

Hong Kong prepares to go underground

The government is planning a holistic underground development scheme that will connect disparate neighbourhoods, increase mobility and alleviate street-level congestion, but stiff challenges need to be overcome to ensure success.

Kit M Yip

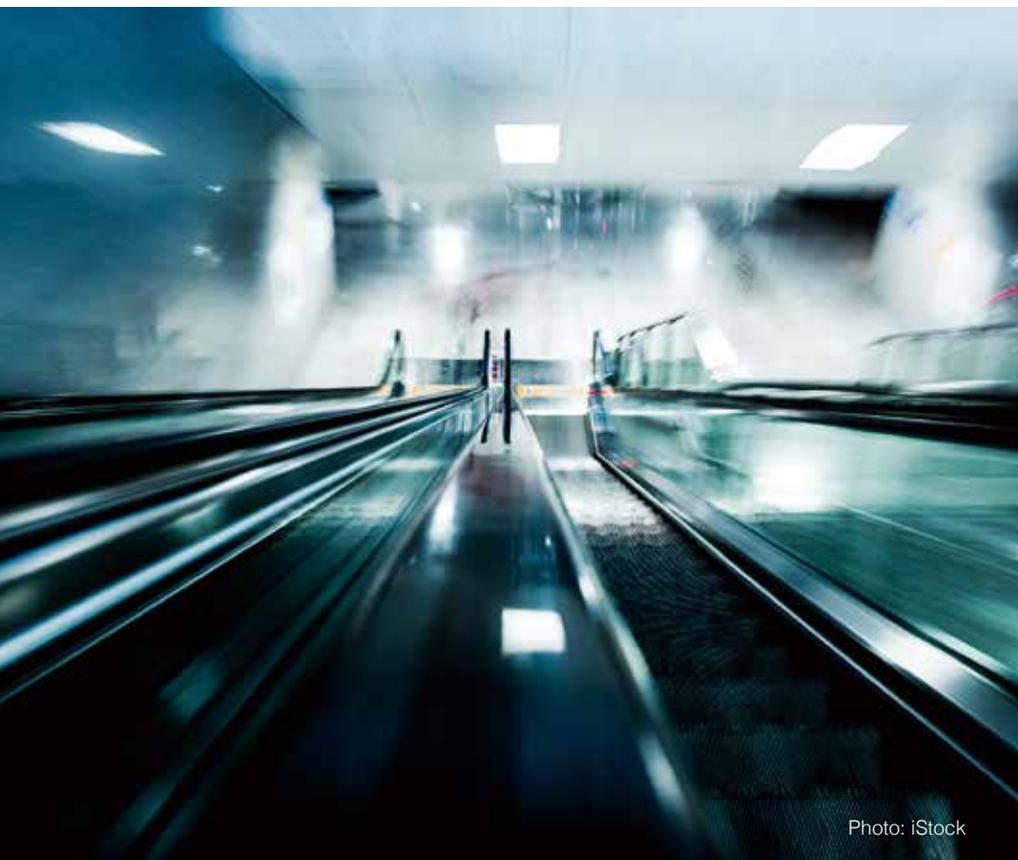


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Principal Assistant Secretary (Works),
Development Bureau



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Chief Geotechnical Engineer,
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Sr Tony Chan Tung-ngok
Honorary Secretary, HKIS



Sr Prof James Kenneth Pong
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The construction of underground space can help ease the problem of urban congestion dilemmas in Hong Kong by providing more space below the ground level.

“ [Underground space development] is intended to create underground pedestrian links and additional usable space to solve the problem of limited land resources. It's not a development project per se. ”

While the development of underground space has already been successfully undertaken in many countries around the world, the practice has not yet been fully explored in Hong Kong. This is all set to change, however, with the recent launch of Hong Kong's pilot study in selected Strategic Urban Areas (SUAs) for public engagement. To discuss the issue further, representatives from the HKIS recently met with individuals from the Development Bureau (DEVB), the Civil Engineering and Development Department (CEDD) and the Planning Department (PlanD).

The aforementioned government meeting was attended by DEVB's Principal Assistant Secretary (Works) Ir Francis Chau Siu-hei and Assistant Secretary (Infrastructure Coordination) Mr Tim Fung Tin-yin, CEDD's Chief Geotechnical Engineer Ir Tony Ho Ying-kit and PlanD's Chief Town Planner Ms April Kun Ka-yin. Attendees from the HKIS included President Sr Thomas Ho Kwok-kwan, Honorary Secretary Sr Tony Chan Tung-ngok and *Surveyors Times* Honorary Editor Sr Dr Joseph Chan Hing-lun.

Tony Ho outlined the value of pursuing underground space development. “The exploration of underground space development considers first and foremost the overarching factor of connectivity, such as connections with MTR stations,” he said. “It is intended to create underground pedestrian links and additional usable space to solve the problem of limited land resources. It's not a development project per se.”

The Study Team is now exploring the preliminary planning concepts for four SUAs. First, the Tsim Sha Tsui West concept involves utilising space underneath Kowloon Park to create a regional multidirectional underground space network. The network will ultimately connect with Jordan to the north, the West Kowloon Cultural District to the west, Tsim Sha Tsui and East Tsim Sha Tsui MTR stations, and the busy Nathan Road to the south and east.

The concept for the second and third SUAs, Causeway Bay and Happy Valley, aims to better connect several key destination nodes, namely Victoria Park, Happy Valley and Hong Kong Stadium. Victoria Park, as a venue for year-round large activities, will benefit from convenient and barrier-free access to nearby Causeway Bay and Tin Hau MTR stations. There is also the distinct potential for creating space for a mix of facilities to address the needs of the district.

Finally, the Admiralty and Wan Chai concept involves using the underground space of Southorn Playground for connecting Wan Chai North and the waterfront by enhancing north-south pedestrian connectivity, and alleviating current pressure on the O'Brien Road elevated walkway.

Tony Ho explained that the below-ground setting is equally congested, due to presence of building foundations, underground utilities and MTR tunnels. It is not easy to identify suitable areas for developing underground space, not to mention other constraints such as narrow street and busy traffic environment. With all these taken into consideration, the sizeable parks and playground in the proximity of MTR stations can offer an opportunity with less physical barriers for

developing underground space to improve the connectivity and create new solution space to meet the needs of the society.

The government representatives noted that developing underground space to enhance connectivity is not entirely new to Hong Kong. Existing examples include the pedestrian subway system between Tsim Sha Tsui and East Tsim Sha Tsui MTR stations, which links the underground levels of several hotels and retail complexes, as well as the basements of many other buildings. Notable examples abroad, they said, include the all-weather pedestrian network in Montreal, and the area beneath the public park in Paris' central Les Halles which links an underground shopping and leisure complex to Metro stations in the area.

The government representatives also explained how public concerns on the preliminary proposals might be addressed, such as excluding the sensitive areas of the parks, including those with dense vegetation and heavily used facilities. Development will likely be carried out in phases to minimise impact on above-ground facilities. They were also keen to emphasise that whereas some people may misunderstand the plans as being focused on the building of “shopping malls”, in actual fact the plans focus on enhancing connectivity, alleviating street-level congestion while enhancing the living environment with facilities for recreation, arts and community activities, as well as for commercial elements.

The government recently finished its Stage 1 Public Engagement (PE1) for the Pilot Study on Underground Space Development in Selected SUAs, which has the aim to create a “connected, coherent, high-quality and vibrant network of underground space”. Public feedback from the consultation has been generally positive. Some people have given suggestions regarding the use of underground space – for example creating space for young entrepreneurs. Some have expressed concerns about possible disturbance to the parks during construction. After PE1, the government will proceed to develop conceptual schemes and underground master plans with due consideration of the views received. Preliminary technical assessments on various aspects of the schemes including geotechnical/structural constraints, fire safety, impact on the surrounding environment and financial viability will also be undertaken. The Stage 2 PE will then be carried out.

In response to more specific concerns including fire safety, conservation and the impact of construction on the public, the government representatives stated that they will definitely put safety and public interest first and explore the best solutions by using the latest technologies. Heritage, as well as “Old and Valuable” trees, will be preserved. The underground developments may expand further pending the urban renewal of older districts. The government will also take into consideration the results of the PE and will remain open to suggestions.

April Kun reiterated that using both above-ground and underground space can facilitate the streaming of pedestrians and solve crowd problems. Even if population growth may see a drop in the times to come, congestion still needs to be alleviated. “We have listened to

“ Hong Kong’s closest comparison is the hustle and bustle in the city centres of Tokyo or New York. Our CBD is busy even on weekends and weeknights, and underground space can help alleviate congestion. ”

local members consistently expressing concerns about congestion in Tsim Sha Tsui, Wan Chai and Causeway Bay, thus showing the need to enhance connectivity in areas which have reached saturation point.”

Hong Kong is unique; its closest comparison is cities in Japan,” she said. “Whereas Hong Kong people travelling in Japan may perceive shopping in association with ‘underground cities’, they are in fact about connectivity and walkability. They provide alternative pedestrian routes and contingency for adverse weather or natural disasters. Shopping is only meant to enhance the pedestrian experience.”

Kun also stressed that the government understands public concerns about the impact of underground development on traffic and users of above-ground facilities. “We hope people understand that, as with home renovations, there will be an impact for a while. When proceeding to the Conceptual Scheme, we will explore and choose methods with less impact, such as phased rather than one-off development. We will continue to communicate with, and cater to, the needs of the district. The future Underground Master Plan will look at underground space development three-dimensionally.”

HKIS Honorary Secretary Sr Tony Chan points out that Hong Kong’s development historically started along the coasts of Victoria Harbour and that while new towns have been developed in the outlying areas, people still tend to congregate in crowded urban areas. Since the urban land is already mostly used, he believes developing underground space to be a viable solution to relieve congestion and enhance connectivity to transportation systems, commercial areas and hubs.

Chan however adds that a number of technical constraints exist that involve land ownership and underground obstructions. “If space is to be developed under existing buildings, it will involve solving tough issues such as land acquisition, and conflicts with existing underground structures for things like water, electricity, sewage and MTR lines. These issues can be avoided if space is developed under public parks, though there would still be an impact on park users during construction,” he says.

Despite slowing population growth and the proliferation of unoccupied units in shopping districts, Chan believes underground space development is still necessary. “For Hong Kong’s long-term benefit, development needs to be continued. The census says the local population will continue to grow. Studies show that congestion causes emotional stress and has a social impact. Unoccupied store space is only a temporary phenomenon, and tourists will continue to come. We cannot assume that things will remain stagnant.”

Sr Prof James Kenneth Pong, Chairman of the HKIS Planning and Development Division and a chartered town planner, chartered building engineer, authorised person and barrister, also highlighted the importance of determining property ownership, given that under the laws of Hong Kong a person who owns land also owns anything below it – including, but not limited to, underground space. In addition, he explained the different construction methods that could be used to develop underground areas.

“Technically, underground space can be created by tunnel boring, but this is costly and requires careful investigation and planning with regards to the nature of the terrain. Alternatively there is the comparatively simple ‘open cut’ method. This begins above ground, cutting downwards to create a void. Once development is completed underground, the void is covered up again for activities to continue above ground. For Hong Kong, it is more likely that development will start using the open-cut method in public parks, where there are few ownership issues. Underground passageways will then have to be constructed to amalgamate these otherwise segregated underground voids.”

Pong adds that careful attention needs to be paid to fire regulations, which require that underground structures have stronger fire resistance. “Underground structures must have the capacity to contain a fire in one location for four hours to give people ample time to escape before it spreads. The requirements for robust structures can be modified, but only when one can demonstrate that such modification is justified under a fire-engineering approach, which aims at performance compliance with all the technically specified fire regulations. Coupled with fire resistance requirements, another important fire requirement for underground space construction is compartmentation, i.e. separating underground space into different compartments to confine fire and smoke in case of fire. In Hong Kong, compartmentation is usually achieved by using roller shutters.”

Pong acknowledges that the cost of building underground structures is usually more than double that of above-ground ones. Apart from cost concerns, there are also disposal concerns. “If an open-cut method is used to excavate under Kowloon Park, the excavated spoil needs to be disposed of. However, the dumping of non-inert excavated soil into the waters and seas of Hong Kong are forbidden under the Water Pollution Control Ordinance and the Dumping At Sea Ordinance for the sake of protecting the environment, marine life and aqueous biodiversity. This will impose an unprecedented burden on our landfills. Government should coordinate with the private sector to re-use this surface spoil for land reclamation as much as possible.”

Pong agrees that the construction of underground space can help easing the problem of urban congestion dilemmas in Hong Kong by providing more space below the ground level. “We cannot compare with sparsely populated countries like Australia where suburban dwellers mostly stay in the suburbs after work. Hong Kong’s closest comparison is the hustle and bustle in the city centres of Tokyo or New York. Our CBD is busy even on weekends and week nights, and underground space can help alleviate congestion.”

As mentioned by Pong above, the project will be very costly. Though Pong generally supports the idea of underground space, he suggests that a detailed cost-benefit analysis be carried out before launching the proposed underground space project to ensure that such work is, in the long run, value for money.

The article is published courtesy of Classified Post.

「發展地下空間的目的是開闢地下行人網絡、提供額外使用空間，以解決土地資源有限的問題。
發展地下空間本身不只是個發展計劃，其意義更深遠。」

發展香港的地下空間

香港政府銳意發展地下空間，以連接各社區、增加流動性、紓緩路面擠塞。不過，在取得成功之前，先要解決眼前的重重挑戰。

Kit M Yip

發展地下空間已成趨勢，外國也提供了不少成功例子，然而，香港在應用層面尚有許多發揮空間。香港近期展開策略性地區先導研究，就發展地下空間進行公眾參與活動。香港測量師學會代表最近與發展局、土木工程拓展署及規劃署會面探討有關議題。

出席會議的包括發展局首席助理秘書長（工務）周紹喜工程師和助理秘書長（基建統籌）馮天賢先生、土木工程拓展署總土力工程師何英傑工程師、規劃署總城市規劃師靳嘉燕女士，以及香港測量師學會會長何國鈞測量師、義務秘書陳東岳測量師及《測量師時代》義務編輯陳慶麟博士測量師。

何英傑簡述發展地下空間的意義，並指出：「在探討發展地下空間時，連接性是首要考慮因素，例如接駁地下空間與港鐵站。發展地下空間的目的是開闢地下行人網絡、提供額外使用空間，以解決土地資源有限的問題。發展地下空間本身不只是個發展計劃，其意義更深遠。」

研究小組目前正探討四個策略性地區的初步規劃概念。首先，尖沙咀西的規劃概念包括在九龍公園地底興建一個多方位的地下空間網絡，連接尖沙咀不同地方：北連佐敦、西接西九文化區、東和南則通向繁忙的彌敦道及港鐵尖沙咀至尖東站。

第二和第三個策略性地區為銅鑼灣和跑馬地，規劃概念旨在改善連接維多利亞公園、跑馬地和香港大球場這三個主要的目的地。維園作為舉辦全年大型活動的場地，會受惠於興建便捷和無障礙通道，以連接鄰近的港鐵銅鑼灣站和天后站。此外，維園亦具有潛力向下發展，增建多元化設施，以應付區內所需。

最後，金鐘、灣仔的規劃概念提議利用修頓球場的地下空間，開闢貫通南北的行人通道，連接灣仔北和海濱，紓緩現時柯布連道行人天橋的壓力。

何英傑解釋，地底情況同樣擠迫，建築物地基、地下公用設施及港鐵隧道走線等增加了覓地開發地下空間的困難，開發前亦要顧及街道狹窄和交通繁忙等限制。綜合以上因素，鄰近港鐵站的大型公園和遊樂場障礙較少，較適合發展地下空間，從而改善行人連接性及開拓更多空間滿足社會需要。

政府代表指，利用發展地下空間改善行人連接性，在香港並非新概念。港鐵尖沙咀站與尖東站之間的地下行人通道，就連接了數間酒店和商場地下層，以及多棟樓宇的地庫。可作參考的外國例子，則有蒙特利爾地下城的全天候行人通道，以及位於巴黎大堂區公共公園的地下空間，連接了地下商場與該區的地鐵站。

此外，政府代表亦提到如何釋除公眾對初步方案的疑慮，例如避免影響公園的敏感範圍，包括茂密樹木和常用設施的地方。發展亦可分階段進行，以減低對地面設施的影響。政府代表解釋，有市民可能誤解這項發展計劃旨在興建地下「商場」，其實，計劃的宗旨是優化行人連接性、紓緩路面擠塞、透過新開拓的空間提供文娛、康樂、藝術、社區和商業等設施，以改善生活環境。

政府最近完成了「城市地下空間發展：策略性地區先導研究」第一階段的公眾參與活動，研究旨在創造一個「互通、連貫、高質素和富有活力的地下空間網絡」。公眾諮詢獲得很多正面的意見，包括如何善用地下空間作不同用途，例如為青年企業家提供發展空間；有市民則關注施工期間可能對公園造成的滋擾。第一階段公眾參與活動結束後，政府將整理收集到的意見，擬備概念方案和地下空間總綱圖。政府稍後會就方案進行初步技術評估，包括土力／結構限制、消防安全、對周圍環境的影響，亦會考慮方案在財務上是否可行。之後再進行第二階段的公眾參與活動。

就消防安全、保育、建築工程對公眾的影響，政府表示必定以安全和公眾利益為優先，運用最新技術研究出最佳解決方案。當局將保留文化遺產和古樹名木。地下空間亦可擴展至舊區以配合市區重建。政府亦會參考公眾諮詢的結果，廣納民意。

靳嘉燕重申，同時運用地面和地下空間有助疏導人流，解決人潮擠迫情況。即使日後人口增長放緩，擠塞問題仍需正視。「市民持續提出尖沙咀、灣仔和銅鑼灣的擠塞問題，由此可見，部份地區行人承載量已達飽和，需要改善行人連接性。」

她說：「本港的情況獨特，若要選最類近的城市可參考日本。然而，赴日旅遊的港人可能會從『地下城』聯想到購物。事實上，這些地下城旨在改善連接性和方便步行，同時提供額外的行人通道，以應付惡劣天氣或天災。購物設施只是為了提升步行的樂趣。」

「與香港情況最相近的是東京或紐約繁忙的市中心，本港的核心商業區在周末及平日晚上依然繁忙，地下空間有助紓緩交通擠塞。」

靳嘉燕強調，政府明白公眾相當關注發展地下空間對交通和路面設施使用者的影響。「正如裝修家居一樣，我們希望市民了解發展地下空間難免會造成一段時間的影響。在制訂概念方案時，我們會研究並選擇影響最少的方法，例如分階段進行工程，並與區內居民保持溝通，照顧區內需要。未來的地下空間總綱圖會以三維角度探討地下空間發展。」

香港測量師學會義務秘書陳東岳測量師指，香港最先開發的是維港沿岸，後來雖陸續在偏遠地方興建新市鎮，但市民仍多聚集在擁擠的鬧市地區。由於多數市區土地已開發，他認為發展地下空間有助紓緩擠塞情況、連接交通網絡、商業地帶和鬧市。

陳東岳承認當中存在許多技術上的困難，例如涉及土地業權和地底障礙物。「如果要在現有的建築物底下發展空間，需解決徵用土地等棘手問題，工程亦會影響現有的水電、污水、港鐵路線等地底建築物。假如在公園底下發展地下空間，就可以避免這些問題，不過在施工期間仍會對公園使用者造成影響。」

雖然人口增長放緩、購物區的空置店舖增加，陳東岳依然認為有必要發展地下空間。「為了香港的長遠利益，需要繼續發展地下空間。人口普查指出，本港人口將持續增長，而研究更顯示擠塞問題會帶來負面情緒，對社會產生影響。空置店舖只是暫時現象，遊客會持續訪港，我們不能假設現時情況將維持不變。」

龐錦強教授測量師是香港測量師學會規劃及發展組主席，亦身兼特許城市規劃師、特許建築工程師、香港政府認可人士及大律師，他關注釐定物業擁有權的重要性。根據香港法律，

一個人如果擁有土地，該片土地底下的所有東西亦為該名人士所有，包括但不限於地下空間。此外，他解釋發展地下空間的各種施工方法。

「技術上，地下空間可透過挖掘隧道來建造，但是這個方法成本高，還需仔細勘查和規劃地形。地下空間亦可以明挖方法建造，只需在地面開挖工作坑，待地下工程完成後，再填補工作坑，回復地面上的活動。按香港情況，公共公園的發展工程多數會先採用明挖方法，因為公園擁有權的問題較少。之後要建造地下通道，將這些分開的地下空間合併起來。」

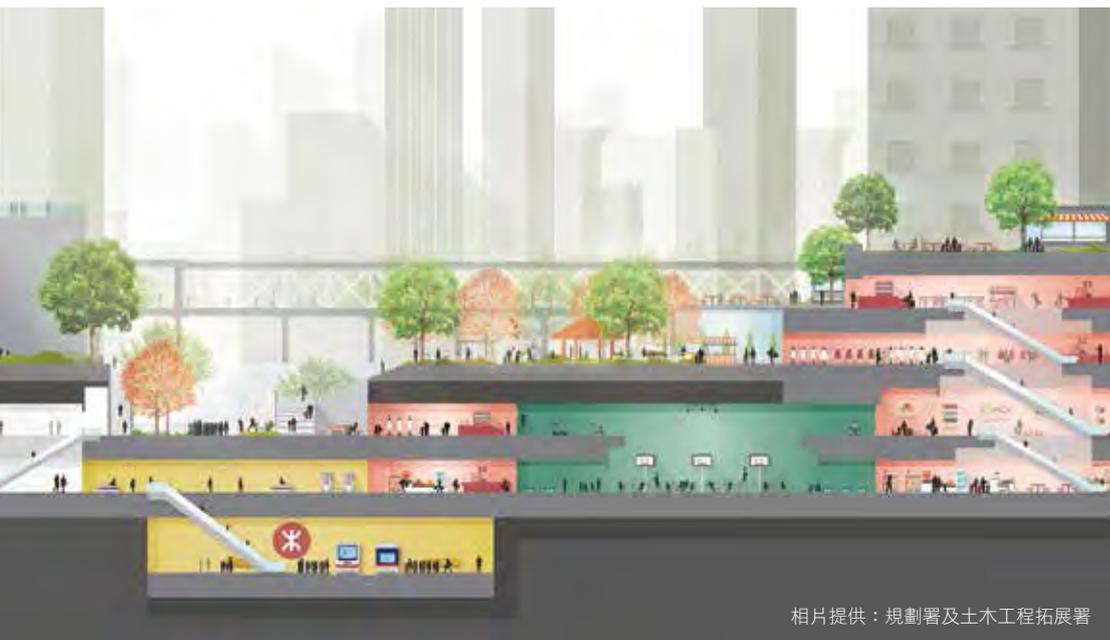
龐錦強提醒工程需小心留意消防規例，當中要求地底建築物需具備較強的耐火能力。「地底建築物必須能阻止火勢迅速蔓延，讓人至少有四小時的逃生時間。有關建築物的嚴謹準則，可以利用消防工程手段 (Fire Engineering Approach) 進行修訂，以確保其性能符合消防規例所訂立的技術要求。除了要符合耐火能力要求外，建造地下空間另一項重要的消防規則是防火分隔法，亦即將地下空間分成不同區域，以便發生火警時，可控制火勢及煙霧的範圍。在香港，通常使用捲閘作為防火分隔。」

龐錦強指出地下建築物的成本通常比地面建築物高出一倍以上。除了成本之外，亦要考慮廢物棄置問題。「如果使用明挖法挖掘九龍公園的地底，就需要棄置挖出的廢土。然而，為保護環境、海洋生物及水中的生物多樣性，《水污染管制條例》和《海上傾倒物料條例》規定，禁止將非惰性廢物，包括挖掘的泥土棄置於香港水域及海域。換言之，這將會對堆填區造成前所未有的龐大負擔，政府應與私營機構協調，盡可能將地面棄土回收作平整土地之用。」

龐錦強認同建造地下空間有助紓緩香港市區擁擠的困境。「我們不能與澳洲等人口稀少的國家比較，這些國家的郊區居民在下班後大多留在郊區。與香港情況相近的是東京或紐約繁忙的市中心，本港的核心商業區在周末及平日晚上依然繁忙，地下空間有助紓緩交通擠塞。」

如龐錦強所言，地下空間發展項目成本不菲。雖然他支持發展地下空間，但是他建議先詳細分析項目的成本效益，再落實地下空間發展項目方案，以確保這項工程長遠而言是物有所值。

本文由《Classified Post》撰文。



相片提供：規劃署及土木工程拓展署

為探討香港發展城市地下空間的潛力，提供額外行人通道以紓緩地面擠迫的人流和交通，政府現已完成第一階段的公眾參與活動，收集市民意見。