

**For discussion
on 15 January 2021**

Legislative Council Panel on Transport

The Hong Kong-Zhuhai-Macao Bridge

PURPOSE

This paper briefs Members on the latest developments of the Hong Kong-Zhuhai-Macao Bridge (HZMB) and the proposal to increase the Approved Project Estimate (APE) of **3QR** “Hong Kong-Zhuhai-Macao Bridge – funding support for Main Bridge” by \$1,514.7 million from \$9,046.5 million to \$10,561.2 million in money-of-the-day (MOD) prices.

BACKGROUND

2. The HZMB is the first cross-boundary land link connecting Hong Kong, Zhuhai and Macao (see **PLAN** attached). The entire HZMB project consists of the Main Bridge in the Mainland waters and the respective link roads and ports in Hong Kong, Zhuhai and Macao. The HZMB Main Bridge and the ports of the three places open 24 hours daily. The HZMB Authority, established under the Mainland laws as a non-profit-making public institution legal person, is responsible for the construction, operation, management and maintenance of the Main Bridge located in the Mainland waters. With the concerted efforts of the three governments and the HZMB Authority, the HZMB, including the Main Bridge, Hong Kong Section, Zhuhai Section and Macao Section, has been officially commissioned on 24 October 2018.

3. Since the commissioning of the HZMB, there is a significant reduction in the costs and travelling time between Hong Kong and western Pearl River Delta (PRD) for people and goods, which brings direct economic benefits to Hong Kong. For example, the travelling time between Zhuhai and the Hong Kong International Airport (HKIA) has been reduced from 4 hours to 45 minutes; and travelling time between Zhuhai and the Kwai Chung Container Terminal has been reduced from 3.5 hours to 75 minutes. The HZMB Hong Kong Port is situated

on Lantau Island and adjacent to the HKIA. The HZMB is the geographical converging point of Guangdong, Hong Kong and Macao. Coupled with development of the Guangdong-Hong Kong-Macao Greater Bay Area (GBA), it is anticipated that the HZMB will perform an important function of fostering the smooth flow of people, capital and technology within western PRD and GBA.

4. The HZMB Main Bridge is located within the Mainland waters and operated by the HZMB Authority on a self-financed basis. Income of the HZMB Main Bridge (including the tolls) is used by the HZMB Authority to repay the relevant bank loan of the Main Bridge project and meet the daily operation and maintenance expenses of the Main Bridge.

Operation of the HZMB

5. The HZMB has been operating smoothly since its commissioning. The governments of Guangdong, Hong Kong and Macao have been working closely to take forward various cross-boundary transport measures, including gradually increasing, in an orderly manner, the number of cross-boundary vehicle quotas for using the HZMB. At present, about 80 000 cross-boundary vehicles from Guangdong, Hong Kong and Macao (including cross-boundary private cars and hire cars, port shuttle buses, cross-boundary coaches, cross-boundary goods vehicles, etc) with relevant quotas and licences/permits are eligible to use the HZMB.

6. The Tuen Mun-Chek Lap Kok Link (TM-CLKL) Northern Connection has been commissioned on 27 December 2020. TM-CLKL provides residents in the Northwestern New Territories with a direct route to Lantau Island and the HZMB Hong Kong Port via Tuen Mun South, and it also serves as an efficient and convenient access to the HKIA and the whole area of Lantau Island, thus helping to divert some of the traffic flow of the Lantau Link to and from the HKIA and HZMB Hong Kong Port. Taking this opportunity, the Chief Executive has announced in the 2020 Policy Address that the Government will press ahead with the “Quota-free scheme for Hong Kong private cars travelling to Guangdong via the HZMB” (“the Scheme”), allowing eligible Hong Kong private cars to travel between Hong Kong and Guangdong via the HZMB without quota. The Scheme will facilitate Hong Kong residents to drive to the Guangdong Province for business, visiting families or sight-seeing on a short-term basis. We are

finalizing with the Guangdong government and relevant Mainland authorities the various specific arrangements and technical details for implementing the Scheme and will strive for early announcement of the details.

7. In addition, the Hong Kong Special Administrative Region (HKSAR) Government has accepted the proposals of the Hong Kong Airport Authority to develop automated car parks on the HZMB Hong Kong Port where self-drive visitors from Guangdong and Macao driving their cars via the HZMB and fly out from the HKIA or visit Hong Kong can park their cars there, and to take forward the Airport City Link project connecting the SKYCITY and HZMB Hong Kong Port by constructing a bridge system, thereby connecting the SKYCITY, HZMB Hong Kong Port and HKIA. We believe that these measures will help maximise synergy between the HZMB and HKIA.

8. The governments of Guangdong, Hong Kong and Macao will pay close attention to the operation of HZMB and continue to work closely to explore feasible enhancement proposals and press ahead with new cross-boundary transport measures for better utilising the HZMB, taking into account the capacity of the respective ports and connecting roads.

Adjustment of the Approved Estimate of the Main Bridge Project

9. The three governments agreed in 2008 to share the responsibility for the construction of the HZMB Main Bridge. The Mainland, HKSAR and Macao Special Administrative Region (Macao SAR) governments contributed Renminbi (RMB) ¥7 billion, RMB¥6.75 billion and RMB¥1.98 billion respectively, to the HZMB Main Bridge Project. The total contribution from the three governments was RMB¥15.73 billion. The remaining amount (approximately RMB¥22 billion) was financed by syndicated bank loans, and repayment would be covered by income generated from the operation of the HZMB.

10. In May 2009, the Finance Committee of the Legislative Council approved the upgrading of **3QR** to Category A at an estimated cost of \$9,046.5 million in MOD prices, to fund the share of the HKSAR government's contribution for the detailed design and construction of the HZMB Main Bridge. The HZMB Main Bridge project commenced in December 2009 and was officially opened to public on 24 October 2018 after 9 years of construction.

11. The HZMB Main Bridge project was mega in scale and highly complex. The construction works had to be conducted under extremely complicated conditions in the open sea since its commencement and the complexity of technical challenges was higher than expected. Some of the design and construction proposals had to be adjusted accordingly and the construction time become longer than expected. Coupling with factors such as increase in labour and material costs, these led to increase in construction costs in the later stage of the project. As a result, there is a need to adjust the approved estimate (similar to the “Approved Project Estimate” for public works in Hong Kong) for payment of the increased construction cost.

12. In 2017, the State Council approved an increase of RMB¥10.35 billion in estimated cost for the HZMB Main Bridge project. The three governments agreed that it would be financed by contribution from the three governments and syndicated bank loan by the HZMB Authority. The total additional contribution by the three governments is RMB¥4.688 billion. The amount to be contributed by the HKSAR Government is RMB¥2.012 billion¹. In accordance with the approval by the Ministry of Transport upon detailed review in end 2017, the revised approved estimate of the Main Bridge project was RMB¥48.068 billion, i.e. the increase in estimated cost was approximately RMB¥9.95 billion. The total additional contribution by the three governments maintained at RMB¥4.688 billion.

13. For the additional contribution from the three governments, the Mainland and Macao SAR governments have already settled their capital injection to the Main Bridge project. For the syndicated bank loan, upon agreement by the Joint Works Committee of the Three Governments², the HZMB Authority signed the supplementary loan agreement with the bank syndicates of approximate RMB¥5.3 billion in January 2020. Since the commissioning of the HZMB, the HZMB Authority has been pressing ahead with the account finalisation of Main Bridge project. According to the information provided by the HZMB Authority, account finalisation of the main construction contracts is expected to complete in three years after the commissioning of the HZMB and

¹ The amount to be contributed by the HKSAR Government is calculated from the increase in estimated cost of RMB¥10.35 billion, multiplied by the percentage of capital injection by the three governments (i.e. 45.3%) and the percentage of Hong Kong’s contribution (i.e. 42.91%).

² The Joint Works Committee of the Three Governments was established in accordance with “Inter-Governmental Agreement”. It aims to facilitate coordination and cooperation of the three governments on public administration issues concerning the HZMB project, and supervision of the legal person of the project (i.e. the HZMB Authority) during construction, operation, maintenance and management.

has entered the final stage.

14. For the contribution by the HKSAR government, we plan to seek support from the Public Works Subcommittee and seek funding approval from the Finance Committee within the current legislative session to increase the APE of **3QR**, so as to cover the additional costs (i.e. increase by \$1,514.7 million from \$9,046.5 million to \$10,561.2 million in MOD prices). Relevant details are set out in **Annex**.

ADVICE SOUGHT

15. Members are invited to note the above-mentioned developments regarding the HZMB, and to comment on the proposal to increase the APE of **3QR** and support its submission to the Public Works Subcommittee for consideration.

Transport and Housing Bureau
Transport Department
Highways Department
January 2021

圖例
LEGEND

-  橋樑
BRIDGE
-  隧道
TUNNEL
-  人工島
ARTIFICIAL ISLAND
-  通航孔橋
CHANNEL BRIDGE



九州航道橋
Jiuzhou Channel Bridge

伶仃洋
LINGDINGYANG



青州航道橋
Qingzhou Channel Bridge



海底隧道及人工島
Subsea Tunnel and Artificial Island



港珠澳大橋

Hong Kong-Zhuhai-Macao Bridge (HZMB)

**3QR – Hong Kong-Zhuhai-Macao Bridge – funding support for Main Bridge
Increase in Project Cost**

PROJECT SCOPE AND NATURE

In May 2009, the Finance Committee (FC) of the Legislative Council (LegCo) approved the upgrading of **3QR** to Category A at an estimated cost of \$9,046.5 million in money-of-the-day (MOD) prices. The approved project scope of **3QR** comprises –

- (a) detailed design and construction of a 29.6 kilometres (km) dual three-lane carriageway in the form of bridge-cum-tunnel structure comprising a tunnel of about 6.7 km;
- (b) detailed design and construction of two artificial islands for the tunnel landings west of the Hong Kong Special Administrative Region boundary;
- (c) associated works including civil, structural, environmental mitigation measures, drainage, electrical and mechanical works, installation of traffic control surveillance system and signage, etc.;
- (d) miscellaneous expenses including land provision for works area, conservation measures for Chinese White Dolphins, further topical studies, testing such as detailed geotechnical assessment, engagement of consultants to carry out site supervision, bank loan interests accrued during construction, etc.; and

- (e) operating cost of the management body of the HZMB Main Bridge (i.e. the Hong-Kong-Zhuhai-Macao Bridge Authority, hereinafter referred to as “HZMB Authority”)¹ from commencement of the detailed design until the commissioning of the Main Bridge.

PROJECT COST OF THE HZMB MAIN BRIDGE

2. In February 2010, the three governments of Guangdong, HKSAR and Macao SAR signed the “Inter-Governmental Agreement in respect of the Construction, Operation, Maintenance and Management of the HZMB” (“Inter-Governmental Agreement”) and confirmed that issues associated with the construction, operation, maintenance and management of the HZMB Main Bridge, the link roads and boundary crossing facilities of the three places would be dealt with according to respective local laws of the three places (the territoriality principle). As the HZMB Main Bridge locates within the Mainland waters, the project has to be implemented in compliance with and according to the works implementation procedures of the Mainland, including its methodology for estimation of project cost, etc.

3. The HZMB is a mega scale transport infrastructure project across Guangdong, Hong Kong and Macao. Its scope, technical and engineering schemes, estimated sum of project investment and financing ratio were approved

¹ The HZMB Authority is a legal entity and non-profit-making public institution set up under relevant Mainland laws in 2010. It is responsible for taking forward the construction, operation, maintenance and management of the Main Bridge project under the supervision of the three governments. The HZMB Authority oversees the implementation of the Main Bridge project, including preparing the design and construction plan, carrying out tendering and assessment, managing site supervision, conducting quality assurance and material testing as well as managing, operating and maintaining the Main Bridge upon its commissioning. The HZMB Authority has also entered into contracts with various agents/contractors carrying out the above works.

by the State Council in the project approval stage. In the subsequent preliminary design stage, the Ministry of Transport reviewed and approved the project estimate (similar to the “Approved Project Estimate” of public works in Hong Kong) having regard to parameters such as the technical standards, wage rates, unit costs of materials and equipment, etc. of the Mainland with a view to controlling the total sum of project investment.

4. In 2008, the three governments agreed to share the responsibility for construction of the Main Bridge. Of the total sum of project investment contributed by the three governments which amounted to RMB¥15.73 billion, RMB¥7 billion (44.5%) was contributed by the Mainland Government, RMB¥6.75 billion (42.9%) by the HKSAR Government, RMB¥1.98 billion (12.6%) by the Macao SAR Government, with the remaining amount financed by syndicated bank loans of which repayment would be covered by the income generated from the operation of the HZMB.

5. When the funding application for 3QR project was submitted to the Legislative Council in May 2009, the estimated project cost of HZMB Main Bridge based on the engineering feasibility study report was about RMB¥37.6 billion of which about 42%, amounting to RMB¥15.73 billion, would be contributed by the three governments. Subsequently, RMB¥34.72 billion was approved as the estimated project cost by the State Council in November 2019 and it was decided that the amount of contribution by the three governments be remained unchanged at RMB¥15.73 billion, amounting to around 45.3% of the project cost. Upon completion of the preliminary design, the Ministry of Transport approved the preliminary design and revised the project estimate of the HZMB Main Bridge to RMB¥ 38.118 billion. As approved by the State Council, the amount of contribution by the three governments still remained unchanged at RMB¥15.73

billion while the remaining RMB¥22.388 billion would be financed by syndicated bank loan.

6. According to the workflow of project implementation in the Mainland, the project estimate of the HZMB Main Bridge project was compiled based on its preliminary design in 2010. However, owing to the enormous scale of the project and its complexity, various engineering challenges and variations encountered during the detailed design and construction stages could not be fully foreseen back then. Given that the construction took place in the open sea where works conditions were extremely complicated, some of the design and construction schemes had to be refined in view of the greater-than-expected construction difficulties, resulting in a longer construction period than expected. Coupled with factors such as increases in the labour and material costs, construction costs escalated during the later stage of the works and hence the approved project estimate has to be adjusted for payment of additional costs anticipated in the account finalisation of the project. In accordance with the relevant requirements in the Mainland, the HZMB Authority has conducted a comprehensive assessment of the project estimate and submitted a report on the adjustment of the approved project estimate for review by the Joint Works Committee of the Three Governments (JWC)². The JWC has engaged an independent consultant to review the proposed adjustment and offer comments to the HZMB Authority. The HZMB Authority then submitted the proposed adjustment to the approved estimate to the Ministry of Transport.

² The Joint Works Committee of the Three Governments was established in accordance with “Inter-Governmental Agreement”. It aims to facilitate coordination and cooperation of the three governments on public administration issues concerning the HZMB project, and supervision of the legal person of the project (i.e. the HZMB Authority) during construction, operation, maintenance and management.

7. In 2017, the State Council approved an increase of RMB¥10.35 billion in project estimate for the Main Bridge project to be financed by contribution from the three governments and syndicated bank loan. Regarding the additional contribution by the three governments, it would be of the same ratio as adopted in the project approval stage (45.3%), i.e. RMB¥4.688 billion (RMB¥10.35 billion X 45.3%). Contribution from the three governments would also be calculated according to the prescribed sharing ratio, namely 44.5% for the Mainland Government (i.e. RMB¥2.086 billion), 42.9% for the HKSAR Government (i.e. RMB¥2.012 billion) and 12.6% for the Macao SAR Government (i.e. RMB¥0.59 billion). The remaining RMB¥5.662 billion would be financed by a syndicated bank loan by the HZMB Authority. Therefore, the contribution required from the HKSAR Government would be RMB¥2.012 billion (approximately HK\$2.4224 billion). In end 2017, as per the State Council's request for minimising the project investment to the furthest extent possible without compromising the quality of works, the Ministry of Transport carried out a detailed review and lowered the increase in project estimate to RMB¥9.95 billion. The total project estimate of the Main Bridge was revised to RMB¥48.068 with the additional contribution from the three governments maintained at RMB¥4.688 billion and the syndicated bank loan to be sought by the HZMB Authority reduced to approximately RMB¥5.262 billion.

JUSTIFICATION

8. As at 31 December 2020, the actual expenditure of **3QR** is HK\$7,896.6 million. Following a detailed review of the financial position of the project, we consider it necessary to increase the APE of **3QR** by HK\$1,514.7 million from HK\$9,046.5 million to HK\$10,561.2 million (in MOD prices) to

cover the additional costs arising mainly from the following –

- (a) Adjustment to construction costs:
 - (i) update of resource input standard;
 - (ii) variations to the works;
 - (iii) adjustment to labour and material costs; and

- (b) Adjustment to other associated costs.

Details of the proposed increase in APE are set out in paragraphs 9 to 23 below.

Adjustment to construction costs

9. Construction costs refer to costs directly incurred from the construction of bridge structures and associated facilities, including temporary and ancillary facilities required during the construction process. The adjustment to construction costs was mainly due to three factors: (i) update of resource input standard; (ii) variations to the works; and (iii) adjustments to labour and material costs. Cost adjustment caused by these three factors are detailed in paragraphs 10 to 21 below.

Update of resource input standard

10. Resource input required for each works procedure is one of the important elements in preparation of cost estimate of works projects in the Mainland. The relevant Mainland authorities would promulgate a set of standards for the resource input required for each works procedure, known as “Budget Norm Standards” (定額標準), to serve as basis for preparation of project cost estimate. The “Budget Norm Standards” cover the resource input requirements of the works procedures for constructing a particular quantity of works under normal circumstances, including labour, materials and machineries. In preparing the

project estimate, the resources required will be calculated based on the “Budget Norm Standards”. The original approved estimate HZMB Main Bridge project was prepared based on the preliminary design and the resources requirements of different works procedures were estimated according to the prevailing “Budget Norm Standards” at that time, while works involved in the construction of the Main Bridge (including bridges, tunnels, road surfaces and subgrades) were mainly calculated according to “Public Road Works Budget Norm Standard” (《公路工程預算定額》), etc. When preparing the original estimate, works in the open sea environment were yet to be covered under the “Budget Norm Standards”, though references were made to similar works projects in the Mainland as far as possible to factor in the resources required for carrying out works procedures in the open sea in the original approved project estimate.

11. However, the Main Bridge project was of such complexity and enormous scale that were unprecedented in the Mainland. It involved the construction of the world’s longest immersed tunnel, about 23 km long sea-crossing bridges and two artificial islands of about 100,000 square metres (m²) each under the very challenging works environment of the open sea. The works area of the Main Bridge spanned across a number of busy navigation channels with an average daily traffic volume up to 4,000 vessels. This, together with the frequently changing wind and wave conditions as well as complex tidal flow in open sea where works were conducted, led to a higher level of resources deployed during construction than originally estimated.

12. In view of the above, the Department of Transportation of Guangdong Province has, with reference to the actual construction methods and resources required for the Main Bridge project, established new resource input standards for the different works procedures for constructing the offshore bridge, immersed tube

tunnel and artificial island projects and promulgated the “Supplementary Budget Norm Standard for Offshore Bridge Project in Guangdong Province (Provisional)” (《廣東省沿海橋樑工程預算補充定額(試行)》) and the “Supplementary Budget Norm Standard of Offshore Subsea Tunnel and Artificial Island Projects in Guangdong Province (Provisional)” (《廣東省沿海沉管隧道、人工島工程預算補充定額(試行)》) in September 2016 and January 2017 respectively. The project estimate of the Main Bridge project has thus been adjusted according to the new standards.

13. For the bridge works, owing to the difficulties and challenges mentioned in paragraphs 10 and 11 above, the vessel and mechanical equipment were deployed for longer period of time and more large-size vessels and machines were needed, resulting in higher expenditure. In view of the adjustment to the “Budget Norm Standards” mentioned above, there was a total increase of RMB¥3.4 billion in the construction and preliminaries cost estimate for bridge works.

14. For the tunnel works, it was expected in the preliminary design that the precasting of most of the immersed tube tunnel segments would be carried out outdoors, which is prone to weather conditions. In view of the tight construction schedule of the HZMB Main Bridge project and to minimize the risk of project delay, it was decided at the detailed design stage that a large indoor precast yard with segregated works zones for segment fabrication would be built to minimize the impact of adverse weather conditions and to better manage the risks of project delay as well as the construction quality and safety control. In this connection, additional large-scale specialised equipment including the tunnel segment transfer system were deployed, resulting an increase in the cost for precasting of segments. Moreover, laying of gravel bed for the foundation works of the immersed tube tunnel had to be conducted at some 40 metres (m) below sea level, and the

construction works were more difficult than expected. To meet the requirement to lay the gravel bed with high precision, after studying the technology of oil drilling platform system, the engineering team manufactured a specialised vessel with integrated working platform to ensure the stability of the vessel at open sea for laying of gravel bed with precision. The cost estimate for the immersed tube tunnel foundation works was thus increased. Furthermore, connection of tunnel segments required high precision, and its transportation at sea and installation could be affected by environmental factors such as water current, waves and wind speed. To overcome these technical difficulties, a specialised system was developed during construction phase to attain the precision level necessary for carrying out the tunnel segment connection works in the deep water environment. Together with adjustment to resources required by other works procedures such as installation and removal of watertight bulkhead at tunnel segment joints, the construction and preliminaries cost estimate for tunnel works was increased by approximately RMB¥1.825 billion.

15. The updates to resource input standards mentioned in paragraphs 10 to 14 led to an increase of a total of approximately RMB¥5.225 billion in the construction and preliminaries cost estimate for bridge and tunnel works of Main Bridge.

Variations to the works

16. The design and construction schemes of the bridge, tunnel and building works recommended in the preliminary design had to be revised to cater for the analysis and investigation results during the detailed design stage, actual site conditions and the latest management and maintenance requirements, thus leading to works variations.

17. For variations to bridge works, during the detailed design stage, the wind tunnel test revealed that some sections of the Main Bridge would generate higher level of vibration³ under low wind speed and thus addition of dampers was required. With reference to the asphalt pavement design experience of large-scale steel bridges in Hong Kong and findings of the bridge asphalt pavement study, a more durable asphalt material was adopted for the bridge pavement. To save on-site construction time and reduce environmental impact during construction, the construction material of the main towers of one of the bridge of about 1 km long was changed from concrete in the preliminary design to steel. This led to an increase in the cost estimate. Although the HZMB Main Bridge was designed in compliance with the marine safety standards in the Mainland, the bridge was located at busy navigation channels, additional study was thus conducted which recommended provision of collision prevention measures in the Main Bridge to further minimise the risks of vessels collision with bridge towers and bridge pier. Furthermore, there were variations to the west landing cum toll plaza of the Main Bridge, including improvement to the design of the landing to reduce the height of wave in the nearby sea and minimize the impact on the vessels travelling in the nearby area; and in accordance with result of the ground investigation carried out in the detailed design stage, the pile design of the toll plaza structures needed to be improved. Taking into account the other variations, the construction and preliminaries cost estimate for bridge works was increased by RMB¥1.39 billion approximately.

18. During tunnel construction, it was necessary to maintain live operation of the navigation channels while ensuring smooth transportation and installation of

³ The wind tunnel test for the bridge carried out during the detailed design stage revealed that vortex induced vibration would occur at some sections of the Main Bridge under low wind speed and may affect the operation of the Bridge. Addition of damper was therefore required to reduce the amplitude of vortex induced vibration to meet the requirement of the relevant design standard.

tunnel segments. In the course of construction, some navigation channels had to be widened in view of the actual maritime situation and to cater for marine transportation arrangement of tunnel segments. Moreover, tunnel segments were mainly transported along existing navigation channels, tunnel segments therefore had to be transported from the precast yard via the navigation channels on the western side, then along the tunnel alignment, to the installation locations. When installing tunnel segments on the eastern side, the distance of transportation would be long and thus there is higher possibility of the transportation being affected by water current. Therefore, additional dredging works were carried out on the eastern side of the tunnel alignment to set up a temporary navigation channel, thus shortening the distance and time for transportation of tunnel segments to the eastern side to ensure their smooth transportation and installation. Furthermore, due to the complex water current and busy marine traffic at the Pearl River Delta estuary, siltation in the trench of the immersed tube tunnel was more serious than expected, which had increased the volume of silt to be cleared. For example, the volume of maintenance dredging increased drastically from about 580,000 cubic metres (m³) as estimated in the preliminary design to 3,540,000 m³. Taking into account other works variations, the construction and preliminaries cost estimate for tunnel works was increased by RMB¥1.633 billion approximately.

19. In the period between the completion of preliminary design and detailed design, there were major changes⁴ to the design standards for building construction works in the Mainland. To meet the requirements of the new standards and operational need, the total floor area of buildings on the eastern and western artificial island had been increased from about 43,600 m² in the

⁴ For instance, outdoor fire hydrant design water supply rate was 30 litres per second in the preliminary design. Subsequently, the “Technical Specification for Fire Water Supply and Fire Hydrant Systems” (《消防給水及消防栓系統技術規範》) was promulgated in 2014. According to the latest standard, outdoor fire hydrants should have a water supply rate of 40 litres per second and be retrofitted with an outdoor fire cistern of about 435 m² in area.

preliminary design to 73,300 m², additional spaces of which were allocated mainly for installation of fire services, mechanical and electrical equipment and associated ducting required for tunnel and traffic management. Meanwhile, the number of pipeline hangers was also increased; for the outdoor rainwater drainage system on the artificial islands, the return period of design rainfall was increased from 120 years in preliminary design to 200 years to reduce the risk of rainwater entering into the tunnel; and the fire protection system was improved to meet the latest fire safety regulations. Together with other works variations, the construction and preliminaries cost estimate for building construction works was increased by RMB¥0.311 billion approximately.

20. Due to the variations to the works mentioned in paragraphs 16 to 19 above, it is necessary to increase the project construction and preliminaries estimate by RMB¥3.334 billion approximately.

Adjustments to labour and material costs

21. In the Mainland, relevant authorities would promulgate unified standards regarding the labour and material costs of the construction industry. During the construction period, the labour and material costs had escalated in the Mainland, leading to an increase in the construction costs. The labour wage was adjusted according to the updated labour wage standards issued by the Department of Transportation of Guangdong Province. Moreover, the material cost was adjusted according to the average of the monthly material price (材料價) released by the Department of Transportation of Guangdong Province during the construction period. Owing to the adjustments to labour and material costs, the cost estimate was increased by RMB¥1.080 billion approximately.

Adjustment to other associated costs

22. Apart from the construction cost adjustment, there were adjustments to other costs such as monitoring and testing, research and experiment, design and project management, etc. and the cost estimate was increased by around RMB¥0.711 billion in total.

23. Owing to the factors mentioned in paragraphs 9 to 22 above, the estimate for the HZMB Main Bridge project was increased by approximately RMB¥10.35 billion in total. As mentioned in paragraph 7 above, the HKSAR Government would have to contribute RMB¥2.012 billion (approximately HK\$2.4224 billion).

Use of Provision for Renminbi Fluctuation

24. As mentioned in the paper PWSC(2009-10)17 concerning **3QR** discussed at the Public Works Subcommittee in 2009, 10% of the project cost (i.e. HK\$843 million) has been earmarked as a provision to cater for fluctuation in Renminbi exchange rate. Currently, the remaining sum of this provision is HK\$402.2 million. With reference to the RMB exchange rate fluctuation in the past year, it is proposed to allow 10% of the additional contribution required by the HKSAR Government (i.e. HK\$242.2 million) as a provision for fluctuation in Reminibi exchange rate whilst the remaining HK\$160.0 million will be used for offsetting the increased project costs.

SUMMARY OF FINANCIAL POSITION

25. A summary of the proposed increase of HK\$1,514.7 million is as follows –

Factors	Increased cost estimate (RMB¥ million) (I)	Proposed increase /offset in MOD prices for 3QR (HK\$ million) (II) = (I) x RMB/HKD exchange rate x the percentage of capital injection by the three governments x the percentage of Hong Kong's contribution ⁵	% of the total increase/offset
Increase due to –			
(a) Adjustment to construction costs			
(i) additional resources arising from updated resource input standards	5,225	1,222.9	50.5
(ii) Variations to the works	3,334	780.3	32.2
(iii) Adjustment to labour and material costs	1,080	252.8	10.4
(b) Adjustment to other associated costs	711	166.4	6.9
(c) Increase in cost estimate (c)=(a)+(b)	10,350	2,422.4	100.0
(d) Provision for fluctuation in RMB exchange rate (d)=(c)x10%		242.2	
(e) Total increase of 3QR (e) = (c)+(d)		2,664.6	

⁵ The RMB/HKD exchange rate is 1.204 (according to RMB-offshore selling price as at 31 December 2020 by the Hong Kong Association of Banks); the percentage of capital injection by the three governments is 45.30% (paragraph 5 above); the percentage of Hong Kong's contribution is 42.91% (paragraph 7 above).

Factors	Increased cost estimate (RMB¥ million) (I)	Proposed increase /offset in MOD prices for 3QR (HK\$ million) (II) = (I) x RMB/HKD exchange rate x the percentage of capital injection by the three governments x the percentage of Hong Kong's contribution ⁵	
The total increase in (e) above is			
partly offset by –			
(f) Remaining provision for contingencies ⁶		(747.7)	65.0
(g) Remaining provision for fluctuation in RMB exchange rate		(402.2)	35.0
(h) Total savings of 3QR (h)=(f)+(g)		(1,149.9)	100.0
(i) Proposed increase of 3QR (i)=(e)-(h)		1,514.7	

Transport and Housing Bureau
January 2021

⁶ As the construction of the HZMB Main Bridge has come to the project finalisation stage, we consider that no additional provision is needed for use as contingencies in the future. The remaining provision of HK\$747.7 million for contingencies under the original APE will be used to offset the additional costs arising from factors mentioned above.