

**For Discussion
on 17 July 2017**

Legislative Council Panel on Development

Cost Management for Capital Works Projects – Progress and Outlook

Purpose

This paper aims to brief Members on the progress as well as providing an outlook of cost management for public works projects. The paper also gives an overview of the implementation of the Capital Works Programme.

Background

2. Hong Kong is facing the challenge of high construction cost and there is a need for Government to strengthen cost management for public works projects. The Development Bureau (DEVB) established the Project Cost Management Office (PCMO) in June last year to take forward various cost management initiatives for public works projects and promote cost management in the private construction sector. In assuming the overall cost management role, the PCMO also oversees the implementation of the Capital Works Programme which comprises the whole of the public works projects.

Infrastructure Investment

Capital Works Expenditure

3. The Government has been seeking to implement public works projects in an orderly manner with a view to enhancing the quality of living and supporting Hong Kong's economic development. Looking ahead, we will need to sustain our capital works investment to meet the needs in various fronts, such as land and housing supply in the medium to longer time horizon;

the 10-year Hospital Development Plan to look after the ageing population; various initiatives to improve people's livelihood and district environment; enhancement of transportation networks to boost connectivity etc. Based on the planned infrastructure programme, we anticipate that the annual capital works expenditure in the coming years will exceed \$80 billion.

4. Recently, there are views that Hong Kong may perhaps be spending too much on capital works projects. Such impression could have arisen from the noticeable increase in annual capital works expenditure (CapWex) since the commencement of the Ten Major Infrastructure Projects in 2007. This is however only a recovery from the long period of low investment due to the challenging economic situation in the early 2000s. The annual CapWex in 2016-17 is \$84 billion. This represents around 3.3% of GDP which is equal to the 35-year long term average of CapWex to real GDP. This is indeed a healthy level and is necessary to sustain the long term development of Hong Kong.

Overall Construction Outputs

5. In planning capital works projects, we have also taken into account the forecast workload in the construction market as a whole. Since 2013, DEVB and the Construction Industry Council (CIC) have been collaborating in making forecasts of the overall construction expenditure, covering both public and private construction works over a 10-year horizon for the reference of industry stakeholders. The overall construction expenditure of Hong Kong in 2016-17 is around \$240 billion. According to the latest forecast, it will reach the level within the range of \$250 billion to \$315 billion in the coming 10 years. The latest CIC forecast is attached in **Enclosure 1**.

The Need for Project Cost Management

6. Hong Kong has been beset by the challenge of high construction costs in recent years. An international report¹ has ranked Hong Kong as the 2nd highest construction cost city in 2017. Despite tender prices have

¹ International Construction Cost 2017, Arcadis

stabilised in recent months, arising from the predicted keen demand on construction services, we need to adopt proactive and structured approaches to tackle the issues of high construction cost. If the challenges of high construction cost are not properly tackled, it will adversely affect the implementation of capital works projects and may eventually undermine Hong Kong's competitiveness.

7. DEVB established the PCMO in June last year with the objective of strengthening cost management of construction projects. This cost management policy drive will also bring forward reform in the construction industry by instilling the culture of treating cost as a major driver of construction projects. The establishment of PCMO to promote cost management is one of the most important Government policy initiatives for the construction industry undertaken in recent years.

Reasons of Cost Increase

8. We commissioned a consultancy study on the reasons of increase in construction cost (referred to as "the study" in the following) in recent years. The study found that over the period from 2010Q1 to 2013Q1, the construction costs for various types of construction works has risen by around 40% to 60%. In addition to a 30% increase due to basic costs², increase in extra costs contributed another 10% to 30% increase in total cost. The quest for higher quality products, higher regulatory and sustainability requirements, more stringent occupational, safety and health provisions, etc. constituted the increase in extra costs. Findings of the study have formed the basis for formulating corresponding measures to tackle the issues of high construction cost.

9. Apart from making reference to the study findings, the PCMO has also engaged professional institutions, trade associations and unions, academia, etc., and obtained valuable suggestions on how to manage construction cost. In addition, the PCMO has liaised with their overseas counterparts, conducted various presentations to promote cost management and has received feedback on their work. The PCMO will continue to engage the industry stakeholders to further consolidate the culture of cost

² Primarily, basic costs include labour cost, materials cost and contract preliminaries.

management within the construction industry.

10. Under the guiding principles of not compromising functionality, quality and safety of works, the PCMO has adopted a three-prong approach to take forward the relevant initiatives for capital works projects, namely –

- (a) reviewing requirements and devising works policies;
- (b) project-by-project scrutiny; and
- (c) enhancing project management

(a) Reviewing Requirements and Devising Works Policies

11. The study concluded that higher standards and requirements have induced a significant portion of cost increase. Moreover, shortage of skilled labour coupled with its aging issue have also contributed substantially to the rise in construction cost. We are formulating appropriate works policies to tackle these challenges.

Application of Technology and Innovation

12. We are striving to adopt innovation and advanced technology in public works projects to reduce manpower requirements and enhance productivity for achieving better cost-effectiveness. With our support, the CIC will soon establish the Innovation and Technology Application Centre (ITAC). We will collaborate with the ITAC to spearhead the introduction of innovative ideas and advanced technology.

13. Furthermore, we are actively seeking to promote the use of the Building Information Modelling (BIM) technology in Hong Kong. The construction industry as a whole will benefit from the adoption of BIM by enhancing visibility and reducing project risks, multiple handling, abortive work, etc. To lead by example, we will require consultants and contractors to adopt BIM when undertaking major Government capital works projects starting from 2018.

14. We have been promoting buildability in capital works projects in

recent years. Buildable designs can lower construction cost through comprehensive appraisal of the construction methods and ensuring their practicality and effectiveness well in advance in the design stage. We aim to pilot the use of buildability evaluation system in Government building projects by end 2017.

15. In view of the consistently high demand on construction services in the coming few years, we will continue to explore and introduce more practical and less labour intensive construction methods for Hong Kong. Through promoting mechanisation, standardisation, prefabrication, etc., we aim to achieving higher productivity and cost-effectiveness for Hong Kong's construction industry.

Contemporary Contract Procurement Strategy

16. The complexity of public works projects has increased substantially in the past few decades. Contemporary procurement strategies should be adopted to cater for different project types with references to their particular features. DEVB has been piloting the use of the New Engineering Contract (NEC)³ since 2009. Through effective provisions, this contractual partnering contract form can foster an environment for the contracting parties to complete the works on time and within budget. We have targeted to adopt NEC as the major contract form for public works contracts in Hong Kong in an incremental manner.

17. For large and complex projects, we see the advantage of adopting a procurement approach on the basis of actual cost incurred for the execution of the works. We are promoting the use of the open-book target cost contract forms⁴ for large public works projects. By providing incentive through the pain/gain share mechanism, contractors are encouraged to employ cost-effective construction methods to complete the works at lower cost and in shorter time. Projects are being selected for trial application of this NEC procurement options.

18. Lists of completed and ongoing NEC contracts are included in

³ NEC has been in use in UK and many other countries for more than 25 years. The majority of public works in UK is now procured by using NEC.

⁴ NEC Option C and Option D.

Enclosure 2.

Comprehensive Review on Requirements and Works Policies

19. We aim to achieve cost reduction by removing outdated requirements and consolidating overlapped ones which had accumulated incrementally over the years. A high level working group, led by the DEVB and comprising senior directorates from Works Departments, has been established to comprehensively review relevant requirements and policies⁵. Since its establishment in mid last year, the working group has reviewed more than 20 requirements/policies and promulgated 8 revised requirements. Not only that the revised requirements will save the direct cost of the works, it can also reduce the administrative efforts which contribute significantly to the overall cost. A list of the promulgated revised requirements is attached in **Enclosure 3**.

(b) Project-by-Project Scrutiny

20. The PCMO is tasked with reviewing the estimates of 300 major capital works projects at the planning and design stage to ensure their cost-effectiveness. By providing a third party's advice, facilitating across bureaux/departments collaboration and benchmarking against unit costs⁶ of similar projects, the PCMO aims to achieve cost reduction through option formulation and design optimisation.

21. In 2016-17, the PCMO has reviewed some 60 projects at a total estimated cost of \$170 billion. While not compromising quality, functionality and safety of works, we managed to achieve \$13 billion savings by reviewing the designs and requirements representing some 7% of the total project cost.

22. The PCMO will continue to vet the design and cost estimates of

⁵ Requirements and policies as stipulated in relevant internal guidelines, technical circulars, manuals, handbooks, etc. covering works specifications and standards, project management, construction safety, environmental protection and other related aspects.

⁶ Indicative unit costs cap (IUCC) for different types of new government buildings is being formulated progressively. Unless with justified reasons, the unit costs of the relevant new Government buildings shall not exceed the corresponding IUCC. IUCCs for schools, government staff quarters and Government offices have been established. IUCC for other types of buildings will also be established later.

projects. The Office will also collaborate with project proponents to ensure that designs for public works projects have strictly observed the overriding principles of “fitness-for-purpose” and “no-frills”. This can ensure more effective use of public funds in the implementation of the Capital Works Programme.

(c) Enhancing Project Management

23. We are committed to deliver high quality public works projects on time and within budget. While there is concern from the society on budget overrun in several major infrastructure projects recently, the performance of the Capital Works Programme as a whole is considered generally satisfactory⁷.

Uplifting Cost Estimation Performance

24. We are always seeking to further uplift the performance in cost estimation for public works projects. We are conducting several studies⁸ on the feasibility of applying Reference Class Forecasting (RCF)⁹ in public works projects in Hong Kong. While reference classes for major roadwork projects and site formation projects have been established, studies on drainage, sewerage, waterworks and building projects are still ongoing. Upon completion of the studies, we will consider the approach of applying RCF to the local public works projects.

25. Estimating using Risk Analysis (ERA) has been in use for over 20 years for estimating the cost of public works projects. The PCMO is now conducting a review on the cost estimation method with the objective of adopting quantitative risk analysis, incorporating RCF, etc. We will seek

⁷ The Capital Works Programme as a whole has been maintaining a good track record in estimating cost of public works projects. In the past 10 years, the Finance Committee (FC) approved a total of about 650 Category A projects with total original Approved Project Estimates (APE) amounting to \$770 billion. Amongst these projects, around 70 required applications for increase in APE which amounted to about \$60 billion in total. In other words, increased estimates are required in about 10 per cent of the projects and the increase in APE is about 8% of the total funding approved.

⁸ By Professor Bent Flyvberg of the University of Oxford, UK.

⁹ RCF is a relatively new method using a top-down outside view approach with an aim to removing subjective bias in project cost estimation. It has been adopted in UK and several European countries for infrastructure projects.

professional input in undertaking the review.

Tackling Budget Overrun

26. The major reasons for budget overrun are: (i) forecasted price adjustment being lower than the outturn; (ii) additional works to deal with unforeseen circumstances; and (iii) higher-than-expected tender prices. We have received many suggestions on how to tackle the issues of budget overrun. After some consideration, we consider that enhancing project management is the key to address the issue. Better project management enables project offices to foresee challenges and manage difficult circumstances when they arise.

27. We are putting in place relevant measures to enhance management of capital works projects. Since its establishment, the PCMO has launched a series of measures to strengthen the prevailing procedures. We are collaborating with the Works Departments to putting in place high level monitoring mechanisms to oversee project cost estimations, cashflow monitoring and vetting of project changes¹⁰, etc. Through independent third party scrutiny, we aim to achieving better cost management for on-going projects.

Enhancing Project Management Capabilities of Government Officers

28. With the ever-increasing complexity and rising aspirations from the public on world class delivery of projects, project leaders and construction professionals must be well-equipped with contemporary project management skills in order to tackle the growing challenges in project delivery. The last formal project management training for government construction professionals was conducted quite many years ago.

29. The PCMO is now conducting a two-tier structured project management training programme to enhance the performance of Government officers. The first tier training designed for senior project leaders, namely Major Project Leaders Colloquium, was completed in November 2016. The

¹⁰ For instance, starting from 1 July 2017, major variations orders have to be reviewed by PCMO before they are issued.

colloquium was conducted by world renowned experts and attended by around 100 senior directorates. The second tier training for some 2 000 Government construction professionals will be arranged in due course. We aim to equip them with contemporary project management skills to tackle the evolving challenges in the implementation of capital works projects, as well as motivating them to adopt more cost-effective solutions to tackle project challenges.

30. In the long run, we will consider how to sustain the effort in uplifting the project management performance for the public works projects.

Latest Market Situation

31. While taking forward the various cost management initiatives, we are also closely monitoring the construction market and the trend of construction costs. As Members have expressed interests on movement of tender price, material costs and labour wages, the latest information is summarised in **Enclosure 4**.

32. We will continue to closely monitor the situation in the construction market and, where necessary, take corresponding measures to cope with any substantial fluctuations in tender prices to ensure that capital works projects can be implemented in a cost-effective manner.

Way Forward

33. Hong Kong has to sustain investment in public works in order to improve people's living environment and support its long-term competitiveness. However, we will also need to tackle the severe challenges arising from high construction cost so as to ensure the cost-effectiveness of public works projects. There is therefore a continuing and genuine need for Government to strengthen the cost management of capital works projects.

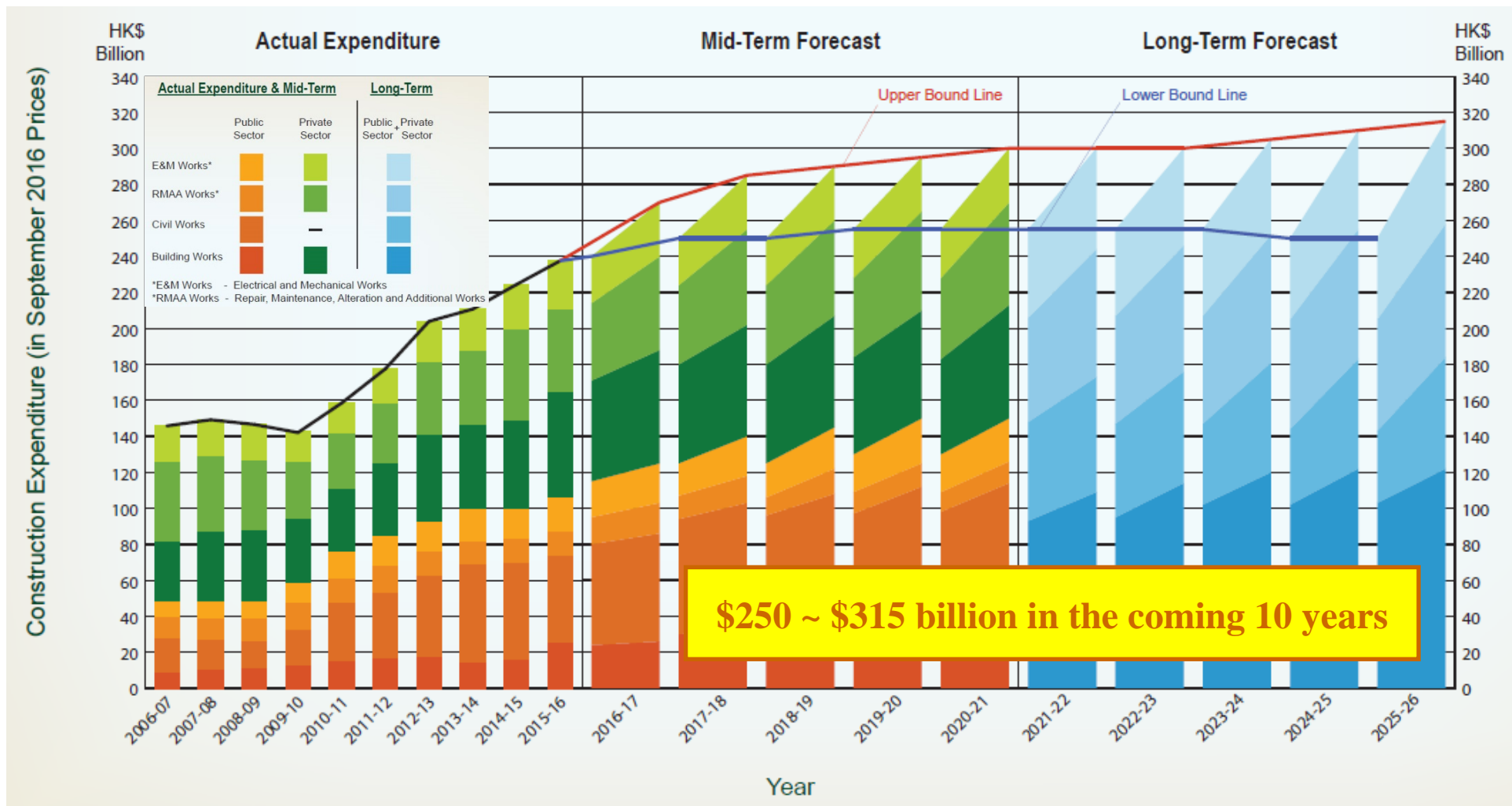
34. The PCMO has achieved some initial success in strengthening

control over the costs of public works projects. While taking forward the various cost management initiatives under the three-prong approach as described in the above, the PCMO will continue to work with the relevant project proponents and works departments to enhance cost effectiveness for the projects. The PCMO will also collaborate with the CIC and other stakeholders in promoting cost management culture in private construction works.

35. We obtained funding approval by the Legislative Council for the establishment of the PCMO until 31 March 2019. Many of the cost management measures implemented by PCMO require continuity to ensure effective reforms that are conducive to the sustainability of public finance and the long-term development of the construction industry. We will review the workload and staffing position of the PCMO from time to time. We will also make reference to relevant overseas establishments in assessing the need for a more permanent establishment and strengthening its manpower where necessary.

Development Bureau
July 2017

Construction Industry Council Construction Expenditure Forecast



Capital Works Contracts Adopting New Engineering Contract (NEC) Form

(A) Completed Contracts

No.	Contract Title	Contract/ Option	Year of Completion
1.	Upgrading of High Voltage Switchgears and Motor Starters in Cheung Sha Wan Sewage Pumping Station	ECC Option A	2017
2.	Sewerage at Yuen Long Kau Hui and Shap Pat Heung	ECC Option D	2017
3.	Lam Tsuen Valley Sewerage - Village Sewerage, Stage 2, Phase 1	ECC Option B	2016
4.	Provision of Electrical and Mechanical Facilities for Tin Liu Ha Sewage Pumping Station and Tong Min Tsuen Sewage Pumping Station	ECC Option C	2016
5.	Design and Construction of Tin Shui Wai Hospital	ECC Option A	2016
6.	Retrofitting of Noise Barriers on Tai Po Tai Wo Road near Po Nga Court	ECC Option C	2014
7.	Retrofitting of Noise Barriers on Fanling Highway (MTR Fanling Station to Wo Hing Road)	ECC Option C	2013
8.	Improvement of Fuk Man Road Nullah in Sai Kung	ECC Option C	2012

Remarks:

1. "ECC" means "Engineering and Construction Contract".
2. "ECSC" means "Engineering and Construction Short Contract".

(B) On-going Contracts

No.	Contract Title	Contract / Option	Year of Commencement
1.	Construction of a 30-Classroom Secondary School at Site 1A-2, Kai Tak Development	ECC Option B	2017
2.	Signature Project Scheme Sai Kung District - Reconstruction of the Sharp Island Pier	ECC Option A	2017
3.	Development of Anderson Road Quarry Site - Pedestrian Connectivity Facilities Works Phase 1	ECC Option B	2017
4.	Provision of Electrical and Mechanical Equipment for Kau To Sewage Pumping Station	ECSC	2017
5.	Provision of High Voltage Electrical Equipment for Stage III of Sha Tin Sewage Treatment Works	ECSC	2017
6.	Provision of Barrier-free Access Facilities for Highways Structures – Phase 3 Contract 8	ECC Option B	2017
7.	Lift and Pedestrian Walkway System at Cheung Hang Estate, Tsing Yi	ECC Option B	2017
8.	Improvement of Water Supply to Sheung Shui and Fanling	ECC Option D	2017
9.	Upgrading of Chai Wan Salt Water Supply System - Mainlaying and Upgrading of Siu Sai Wan Salt Water Pumping Station	ECC Option B	2017
10.	Signature Project Scheme in Sha Tin - Decking of Tai Wai Nullah in Sha Tin and Revitalisation of Shing Mun River Promenade near Sha Tin Town Centre	ECC Option D	2016
11.	Cycle Tracks from Tuen Mun to Sheung Shui - Remaining Works	ECC Option B	2016

No.	Contract Title	Contract / Option	Year of Commencement
12.	Provision of Universal Access Facilities for Highway Structures - Package 1 Contract 3	ECC Option A	2016
13.	Road and Infrastructure Works for Development at Lin Cheung Road, Sham Shui Po	ECC Option A	2016
14.	Improvement works at Mui Wo, Phase 2 Stage 1	ECC Option B	2016
15.	Improvement Works at Tai O - Phase 2 Stage 1	ECC Option B	2016
16.	West Kowloon Reclamation - mainworks (remainder) - footbridge at junction of Sham Mong Road and Tonkin Street West in Sham Shui Po	ECC Option B	2016
17.	Tseung Kwan O-Lam Tin Tunnel – Road P2 and associated works	ECC Option C	2016
18.	Demolition and ground decontamination works for development at North West Kowloon Reclamation Site 1, Sham Shui Po - Phase 1	ECC Option A	2016
19.	Tseung Kwan O-Lam Tin Tunnel - Northern Footbridge	ECC Option B	2016
20.	Widening of the Footbridge connecting Pak Wo Road to MTR Fanling Station and its Associated Works	ECC Option B	2016
21.	Tung Chung New Town Extension – Site Investigation Works Stage 1	ECC Option B	2016
22.	Queen's Hill Development - Road and Drainage Works	ECC Option B	2016
23.	Queen's Hill Development - Sewage Pumping Station Works	ECC Option A	2016
24.	Kai Tak Development - Stage 3B Infrastructure at Former North Apron Area	ECC Option B	2016

No.	Contract Title	Contract / Option	Year of Commencement
25.	Improvement Works of Rotating Biological Contactors (RBC) in Ma Wan Sewage Treatment Works	ECC Option A	2016
26.	Construction of an Additional Sewage Rising Main between Tung Chung and Siu Ho Wan and Associated Works	ECC Option D	2016
27.	Improvement Works Gasholder No.3 at Shatin Sewage Treatment Works	ECSC	2016
28.	Provision of Electrical and Mechanical Facilities for O Tsai Sewage Pumping Station and Enhancement Works of Electrical and Mechanical Facilities for Yung Shue Wan Sewage Treatment Works and Sok Kwu Wan Sewage Treatment Works	ECC Option A	2016
29.	Provision of Electrical and Mechanical Equipment for Detritor Nos. 1 and 2 of To Kwa Wan Preliminary Treatment Works	ECC Option A	2016
30.	Minor Drainage Improvement Works in Northern Hong Kong Island and North District	ECC Option A	2016
31.	Provision of Universal Access Facilities for Highway Structures - Package 1 Contract 2	ECC Option A	2015
32.	Provision of Universal Access Facilities for Highway Structures - Package 2 Contract 2	ECC Option A	2015
33.	Site Formation and Infrastructural Works near Tong Hang Road and Tsz Tin Road in Area 54, Tuen Mun	ECC Option C	2015
34.	Provision of Electrical and Mechanical Facilities for Eight Sewage Pumping Stations in the North and Tai Po Districts, N.T.	ECC Option C	2015

No.	Contract Title	Contract / Option	Year of Commencement
35.	Provision of Electrical and Mechanical Facilities for Shek Wu Hui Sewage Treatment Works - Further Expansion Phase 1A - Advance Works and Ng Chow South Road Sewage Pumping Station	ECC Option C	2015
36.	Retrofitting of Noise Barriers on Tuen Mun Road - Town Centre Section	ECC Option A	2015
37.	Improvement works at Mui Wo, phase 1	ECC Option C	2014
38.	Improvement of Fresh Water Supply to Cheung Chau	ECC Option C	2013
39.	Pak Hok Lam Trunk Sewer and Sha Tau Kok Village Sewerage	ECC Option B	2012
40.	Happy Valley Underground Stormwater Storage Scheme	ECC Option C	2012
41.	Yuen Long and Kam Tin Sewerage, stage 3 package 2	ECC Option D	2012
42.	Improvement to Pok Oi Interchange	ECC Option C	2012

Remarks:

1. "ECC" means "Engineering and Construction Contract".
2. "ECSC" means "Engineering and Construction Short Contract".

Reviewed Works Policies/Requirements Promulgated

No.	Items
1.	Requirements on site cleanliness and tidiness
2.	Uniforms for personnel working on public works sites
3.	Reimbursement of contractor's and sub-contractors' MPF contributions for their site personnel
4.	Sub-contractor management plan
5.	Site accommodation for site staff
6.	Digitalization of as-constructed drawings
7.	Digitalization of progress photos
8.	Requirements for drainage impact assessment of new development

Latest Trends in Tender Prices, Materials Costs and Labour Wages

The latest trends of tender prices, material costs and labour costs are set out in the ensuing paragraphs –

Tender Prices

1. As a result of cost management and coupled with the latest market situation, the 8 years long rising trend in tender price for public works projects has stopped. For government building works, the tender price index¹ remained stable in the last 12 months. For civil engineering works, we have also observed 13.7% decrease in tender price index² from Q2 2015 to Q2 2016. It is anticipated that the returned tender prices for public works contracts would remain steady over the coming months. The trend on tender price indices in the past 10 years is at **Annex 1**.

Material Costs

2. In general, materials accounts for around 50% of the total cost of construction work. As the majority of construction materials are imported from outside Hong Kong, materials price hinges on the global commodity market and the local construction demand has minimal influence. In the past few years, the movement of major construction material cost indices remains relatively flat³, with quarter-to-quarter changes varied from about -0.7% to +6.6% in Q1 2017. Trends of material cost indices for public sector construction projects in the past 10 years are at **Annex 2**.

¹ ArchSD Building Works Tender Price Index has slightly increased by 0.2% in the last 4 quarters but has slightly decreased by 0.2% in the last 2 quarters. It is also projected to remain stable in the coming few months.

² as assessed by the Civil Engineering Works Tender Price Index which is still under internal trial use.

³ according to information from the Census and Statistics Department

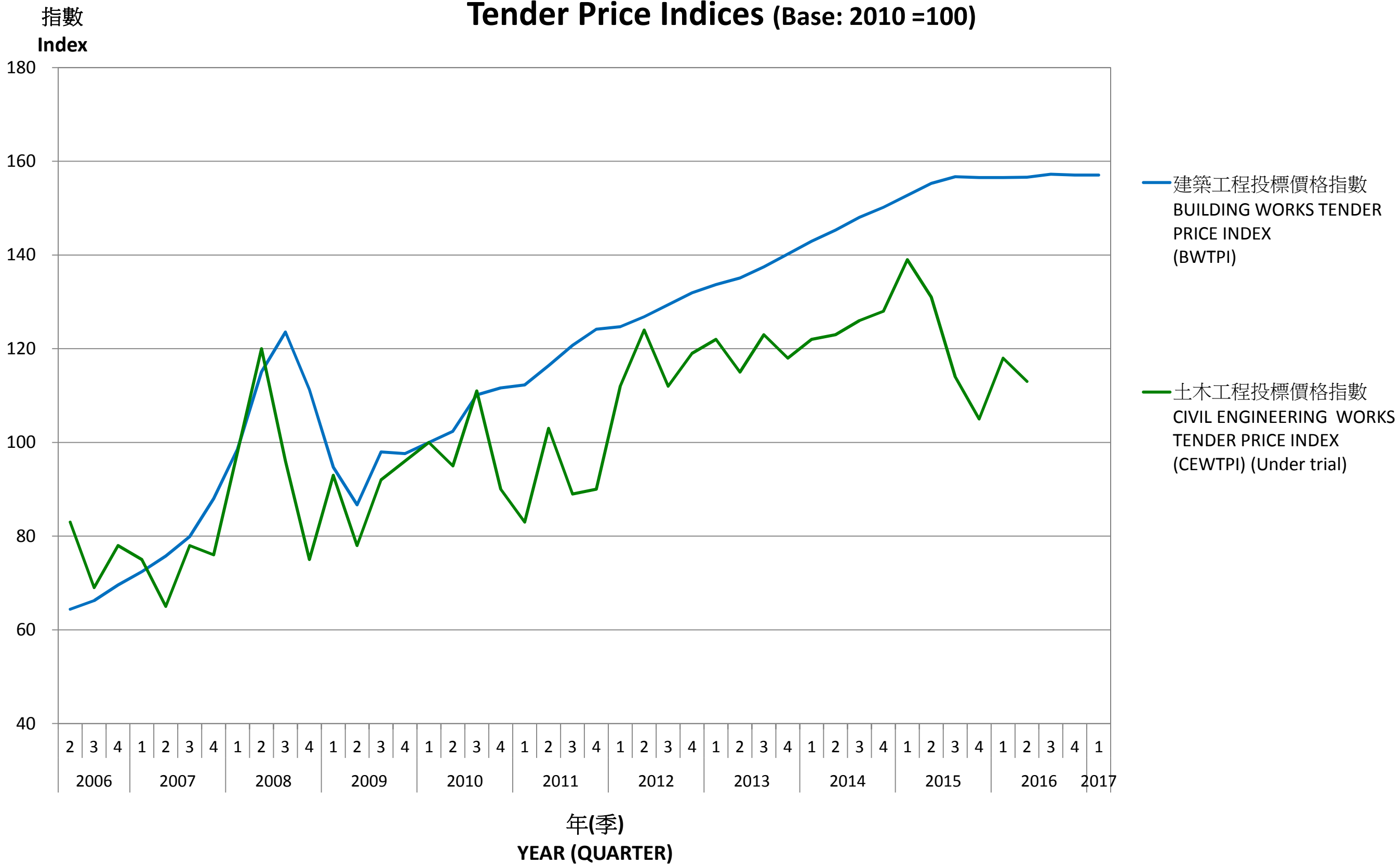
Labour Wages

3. In general, labour cost accounts for 30%⁴ of the total construction cost. The movement of wage level of construction workers generally follows that of other similar occupations⁵. It is observed that the rate of increase of daily wages for selected major skilled labour trades have slowed down since Q1 2016, with quarter-to-quarter changes varied from -2.7% to +1.9% in Q1 2017. The trend on labour wages indices for public sector construction projects in the past 10 years is at **Annex 3**.

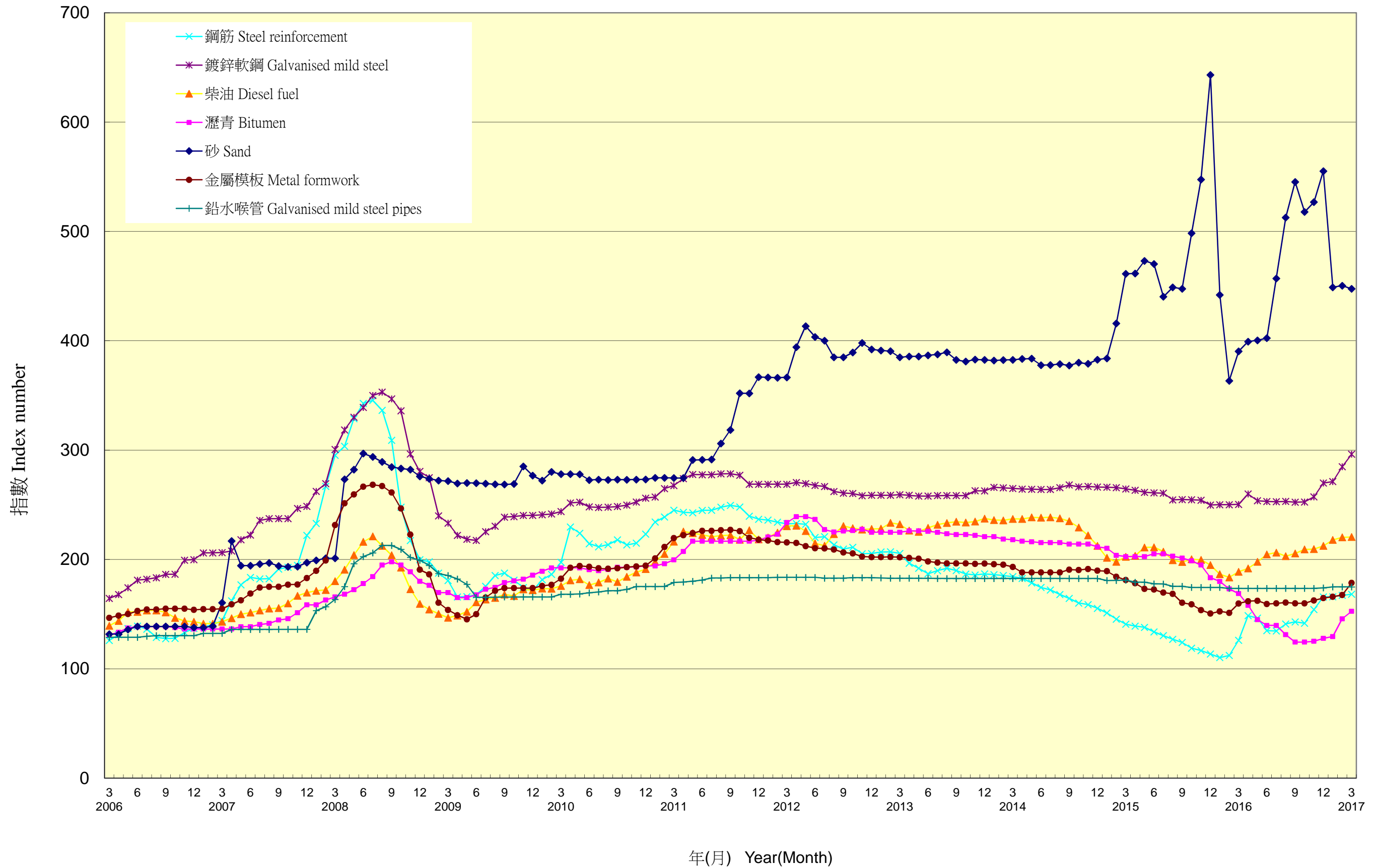
⁴ for highly labour intensive works, the labour cost can account for 40% of total construction cost

⁵ noticeably, that of the employees up to supervisory level

投標價格指數 (基期: 2010 = 100) Tender Price Indices (Base: 2010 = 100)



統計處公營建築工程的材料成本指數 C&SD Index Numbers of Costs of Materials used in Public Sector Construction Projects



從事公營建築工程的工人工資趨勢

Wages Trend for Public Section Construction Workers

