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AWARDS 2017

INNOVATIVE  
UNDERGROUND SPACE  
CONCEPT  
- OF THE YEAR -

# CAVERN MASTER PLAN OF HONG KONG

*Unlock Hidden Land Resources for Sustainable City Development*



**Mr Edward LO**  
Chief Town Planner  
Planning Department  
Hong Kong, China



**Mr Tony HO**  
Chief Geotechnical Engineer  
Geotechnical Engineering Office  
Civil Engineering and Development Department  
Hong Kong, China







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## **Project Owner and Manager (Joint Project)**

***Civil Engineering and Development Department (CEDD) &  
Planning Department (PlanD)***

***The Government of the Hong Kong Special Administrative Region (HKSAR)***

## **Project Consultant**

***Ove Arup and Partners Hong Kong Limited (ARUP)***



**Mr Edward LO**

**Chief Town Planner  
Technical Services Division, PlanD  
The HKSAR Government**



**Mr Tony HO**

**Chief Geotechnical Engineer  
Planning Division, CEDD  
The HKSAR Government**



**Mr Mark Wallace**

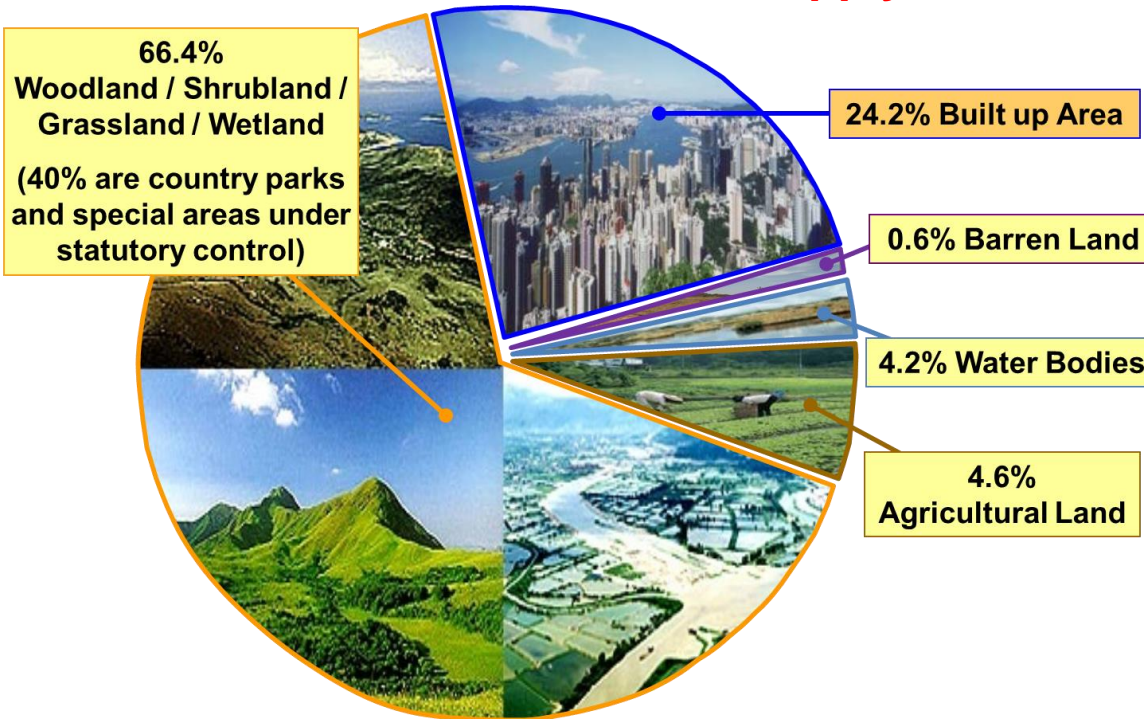
**Director of Infrastructure  
ARUP**





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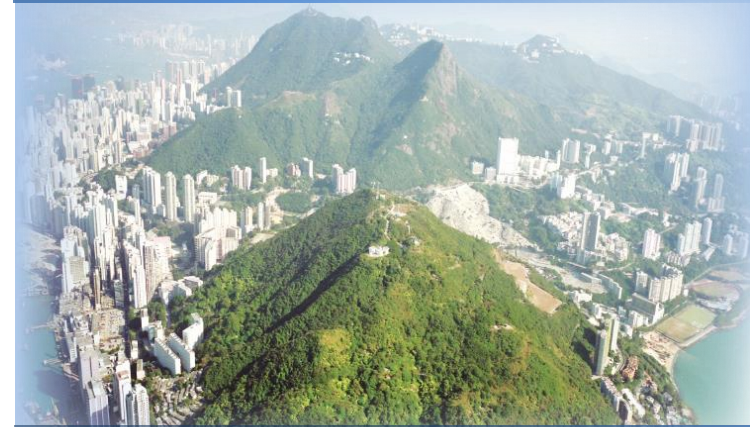
## Key Driver in Hong Kong - Land Supply Initiative



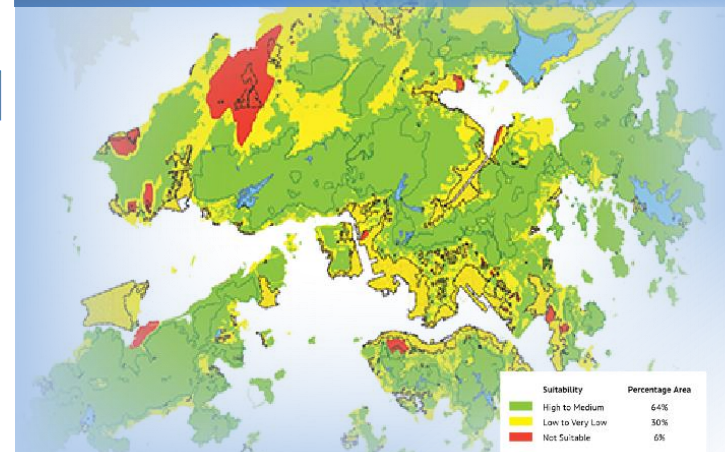
Total Land Area  
1,110 km<sup>2</sup>

Population  
2016: 7.35M  
2043: 8.22M

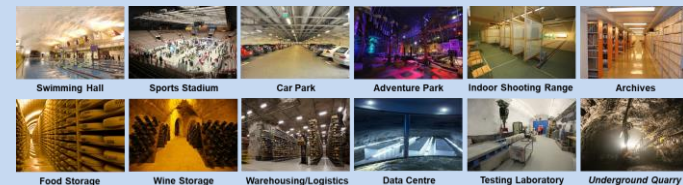
## Natural Setting of Hong Kong



## Cavern Suitability Map



## Rock Caverns – Solution Space for a Wide Spectrum of Land Uses





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# Underground Space Development Strategy

## *From 2-D to 3-D perspective*



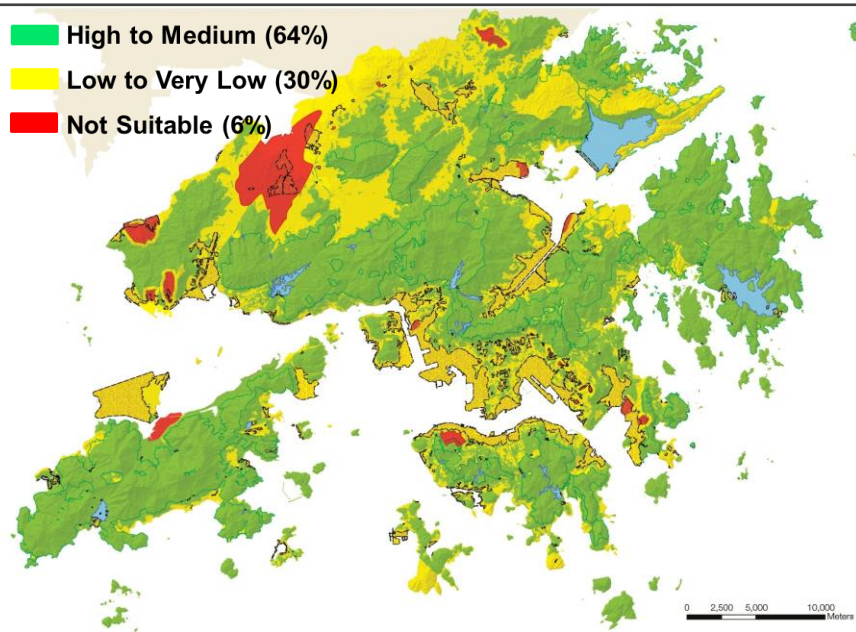




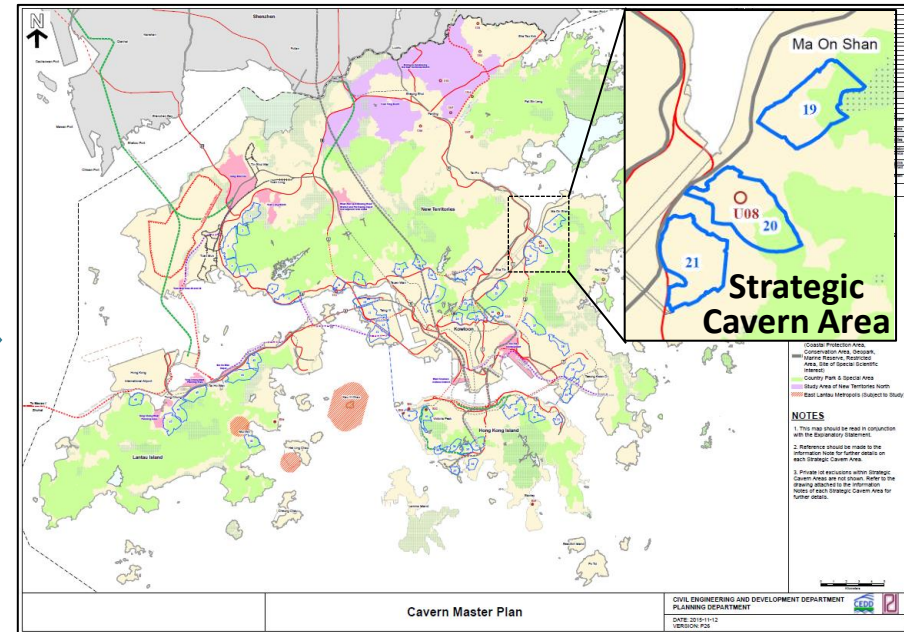
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# Hong Kong's **first, unique** and **visionary** **CAVERN MASTER PLAN**

Providing a **strategic planning framework** to guide and facilitate territory-wide application of rock caverns for sustainable city development



**Cavern Suitability Map (2011)**  
(Mainly geological consideration)



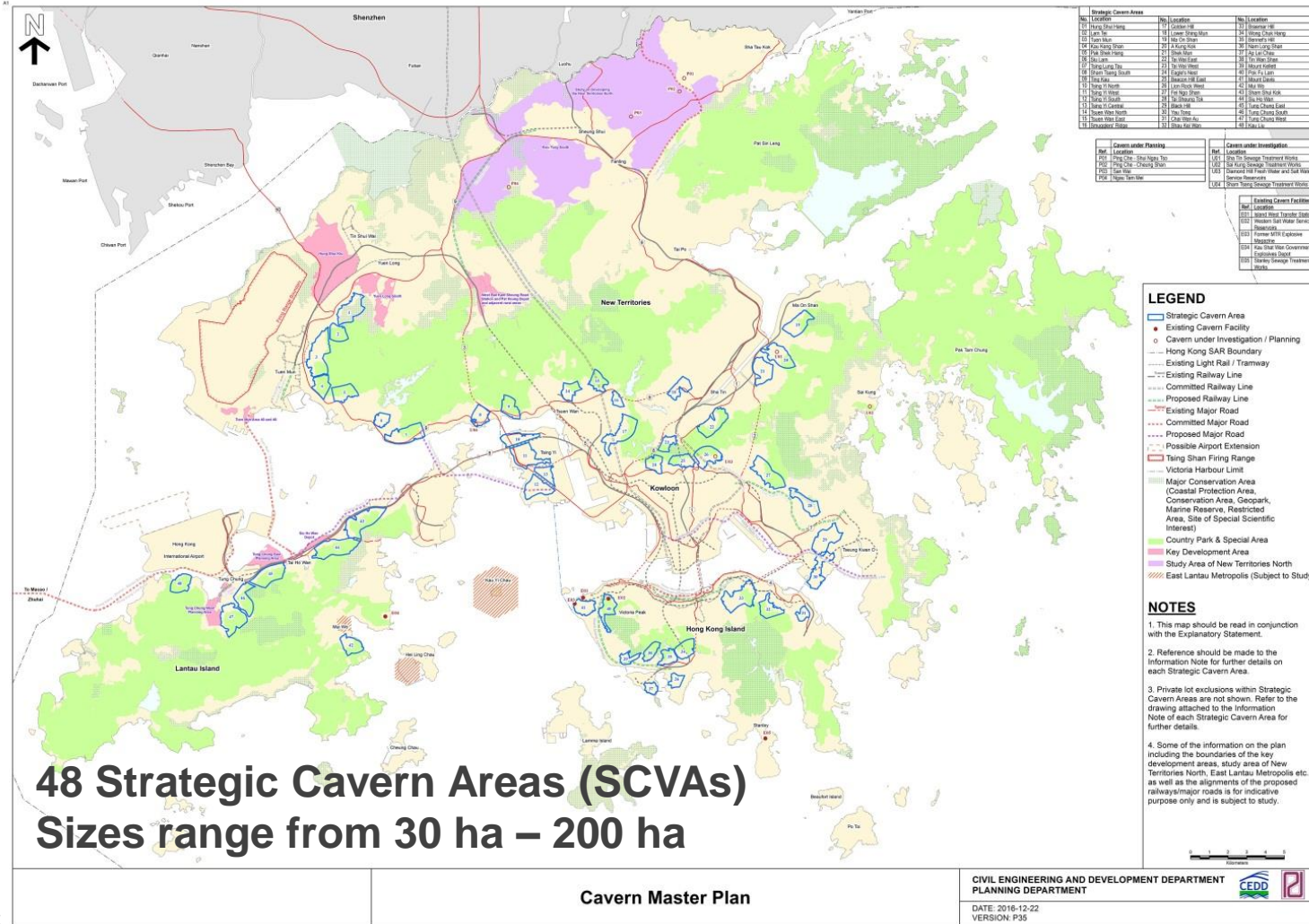
## **Cavern Master Plan (2017)**

(Adopting an **innovative concept** to holistically integrating urban planning and multidisciplinary engineering & geological elements in formulating the plan)



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# Hong Kong's **first, unique** and **visionary** **CAVERN MASTER PLAN**



A Strategic  
Planning Tool to  
facilitate Cavern  
Development

A Holistic Planning  
Strategy Optimising  
the Use of Scarce  
Land Resources

Optimize  
Utilization of  
SCVAs

Promulgation of  
Essential  
Information  
To facilitate public and the  
private sector to identify suitable  
cavern sites for developments

Synergy of  
Engineering  
and Planning  
Efforts

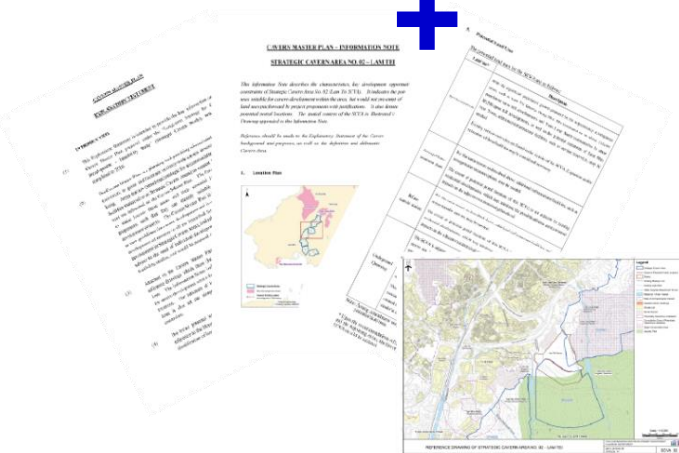
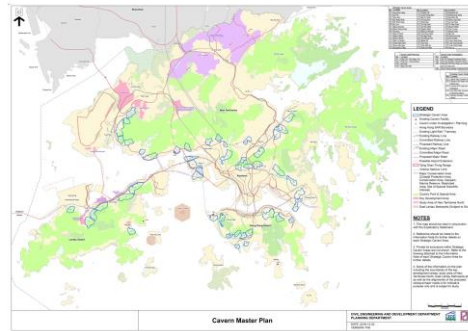




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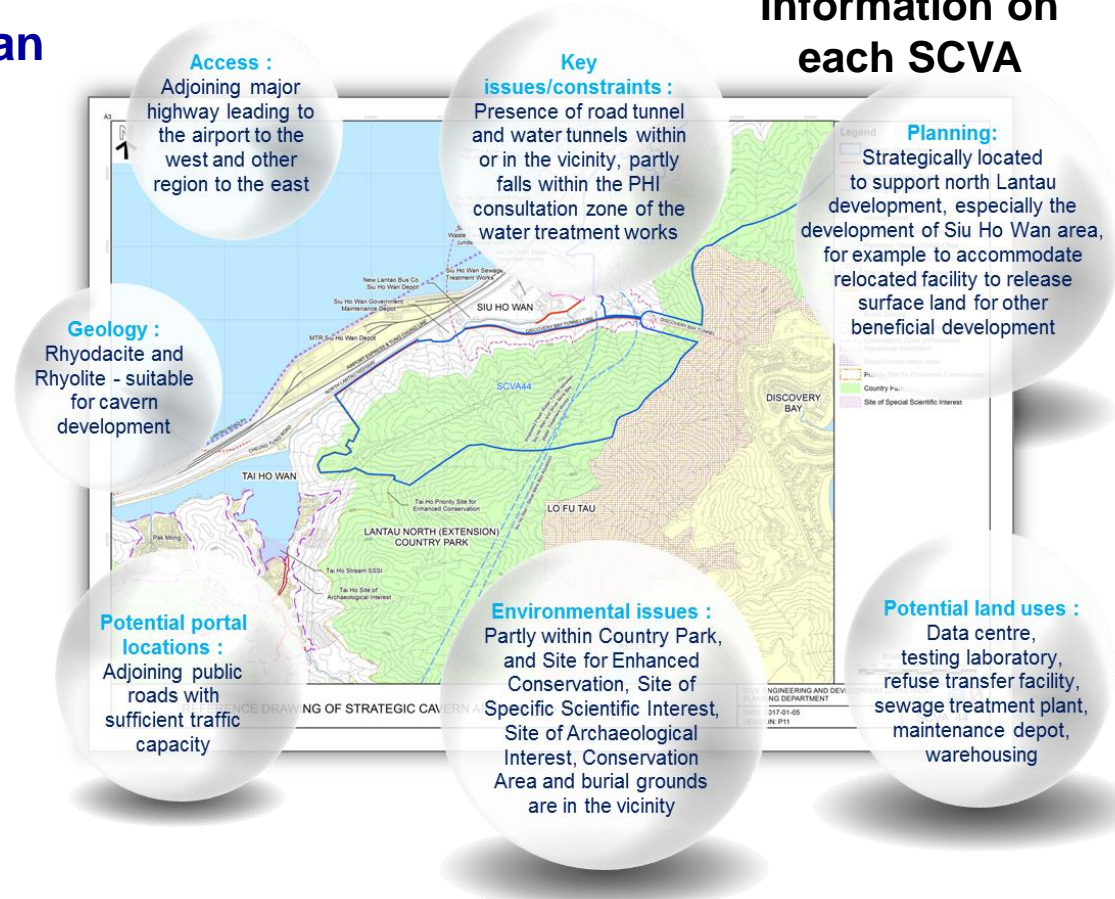
# Hong Kong's **first, unique** and **visionary** **CAVERN MASTER PLAN**

## A whole set of Cavern Master Plan



## Explanatory Statement and Information Notes for 48 SCVAs

## Information on each SCVA



- Built on a GIS platform
- PDF version will be available on the CEDD and PlanD websites

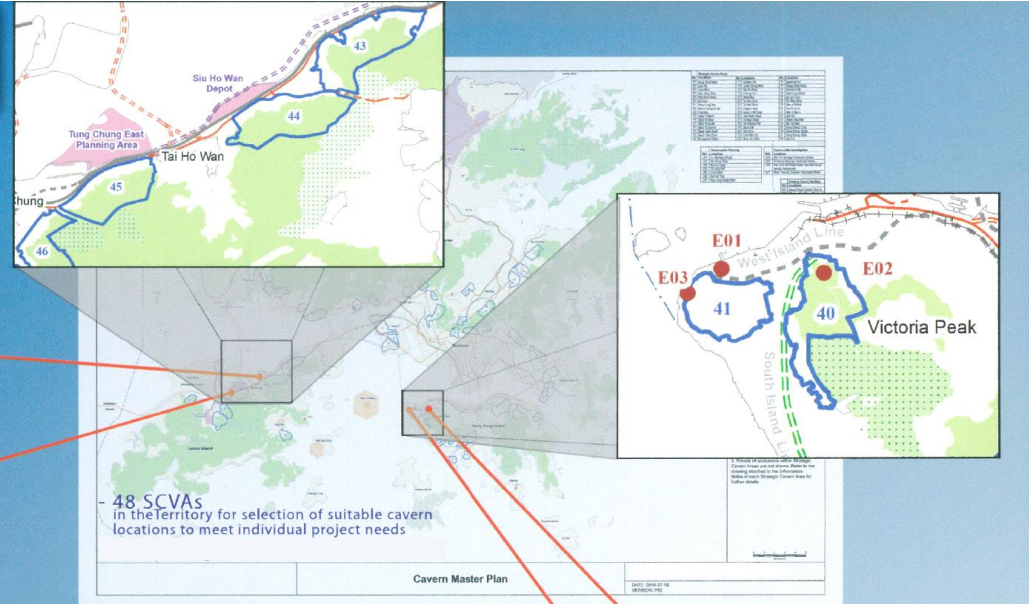


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# Hong Kong's **first, unique** and **visionary** **CAVERN MASTER PLAN**

## What is a Strategic Cavern Area?

SCVAs identified in North Lantau in view of their strategic functions in creating land to support economic development including logistics and data centre facilities



48 SCVAs  
in the territory for selection of suitable cavern  
locations to meet individual project needs

Cavern Master Plan

**Suitable for  
Cavern Development**  
With favourable topographic  
and geological settings

**Easy  
to access**  
At urban fringe with  
supporting infrastructure network

### Strategic Cavern Area

**Accommodating  
Multiple Facilities**  
Suitably large sized  
with sufficient portals

**Meeting  
Development Needs**  
Planning context of  
surrounding areas considered

SCVAs identified to serve the adjacent urban areas







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# Turn **Concepts** into **Applications**



Many **Possibilities** within a  
**Strategic Cavern Area**



## Land Uses with Potential for Cavern Development

<b>Commercial</b>	Retail	Food/Wine storage Food and beverage
<b>Industrial</b>	Industry	Data centre
	LPG bulk storage	Research/Testing laboratories
	Oil bulk storage	Container storage
	Storage/Warehousing	
<b>Government/ Institution/ Community and Other Specified Uses</b>	Civic centre	Archives
	Columbarium/Mausoleum/Mortuary	Vehicle parking
	Incinerator	Cultural/Performance venue
	Leisure/Sports centre	Explosives depot/magazine
	Refuse transfer facility	Indoor swimming pool/complex
	Sewage/Water treatment plant	Maintenance depot
	Service reservoir	Vehicle (including bus) depot
	Slaughterhouse	Recreational complex
	Transport connections & networks	Underground quarrying
	Wholesale market	
<b>Public Utilities</b>	Power station	Public utility installation



**Opportunities** for both  
**Public & Private Sectors**





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# Turn **Concepts** into **Applications**

## A Signature Example

*Relocation of Shatin Sewage Treatment Works to caverns would release a prime site for housing and other uses that will enhance the liveability and bring benefits to the community and environment of Sha Tin.*



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# Turn **Concepts** into **Applications**

## Other Ongoing Projects or Studies in SCVAs

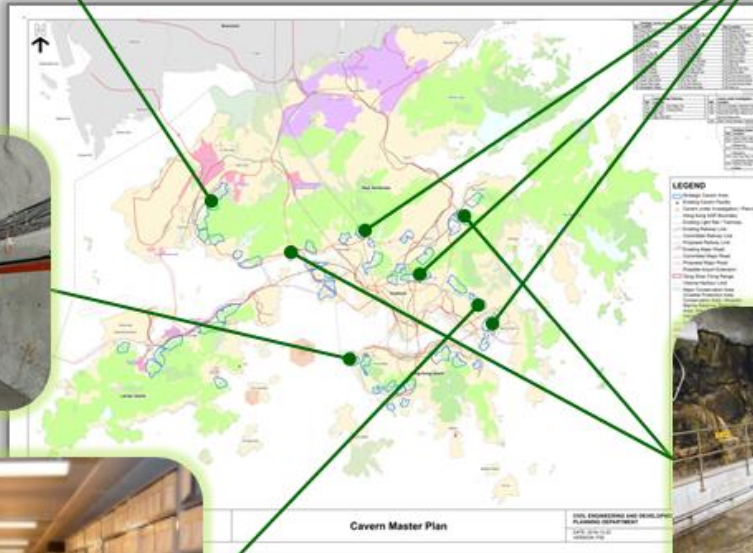


Underground Quarrying  
And Industrial Uses  
(Lam Tei SCVA)

Mortuary  
(Mount Davis SCVA)



Service Reservoirs  
(Lion Rock West SCVA)  
(Black Hill SCVA)  
(Tsuen Wan East SCVA)



Archives  
(Tai Sheung Tok SCVA)



Sewage Treatment Works  
(A Kung Kok SCVA)  
(Sham Tseng South SCVA)



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# New Era of Subterranean Planning

*With the CMP as a facilitation and guidance, Hong Kong could leap a big step forward in wider application of cavern development, thus to align with the international trend of extensive adoption of cavern development for accommodating suitable land uses.*

## VERSATILITY OF ROCK CAVERN FACILITIES WORLDWIDE

Gjøvik Olympic Mountain Hall, Norway



## VERSATILITY OF

## ROCK CAVERN FACILITIES WORLDWIDE

Itäkeskus Swimming Pool, Finland



Springfield Underground, USA  
(Logistics / Warehousing)



National Archives, Norway



Taittinger Champagne, France  
(Wine Storage)



Brünig Park, Switzerland  
(Restaurant)



### Other Potential Land Uses (Proposed to be added to HKPSG)

Food/Wine storage

Food and beverage

Data centre

Research/Testing laboratories

Container storage

Archives

Vehicle parking

Cultural/Performance venue

Explosives depot/magazine

Indoor swimming pool/complex

Maintenance depot

Vehicle (including bus) depot

Recreational complex

Underground quarrying

Public utility installation

## Incorporation into HKPSG :

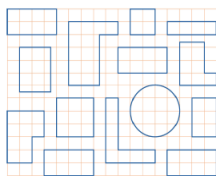
The current Chapter 12 of HKPSG provides us with some guidelines for potential land uses and planning considerations. The CMP, which includes an updated list of potential land uses for cavern development, will be incorporated into this chapter of the HKPSG, and will be made available through websites. The launch of the CMP can facilitate effective planning of cavern projects.

Land Use Category	Potential Land Uses from HKPSG (Existing)	Other Potential Land Uses (Proposed to be added to HKPSG)
Commercial	Retail	Food/Wine storage Food and beverage
Industrial	Industry LPG bulk storage Oil bulk storage Storage/Warehousing	Data centre Research/Testing laboratories Container storage
Government/ Institution/ Community and Other Specified Uses	Civic centre Columbarium/Mausoleum/Mortuary Incinerator Leisure/Sports centre Refuge transfer facility Sewage/Water treatment plant Service reservoir Slaughterhouse Transport connections & networks Wholesale market	Archives Vehicle parking Cultural/Performance venue Explosives depot/magazine Indoor swimming pool/complex Maintenance depot Vehicle (including bus) depot Recreational complex Underground quarrying
Public Utilities	Power station	Public utility installation

Note: Potential land uses should be assessed on a case-by-case basis on their suitability for cavern development in consultation with the relevant bureaux/departments having regard to, amongst others, safety, operational and financial considerations.

### HONG KONG PLANNING STANDARDS AND GUIDELINES

Chapter 12 Miscellaneous  
Rock Cavern Development  
Pond Filling Station  
Identifiy Struction Installations  
Vehicle Repair Workshops  
Port Back-up and Open Storage Yards  
Use of Land beneath Flyovers and Footbridges



PLANNING DEPARTMENT  
THE GOVERNMENT OF THE HONG KONG SPECIAL ADMINISTRATIVE REGION





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# Our Vision



***Cavern Master Plan – An Innovative Planning Tool Conducive to Wider Cavern Development***  
***Unlock the potential of rock caverns as a sustainable and innovative source of long-term Land Supply to meet the challenges of creating developable land to sustain the population and economic growth of Hong Kong.***

