

Climate change and the role of surveyors

Experts hope recent typhoons can be used as case studies to boost future prevention measures and that surveying expertise can be pressed into service in the fight against climate change.

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Sr Leung Shou Chun
Managing Director of Leung Shou Chun Land Surveying Consultants Ltd and the HKIS' Past President



Sr Wong Bay
Chairman of the Hong Kong Green Building Council and the HKIS' Past President



Sr Gary Yeung Man Kai
General Manager of Property Management at Shui On Property Management and Past Chairman of the HKIS' Property and Facility Management Division



Broken windows on an apartment building in Macau, following Typhoon Hato on 23 August 2017.

Photo: SCMP / Edward Wong

“Before the typhoon season, it is essential to conduct a thorough inspection of drainage and sewage systems. This is especially important for belowground drains in basements where sump pumps are required to discharge waste water into the public sewer at ground level.

- Sr Gary Yeung ,

Typhoons frequently visit Hong Kong with the potential to inflict severe threats to lives as well as damage to properties. As climate change brings about frequent typhoons and challenging situations, surveyors have crucial roles to play in both hazard prevention and sustainable development. In this issue, we will explore surveyors' contribution to combating related issues.

Sr Leung Shou Chun, Managing Director of Leung Shou Chun Land Surveying Consultants Ltd, former President of the HKIS and former Deputy Director at the Lands Department, elaborated on the roles of land surveyors with regards to climate change and natural disasters. "With 3D modelling, land surveyors make maps and provide spatial data. Our maps, with specific details about contours and altitudes, are instrumental in measuring sea level in relation to terrain, and in turn help make predictions about potential land areas to be affected when water rises to a certain level. This data can then be extracted by other professionals such as engineers, town planners and typhoon specialists to do enhancement and prevention work."

Land surveyors make contributions immediately after natural disasters such as heavy rain and typhoons. "At the scenes of landslides, we engage in aerial surveying to generate photographs," says Sr Leung. "The day after the Kotewall Court toppled in 1972, for instance, we took plane rides to take pictures and prepare 3D models to facilitate landslide analyses. Even with drones today, surveyors need to take plane rides to conduct real-time surveying of extensive areas. Accurate mapping after disasters is essential for effective relief work."

Besides, land surveyors constantly make measurements at major infrastructural facilities such as reservoirs, dams, bridges and slopes. "Dam measurements are essential. When full of water, dams may experience a certain degree of deformation; our role is to ensure the deformation is contained within a range that is allowed in the original design. We also monitor thousands of major slopes in Hong Kong, and more frequently so after typhoons," Sr Leung adds.

Apart from making measurements on land, land surveyors measure water level, depth, velocity and direction of water flow in relation to wind and other factors with tracking buoys. During incidents at sea, such data is useful for disaster management.

Although land surveyors may not participate in green practices directly, Sr Leung says that for environmental practices to be possible, mapping data about terrain and distribution of trees and so on is significant. During reclamation projects, for instance, land surveyors have contributed by providing terrestrial data so that only top-layer soil on an outlying island was removed to reclaim land elsewhere, thus leaving the island itself in good shape after the mega project.

In the long run, Sr Leung believes land surveyors can contribute by combining terrestrial data with that from multiple disciplines such as medical data, distribution of plants and fisheries, human population, and traffic to generate a mega database. This will then serve as a resource library for other professionals to extract and deploy for various purposes and analyses, such as exploring correlation among factors. Climate change and typhoon specialists can then learn more about their subjects using this substantial data.

From the property and facility management perspective, Sr Gary Yeung Man Kai thinks that Hong Kong boasts the advantages of perfect infrastructure and competent professional to manage potential typhoon damage. The General Manager of Property Management at Shui On Property Management, and Past Chairman of the HKIS' Property and Facility Management Division, notes that Hong Kong has utility services covered underground which will be less susceptible to typhoon damage than exposed and unprotected utilities in other Asian cities. The city adheres to British standards, which are generally considered superior to other Asian standards. More importantly, Hong Kong has learned its lessons through severe landslides and building ruptures over the decades in developing a high level of crisis awareness.

Nevertheless, the recent typhoons have exposed severe problems concerning flooding and property damage. To Sr Yeung, this damage could have been mitigated, to a certain extent, through proper preventive maintenance programme.

"Before the typhoon season, it is essential to conduct a thorough inspection of drainage and sewage systems. This is especially important for belowground drains in basements where sump pumps are required to discharge waste water into the public sewer at ground level. Bamboo scaffolding and suspended working

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platforms should be dismantled, or platforms should at least be fastened tightly to the rooftop of the building. Typhoon shutters should be examined regularly and be closed when typhoon signal number 3 or above has been hoisted. Temporary timber panel should be readily available just in case to protect external openings where glass windows are broken”, Sr Yeung explained.

There should also be pre-arranged emergency handling plans linked with staff familiarisation rehearsals. Property managers should have emergency contacts for connecting owners/residents in case evacuation is required. Dedicated teams should pay special attention to news about the direction of the typhoon in relation to the property's orientation.

Sr Yeung said of Typhoon Hato, which broke a vast number of glass windows in a seafront property in Macau, “Damage could have been prevented or at least mitigated with a modified architectural design, such as reducing the size of glass panels or adding supporting fins to help withstand external pressure.”

As to the long-term alleviation of climate change, Sr Yeung acknowledges that surveyors are enthusiastic advocates of green management practices. “We try to reduce the use of materials containing volatile organic compounds. Alternatively, building service installations with fewer carbon emissions, or use energy-saving materials such as LED to replace the traditional less environmentally-friendly facilities. Dismantling is only carried out when strictly necessary. Paper, metal and other municipal waste are recycled as far as possible. Waste that is susceptible to pollution such as batteries and electrical appliances are collected separately. And to raise public awareness among residents, eco-friendly competitions are often organised at housing estates.”

Whereas a number of government buildings have won awards in green design, Sr Yeung suggests that the government should provide economic incentives such as bonus gross floor areas for the private sector to adopt green practices. To persuade owners to buy units in green buildings, their potentially higher management fees could be spent not only on eco-management but on other services and facilities as well to bring direct benefits to owners.

Sr Wong Bay, Chairman of the Hong Kong Green

Building Council and the HKIS' Past President, shares the view that incentives are needed for the private sector and the general public. “Government departments have green standards for government buildings, though green practices among private buildings depend very much on individual management. Better education and publicity are the solutions to enhancing eco-awareness among members of the public, owners, inhabitants, and the younger generation.”

The Hong Kong Green Building Council has been advocating Building Environmental Assessment Method's (BEAM) best practices not only among new building projects, but also among existing buildings with its BEAM Plus Existing Buildings (EB) scheme. This contributes towards achieving the government's Energy Saving Plan by 2025.

“Hong Kong should consider the recent typhoons as warnings to strengthen its focus on sustainability and alleviation of global warming. We have been relatively lucky this time, but the real test is yet to come. With global warming, sea water temperatures, and atmospheric pressure, as well as deep-sea pressure are disrupted, thus generating extreme weather and typhoons more frequently and rapidly; typhoons have become increasingly unpredictable. We thus need to learn from mistakes and enhance our infrastructure to be more resilient, and improve contingency and disaster management to combat extreme weather conditions,” Sr Wong warned.

The seasoned surveyors have high hopes that surveying education can help combat climate change. Sr Yeung hopes that surveying education will include more about surveyors' role in sustainable design and management, while Sr Wong thinks that surveying professors are well aware of the need to incorporate climate change into the university curriculum.

More importantly, Sr Wong harbours a vision that the recent typhoons will become case studies in the HKIS' Continuing Professional Development. In that case, young surveyors can acquire practical knowledge, while seasoned surveyors share experience with professionals from related fields to further enhance the city's standards as a whole.

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「風季到來前，必須仔細檢查去水及排污系統，尤其要留意地庫的地下去水管道，確保排污系統的潛水泵可將污水排到地面的公共污水渠。」 — 楊文佳測量師

測量師應對氣候變化的角色

香港最近屢受颱風吹襲，專家期望有關方面以此為鑑，完善防風措施，相信測量業的專業知識有助應對氣候變化問題。

葉潔明

颱風襲港頻密，嚴重威脅人身安全，強風暴雨亦可能損害建築物。氣候變化增加香港受颱風吹襲的機會，並帶來其他難以預測的情況，如何預防意外發生和推動可持續發展，測量師扮演著相當重要的角色。本期內容將探討測量師如何協助應對相關問題。

梁守舵土地測量顧問有限公司董事總經理、香港測量師學會前會長及前地政總署副署長梁守舵測量師闡述土地測量師應對氣候變化與天然災害的角色。「土地測量師利用三維模型繪製地圖及提供空間數據。我們的地圖包括地勢和高度等詳細資料，在量度海平面與地形相對水平非常重要，當水位上升至某水平時，有助估算屆時可能受影響的土地範圍。有關數據亦可協助工程師、城市規劃師和颱風專家等其他領域的專業人士開展改善及預防工作。」

土地測量師會在暴雨和颱風等天災過後即時提供支援。梁守舵測量師表示：「我們會在山泥傾瀉現場進行航空攝影測量，拍下相關影像。以 1972 年的旭龢大廈倒塌事故為例，我們在翌日便登上飛機進行拍攝，並準備了三維模型，協助開展山泥傾瀉的分析工作。即使現在可使用航拍機協助拍攝，測量師仍需要乘坐定翼飛機進行大範圍的實時測量。準確的地圖資料對有效執行救災工作非常重要。」

此外，土地測量師亦會經常更新水塘、堤壩、大橋和斜坡等大型基建設施的變形數據。梁守舵測量師補充指：「定期收集堤壩數據非常重要。當堤壩盛滿水時，有可能出現一定程度的變形；堤壩一旦出現變形，我們要確保情況不超過原有設計的許可範圍。我們同時負責監察全港數以千計的大型斜坡；每逢颱風過後，我們都會加密巡查。」

除了量度地面數據，土地測量師亦會使用追蹤浮標，量度海水在風和其他因素影響下，水量、深度、速度和流向的變化。當海面發生事故時，這些資料有助實施災難應變工作。

雖然土地測量師不一定會直接參與綠化和環保工作，梁守舵測量師表示，有關地形和樹木分佈等地圖數據有助推動環保。以一項填海工程為例，有土地測量師提供地面數據，工程人員才能夠只移除離島最頂層的土壤，用於填海工程。在完成大型工程後，仍可完整地保留島嶼的外觀。

長遠而言，梁守舵測量師認為土地測量師收集地面數據後，更可結合醫療數據、植物和漁業分佈、人口和交通等資料，最終可建立龐大數據庫。其他界別的專業人士可共享資源，從中擷取和應用資料，以用於各種用途和分析，例如探索各環境因素之間的相互關係。氣候變化和颱風專家則可利用這些重要數據，鑽研有關氣候課題。

在物業及設施管理方面，楊文佳測量師認為香港擁有兩大優勢：完善的基建和擅於風災應變的專業人士。楊文佳測量師為瑞安物業管理有限公司總經理及香港測量師學會物業設施管理組前主席，他指出，部分亞洲城市的公用設施多為外露，相反香港將公用服務設施設於地底，減輕了颱風損毀設施的機會。香港的建築工程依據英國標準設計，普遍認為這套標準較其他亞洲標準嚴謹。更重要的是，香港過去數十年多次發生嚴重山泥傾瀉和建築物損毀事故，從中汲取到不少教訓，因而培養出高危機意識。

「香港應視近期襲港的颱風為警號，更積極推動可持續發展及紓緩全球暖化問題。這次僥倖過渡，但真正的考驗早晚將至。」 — 黃比測量師

儘管如此，近期襲港的颱風亦凸顯出有關水浸和物業損壞的問題。楊文佳測量師認為，從業員只要推行適當的預防性維修計劃，便可在一定程度上紓緩有關問題。

楊文佳測量師解釋：「風季來臨前，必須仔細檢查去水及排污系統，尤其要留意地庫的地下去水管道，確保排污系統的潛水泵可將污水排到地面的公共污水渠。另應拆除棚架和懸吊式工作台；若情況不許可，最低限度亦應將工作台繫繫於大廈天台。此外，應定期檢查防風閘，並在懸掛三號或以上颱風信號期間將防風閘關好。亦應常備一批急用的木板，以便在玻璃窗破裂時遮擋外牆缺口。」

有關部門應制訂好應變計劃，並定期安排演習，確保員工熟習有關流程。物業管理公司應保存一份業主／住戶緊急聯絡資料，以便在需要疏散時作聯絡之用。專責團隊應時刻留意颱風風向的變化，以便因應物業座向實施應對措施。

楊文佳測量師舉例，在颱風天鵝吹襲澳門期間，強風吹破海旁一幢大廈多個玻璃窗，他指出：「若改用另一種建築方式，例如縮小玻璃尺寸、加裝支架抵擋外來壓力，應可避免同類事故，最低限度亦可減輕損毀程度。」

談到紓緩氣候變化的長期措施，楊文佳測量師表示，很多測量師都熱心推行綠化及環保項目。「我們嘗試減少使用揮發性有機化合物等物料，同時積極減低建築物的碳排放量，以發光二極管等節能物料取代傳統物料。如非必要，減少進行拆卸工程。盡可能循環再用紙、金屬和其他社區廢料。分類收集容易造成污染的廢料，例如電池和電子。此外，為提高住戶的環保意識，我們也經常在不同屋苑舉辦環保比賽。」

即使不少政府建築物曾贏得綠色設計獎項，楊文佳測量師認為政府應提供更多經濟誘因鼓勵環保，例如為採納環保措施的私營機構提供額外建築樓面面積。為鼓勵專業主選購綠色建築的單位，其可能面對額外的管理費用於環保管理外，應盡可能在使用該環保服務和設施時，確保業主能夠在其他地方受惠，例如節省電費開支。

香港綠色建築議會主席兼香港測量師學會前會長黃比測量師認為，有關當局須為私營機構和公眾提供誘因，他說：「對於政府物業，政府部門自有一套綠色建築標準。但私人大廈是否推行綠色作業則很視乎個別管理人員的取態。要提高公眾、業主、住戶和年輕一代的環保意識，我們必須在教育和宣傳方面做得更多。」

香港綠色建築議會提倡新建築項目採用「建築環境評審法」的最佳作業模式，亦透過「綠建環評既有建築」計劃將有關模式應用於現有建築上，有助於 2025 年之前落實政府的香港都市節能藍圖。

黃比測量師警告指：「香港應視近期襲港的颱風為警號，更積極推動可持續發展及紓緩全球暖化問題。這次僥倖過渡，但真正的考驗早晚將至。全球暖化導致海水溫度、大氣壓力和深海壓力都出現異常。這些情況不但衍生了極端天氣問題，也增加了颱風出現的次數和強度；颱風變得越來越難以預測。因此，我們需要從錯誤中學習，加強基建的防禦能力，以及應變和災難管理能力，以應對極端天氣問題。」

一眾資深測量師期望透過測量教育，有助本港應對氣候變化問題。楊文佳測量師期望測量課程可加入更多測量師如何設計和管理可持續發展的內容；黃比測量師則認為，測量學教授都清楚知道要將氣候變化問題納入到大學課程中。

更重要的是，黃比測量師期望近期襲港的颱風能成為香港測量師學會持續專業發展的案例。如此一來，年輕測量師可獲得實用知識，而資深測量師則能夠與相關領域的專業人士分享經驗，進一步提升香港的整體標準。



Photo: Thinkstock

香港易受颱風吹襲，如何加強樓宇結構安全，抵禦風雨吹襲，測量師的角色不容忽視。