若答「完全冇效／唔係幾有效」(C13=1-2)，續問C14；否則跳至C(III) 部分。		
C14	點解你覺得你曾經作出嘅相應對策唔能夠有效減少噪音對你嘅煩擾？仲有呢？仲有冇呢？(可複選)	
	對於星期一至星期六嘅日間工程噪音管制比較寬鬆	1 ☐
	需要好長時間先可以取得回覆	2 ☐
	之後噪音再重現／再受到噪音嘅煩擾	3 ☐
	關閉窗戶／戴上耳塞／開大影音器材音量後，噪音依然好大	4 ☐
	其他 (請註明): _____	
則跳至C(III) 部分。		

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C(II). 不受家居裝修噪音煩擾情況

若過去12個月內或過去10年內不曾受「家居裝修」噪音煩擾 (C1=2)，續問C15；否則跳至C(III) 部分。

C15 示咭
以下邊一句句子最能夠形容你冇受到「家居裝修」噪音煩擾嘅原因呢？

當我喺屋企嘅時候，好少有家居裝修進行	1 ☐
我屋企附近嘅背景聲好大，所以聽唔到	2 ☐
工程承建商採取咗足夠嘅噪音緩解措施	3 ☐
因為我事先獲得通知有關工程，而作出咗適當嘅安排	4 ☐
其他 (請註明): _____	

C16 示咭
如果你喺屋企**日間**時間受到「家居裝修」噪音煩擾，你會作出以下邊啲相應嘅對策呢？仲有呢？仲有冇呢？(可複選)

就有關噪音作出投訴	1 ☐
關閉窗戶	2 ☐
關閉門戶	3 ☐
開啟冷氣機	4 ☐
喺屋企戴上耳塞	5 ☐
開大屋企嘅影音器材音量／配戴耳筒使用影音設備	6 ☐
施工期間短暫離開屋企	7 ☐
其他 (請註明): _____	
忍受噪音，乜都唔做	9 ☐

若會就有關噪音作出投訴(C16=1)，續問C17；否則跳至C18。

C17 示咭
咁對於呢啲**日間**時間出現嘅「家居裝修」噪音，你會向邊個部門或單位作出投訴呢？仲有呢？仲有冇呢？(可複選)

警方	1 ☐
環保署	2 ☐
管理處或物業管理公司	3 ☐
業主立案法團／互助委員會／業主委員會	4 ☐
議員／地區關注組織	5 ☐
街坊代表／地方代表／村長(或村代表)	6 ☐
工程承建商／噪音製造者／源頭	7 ☐
其他 (請註明): _____	

C18 示咭
如果你喺屋企**晚間**時間受到「家居裝修」噪音煩擾，你會作出以下邊啲相應嘅對策呢？仲有呢？仲有冇呢？(可複選)

就有關噪音作出投訴	1 ☐
關閉窗戶	2 ☐
關閉門戶	3 ☐
開啟冷氣機	4 ☐
喺屋企戴上耳塞	5 ☐
開大屋企嘅影音器材音量／配戴耳筒使用影音設備	6 ☐
施工期間短暫離開屋企	7 ☐
其他 (請註明): _____	
忍受噪音，乜都唔做	9 ☐

若會就有關噪音作出投訴(C18=1)，續問C19；否則跳至C(III) 部分。

C19 示咭
咁對於呢啲**晚間**時間出現嘅「家居裝修」噪音，你會向邊啲部門或單位作出投訴呢？仲有呢？仲有冇呢？ (可複選)

警方	1 ☐
環保署	2 ☐
管理處或物業管理公司	3 ☐
業主立案法團／互助委員會／業主委員會	4 ☐
議員／地區關注組織	5 ☐
街坊代表／地方代表／村長(或村代表)	6 ☐
工程承建商／噪音製造者／源頭	7 ☐
其他 (請註明): _____	

C(III). 家居裝修工程經驗

C20	請問你屋企有冇曾經進行過裝修工程呢？包括而家住緊或者以前住過嘅屋企。	
	有→C21	1 ☐
	冇→C28	2 ☐

若屋企「有」曾經進行過裝修工程 (C20=1)，續問C21；否則跳至C28。

C21	請問你清唔清楚有關你屋企進行過嘅裝修工程呢？	
	清楚 →C22	1 ☐
	唔清楚 →C28	2 ☐

若「清楚」有關屋企進行過嘅裝修工程 (C21=1)，續問C22；否則跳至C28。

C22	咁你屋企最近一次進行裝修工程係幾耐之前呢？	
	最近一次進行嘅裝修工程	____年____月前

C23	咁個家居裝修工程係由裝修公司／工人抑或係你自己進行呢？	
	裝修公司／工人	1 ☐
	自己	2 ☐

C24	咁個家居裝修工程由開始動工至完工總共大約用咗幾多時間呢？	
	少過 30 日	1 ☐
	30 日至少過 45 日	2 ☐
	45 日至少過 60 日	3 ☐
	60 日至少過 70 日	4 ☐
	70 日至少過 90 日	5 ☐
	90 日至少過 110 日	6 ☐
	110 日至少過 120 日	7 ☐
	120 日或以上	8 ☐

C25	咁個家居裝修工程費用總共大約用咗幾多錢呢？(以萬元計)	
	少過 10 萬	1 ☐
	10 萬至少過 25 萬	2 ☐
	25 萬至少過 55 萬	3 ☐
	55 萬至少過 85 萬	4 ☐
	85 萬至少過 105 萬	5 ☐
	105 萬至少過 135 萬	6 ☐
	135 萬至少過 200 萬	7 ☐
	200 萬或以上	8 ☐

C26	請問你有冇曾經收到鄰居對你嘅裝修工程作出投訴呢？	
	有→C27	1 ☐
	冇→C28	2 ☐

若「有」曾經收到鄰居對裝修工程作出投訴(C26=1)，續問C27；否則跳至C28。

C27	示咭 咁你作出咗乜嘢嘅緩解措施呢？仲有呢？仲有冇呢？(可複選)	
	立即停止進行裝修工程／噪音	1 ☐
	縮短每日進行裝修工程嘅時間	2 ☐
	縮短進行裝修工程嘅日數	3 ☐
	喺對他人影響少啲嘅時間(如日間上班上學時間)進行裝修工程	4 ☐
	降低噪音音量	5 ☐
	同鄰居溝通／商議	6 ☐
	同管理處或物業管理公司溝通／商議	7 ☐
	其他 (請註明): _____	

C28	就你居住嘅 (屋邨／大廈／住宅)，喺家居進行室內裝修工程前需唔需要預先通知物業管理公司呢？	
	需要→C29	1 ☐
	唔需要 } →C30	2 ☐
	唔知道 } →C30	9 ☐

若「需要」預先通知物業管理公司 (C28=1)，續問C29；否則跳至C30。

C29	咁需要預先幾耐通知呢？	
	1 日至 6 日	1 ☐
	7 日至 13 日	2 ☐
	14 日至 29 日	3 ☐
	30 日或以上	4 ☐
	唔知道	9 ☐

C30 就你居住嘅（屋邨／大廈／住宅），喺家居進行室內裝修工程，有冇限制邊啲日子（平日，即星期一至五 、 星期六 、 星期日或公眾假期）邊段時間 (24小時制) 唔可以進行裝修工程呢？(可複選)

	時	分		時	分
1. 平日，即星期一至五			至		
2. 星期六			至		
3. 星期日或公眾假期			至		

90. 冇限

99. 唔知道

C(IV). 支付意願

C31 如果有一啲喺家居進行嘅室內裝修工程方法可以減低噪音對鄰居嘅影響，但實行呢啲建議措施同時亦會延長進行工程嘅日數。咁你會唔會考慮呢啲室內裝修工程嘅方法？

會考慮→C32 ..... 1 ☐

唔會考慮→C33 ..... 2 ☐

若「會考慮」 (C31=1)，續問C32；否則跳至C33。

C32 **[若C24有答案，讀出]** 假設一個家居室內裝修工程原本需要**[讀出C24答案]**日，咁你可以接受工程延長幾多日呢？

[若C24沒有答案，根據單位大小讀出] 假設一個家居室內裝修工程原本需要(根據下表與受訪者確認單位實用面積呎數後再讀出日數)，咁你可以接受工程由開工至完工嘅總日數延長幾多日呢？

單位實用面積呎數	原本工程日數
<300呎	45日
300至600呎	60日
600至900呎	70日
900至1200呎	90日
1200至1500呎	110日
> 1500呎	120日

可接受延長日數 ..... ☐ 日

C33 同樣，如果有一啲喺家居進行嘅室內裝修工程方法可以減低噪音對鄰居嘅影響，但實行呢啲建議措施同時亦會增加成本。咁你會唔會考慮呢啲室內裝修工程嘅方法？

會考慮→C34 ..... 1 ☐

唔會考慮→C35 ..... 2 ☐

若「會考慮」 (C33=1)，續問C34；否則跳至C35。

C34 **[若C25有答案，讀出]** 假設工程成本原本需要港幣**[讀出C25答案]**萬元，咁你可以接受工程成本增加幾多錢呢？(以萬元計)

[若C25沒有答案，讀出] 假設工程成本原本需要港幣(根據下表與受訪者確認單位實用面積呎數後再讀出裝修費)萬元，咁你可以接受工程成本增加幾多錢呢？(以萬元計) (若少於1萬元，填996)

單位實用面積呎數	原本裝修費(港幣)
<300呎	$25萬
300至600呎	$55萬
600至900呎	$85萬
900至1200呎	$105萬
1200至1500呎	$135萬
> 1500呎	$200萬

可接受增加成本金額 ..... ☐ 萬元

C35 如果一啲發出好大噪音嘅室內裝修工程程序可以集中喺一日或幾日內做哂，但噪音會更大。你會唔會考慮呢啲室內裝修工程嘅方法？

會考慮 ..... 1 ☐

唔會考慮 ..... 2 ☐

C36 對於應對「家居裝修」噪音，你仲有冇其他建議方案或對策呢？仲有呢？仲有冇呢？(記錄受訪者答案)

_____ ( )

_____ ( )

_____ ( )

D. 「建築／拆卸地盤、道路維修工程，以及大廈／商場翻新／維修工程」噪音

D(I). 「建築／拆卸地盤、道路維修工程，以及大廈／商場翻新／維修工程」噪音煩擾情況

讀出：剛才我哋傾過「家居裝修」嘅噪音，跟住我哋會傾吓有關「建築／拆卸地盤、道路維修工程，以及大廈／商場翻新／維修工程」產生嘅噪音。以下我哋簡稱呢啲噪音為「一般建築噪音」。

若過去12個月內不曾受「一般建築噪音」煩擾 (B5e(i)=88／99／B5e(ii)=8／9)，續問D1；否則跳至D3。

D1 喺過去10年內，你喺屋企有冇曾經受「一般建築噪音」煩擾呢？

有 →**D2** ..... 1 ☐

冇 →**D(II)部分** ..... 2 ☐

若過去10年內曾受「一般建築噪音」煩擾 (D1=1)，續問D2；否則跳至D(II) 部分。

D2 諗番過去10年，你記得喺屋企最受「一般建築噪音」煩擾係幾耐之前呢？

最受「一般建築噪音」煩擾 ..... ____年____月前

D3 咁（喺過去12個月／讀出D2答案）受「一般建築噪音」煩擾咗你幾耐呢？

受煩擾日子長度 ..... 月／ 星期／ 日

D4 咁喺邊啲日子（平日，即星期一至五 、 星期六 、 星期日或公眾假期）邊段時間受「一般建築噪音」煩擾呢？(可複選) [請以24小時制記錄時間]

	時	分		時	分
1. 平日，即星期一至五			至		
2. 星期六			至		
3. 星期日或公眾假期			至		

D5 **示咭**

咁嗰次「一般建築噪音」係屬於以下邊種類別噪音呢？仲有呢？仲有冇呢？(可複選)

建築地盤撞擊式打樁工程 ..... 1 ☐

建築地盤一般工程(例如：撞擊式油壓破碎機、鑽機等) ..... 2 ☐

拆卸地盤／樓宇工程 ..... 3 ☐

道路維修工程 ..... 4 ☐

大廈／商場翻新／維修工程(例如：樓宇更新大行動、外牆維修等) ..... 5 ☐

其他 (請註明): _____

唔知道 ..... 9 ☐

D6 (i) 示啱
以下尺度入面0至10之間邊個數字最能夠表示嗰次 **[讀出 D5 噪音類別]** 噪音對你嘅打擾、干擾或煩擾程度呢? **[若D5答「唔知道」，問D6g(i)]**

(ii) 示啱
跟住我想請你用另一個尺度嚟表示噪音對你嘅打擾、干擾或煩擾嘅程度。
嗰次 **[讀出 D5 噪音類別]** 噪音有幾大程度打擾、干擾或煩擾你呢？ **[若D5答「唔知道」，問D6g(ii)]**

a. 建築地盤撞擊式打樁工程

(i)..... 完全唔煩擾 極之煩擾

0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

(ii) .....

完全唔煩擾	有啲煩擾	煩擾	好煩擾	極之煩擾
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

b. 建築地盤一般工程(例如：撞擊式油壓破碎機、鑽機等)

(i)..... 完全唔煩擾 極之煩擾

0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

(ii) .....

完全唔煩擾	有啲煩擾	煩擾	好煩擾	極之煩擾
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

c. 拆卸地盤／樓宇工程

(i)..... 完全唔煩擾 極之煩擾

0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

(ii) .....

完全唔煩擾	有啲煩擾	煩擾	好煩擾	極之煩擾
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

d. 道路維修工程

(i)..... 完全唔煩擾 極之煩擾

0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

(ii) .....

完全唔煩擾	有啲煩擾	煩擾	好煩擾	極之煩擾
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

e. 大廈／商場翻新／維修工程 (例如：樓宇更新大行動、外牆維修等)

(i)..... 完全唔煩擾 極之煩擾

0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

(ii) .....

完全唔煩擾	有啲煩擾	煩擾	好煩擾	極之煩擾
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

f. 其他 (請註明): _____

(i)..... 完全唔煩擾 極之煩擾

0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

(ii) .....

完全唔煩擾	有啲煩擾	煩擾	好煩擾	極之煩擾
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

g. **[只適用 D5 答「唔知道」]**
「一般建築噪音」

(i)..... 完全唔煩擾 極之煩擾

0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

(ii) .....

完全唔煩擾	有啲煩擾	煩擾	好煩擾	極之煩擾
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

若 D4 受噪音煩擾時段只涵蓋07:00至18:59，問D7；否則跳至D10前指示。

D7 請問你嗰**晚間**時間（即晚上7點至早上7點）有冇曾經喺屋企受到「一般建築噪音」煩擾呢？

有→**D8**	1 ☐
冇→**D13**	2 ☐

若嗰晚間時間曾經喺屋企受到「一般建築噪音」煩擾 (D7=1)，續問D8；否則跳至D13。

D8 示啱
剛才你話嗰**晚間**時間曾經喺屋企受到「一般建築噪音」煩擾，咁係受以下邊種類別嘅噪音煩擾呢？仲有呢？仲有冇呢？(可複選)

建築地盤一般工程(例如：撞擊式油壓破碎機、鑽機等)	2 ☐
拆卸地盤／樓宇工程	3 ☐
道路維修工程	4 ☐
大廈／商場翻新／維修工程(例如：樓宇更新大行動、外牆維修等)	5 ☐
其他 (請註明): _____	
唔知道	9 ☐

D9 (i) 示啱
以下尺度入面0至10之間邊個數字最能夠表示喺**晚間**時間嘅 **[讀出 D8 噪音類別]** 噪音對你嘅打擾、干擾或煩擾程度呢? **[若D8答「唔知道」，問D9g(i)]**

(ii) 示啱
跟住我想請你用另一個尺度嚟表示噪音對你嘅打擾、干擾或煩擾嘅程度。
喺**晚間**時間嘅 **[讀出 D8 噪音類別]** 噪音有幾大程度打擾、干擾或煩擾你呢？ **[若D8答「唔知道」，問D9g(ii)]**

b. 建築地盤一般工程(例如：撞擊式油壓破碎機、鑽機等)											
(i).....	完全唔煩擾										極之煩擾
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
c. 拆卸地盤／樓宇工程											
(i).....	完全唔煩擾										極之煩擾
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
d. 道路維修工程											
(i).....	完全唔煩擾										極之煩擾
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
e. 大廈／商場翻新／維修工程 (例如：樓宇更新大行動、外牆維修等)											
(i).....	完全唔煩擾										極之煩擾
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
f. 其他 (請註明): _____											
(i).....	完全唔煩擾										極之煩擾
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
g. **[只適用 D8 答「唔知道」]** 「一般建築噪音」											
(i).....	完全唔煩擾										極之煩擾
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii)	完全唔煩擾		有啲煩擾		煩擾		好煩擾		極之煩擾		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		

若 D4 受噪音煩擾時段只涵蓋19:00至06:59，問D10；否則跳至D13。

D10	請問你喺**日間**時間（即早上7點至晚上7點）有冇曾經喺屋企受到「一般建築噪音」煩擾呢？	
	有→**D11**	1 ☐
	冇→**D13**	2 ☐

若喺日間時間曾經喺屋企受到「一般建築噪音」煩擾 (D10=1)，續問D11；否則跳至D13。

D11	示啱 剛才你話喺**日間**時間曾經喺屋企受到「一般建築噪音」煩擾，咁係受以下邊種類別嘅噪音煩擾？仲有呢？仲有冇呢？(可複選)	
	建築地盤撞擊式打樁工程	1 ☐
	建築地盤一般工程(例如：撞擊式油壓破碎機、鑽機等)	2 ☐
	拆卸地盤／樓宇工程	3 ☐
	道路維修工程	4 ☐
	大廈／商場翻新／維修工程(例如：樓宇更新大行動、外牆維修等)	5 ☐
	其他 (請註明): _____	
	唔知道	9 ☐

D12 (i) 示咭
以下尺度入面0至10之間邊個數字最能夠表示喺日間時間嘅 **[讀出D11噪音類別]** 噪音對你嘅打擾、干擾或煩擾程度呢? **[若D11答「唔知道」，問D12g(i)]**

(ii) 示咭
跟住我想請你用另一個尺度嚟表示噪音對你嘅打擾、干擾或煩擾嘅程度。
喺日間時間嘅 **[讀出D11噪音類別]** 噪音有幾大程度打擾、干擾或煩擾你呢？ **[若D11答「唔知道」，問D12g(ii)]**

a. 建築地盤撞擊式打樁工程											
(i).....	完全唔煩擾										極之煩擾
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐
(ii)	完全唔煩擾		有啲煩擾		煩擾			好煩擾			極之煩擾
	1☐		2☐		3☐			4☐			5☐
b. 建築地盤一般工程(例如：撞擊式油壓破碎機、鑽機等)											
(i).....	完全唔煩擾										極之煩擾
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐
(ii)	完全唔煩擾		有啲煩擾		煩擾			好煩擾			極之煩擾
	1☐		2☐		3☐			4☐			5☐
c. 拆卸地盤／樓宇工程											
(i).....	完全唔煩擾										極之煩擾
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐
(ii)	完全唔煩擾		有啲煩擾		煩擾			好煩擾			極之煩擾
	1☐		2☐		3☐			4☐			5☐
d. 道路維修工程											
(i).....	完全唔煩擾										極之煩擾
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐
(ii)	完全唔煩擾		有啲煩擾		煩擾			好煩擾			極之煩擾
	1☐		2☐		3☐			4☐			5☐
e. 大廈／商場翻新／維修工程 (例如：樓宇更新大行動、外牆維修等)											
(i).....	完全唔煩擾										極之煩擾
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐
(ii)	完全唔煩擾		有啲煩擾		煩擾			好煩擾			極之煩擾
	1☐		2☐		3☐			4☐			5☐
f. 其他 (請註明): _____											
(i).....	完全唔煩擾										極之煩擾
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐
(ii)	完全唔煩擾		有啲煩擾		煩擾			好煩擾			極之煩擾
	1☐		2☐		3☐			4☐			5☐
g. **[只適用 D11 答「唔知道」]** 「一般建築噪音」											
(i).....	完全唔煩擾										極之煩擾
	0☐	1☐	2☐	3☐	4☐	5☐	6☐	7☐	8☐	9☐	10☐
(ii)	完全唔煩擾		有啲煩擾		煩擾			好煩擾			極之煩擾
	1☐		2☐		3☐			4☐			5☐

D13 示咭
當你喺屋企受到「一般建築噪音」煩擾嘅時候，你有幾經常會作出以下相應嘅對策呢？[示咭，並讀出下列對策]

對策	從來都冇	有時有	好多時有	差唔多所有時間都有	沒回答
a. 就有關噪音作出投訴.....	1☐	2☐	3☐	4☐	8☐
b. 關閉窗戶.....	1☐	2☐	3☐	4☐	8☐
c. 關閉門戶.....	1☐	2☐	3☐	4☐	8☐
d. 開啟冷氣機.....	1☐	2☐	3☐	4☐	8☐
e. 喺屋企戴上耳塞.....	1☐	2☐	3☐	4☐	8☐
f. 開大屋企嘅影音器材音量／配戴耳筒使用影音設備.....	1☐	2☐	3☐	4☐	8☐
g. 施工期間短暫離開屋企.....	1☐	2☐	3☐	4☐	8☐
h. 其他 (請註明): _____	1☐	2☐	3☐	4☐	8☐

若曾經就有關噪音作出投訴(D13a=2-4)，續問D14；否則跳至D17。

D14 示咭
以下邊一句句子最能夠形容你曾經作出投訴嘅原因呢？

噪音水平難以容忍.....	1☐
噪音影響咗我嘅睡眠.....	2☐
噪音影響咗我的日常生活.....	3☐
噪音持續咗好長時間，冇任何改善.....	4☐
其他 (請註明): _____	

D15	示咭 你期望作出投訴可以達到乜嘢結果呢？仲有呢？仲有冇呢？(可複選) 立即停止進行「建築／拆卸地盤、道路維修工程，以及大廈／商場翻新／維修工程」／噪音..... 改善發出噪音情況..... 改變發出噪音嘅時間..... 工程承建商／噪音製造者／源頭受到懲罰..... 其他 (請註明): _____	1 ☐ 2 ☐ 3 ☐ 4 ☐
D16	示咭 你曾經向邊啲部門或單位作出投訴呢？仲有呢？仲有冇呢？(可複選) 警方..... 環保署..... 管理處或物業管理公司..... 業主立案法團／互助委員會／業主委員會..... 議員／地區關注組織..... 街坊代表／地方代表／村長(或村代表)..... 工程承建商／噪音製造者／源頭..... 其他 (請註明): _____	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
跳至D18。		
D17	示咭 以下邊一句句子最能夠形容你冇作出投訴嘅原因呢？ 噪音冇影響我日常生活..... 噪音只持續咗好短時間..... 事先有通知我呢項工程..... 我知道呢項工程有噪音舒緩方案同管制..... 我唔知道有邊啲投訴渠道..... 投訴後需要好長時間先可以改善噪音情況..... 其他 (請註明): _____	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐
D18	整體□講，對於喺屋企受到「一般建築噪音」嘅煩擾，你覺得你曾經作出嘅相應對策能唔能夠有效減少噪音對你個人所造成嘅煩擾呢？（追問程度） 完全冇效..... 唔係幾有效..... D19 幾有效..... 非常有效..... D25 冇意見.....	1 ☐ 2 ☐ 3 ☐ 4 ☐ 9 ☐
若答「完全冇效／唔係幾有效」(D18=1-2)，續問C19；否則跳至D25。		
D19	點解你覺得你曾經作出嘅相應對策唔能夠有效減少噪音對你嘅煩擾？仲有呢？仲有冇呢？(可複選) 對於星期一至星期六嘅日間工程噪音管制比較寬鬆..... 需要好長時間先可以取得回覆..... 之後噪音再重現／再受到噪音嘅煩擾..... 關閉窗戶／戴上耳塞／開大影音器材音量後，噪音依然好大..... 其他 (請註明): _____	1 ☐ 2 ☐ 3 ☐ 4 ☐
跳至 D25。		

D(II). 不受建築／裝修工程噪音煩擾情況

若過去12個月內或過去10年內不曾受「一般建築噪音」煩擾 (D1=2)，續問D20；否則跳至E部分。

D20	示咭 以下邊一句句子最能夠形容你冇受到「一般建築噪音」煩擾嘅原因呢？ 當我喺屋企嘅時候，好少有「建築／拆卸地盤、道路維修工程，以及大廈／商場翻新／維修工程」進行 我屋企附近嘅背景聲好大，所以聽唔到 工程承建商採取咗足夠嘅噪音緩解措施 因為我事先獲得通知有關工程，而作出咗適當嘅安排 其他（請註明）:	1 ☐ 2 ☐ 3 ☐ 4 ☐
D21	示咭 如果你喺屋企**日間**時間受到嘅「一般建築噪音」煩擾，你會作出以下邊啲相應嘅對策呢？仲有呢？仲有冇呢？(可複選) 就有關噪音作出投訴 關閉窗戶 關閉門戶 開啟冷氣機 喺屋企戴上耳塞 開大屋企嘅影音器材音量／配戴耳筒使用影音設備 施工期間短暫離開屋企 其他（請註明）: 忍受噪音，乜都唔做	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 9 ☐

若會就有關噪音作出投訴(D21=1)，續問D22；否則跳至D23。

D22	示咭 咁對於呢啲**日間**時間出現嘅噪音你會向邊個部門或單位作出投訴呢？仲有呢？仲有冇呢？(可複選) 警方 環保署 管理處或物業管理公司 業主立案法團／互助委員會／業主委員會 議員／地區關注組織 街坊代表／地方代表／村長(或村代表) 工程承建商／噪音製造者／源頭 其他（請註明）:	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
D23	示咭 如果你喺屋企**晚間**時間受到「一般建築噪音」煩擾，你會作出以下邊啲相應嘅對策呢？仲有呢？仲有冇呢？(可複選) 就有關噪音作出投訴 關閉窗戶 關閉門戶 開啟冷氣機 喺屋企戴上耳塞 開大屋企嘅影音器材音量／配戴耳筒使用影音設備 施工期間短暫離開屋企 其他（請註明）: 忍受噪音，乜都唔做	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 9 ☐

若會就有關噪音作出投訴(D23=1)，續問D24；否則跳至D25。

D24	示咭 咁對於呢啲**晚間**時間出現嘅噪音，你會向邊啲部門或單位作出投訴呢？仲有呢？仲有冇呢？ (可複選) 警方 環保署 管理處或物業管理公司 業主立案法團／互助委員會／業主委員會 議員／地區關注組織 街坊代表／地方代表／村長(或村代表) 工程承建商／噪音製造者／源頭 其他（請註明）:	1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐
D25	對於應對「一般建築噪音」，你仲有冇其他建議方案或對策呢？仲有呢？仲有冇呢？(記錄受訪者答案) _____( ) _____( ) _____( )	

E. 生活習慣及個人狀況

讀出：跟住，我想知道一啲你嘅生活習慣，用，分析噪音對你(屋企／呢伙人)嘅影響。請你唔好介意，有啲問題可能比較敏感，你所提供嘅資料會絕對保密，我哋只會作綜合分析。

E1 喺過去一個月內，一般喺 [逐一讀出a至c項]，你通常喺日頭或者夜晚幾點開始上床瞓覺，到幾點起身呢？
[第2段時間只在受訪者提及才記錄] [請以24小時制記錄時間]

a. 平日，即星期一至五

	時	分		時	分
1. 通常:			至		
2. 其次:			至		

b. 星期六

	時	分		時	分
1. 通常:			至		
2. 其次:			至		

c. 星期日或公眾假期

	時	分		時	分
1. 通常:			至		
2. 其次:			至		

E2 對於家居裝修或一般建築噪音，一般喺 [逐一讀出a至c項]邊段時間對你(屋企／呢伙人)影響最少呢？ (例如：上班／上學時間／非作息時間)
[第2段時間只在受訪者提及才記錄] [請以24小時制記錄時間]

a. 平日，即星期一至五

	時	分		時	分
1. 通常:			至		
2. 其次:			至		

b. 星期六

	時	分		時	分
1. 通常:			至		
2. 其次:			至		

c. 星期日或公眾假期

	時	分		時	分
1. 通常:			至		
2. 其次:			至		

讀出：以下係一啲有關你個人狀況，用嚟評估身體狀況同噪音煩擾水平有冇關聯。

E3 醫生有冇曾經診斷過你有以下嘅病呢？ [讀出下列病症]

若任何一項病症答「有」，續問E4；否則跳至E5

E4 喺過去一個月內，你有冇因為**[逐一讀出E3回答「有」嘅病症]**而接受過治療，包括定時或間中食藥呢？

	E3		E4	
病症	冇	有	冇	有
a. 高血壓	0 ☐	1 ☐	0 ☐	1 ☐
b. 心臟病或心血管問題	0 ☐	1 ☐	0 ☐	1 ☐
c. 糖尿病	0 ☐	1 ☐	0 ☐	1 ☐
d. 慢性頭痛或偏頭痛	0 ☐	1 ☐	0 ☐	1 ☐
e. 抑鬱或焦慮	0 ☐	1 ☐	0 ☐	1 ☐
f. 失眠症 (嚴重睡眠問題)	0 ☐	1 ☐	0 ☐	1 ☐
g. 消化性潰瘍(胃、十二指腸)	0 ☐	1 ☐	0 ☐	1 ☐
h. 哮喘	0 ☐	1 ☐	0 ☐	1 ☐

E5 喺過去一個月內，你有冇服用以下嘅藥物呢？ [讀出下列藥物]

若任何一種藥物答「有」，續問E6；否則跳至E7

E6 咁你有幾經常服用**[逐一讀出E5「有」服用嘅藥物]**呢？

藥物	E5	E6					
	有	每日一次或多次	每星期兩次或以上但並非每日	每星期一次	每月兩次或以上但每星期少於一次	每月一次	每月少於一次
a. 降血壓藥	0 ☐ 1 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
b. 心血管藥	0 ☐ 1 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
c. 糖尿病藥	0 ☐ 1 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
d. 安眠藥	0 ☐ 1 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
e. 鎮靜劑	0 ☐ 1 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐

E7 喺冇配戴任何助聽器嘅情況下，你感覺聽嘢有冇任何問題或者困難呢？

有 → **E8** ..... 1 ☐
冇 → **跳至F部分** ..... 2 ☐

若答「有」(E7=1)，續問E8；否則跳至F部分

E8 請問你喺乜嘢情況下覺得聽覺有問題或困難呢？仲有呢？仲有冇呢？ (可複選)

所有時間 (在沒有配戴任何助聽器的情況下) ..... 1 ☐
在室內同人談話／溝通時 ..... 2 ☐
在室外與人談話／溝通時 ..... 3 ☐
身處室內嘈吵環境時 ..... 4 ☐
身處室外嘈吵環境時 ..... 5 ☐
身體狀況不好／差時 ..... 6 ☐
其他 (請註明)：_____

E9 你需唔需要配戴任何助聽器呢？

唔需要 ..... 1 ☐
需要 ..... 2 ☐

F. 個人資料	
讀出: 為「幫助我「分析資料，我想知道一 你「個人資料。你所提供「資料係會絕對保密。	
F1 (記錄性別) 男 女	 1 ☐ 2 ☐
F2 請問你今年幾多歲？ (以足歲計) 年齡	 _____歲
F3 請問你而家嘅婚姻狀況係乜嘢呢？ 未婚 已婚 離婚／分居 喪偶 其他 (請註明)：_____	 1 ☐ 2 ☐ 3 ☐ 4 ☐
F4 請問你而家有冇喺學校或者教育機構讀緊書呢？ 有 → F5 冇 → F7	 1 ☐ 2 ☐
若「有」(F4=1)，續問F5；否則跳至F7。	
F5 係讀全日制、部分時間制抑或係遙距課程呢？ 全日制 部分時間制 (兼讀) 遙距課程	 1 ☐ 2 ☐ 3 ☐
F6 **<u>示咭</u>** 你係讀緊幾年級呢？ 小一至小六 中一至中三 中四至中六 毅進文憑 工業學院／職業訓練學院 (學徒課程) 工業學院／職業訓練學院 (證書課程) 大專：(非學位課程／副學士學位課程) 大學：(學士學位課程) 大學：(碩士／博士學位課程)	 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐
F7 **<u>示咭</u>** 你<u>最高</u>係讀到幾多年級或者乜嘢教育程度呢? (請填寫最高完成程度) 未受教育完全不能閱讀 未受教育能閱讀少許生字 幼稚園／幼兒園 小一至小六 中一至中三 中四至中六／中七 毅進文憑 工業學院／職業訓練學院 (學徒課程) 工業學院／職業訓練學院 (證書課程) 大專：(非學位課程／副學士學位課程) 大學：(學士學位課程) 大學：(碩士／博士學位課程)	 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐
F8 請問你喺過去7日有冇全職或者兼職工作呢？包括自己做生意又或者幫屋企嘅生意工作而有收人工都計，包括任何做咗一個鐘頭或者以上嘅工作。 **[訪問員注意: 「過去7日有工作」指過去7日至少工作一小時]** 有 → F9 冇 → F13	 1 ☐ 2 ☐
若「有」（F8=1），續問F9；否則跳至F13。	

F9	你喺邊個行業工作呢？(請加註明) **[訪問員注意：若受訪者有多過一份工作，問主業資料 (即每星期工作時間最長的一份工)]** (註明行業)：_____	
	農業、漁業、採礦及採石	1 ☐
	製造	2 ☐
	電力、燃氣和自來水供應及廢棄物管理	3 ☐
	建造	4 ☐
	進出口貿易及批發	5 ☐
	零售、住宿及膳食服務	6 ☐
	運輸、倉庫、郵政及速遞服務、資訊及通訊	7 ☐
	金融、保險、地產、專業及商用服務	8 ☐
	公共行政、教育、人類醫療保健及社工活動、雜項社會及個人服務	9 ☐
	其他 (請註明)：_____	
F10	咁你係做乜嘢職位呢？(請加註明) (註明職位)：_____	
	經理及行政級人員	1 ☐
	專業人員	2 ☐
	輔助專業人員	3 ☐
	文書支援人員	4 ☐
	服務工作及銷售人員	5 ☐
	漁農業工人	6 ☐
	工藝及有關人員	7 ☐
	機台及機器操作員／裝配員	8 ☐
	非技術工人	9 ☐
	其他 (請註明)：_____	
F11	你份工有冇需要返通宵夜班／更工作呢？我指嘅通宵夜班／更係喺半夜12點至清晨6點內至少有4個鐘時間工作。	
	有需要 → **F12**	1 ☐
	冇需要 → **F17**	2 ☐
若答「有需要」(F11=1)，續問F12；否則跳至F17		
F12	咁，你係需要經常返通宵夜班／更，抑或係要輪日夜班／更呢？	
	經常返通宵夜班	1 ☐
	輪日夜班／更	2 ☐
跳至F17		
F13	咁喺過去7日內，如果有人請你做工，你可唔可以隨時返工呢？	
	可以→ F15	1 ☐
	唔可以→ F14	2 ☐
若「唔可以」（F13=2），續問F14；否則跳至F15。		
F14	係乜嘢原因你唔可以隨時返工呢？	
	返學	1 ☐
	料理家務	2 ☐
	年紀大／已退休 → F17	3 ☐
	生病 (長期)	4 ☐
	生病 (非長期)	5 ☐
	其他 (請註明)：_____ → F15	
若「非長期生病／其他」（F12=5／其他），續問F15；否則跳至F17。		
F15	喺過去30日內，你有冇搵工做呢？ **[訪問員注意：「搵工」指有積極行動才算 (例如：到勞工處登記、寄求職信申請、曾打電話詢問等)]**	
	有 → F17	1 ☐
	冇 → F16	2 ☐

若「冇」（F15=2），續問F16；否則跳至F17。	
F16 點解你冇搵工呢？	
返學	1 ☐
料理家務	2 ☐
年紀大／已退休	3 ☐
生病	4 ☐
相信冇工作可做／等候返新工／期待返回原有工作崗位／稍後自己開業	5 ☐
其他（請註明）：_____	

F17 示啫	
包括所有收入來源同埋強積金供款，請問你每月嘅個人收入大約有幾多錢呢？	
[若過去7日有全職或兼職工作(F8=1)但冇工作收入，請加註明。]	
$1 - $1,999	1 ☐
$2,000 – $3,999	2 ☐
$4,000 – $5,999	3 ☐
$6,000 – $7,999	4 ☐
$8,000 – $9,999	5 ☐
$10,000 – $12,499	6 ☐
$12,500 – $14,999	7 ☐
$15,000 – $19,999	8 ☐
$20,000 – $24,999	9 ☐
$25,000 – $29,999	10 ☐
$30,000 – $39,999	11 ☐
$40,000 – $49,999	12 ☐
$50,000 或以上	13 ☐
冇收入（請註明原因）：_____	97 ☐

F18 示啫	
包括所有收入來源同埋強積金供款，請問你（屋企／呢伙人）每月嘅家庭總收入大約有幾多錢呢？	
$1 - $1,999	1 ☐
$2,000 – $3,999	2 ☐
$4,000 – $5,999	3 ☐
$6,000 – $7,999	4 ☐
$8,000 – $9,999	5 ☐
$10,000 – $12,499	6 ☐
$12,500 – $14,999	7 ☐
$15,000 – $19,999	8 ☐
$20,000 – $24,999	9 ☐
$25,000 – $29,999	10 ☐
$30,000 – $39,999	11 ☐
$40,000 – $49,999	12 ☐
$50,000 或以上	13 ☐
冇收入（請註明原因）：_____	97 ☐

- 多謝受訪者，並讀出 -

為咗保証我哋嘅訪問質素，我哋公司嘅品質保證部門(QA)有機會喺稍後嘅時間再聯絡閣下作簡短嘅抽樣覆查，以確保數據嘅準確，希望閣下能夠再次合作。

MOV Data Collection Center Ltd.

Tel: 3900 1271

RESTRICTED WHEN ENTERED
WITH DATA ASSESSIBLE TO
AUTHORIZED PERSONS ONLY

|EDIT _________|CARD 1 ....(1)
|CODE ________|JOB NO...........(2-5)
|CHECK _______|Q'NAIRE NO.....(6-9)
|________________________________

H17189864 Construction Noise Control in Hong Kong - Household Survey

Quarter Contact name: ____________________ (Member no.____) Contact tel. no.: ______________________

No. of visits	1	2	3	4	5	6
Interviewer no.						
Date						
Time start						
Time end						
Mode of interview: H/H visit......... Telephone	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐
Result						
No. of persons enumerated						

Quarter Contact name: ____________________ (Member no.____) Contact tel. no.: ______________________

No. of visits	1	2	3	4	5	6
Interviewer no.						
Date						
Time start						
Time end						
Mode of interview: H/H visit......... Telephone	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐
Result						
No. of persons enumerated						

Quarter Contact name: ____________________ (Member no.____) Contact tel. no.: ______________________

No. of visits	1	2	3	4	5	6
Interviewer no.						
Date						
Time start						
Time end						
Mode of interview: H/H visit......... Telephone	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐	1 ☐ 2 ☐
Result						
No. of persons enumerated						

Enumeration result:
(1) EN = Enumerated
(2) NC = Non-Contact
(3) NR = Refusal
(4) ND = Non-Domestic
(5) MER = MERged
(6) DEM = DEMolished
(7) MP = Military Personnel
(8) PE = Partially Enumerated
(9) UN = Unoccupied
(10) INS = Institution

RESTRICTED WHEN ENTERED WITH DATA ASSESSIBLE TO AUTHORIZED PERSONS ONLY

S/N No.: | | | | | | | | |

Introduction: Good morning/afternoon/evening, my name is (read out name and show the identity card), an interviewer from MOV Data Collection Center Ltd. We are commissioned by Environmental Protection Department to conduct a survey to collect information from the public on environmental issues. The information is useful to the Government for policy formulation. Your data collected will be kept in strict confidence. Thank you for your cooperation.

A. Quarters Information

A1 [Directly record whether the estate/building/premise have **owners' corporations / mutual aid committees or property management company**. Confirm with the relevant person or household head before/after the interview] (MA)

Yes: Owners' corporations / mutual aid committees ..... 1 ☐
Property management company ..... 2 ☐
None of the above ..... 3 ☐

A2 **For "public housing", ask:**
Does your household rent or own this house/ flat? If "owned", probe: Has the premium been paid for this house/ flat?
For "subsidised sale flats", ask:
Has the premium been paid for this house/ flat?
For "other housing types":
[Please directly record the appropriate category; if necessary, ask or confirm with the household head]
[For sub-divided unit, please specify]

Public housing
Public rental housing (including the rental flats of Housing Authority and Housing Society) ..... 1 ☐
Tenants Purchase Scheme flats of Housing Authority **without** premium-paid ..... 2 ☐
Tenants Purchase Scheme flats of Housing Authority **with** premium-paid ..... 3 ☐

Subsidised sale flats
Subsidised sale flats of Housing Authority / Housing Society / Urban Renewal Authority **without** premium-paid (including Home Ownership Scheme / Private Sector Participation Scheme / Middle Income Housing Scheme flats etc.) ..... 4 ☐
Subsidised sale flats of Housing Authority / Housing Society / Urban Renewal Authority **with** premium-paid ..... 5 ☐

Other housing types
Private permanent residential flats.....
- Building with 10 floors or below ..... 6 ☐
- Building with 11 floors or above ..... 7 ☐
- Villa/ house ..... 8 ☐
Village house / small house ..... 9 ☐
Other permanent housing (including hotels, hostels, dormitories and other residential flats and staff quarters in non-domestic buildings) ..... 10 ☐
Temporary housing (including rooftop structures, mobile dwellings and temporary structures) ..... 11 ☐
Institutional housing → **End interview** ..... 12 ☐
Others (please specify): 13 ☐

If A3="3 / 5-11 / 13", continue with A3; otherwise skip to A4.

A3 Does your household rent or own this house/ flat?

Owner occupied ..... 1 ☐
Tenant
- Sole-tenant ..... 2 ☐
- Co-tenant ..... 3 ☐
- Main tenant ..... 4 ☐
- Sub-tenant ..... 5 ☐
Provided by employer ..... 6 ☐
Rent-free (e.g. belongs to relative, no need to pay any rent or living expenses; help others to look after and no need to pay rent, etc) ..... 7 ☐
Others (please specify):

A4 How many households are there in this unit of quarters? A household is defined as a group of people who live and dine together in a unit of quarters. They may not necessarily be relatives. A person who takes care of his/ her daily necessities alone will also be counted as a household.

No. of households: ..... | | |

Each household - Household I / II / III / IV / V

Ask household head or person who has the best knowledge of household for A5-A6. If different respondent is interviewed, please repeat the introduction.
Read out: Now, I would like to ask for some information about (you/ your family).

A5	Excluding live-in foreign domestic helper, how many members are there in this household? I am referring to members who have lived in Hong Kong for at least 1 month in the past 6 months or will live in Hong Kong for at least 1 month in the coming 6 months, and usually stay in this household.	
	No. of household members (excluding live-in foreign domestic helper).....	
A6	How many of them are aged 18 or above	
	No. of household members aged 18 or above	
	None.....	99 ☐ - End interview

If more than one household members aged 18 or above (A6 > 1) , continue with A7; if only one household members aged 18 or above, invite that member for interview and skip to Part B.

A7	Now, I'd randomly select one member aged 18 or above of your household for interview. Could you tell me which member who just celebrated his/her birthday? (If respondent do not understand: i.e. if today is _____(month & day), which member is the previous one who has his/her brithday?)	
	Self→ **Continue with Part B**.....	1 ☐
	Other person→ **Invite that member for interview and repeat introduction**.....	2 ☐

B(I). Living Environment

Read out: First I would like to ask you some questions about your living environment.

B1	How many years have you lived in this home?	
	Duration of living in this home→B3	years
	Less than 12 months →B2.....	999 ☐

If less than 12 months (B1=999), continue with B2; otherwise skip to B3.

B2	**Show card** Before you moved into this house/ flat, which type of housing do you live in?	
	Public housing	
	Public rental housing (including the rental flats of Housing Authority and Housing Society).....	1 ☐
	Tenants Purchase Scheme flats of Housing Authority **without** premium-paid	2 ☐
	Tenants Purchase Scheme flats of Housing Authority **with** premium-paid.....	3 ☐
	Subsidised sale flats	
	Subsidised sale flats of Housing Authority / Housing Society / Urban Renewal Authority **without** premium-paid (including Home Ownership Scheme / Private Sector Participation Scheme / Middle Income Housing Scheme flats etc.).....	4 ☐
	Subsidised sale flats of Housing Authority / Housing Society / Urban Renewal Authority **with** premium-paid	5 ☐
	Other housing type	
	Private permanent residential flats.....	6 ☐
	Village house / small house.....	7 ☐
	Other permanent housing (including hotels, hostels, dormitories and other residential flats and staff quarters in non-domestic buildings).....	8 ☐
	Temporary housing (including rooftop structures, mobile dwellings and temporary structures).....	9 ☐
	Institutional housing.....	10 ☐
	Others (please specify):	

B3	Do you think the environment you live in this estate/ street block is quiet or noisy? (probe the level)	
	Very quiet.....	1 ☐
	Fairly quiet.....	2 ☐
	Average	3 ☐
	Fairly noisy.....	4 ☐
	Very noisy.....	5 ☐
	No opinion / don't know.....	9 ☐

B4	Then, do you think the overall Hong Kong environment is quiet or noisy? (probe the level)	
	Very quiet.....	1 ☐
	Fairly quiet.....	2 ☐
	Average.....	3 ☐
	Fairly noisy	4 ☐
	Very noisy.....	5 ☐
	No opinion / don't know.....	9 ☐

B(II). Sources of Noise

B5 (i) Thinking about the last 12 months or so, when you were at home, how much you are bothered, disturbed, or annoyed by the following noises.

Show card

First, please use a 0 to 10 opinion scale to show how much you are bothered, disturbed, or annoyed by the noises. If you are not at all annoyed, choose 0; if you are extremely annoyed, choose 10; if you are somewhere in between, choose a number between 0 and 10. [Show card and read out sources]

(ii) **Show card**

Then, please use another scale to show how much you are bothered, disturbed, or annoyed by the noises.

Thinking about the last 12 months or so, when you were at home, how much does noise from the following sources bother, disturb, or annoy you? [Show card and read out sources]

a. Road traffic														Not answered	Not heard such noises
(i).....	Not at all											Extremely			
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐			88 ☐	99 ☐
(ii).....	Not at all			Slightly			Moderately			Very			Extremely		- skip to b(i)
	1 ☐			2 ☐			3 ☐			4 ☐			5 ☐	8 ☐	
b. MTR, trains or LRT															
(i).....	Not at all											Extremely			
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐			88 ☐	99 ☐
(ii).....	Not at all			Slightly			Moderately			Very			Extremely		- skip to c(i)
	1 ☐			2 ☐			3 ☐			4 ☐			5 ☐	8 ☐	
c. Industrial / business activities															
(i).....	Not at all											Extremely			
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐			88 ☐	99 ☐
(ii).....	Not at all			Slightly			Moderately			Very			Extremely		- skip to d(i)
	1 ☐			2 ☐			3 ☐			4 ☐			5 ☐	8 ☐	
d. Domestic renovation															
(i).....	Not at all											Extremely			
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐			88 ☐	99 ☐
(ii).....	Not at all			Slightly			Moderately			Very			Extremely		- skip to e(i)
	1 ☐			2 ☐			3 ☐			4 ☐			5 ☐	8 ☐	
e. Construction/ demolition (including percussive piling in construction sites, general construction works in construction sites, demolition work in construction sites/for building), road maintenance works, and renovation / maintenance works for building /shopping mall															
(i).....	Not at all											Extremely			
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐			88 ☐	99 ☐
(ii).....	Not at all			Slightly			Moderately			Very			Extremely		- skip to f(i)
	1 ☐			2 ☐			3 ☐			4 ☐			5 ☐	8 ☐	
f. Neighbour															
(i).....	Not at all											Extremely			
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐			88 ☐	99 ☐
(ii).....	Not at all			Slightly			Moderately			Very			Extremely		- skip to g(i)
	1 ☐			2 ☐			3 ☐			4 ☐			5 ☐	8 ☐	
g. Parks / Playgrounds (including music and singing)															
(i).....	Not at all											Extremely			
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐			88 ☐	99 ☐
(ii).....	Not at all			Slightly			Moderately			Very			Extremely		- skip to h(i)
	1 ☐			2 ☐			3 ☐			4 ☐			5 ☐	8 ☐	
h. Music played and songs sang on street															
(i).....	Not at all											Extremely			
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐			88 ☐	99 ☐
(ii).....	Not at all			Slightly			Moderately			Very			Extremely		- skip to i(i)
	1 ☐			2 ☐			3 ☐			4 ☐			5 ☐	8 ☐	
i. Selling sounds from wet makret or stores															
(i).....	Not at all											Extremely			
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐			88 ☐	99 ☐
(ii).....	Not at all			Slightly			Moderately			Very			Extremely		- skip to j(i)
	1 ☐			2 ☐			3 ☐			4 ☐			5 ☐	8 ☐	
j. Schools															
(i).....	Not at all											Extremely			
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐			88 ☐	99 ☐
(ii).....	Not at all			Slightly			Moderately			Very			Extremely		- skip to Part C
	1 ☐			2 ☐			3 ☐			4 ☐			5 ☐	8 ☐	

C. Domestic Renovation Noise

C(I). Annoyance from Domestic Renovation Noise

Read out: Now we will talk about noise produced by "domestic renovation". After asking the questions about "domestic renovation", we will ask another set of questions about noise produced by "construction/ demolition, road maintenance works, and renovation / maintenance works for building /shopping mall.

If not annoyed by "domestic renovation" noise in the past 12 months (B5d(i)= 88/99 / B5d(ii)= 8/9), continue with C1; otherwise skip to C3.

C1 Over the past 10 years, were you annoyed by "domestic renovation" noise when you were at home?
Yes →**C2** ..... 1 ☐
No →**Part C(II)** ..... 2 ☐

If annoyed by "domestic renovation" noise in the past10 years (C1=1), continue with C2; otherwise skip to Part C(II).

C2 Over the past 10 years, how long ago were you annoyed most by "domestic renovation" noise when you were at home?
Annoy most by "domestic renovation" noise ..... ____ year(s) ____month(s) ago

C3 How long were you annoyed by "domestic renovation" noise (**in the past 12 months / read out C2 answer**)?
Duraction of the annoyance ..... month(s) / week(s) / day(s)

C4 At what time and on which day (weekday, i.e. Monday through Friday, Saturday, Sunday or public holiday) were you annoyed by "domestic renovation" noise? (MA) [Record in 24-hour clock]

	Hour	Minute		Hour	Minute
1. Weekday, i.e. Monday through Friday			to		
2. Saturday			to		
3. Sunday or public holiday			to		

C5 (i) **Show card**
Using the scale below, which figure between 0 to 10 best represent how much you were bothered, disturbed, or annoyed by "domestic renovation" noise at that time?
(ii) **Show card**
Then, please use another scale to show how much you are bothered, disturbed, or annoyed by the noises.
How much were you bothered, disturbed, or annoyed by "domestic renovation" noise at that time?

(i) .....

Not at all										Extremely
0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

(ii) .....

Not at all	Slightly	Moderately	Very	Extremely
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

If annoyance of "domestic renovation" noise covered only 19:00 to 06:59 in C4, ask C6; otherwise skip to C8.

C6 Have you ever been annoyed by "domestic renovation" noise when you were at home at **daytime** (i.e. 7 a.m. to 7 p.m.)?
Yes→**C7** ..... 1 ☐
No→**C8** ..... 2 ☐

If ever been annoyed by "domestic renovation" noise at home at daytime (C6=1), continue with C7; otherwise skip to C8.

C7 (i) **Show card**
Using the scale below, which figure between 0 to 10 best represent how much you were bothered, disturbed, or annoyed by "domestic renovation" noise at **daytime**?
(ii) **Show card**
Then, please use another scale to show how much you are bothered, disturbed, or annoyed by the noises.
How much were you bothered, disturbed, or annoyed by "domestic renovation" noise at **daytime**?

(i) .....

Not at all										Extremely
0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐

(ii) .....

Not at all	Slightly	Moderately	Very	Extremely
1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

C8 **Show card**
When you were annoyed by "domestic renovation" noise at home, how often did you make the following responses or actions? [Show card and read out the measures below]

Responses/actions	Never	Sometimes	A lot	Nearly all the time	Not answered
a. Made a complaint about the noise	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
b. Closed the window	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
c. Closed the door	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
d. Turned on air-conditioner	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
e. Wore ear plugs	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
f. Increased the volume of audio-visual equipment at home/ wore headphone when using audio-visual equipment	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
g. Left the premise for a short duration during the works	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
h. Others (please specify): _____	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐

If having "made a complaint about the noise" (C8a=2-4), continue with C9; otherwise skip to C12.

C9	**Show card** Which of the following statement best describe the reason why you made a complaint?	
	The noise level was not tolerable	1 ☐
	The noise was affecting my sleep	2 ☐
	The noise was affecting my daily life	3 ☐
	The noise has persisted for a long time and did not show any improvement	4 ☐
	Others (please specify): _____	
C10	**Show card** What results did you expect to achieve by making a complaint? Any others? Any others? (MA)	
	Stop the renovation works/noise immediately	1 ☐
	Alleviate the noise	2 ☐
	Change the time of making noise	3 ☐
	Punish the contractor / noise maker / noise source	4 ☐
	Others (please specify): _____	
C11	**Show card** Which party or department did you make the complaint to?Any others? Any others? (MA)	
	Police	1 ☐
	Environmental Protection Department	2 ☐
	Management office or property management company	3 ☐
	Owners' Corporations / Mutual Aid Committees / Owners Committees	4 ☐
	Councillors / district concern groups	5 ☐
	Kaifong representative / local representative / village representative	6 ☐
	Project contractor / noise maker / noise source	7 ☐
	Others (please specify): _____	
Skip to C13.		
C12	**Show card** Which of the following statement best describe the reason why you didn't make a complaint?	
	The noise was not affecting my daily life	1 ☐
	The noise event only lasted for short duration	2 ☐
	I was informed about the work in advance	3 ☐
	I understood the noise mitigation and constraints	4 ☐
	I did not know any complaint channels	5 ☐
	It took a long time to alleviate the noise after complaining	6 ☐
	Others (please specify): _____	
C13	Overall speaking, do you think the response action(s) you have taken effective in alleviating the nuisance to you?	
	Not effective at all } C14	1 ☐
	Not fairly effective } C14	2 ☐
	Fairly effective } Part C(III)	3 ☐
	Very effective } Part C(III)	4 ☐
	No opinion } Part C(III)	9 ☐
If "Not effective at all/ Not fairly effective" (C13=1-2), continue with C14; otherwise skip to Part C(III).		
C14	Why do you think the response action(s) you have taken was/were not effective in alleviating the nuisance to you? Any others? Any others? (MA)	
	The noise control restrictions are less strict during daytime on Monday to Saturday	1 ☐
	It took long time to get response	2 ☐
	The noise resumed afterwards	3 ☐
	The noise was still annoying after I closed the window / wore earplug / turned up the volume of audio-visual equipment	4 ☐
	Others (please specify): _____	
Skip to Part C(III).		

C(II). Not Annoyed by Domestic Renovation Noise

If not annoyed by "domestic renovation" noise in the past 12 months or past10 years (C1=2), continue with C15; otherwise skip to Part C(III).

C15 **Show card**
Which statement best explain why you have not been affected by "domestic renovation" noise at home?

There were not many renovation works while I am staying at home	1 ☐
The background noise in my neighbourhood was very high	2 ☐
Sufficient noise mitigations were adopted by contractor	3 ☐
I was well informed about the work in advance and made proper arrangement	4 ☐
Others (please specify): _____	

C16 **Show card**
If you were annoyed by "domestic renovation" noise at home at **daytime**, which of the following responses or actions will you made? Any others? Any others? (MA)

Make a complaint about the noise	1 ☐
Close the window	2 ☐
Close the door	3 ☐
Turn on air-conditioner	4 ☐
Wear ear plugs	5 ☐
Increase the volume of audio-visual equipment at home/ wear headphone when using audio-visual equipment	6 ☐
Leave the premise for a short duration during the works	7 ☐
Others (please specify): _____	
Doing nothing and tolerate the noise	9 ☐

If "make a complaint about the noise" (C16=1), continue with C17; otherwise skip to C18.

C17 **Show card**
Which party or department will you make the complaint to about the "domestic renovation" noise at home at **daytime**? Any others? Any others? (MA)

Police	1 ☐
Environmental Protection Department	2 ☐
Management office or property management company	3 ☐
Owners' corporations / mutual aid committees / owners committees	4 ☐
Councillors / district concern groups	5 ☐
Kaifong representative / local representative / village representative	6 ☐
Project contractor / noise maker / noise source	7 ☐
Others (please specify): _____	

C18 **Show card**
If you were annoyed by "domestic renovation" noise at home at **nighttime**, which of the following responses or actions will you made? Any others? Any others? (MA)

Make a complaint about the noise	1 ☐
Close the window	2 ☐
Close the door	3 ☐
Turn on air-conditioner	4 ☐
Wear ear plugs	5 ☐
Increase the volume of audio-visual equipment at home/ wear headphone when using audio-visual equipment	6 ☐
Leave the premise for a short duration during the works	7 ☐
Others (please specify): _____	
Doing nothing and tolerate the noise	9 ☐

If "make a complaint about the noise" (C18=1), continue with C19; otherwise skip to Part C(III).

C19 **Show card**
Which party or department will you make the complaint to about the "domestic renovation" noise at home at **nighttime**? Any others? Any others? (MA)

Police	1 ☐
Environmental Protection Department	2 ☐
Management office or property management company	3 ☐
Owners' Corporations / Mutual Aid Committees / Owners Committees	4 ☐
Councillors / district concern groups	5 ☐
Kaifong representative / local representative / village representative	6 ☐
Project contractor / noise maker / noise source	7 ☐
Others (please specify): _____	

C(III). Domestic Renovation Experience

C20	Have you carried out any renovation work in your existing or previous premises?	
	Yes→C21	1 ☐
	No→C28	2 ☐

If "Yes" (C20=1), continue with C21; otherwise skip to C28.

C21	Are you knowledgeable about the renovation works carried out in your premises?	
	Yes →C22	1 ☐
	No →C28	2 ☐

If "Yes" (C21=1), continue with C22; otherwise skip to C28.

C22	When did you last carry out renovation work in your premises?	
	Last carry out renovation works ____ year(s) ____month(s) ago	

C23	Was the domestic renovation work carried out by renovation company/worker or by yourself?	
	Renovation company/worker	1 ☐
	Self	2 ☐

C24	What is the total approximate duration of completing the domestic renovation work?	
	Less than 30 days	1 ☐
	30 days to less than 45 days	2 ☐
	45 days to less than 60 days	3 ☐
	60 days to less than 70 days	4 ☐
	70 days to less than 90 days	5 ☐
	90 days to less than 110 days	6 ☐
	110 days to less than 120 days	7 ☐
	120 days or above	8 ☐

C25	What is the total approximate cost of completing the domestic renovation work?	
	Less than $100,000	1 ☐
	$100,000 to less than $250,000	2 ☐
	$250,000 to less than $550,000	3 ☐
	$550,000 to less than $850,000	4 ☐
	$850,000 to less than $1,050,000	5 ☐
	$1,050,000 to less than $1,350,000	6 ☐
	$1,350,000 to less than $2,000,000	7 ☐
	$2,000,000 or above	8 ☐

C26	Did you receive any complaints from neighbour about your domestic renovation work before?	
	Yes→C27	1 ☐
	No→C28	2 ☐

If "Yes" (C26=1), continue with C27; otherwise skip to C28.

C27	**Show card**	
	What noise mitigations did you adopt? Any others? Any others? (MA)	
	Stopped the renovation works/noise immediately	1 ☐
	Shortened the time for carrying out renovation works on each day	2 ☐
	Shortened the no. of days for carrying out renovation works	3 ☐
	Carried out renovation works during the time with least impact (e.g. time at work/school)	4 ☐
	Decrease the noise level	5 ☐
	Communicate/laise with neighbour	6 ☐
	Communicate/laise with management office or property management company	7 ☐
	Others (please specify): _____	

C28	Do you need to inform property management company before carrying out renovation work in your premise?	
	Yes→C29	1 ☐
	No } →C30	2 ☐
	Don't know }	9 ☐

If "Yes" (C28=1), continue with C29; otherwise skip to C30.

C29	What is the notice period required in advance?	
	1 days to 6 days	1 ☐
	7 days to 13 days	2 ☐
	14 days to 29 days	3 ☐
	30 days or above	4 ☐
	Don't know	9 ☐

C30 Is there any time limit on the renovation work hours in your living estates on (weekday, i.e. Monday through Friday, Saturday, Sunday or public holiday)? [Record in 24-hour clock] (MA)

	Hour	Minute		Hour	Minute
1. Weekday, i.e. Monday through Friday			to		
2. Saturday			to		
3. Sunday or public holiday			to		

90. No limit

99. Don't know

C(IV). Willingness to Pay

C31 Suppose there are some renovation methods that could cause less noise nuisance to your neighbour, but the renovation period will be prolonged. Are you willing to consider such renovation methods?

Yes →C32 ..... 1 ☐

No →C33..... 2 ☐

If "Yes" (C31=1), continue with C32; otherwise skip to C33.

C32 **[If C24 have answer, read out]** Suppose a renovation work originally require **[read out C24 answer]** days. How many days of prolongation you can accept?

[If C24 do not have answer, read out based on the usable floor size of the current premise] Suppose a renovation work originally require (read out no. of days based on the usable floor size of the current premise after confirmation with respondent) days. How many days of prolongation you can accept?

Usable floor size of premise	Original no. of days required
<300 sq. feet	45 days
300 to 600 sq. feet	60 days
600 to 900 sq. feet	70 days
900 to 1200 sq. feet	90 days
1200 to 1500 sq. feet	110 days
> 1500 sq. feet	120 days

No. of days of prolongation accept ..... days

C33 Suppose there are some renovation methods that could cause less noise nuisance to your neighbour, but the renovation cost will be increased. Are you willing to consider such renovation methods?

Yes →C34 ..... 1 ☐

No →C35..... 2 ☐

If "Yes" (C33=1), continue with C34; otherwise skip to C35.

C34 **[If C25 have answer, read out]** Suppose a renovation work originally require HK$ **[read out C25 answer]**. How much extra cost are you willing to spend?

[If C25 do not have answer, read out based on the usable floor size of the current premise] Suppose a renovation work originally require HK$ (read out renovation cost based on the usable floor size of the current premise after confirmation with respondent). How much extra cost are you willing to spend? (If less than HK$1,000, fill in 996)

Usable floor size of premise	Original renovation cost (HK$)
<300 sq. feet	$250,000
300 to 600 sq. feet	$550,000
600 to 900 sq. feet	$850,000
900 to 1200 sq. feet	$1,050,000
1200 to 1500 sq. feet	$1,350,000
> 1500 sq. feet	$2,000,000

Extra cost willing to spend.....

C35 Suppose there are some renovation work procedures that produces very loud noise could be carried out within a day or several days, but the noise level would even be higher. Would you consider such renovation methods?

Yes..... 1 ☐

No..... 2 ☐

C36 What are the any other comments or suggested measures on the control of domestic renovation noise do you have? Any others? Any others? (Record respondent's answers)

_____( )

_____( )

_____( )

D. "Construction/ demolition, road maintenance works, and renovation / maintenance works for building /shopping mall" Noise

D(I). Annoyance from "Construction/ demolition, road maintenance works, and renovation / maintenance works for building /shopping mall" Noise

Read out: Just earlier we have discussed "domestic renovation" noise. Now, we will talk about noise produced by "construction/ demolition, road maintenance works, and renovation / maintenance works for building /shopping mall". Hereafter, such noise is referred to "general construction noise".

If not annoyed by "general construction noise" in the past 12 months (B5e(i)= 88/99 / B5e(ii)= 8/9), continue with D1; otherwise skip to D3.

D1 Over the past 10 years, were you annoyed by "general construction noise" when you were at home?

Yes →**D2**	1 ☐
No →**Part D(II)**	2 ☐

If annoyed by "general construction noise" in the past10 years (D1=1), continue with D2; otherwise skip to Part D(II).

D2 Over the past 10 years, how long ago were you annoyed most by "general construction noise" when you were at home?

Annoy most by "general construction noise" ..... ____ year(s) ____month(s) ago

D3 How long were you annoyed by "general construction noise" (**in the past 12 months / read out D2 answer**)?

Duration of the annoyance ..... month(s) / week(s) / day(s)

D4 At what time and on which day (weekday, i.e. Monday through Friday, Saturday, Sunday or public holiday) were you annoyed by "general construction noise"? (MA) [Record in 24-hour clock]

	Hour	Minute		Hour	Minute
1. Weekday, i.e. Monday through Friday			to		
2. Saturday			to		
3. Sunday or public holiday			to		

D5 **Show card**

What type(s) of "general construction noise" was it/were they?Any others? Any others? (MA)

Percussive piling in construction sites	1 ☐
General construction works in construction sites (e.g. percussive hydraulic breakers, drills)	2 ☐
Demolition work in construction sites/for building	3 ☐
Road maintenance works	4 ☐
Renovation / maintenance works for building /shopping mall (e.g. Operation Building Bright, exterior wall maintenance works etc.)	5 ☐
Others (please specify): _____	
Don't know	9 ☐

D6 (i) **Show card**
Using the scale below, which figure between 0 to 10 best represent how much you were bothered, disturbed, or annoyed by **[read out type of noise in D5]** noise at that time? **[If "don't know" in D5, ask D6g(i)]**

(ii) **Show card**
Then, please use another scale to show how much you are bothered, disturbed, or annoyed by the noises.
How much were you bothered, disturbed, or annoyed by **[read out type of noise in D5]** noise at that time? **[If "don't know" in D5, ask D6g(ii)]**

a. Percussive piling in construction sites											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
b. General construction works in construction sites (e.g. percussive hydraulic breakers, drills)											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
c. Demolition work in construction sites/for building											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
d. Road maintenance works											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
e. Renovation / maintenance works for building /shopping mall											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
f. Others (please specify): _____											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
g. **[Only applicable if "don't know" in D5]** "General construction noise"											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		

If annoyance by "general construction noise" covered only 07:00 to 18:59 in D4, ask D7; otherwise skip to instruction before D10.

D7	Have you ever been annoyed by "general construction noise" when you were at home at **nighttime** (i.e. 7 p.m. to 7 a.m.)?	
	Yes→ **D8**	1 ☐
	No→ **D13**	2 ☐

If ever been annoyed by "general construction noise" at home at nighttime (D7=1), continue with D8; otherwise skip to D13.

D8	**Show card** You said you have been annoyed by "general construction noise" when you were at home at **nighttime**. What types of "general construction noise" did it belonged?Any others? Any others? (MA)	
	General construction works in construction sites (e.g. percussive hydraulic breakers, drills)	2 ☐
	Demolition work in construction sites/for building	3 ☐
	Road maintenance works	4 ☐
	Renovation / maintenance works for building /shopping mall (e.g. Operation Building Bright, exterior wall maintenance works etc.)	5 ☐
	Others (please specify): _____	
	Don't know	9 ☐

D9 (i) **Show card**
Using the scale below, which figure between 0 to 10 best represent how much you were bothered, disturbed, or annoyed by **[read out type of noise in D8]** noise at **nighttime**? **[If "don't know" in D8, ask D9g(i)]**

(ii) **Show card**
Then, please use another scale to show how much you are bothered, disturbed, or annoyed by the noises.
How much were you bothered, disturbed, or annoyed by **[read out type of noise in D8]** noise at **nighttime**? **[If "don't know" in D8, ask D9g(ii)]**

b. General construction works in construction sites (e.g. percussive hydraulic breakers, drills)

(i)..... Not at all 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ Extremely

(ii)..... Not at all 1 ☐ | Slightly 2 ☐ | Moderately 3 ☐ | Very 4 ☐ | Extremely 5 ☐

c. Demolition work in construction sites/for building

(i)..... Not at all 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ Extremely

(ii)..... Not at all 1 ☐ | Slightly 2 ☐ | Moderately 3 ☐ | Very 4 ☐ | Extremely 5 ☐

d. Road maintenance works

(i)..... Not at all 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ Extremely

(ii)..... Not at all 1 ☐ | Slightly 2 ☐ | Moderately 3 ☐ | Very 4 ☐ | Extremely 5 ☐

e. Renovation / maintenance works for building /shopping mall

(i)..... Not at all 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ Extremely

(ii)..... Not at all 1 ☐ | Slightly 2 ☐ | Moderately 3 ☐ | Very 4 ☐ | Extremely 5 ☐

f. Others (please specify): _____
.....

(i)..... Not at all 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ Extremely

(ii)..... Not at all 1 ☐ | Slightly 2 ☐ | Moderately 3 ☐ | Very 4 ☐ | Extremely 5 ☐

g. **[Only applicable if "don't know" in D8]**
"General construction noise"

(i)..... Not at all 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ Extremely

(ii)..... Not at all 1 ☐ | Slightly 2 ☐ | Moderately 3 ☐ | Very 4 ☐ | Extremely 5 ☐

If annoyance of "general construction noise" covered only 19:00 to 06:59 in D4, ask D10; otherwise skip to D13.

D10 Have you ever been annoyed by "general construction noise" when you were at home at **daytime** (i.e. 7 a.m. to 7 p.m.)?

Yes→**D11** ..... 1 ☐

No→**D13** ..... 2 ☐

If ever been annoyed by "general construction noise" at home at daytime (D10=1), continue with D11; otherwise skip to D13.

D11 **Show card**
You said you have been annoyed by "general construction noise" when you were at home at **daytime**. What type(s) of "general construction noise" was it/were they?Any others? Any others? (MA)

Percussive piling in construction sites ..... 1 ☐

General construction works in construction sites (e.g. percussive hydraulic breakers, drills) ..... 2 ☐

Demolition work in construction sites/for building ..... 3 ☐

Road maintenance works..... 4 ☐

Renovation / maintenance works for building /shopping mall (e.g. Operation Building Bright, exterior wall maintenance works etc.)..... 5 ☐

Others (please specify): _____

Don't know ..... 9 ☐

D12 (i) **Show card**
Using the scale below, which figure between 0 to 10 best represent how much you were bothered, disturbed, or annoyed by **[read out type of noise in D11]** noise at **daytime**? **[If "don't know" in D11, ask D12g(i)]**

(ii) **Show card**
Then, please use another scale to show how much you are bothered, disturbed, or annoyed by the noises.
How much were you bothered, disturbed, or annoyed by **[read out type of noise in D11]** noise at **daytime**? **[If "don't know" in D11, ask D12g(ii)]**

a. Percussive piling in construction sites											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
b. General construction works in construction sites (e.g. percussive hydraulic breakers, drills)											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
c. Demolition work in construction sites/for building											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
d. Road maintenance works											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
e. Renovation / maintenance works for building /shopping mall											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
f. Others (please specify): _____											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		
g. **[Only applicable if "don't know" in D11]** "General construction noise"											
(i).....	Not at all										Extremely
	0 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐	7 ☐	8 ☐	9 ☐	10 ☐
(ii).....	Not at all		Slightly		Moderately		Very		Extremely		
	1 ☐		2 ☐		3 ☐		4 ☐		5 ☐		

D13 **Show card**
When you were annoyed by "general construction noise" at home, how often did you make the following responses or actions? [Show card and read out the measures below]

Responses/actions	Never	Sometimes	A lot	Nearly all the time	Not answered
a. Made a complaint about the noise	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
b. Closed the window	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
c. Closed the door.....	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
d. Turned on air-conditioner.....	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
e. Wore ear plugs.....	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
f. Increased the volume of audio-visual equipment at home/ wore headphone when using audio-visual equipment	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
g. Left the premise for a short duration during the works.....	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐
h. Others (please specify): _____	1 ☐	2 ☐	3 ☐	4 ☐	8 ☐

If having "made a complaint about the noise" (D13a=2-4), continue with D14; otherwise skip to D17.

D14 **Show card**
Which of the following statement best describe the reason why you made a complaint?

The noise level was not tolerable	1 ☐
The noise was affecting my sleep	2 ☐
The noise was affecting my daily life	3 ☐
The noise has persisted for a long time and did not show any improvement	4 ☐
Others (please specify): _____	

D15	**Show card** What results did you expect to achieve by making a complaint? Any others? Any others? (MA)	
	Stop the works/noise immediately	1 ☐
	Alleviate the noise	2 ☐
	Change the time of making noise	3 ☐
	Punish the contractor / noise maker / noise source	4 ☐
	Others (please specify): _____	

D16	**Show card** Which party or department did you make the complaint to?Any others? Any others? (MA)	
	Police	1 ☐
	Environmental Protection Department	2 ☐
	Management office or property management company	3 ☐
	Owners' Corporations / Mutual Aid Committees / Owners Committees	4 ☐
	Councillors / district concern groups	5 ☐
	Kaifong representative / local representative / village representative	6 ☐
	Project contractor / noise maker / noise source	7 ☐
	Others (please specify): _____	

Skip to D18.

D17	**Show card** Which of the following statement best describe the reason why you didn't make a complaint?	
	The noise was not affecting my daily life	1 ☐
	The noise event only lasted for short duration	2 ☐
	I was informed about the work in advance	3 ☐
	I understood the noise mitigation and constraints	4 ☐
	I did not know any complaint channels	5 ☐
	It took a long time to alleviate the noise after complaining	6 ☐
	Others (please specify): _____	

D18	Overall speaking, do you think the response action(s) you have taken effective in alleviating the nuisance to you?		
	Not effective at all	→ D19	1 ☐
	Not fairly effective	→ D19	2 ☐
	Fairly effective	→ D25	3 ☐
	Very effective	→ D25	4 ☐
	No opinion	→ D25	9 ☐

If "Not effective at all/ Not fairly effective"(D18=1-2), continue with C19; otherwise skip to D25.

D19	Why do you think the response action(s) you have taken was/were not effective in alleviating the nuisance to you? Any others? Any others? (MA)	
	The noise control restrictions are less strict during daytime on Monday to Saturday	1 ☐
	It took long time to get response	2 ☐
	The noise resumed afterwards	3 ☐
	The noise was still annoying after I closed the window / wore earplug / turned up the volume of audio-visual equipment	4 ☐
	Others (please specify): _____	

Skip to D25.

D(II). Not Annoyed by General Construction Noise

If not annoyed by "general construction noise" in the past 12 months or past10 years (D1=2), continue with D20; otherwise skip to Part E.

D20 **Show card**
Which statement best explain why you have not been affected by "general construction noise" at home?

There were not many renovation works while I am staying at home	1 ☐
The background noise in my neighbourhood was very high	2 ☐
Sufficient noise mitigations were adopted by contractor	3 ☐
I was well informed about the work in advance and made proper arrangement	4 ☐
Others (please specify): _____	

D21 **Show card**
If you were annoyed by "general construction noise" at home at **daytime**, which of the following responses or actions will you made? Any others? Any others? (MA)

Make a complaint about the noise	1 ☐
Close the window	2 ☐
Close the door	3 ☐
Turn on air-conditioner	4 ☐
Wear ear plugs	5 ☐
Increase the volume of audio-visual equipment at home/ wear headphone when using audio-visual equipment	6 ☐
Leave the premise for a short duration during the works	7 ☐
Others (please specify): _____	
Doing nothing and tolerate the noise	9 ☐

If "make a complaint about the noise" (D21=1), continue with D22; otherwise skip to D23.

D22 **Show card**
Which party or department will you make the complaint to about the "general construction noise" at home at **daytime**? Any others? Any others? (MA)

Police	1 ☐
Environmental Protection Department	2 ☐
Management office or property management company	3 ☐
Owners' corporations / mutual aid committees / owners committees	4 ☐
Councillors / district concern groups	5 ☐
Kaifong representative / local representative / village representative	6 ☐
Project contractor / noise maker / noise source	7 ☐
Others (please specify): _____	

D23 **Show card**
If you were annoyed by "general construction noise" at home at **nighttime**, which of the following responses or actions will you made? Any others? Any others? (MA)

Make a complaint about the noise	1 ☐
Close the window	2 ☐
Close the door	3 ☐
Turn on air-conditioner	4 ☐
Wear ear plugs	5 ☐
Increase the volume of audio-visual equipment at home/ wear headphone when using audio-visual equipment	6 ☐
Leave the premise for a short duration during the works	7 ☐
Others (please specify):	
Doing nothing and tolerate the noise	9 ☐

If "make a complaint about the noise" (D23=1), continue with D24; otherwise skip to D25.

D24 **Show card**
Which party or department will you make the complaint to about the "general construction noise" at home at **nighttime**? Any others? Any others? (MA)

Police	1 ☐
Environmental Protection Department	2 ☐
Management office or property management company	3 ☐
Owners' Corporations / Mutual Aid Committees / Owners Committees	4 ☐
Councillors / district concern groups	5 ☐
Kaifong representative / local representative / village representative	6 ☐
Project contractor / noise maker / noise source	7 ☐
Others (please specify):	

D25 What are the any other comments or suggested measures on the control of general construction noise do you have? Any others? Any others? (Record respondent's answers)

_____( )
_____( )
_____( )

E. Living Habit & Health Conditions

Read out: Now, I would like to know your living habit to analyse the impact of noise to (you/ your family). Kindly note that some questions may be a bit sensitive and please do not mind. The information you provided will be kept in strict confidence and will be used for aggregate analysis only.

E1 During the past one month on an average [read out each item a to c], what time of the day/ night do you start to sleep in bed and what time do you get up? [Record the second period only if the respondent mentions it] [Record in 24-hour clock]

a. Weekday, i.e. Monday through Friday

	Hour	Minute		Hour	Minute
1. Most often:			to		
2. Secondary:			to		

b. Saturday

	Hour	Minute		Hour	Minute
1. Most often:			to		
2. Secondary:			to		

c. Sunday or public holiday

	Hour	Minute		Hour	Minute
1. Most often:			to		
2. Secondary:			to		

E2 Regarding domestic renovation or general construction noise, which time period on an average [read out each item a to c] such noise has least impact to (you/ your family)? (For example, time at work/school/ non-rest hours) [Record the second period only if the respondent mentions it] [Record in 24-hour clock]

a. Weekday, i.e. Monday through Friday

	Hour	Minute		Hour	Minute
1. Most often:			to		
2. Secondary:			to		

b. Saturday

	Hour	Minute		Hour	Minute
1. Most often:			to		
2. Secondary:			to		

c. Sunday or public holiday

	Hour	Minute		Hour	Minute
1. Most often:			to		
2. Secondary:			to		

Read out: This part of the questionnaire is about your personal condition, which is used to assess whether there is any connection existed between the physical condition and the noise level.

E3 Have you ever been diagnosed by a doctor with the following diseases? [Read out each disease]

If any diseases answered "Yes", continue with E4; otherwise skip to E5

E4 Have you been treated regularly for **[read out each disease answered "Yes" in E3]** in the past one month? Treatment including taking medicine regularly or from time to time.

	E3		E4	
Diseases	No	Yes	No	Yes
a. Hypertension	0 ☐	1 ☐	0 ☐	1 ☐
b. Heart disease/ cardiovascular effects	0 ☐	1 ☐	0 ☐	1 ☐
c. Diabetes	0 ☐	1 ☐	0 ☐	1 ☐
d. Chronic headaches/ migraines	0 ☐	1 ☐	0 ☐	1 ☐
e. Depression/ anxiety	0 ☐	1 ☐	0 ☐	1 ☐
f. Insomnia (severe sleeping problems)	0 ☐	1 ☐	0 ☐	1 ☐
g. Peptic ulcer	0 ☐	1 ☐	0 ☐	1 ☐
h. Asthma	0 ☐	1 ☐	0 ☐	1 ☐

E5 Have you taken the following drugs in the past 1 month? [Read out each drug]

If any drugs answered "Yes", continue with E6; otherwise skip to E7

E6 How often do you take **[read out each drug answered "Yes" in E5]?**

Drugs	E5		E6					
	No	Yes	Once a day or more often	More than once a week but not daily	Once a week	More than once a month but less than once a week	Once a month	Less than once a month
a. Hypertension drugs	0 ☐	1 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
b. Cardiovascular drugs	0 ☐	1 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
c. Antidiabetic drugs	0 ☐	1 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
d. Sleeping pills	0 ☐	1 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐
e. Tranquilizer	0 ☐	1 ☐	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	6 ☐

E7 Without using any hearing aid, do you have any problems or difficulties with your sense of hearing?

Yes → **E8** ..... 1 ☐

No → **Skip to Part F** ..... 2 ☐

If "Yes" (E7=1), continue with E8; otherwise skip to Part F

E8 Please specify the condition of hearing problems or difficulties.Any others? Any others? (MA)

All the time (when not wearing hearing aid) ..... 1 ☐

When talking/communicating with people indoor ..... 2 ☐

When talking/communicating with people outdoor ..... 3 ☐

At noisy indoor environment ..... 4 ☐

At noisy outdoor environment ..... 5 ☐

When physical condition is poor ..... 6 ☐

Others (please specify): _____

E9 Do you need any hearing aid?

No 1 ☐

Yes 2 ☐

F. Personal Data		
Read out: Now we would like to ask you some personal data. Your data collected will be kept in strict confidence and will only be used for aggregated analysis.		
F1	(Record gender) Male Female	 1 ☐ 2 ☐
F2	How old are you? (Count in full years) Age	 _____
F3	What is your current marital status? Never married Married Divorced/ separated Widowed Others (please specify):_____	 1 ☐ 2 ☐ 3 ☐ 4 ☐
F4	Are you attending a school/educational institute? Yes → F5 No → F7	 1 ☐ 2 ☐
If "Yes" (F4=1), continue with F5; otherwise skip to F7.		
F5	Is it a full-time, part time or distance learning course? Full-time Part-time Distance learning	 1 ☐ 2 ☐ 3 ☐
F6	**Show card** Which level are you studying? P.1-P.6 F.1-F.3 F.4-F.6 Diploma Yi Jin Technical/ vocational training (craft course/ apprenticeship) Technical/ vocational training (certificate courses) Tertiary education: (non-degree / associate degree courses) Tertiary education: (bachelor degree courses) Tertiary education: (master's / doctorate courses)	 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐
F7	**Show card** What is the highest class/level of education you have completed? (Please fill in the highest class/level of education completed) No schooling, illiterated Attended some classes, know a few words Kindergarten / nursery P.1-P.6 F.1-F.3 F.4-F.6 Diploma Yi Jin Technical/ vocational training (craft course/ apprenticeship) Technical/ vocational training (certificate courses) Tertiary education: (non-degree / associate degree courses) Tertiary education: (bachelor degree courses) Tertiary education: (master's / doctorate courses)	 1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6 ☐ 7 ☐ 8 ☐ 9 ☐ 10 ☐ 11 ☐ 12 ☐
F8	Did you have a full-time or part-time job in the past 7 days? Running own business or assisting in family business without pay are also included. Please count any work for an hour or above. **[Interviewer note: "Having a job in the past 7 days" refers to work for at least one hour in the past 7 days]** Yes → F9 No → F13	 1 ☐ 2 ☐
If "Yes" (F8=1) , continue with F9; otherwise skip to F13.		

F9	What industry are you engaged in? (Please specify) **[Interviewer note: If engaged in more than one job, ask about the main (i.e. the job with the longest working hours per week)]** (Record industry):_____	
	Agriculture, fishing, mining & quarrying	1 ☐
	Manufacturing	2 ☐
	Electricity, gas and water supply, and waste management	3 ☐
	Construction	4 ☐
	Import/ export trade and wholesale	5 ☐
	Retail, accommodation and food services	6 ☐
	Transportation, storage, postal and courier services, information & communications	7 ☐
	Financing, insurance, real estate, professional and business services	8 ☐
	Public administration, education, human health and social work activities, miscellaneous social and personal services	9 ☐
	Others (please specify):_____	
F10	What is your occupation? (Please specify) (Record occupation):_____	
	Managers and administrators	1 ☐
	Professionals	2 ☐
	Associate professionals	3 ☐
	Clerical support workers	4 ☐
	Service and sales workers	5 ☐
	Skilled agricultural and fishery workers	6 ☐
	Craft and related workers	7 ☐
	Plant and machine operators and assemblers	8 ☐
	Elementary occupations	9 ☐
	Others (please specify):_____	
F11	Does your job require overnight shift work? Overnight shift work refers to work for at least 4 hours between 12 a.m. midnight to 6 a.m. in the morning.	
	Yes → **F12**	1 ☐
	No → **F17**	2 ☐
If "Yes" (F11=1), continue with F12; otherwise skip to F17		
F12	Do you frequently work overnight shift or work day and night shift alternatively?	
	Frequently work overnight shift	1 ☐
	Work day and night shift alternatively	2 ☐
Skip to F17		
F13	If someone offered you a job in the past 7 days, were you immediately available for work?	
	Yes→ F15	1 ☐
	No→ F14	2 ☐
If "No" (F13=2) , continue with F14; otherwise skip to F15.		
F14	Why were you not available?	
	Attendance at educational institutions	1 ☐
	Engagement in household duties	2 ☐
	Retirement → F17	3 ☐
	Illness (Chronic)	4 ☐
	Illness (Non-chronic) → F15	5 ☐
	Others (please specify):_____	
If "Non-chronic illness / Others" (F12=5 / Others) , continue with F15; otherwise skip to F17.		
F15	Did you seek job during the past 30 days? **[Interviewer note: Only those having sought job proactively (e.g. registering at Labour Department, sending job application letter, making phone call for enquiries) are counted as "have sought job".]**	
	Yes → F17	1 ☐
	No → F16	2 ☐

If "No" (F15=2) , continue with F16; otherwise skip to F17.		
F16	Why did you not seek job?	
	Attendance at educational institutions	1 ☐
	Engagement in household duties	2 ☐
	Old age/ retired	3 ☐
	Illness	4 ☐
	Believed no job was available Waited to take up a new job / Expected to return to original job / Would start up a business later	5 ☐
	Others (please specify):_____	
F17	**Show card** Including all your income sources and MPF contribution, what is your average monthly personal income? **[If having a job in the past 7 days (F8=1) but no income, please specify reason.]**	
	$1 - $1,999	1 ☐
	$2,000 – $3,999	2 ☐
	$4,000 – $5,999	3 ☐
	$6,000 – $7,999	4 ☐
	$8,000 – $9,999	5 ☐
	$10,000 – $12,499	6 ☐
	$12,500 – $14,999	7 ☐
	$15,000 – $19,999	8 ☐
	$20,000 – $24,999	9 ☐
	$25,000 – $29,999	10 ☐
	$30,000 – $39,999	11 ☐
	$40,000 – $49,999	12 ☐
	$50,000 or above	13 ☐
	No income (please state reason):_____	97 ☐
F18	**Show card** Including all your income sources and MPF contribution, what is your average monthly household income in total?	
	$1 - $1,999	1 ☐
	$2,000 – $3,999	2 ☐
	$4,000 – $5,999	3 ☐
	$6,000 – $7,999	4 ☐
	$8,000 – $9,999	5 ☐
	$10,000 – $12,499	6 ☐
	$12,500 – $14,999	7 ☐
	$15,000 – $19,999	8 ☐
	$20,000 – $24,999	9 ☐
	$25,000 – $29,999	10 ☐
	$30,000 – $39,999	11 ☐
	$40,000 – $49,999	12 ☐
	$50,000 or above	13 ☐
	No income (please state reason):_____	97 ☐

- Thank respondent and read out -
In order to ensure the quality of data, our QA department may contact you for a short sample quality check at a later time. Thank you in advance for your cooperation.

Appendix B: Schemes Analysis – Benefits

Proposed Schemes		Noise Reduction	Other Benefits
A)	Explore Non-percussive Means of Piling	3-17 dB(A)	Reduce dust, improve occupational health and safety; Improve plot ratio due to high load capacity of bored pile for deep foundation; Reduced working area due to a smaller prohibition zone for safety purpose for retaining wall pile installation
B)	Explore Non-percussive Means of Rock Breaking	3-25 dB(A)	Reduce dust, improve occupational health and safety; Higher chance of securing a CNP
C)	Explore Non-percussive Means of Concrete Breaking		
D)	Explore Non-percussive Means of Building Demolition		
E)	Minimize the Number of Percussive Breakers Operating Simultaneously	2-3 dB(A)	Reduce prolonged dust generation, improve occupational health and safety
F)	Minimize the Time of Percussive Breakers Operation		
G)	QPME Adoption	Up to 5 dB(A)	Reduce air pollutant emission; Financial incentive; Lower SWL value could be used directly in CNP application
H)	Noise Barrier and Enclosure Construction	5-20 dB(A)	Improve dust control for noise enclosure; Facilitate CNP application for higher production output
I)	Insulation at Receiver	10-20 dB(A)	Nil
J)	Construction Noise Management Plan (CNMP)	2-25 dB(A)	Promote early planning to pre-empt problem and positive cultural changes for green construction

Remarks:

The benefits, cost and constraints were evaluated with reference to some common or typical operation scenarios. There could be circumstances which may give a different evaluation result due to specific geological, engineering or site conditions.

Proposed Schemes		Noise Reduction	Other Benefits
K)	Deeds of Mutual Covenant (DMC) Enhancement	Contractually bind the owners to abide the house rules for noise reduction as an obligation	Enhance building management and resolution
L)	House Rules for Domestic Renovation	A channel to promote quiet renovation machines and practices backed by DMC	Enhance building management and resolution
M)	Renovation Time Limitation	To confine a limited renovation noisy period within a day	Facilitate those being affected to plan ahead to avoid unexpected disturbance
N)	Non-percussive Machines Usage	9-20 dB(A) in SBN	Reduce prolonged dust generation, improve occupational health and safety
O)	Limiting Number of Percussive Machines Operating Simultaneously	3-5 dB(A) in SBN	Reduce dust, improve occupational health and safety
P)	Limiting percussive machine operation time		
Q)	Limiting Percussive Machine Operation Consecutive Number of Days	Prevent overall duration of intrusive noise exposure	Reduce renovation cost and time from promoting better work schedule planning; Facilitate those being affected to plan ahead to avoid unexpected disturbance
R)	Renovation plan for prior consent	Promote better renovation planning to minimize sporadic noisy work	History of alteration in good record; Prevent illegal alteration; Promoting better work schedule planning
S)	Advance Notice to Neighbourhood	To notify nearby neighbour for advance preparation or arrangement to avoid unexpected disturbance	Seek mutual understanding; Reduce complaint rate

Remarks:

The benefits, cost and constraints were evaluated with reference to some common or typical operation scenarios. There could be circumstances which may give a different evaluation result due to specific geological, engineering or site conditions.

Appendix C: Schemes Analysis – Cost Implications and Constraints

Proposed Schemes		Cost Implications[1&2]	Constraints	Remarks
A)	Explore Non-percussive Means of Piling	At least double in cost for the same production output for bored pile (deep foundation pile installation) Same cost with equal production output for press-in type of silent piler (retaining wall pile installation) [2]	Site available space is a limiting factor (min. 10m x 10m) for bored pile; Works up to SPT N25 for standard model for press-in machine; Usage may be heavily subjected to project requirement or/and engineering constraints.	For retaining wall pile installation, water jet, hard-ground press-in and gyropress is able to work ground condition up to SPT N 600 with press-in type of silent piler
B)	Explore Non-percussive Means of Rock Breaking	Same cost or up to 140% increase for the same production output (depending on scale and geological conditions)	Attention to constraint on hard rocks, first concrete break operation which breaker is used as a conventional method; Usage may be heavily subjected to project requirement or/and engineering constraints.	Some constraint could be overcome by advance planning of work sequence and combined use with other options, depending on specific circumstances
C)	Explore Non-percussive Means of Concrete Breaking			
D)	Explore Non-percussive Means of Building Demolition			
E)	Minimize the Number of Percussive Breakers Operating Simultaneously	Same cost or up to 270% increase for equal production output (depending on scale and geological conditions)	Longer work programme for construction work with limited site area, e.g. building demolition, for extra machine placement	Some constraint could be overcome by advance planning of work sequence or adopting other options, depending on specific circumstances
F)	Minimize the Time of Percussive Breakers Operation			
G)	QPME Adoption	Same as non-QPME counterparts	Nil	QPME inventory type could be expanded
H)	Noise Barrier and Enclosure Construction	HK$20,000 (for 5-10dB(A) noise reduction) – HK$2,000,000 (for up to 20 dB(A) noise reduction) in material cost	Construction constraint on ground condition and available site area	Advance planning to address constraint and practicality.
I)	Insulation at Receiver	HK$10,000 – HK$15,000 per acoustic windows, subjected to acoustic performance. Administration and installation time cost.	May not fit in with the construction programme; Deprive the users' right to enjoy open window livelihood	Given the cost and time of this option required to be implemented and disturbance to the users' livelihood, the consultant would consider this option not practical.
J)	Construction Noise Management Plan (CNMP)	HK$20,000 – HK$500,000 for CNMP formulation at early implementation stage (depending on the scale and complexity of projects	Nil	-

Remarks:

1. The benefits, cost and constraints were evaluated with reference to some common or typical operation scenarios. There could be circumstances which may give a different evaluation result due to specific geological, engineering or site conditions.
2. Capital cost of the machines are excluded.

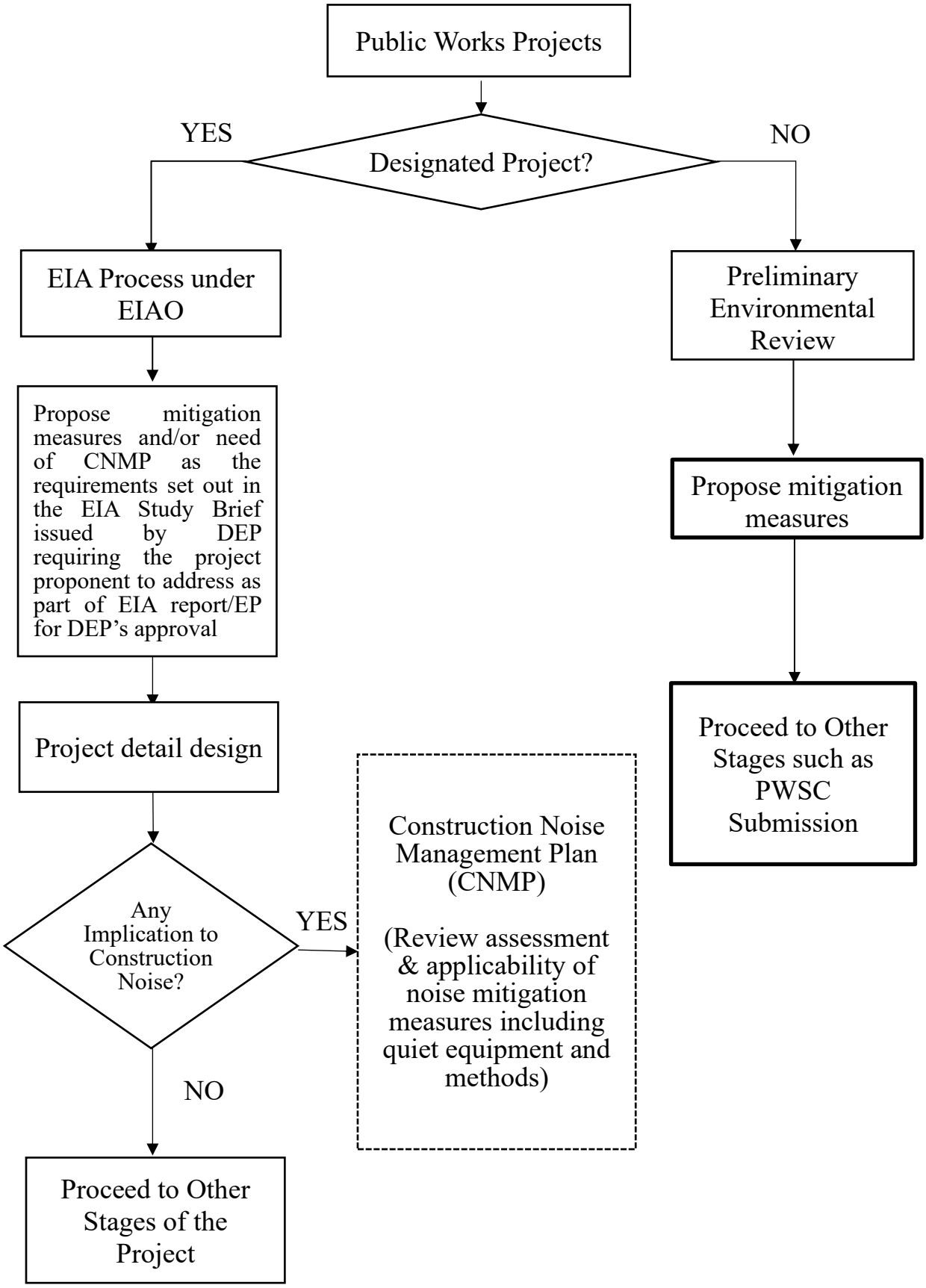
Proposed Schemes		Cost Implication[1&2]	Constraint	Remarks
K)	Deeds of Mutual Covenant (DMC) Enhancement	None, as developer has to furnish a DMC anyway	Limited feasibility for existing DMCs	-
L)	House Rules for Domestic Renovation	None, as an existing role of Owners' Committees	Time for reaching agreement among relevant bodies	Grace period to allow both tenants and contractors to get familiarize the rules and the new tools
M)	Renovation Time Limitation	None	Nil	Relevant guidelines could serve as a good practice example
N)	Non-percussive Machines Usage	63% in cost reduction to 138% increase cost under equal production output (depending on specific type of work and machines to be compared)	Specific tool for specific applications	Rental or borrow service from property management could facilitate usage
O)	Limiting Number of Percussive Machines Operating Simultaneously	63% in cost reduction to 138% increase cost under equal production output (depending on specific type of work and machines to be compared)	Nil for small flats; Some extra renovation period for large flats	Promote better planning Rental or borrow service from property management could facilitate usage
P)	Limiting operation time of percussive machine			
Q)	Limiting Consecutive Number of Days for Percussive Machine Operation	None	Nil for small flats; Some extra renovation period for large flats	Promote better planning
R)	Renovation plan for prior consent	Preparation time required to produce the plan and drawings by contractors, but overall programme cost and time may be reduced due to advance planning	Nil	House rules imposing penalty for non-compliance could be considered

S)	Advance Notice to Neighbourhood	Minimal administrative cost for notice placement and production	Nil	A standing practice for many residences

Remarks:

1. The benefits, cost and constraints were evaluated with reference to some common or typical operation scenarios. There could be circumstances which may give a different evaluation result due to specific geological, engineering or site conditions.
2. Capital cost of the machines are excluded.

Appendix D: Flowchart of CNMP Implementation for Public Works Projects



Appendix E: Examples of House Rules for Quiet Renovation

House Rules for Domestic Renovation (Examples):

1. Renovation consent shall be sought from property management prior to work commencement. The tenant shall make deposit of [*amount*] to property management office.

    - Renovation plan shall show the following information:

        i. Locations of power conduit alteration, area of tile removal, floor breaking, etc., and their respective schedule.

        ii. A schedule of the use of percussive machines; and

        iii. Types of machine and their respective number that will be used for each renovation procedures

    - Property management may assign specific time and date for specific procedures, e.g. floor breaking, or forbid specific machines operation, e.g. hand-held breakers. Any personnel within the dwelling shall follow such instruction.

    - Notification of any change in the schedule shall be given to the property management before the specified work commences.

    - Alteration that could potentially harm the structural integrity of the building are forbidden.

2. The use of percussive machines, e.g. hand-held breaker, percussive drill, etc, shall not be operated for more than 4 consecutive days. There shall be at least one week cool-off time before the resumption of operation of percussive machines.

    - For more information on non-percussive means machine for renovation, please refer to [*insert EPD guidelines*].

    - Non-percussive means machine for renovation could be borrowed at property management office.

3. Only the following time allows renovation work to be conducted within tenants dwelling:

    - Monday to Friday: 0900 to 1800

    - Saturday: 1200 to 1800

    - Sunday or Public Holiday: Renovation not allowed

4. Failure to comply with the above rules may result in deduction of deposit.

Appendix F: List of Reference

[Ref.1] Quarterly Report of Employment and Vacancies at Construction Sites (Second Quarter 2018)
https://www.statistics.gov.hk/pub/B10500042018QQ02B0100.pdf

[Ref.2] Quarterly Report of Employment and Vacancies at Construction Sites (Second Quarter 2010)
https://www.statistics.gov.hk/pub/B10500042010QQ02B0100.pdf

[Ref.3] Long Term Housing Strategy Annual Progress Report 2019
https://www.legco.gov.hk/yr19-20/english/panels/hg/papers/hg20200106cb1-278-3-e.pdf

[Ref.4] Private Domestic - Completions, Stock, Vacancy and Take-up
https://www.rvd.gov.hk/doc/en/statistics/private_domestic.xls

[Ref.5] Actual Public Housing Production
https://www.housingauthority.gov.hk/en/about-us/publications-and-statistics/actual-public-rental-housing-production/index.html

[Ref.6] Investigation Report of Hong Kong Domestic Indoor Design Market
https://www1.hkexnews.hk/listedco/listconews/gem/2017/0412/a10656/clai-20170330-14.pdf

[Ref.7] Understanding and Complying with the New York City Construction Noise Regulation
https://slidex.tips/download/plenary-paper-understanding-and-complying-with-the-new-york-city-construction-no