

Rock Cavern Development in Hong Kong

Key Messages: The geological setting of Hong Kong is favourable to rock cavern development. Applications of rock caverns can achieve multiple societal benefits including avoidance of nuisance of “not-in-my-backyard” (NIMBY) type facilities on surface sites and releasing surface land for sustainable development of Hong Kong. Policy to promote rock caverns has been established and several studies of rock caverns development have commenced. In order to facilitate wider application of rock caverns, a number of technical guidance documents have been promulgated by the Geotechnical Engineering Office (GEO).

Introduction

Rock caverns are large man-made spaces in rock. Hong Kong’s steep hilly terrain with strong igneous rocks offers a great opportunity for territory-wide cavern development, particularly in the urban fringe. Existing rock caverns housing numerous facilities in Hong Kong and other places have already articulated the benefits of the rock cavern development, and demonstrated that rock caverns can be a viable option to increase land supply.

Benefits of Rock Caverns

Since the 1990s, there were a number of purposely built rock caverns for housing different Government facilities, including the Stanley Sewage Treatment Works, Island West Transfer Station and Kau Shat Wan Government Explosives Depot. While they are municipal facilities important to the community, these Government infrastructures are the NIMBY facilities and their development on surface sites in the vicinity to or within populated areas may not be acceptable.

In the early 2000s, the Western Salt Water Service Reservoirs were relocated to rock caverns in the hillside at the back of the University of Hong Kong in order to free up land for the Centennial Campus development. This is another successful example of using rock caverns for housing NIMBY facilities. In addition, this project demonstrated that application of rock caverns can release surface land for sustainable development. More recently, the Task Force on Land Supply has recommended that rock cavern development can serve as a medium- to long-term option to increase the land supply in Hong Kong.

The applications of rock caverns are even more versatile and popular overseas. For example, the Norwegians created rock caverns to house their national archives and the Swedish developed a data centre in a rock cavern for the benefit of better security.

There are also intangible benefits of rock cavern development. For example, the excavated rock materials obtained from the cavern construction can be processed for use by other construction projects. Temperature in rock caverns is steady throughout the year. Therefore, caverns provide an ideal environment for storage of perishable goods (e.g. wines) with less electricity consumption.

Rock Cavern related Studies in the Pipeline

Relocation of existing suitable Government facilities into rock caverns

Rock cavern projects usually involve more capital investment and relatively long implementation time-frame compared with surface site development. The societal gains of each rock cavern development initiatives should be studied carefully with consideration given to merits and constraints from the town planning and technical perspectives. In general, relocations of public NIMBY facilities at strategic locations (e.g. sewage treatment plants and service reservoirs in or close to urban areas) into rock caverns could yield substantial social benefits. The ongoing project of the relocation of Sha Tin Sewage Treatment Works into rock caverns, which will release 28 ha of surface land for residential development, is one of the manifest examples. Besides, the investigation study of a joint cavern development within Anderson Road Quarry site for relocation of the Public Works Central Laboratory (PWCL) from Kowloon Bay and development of a new Archives Centre is underway. Initiatives involving relocation of the existing Government facilities such as service reservoirs at different locations have also commenced.

Placement of new NIMBY facilities into rock caverns

It is the prevailing Government policy that the cavern option shall be considered in public projects involving new refuse transfer station, sewage treatment works and service reservoir, subject to availability of suitable cavern sites. Related technical feasibility studies for service reservoirs at the western New Territories are in progress.

Studying of underground quarry

Underground quarrying is not uncommon overseas. The underground quarrying operations in Switzerland also incorporate ancillary business activities, e.g. rock processing within the rock caverns formed by the quarrying activity. This mode of quarrying operation achieves multiple benefits including (i) avoidance of nuisance as a result of surface quarrying and the ancillary business activities and (ii) creation of rock cavern space as part of the quarrying operations. The GEO has been conducting studies to investigate the technical and financial viability of setting up underground quarries in Hong Kong.

Technical Support to Rock Cavern Development in Hong Kong

GEO has been working closely with relevant Bureaux and Government Departments to establish an institutional framework for promoting the wider application of rock caverns. The GEO also provides technical assistance, e.g. preliminary geological appraisals and technical feasibility studies, to different Government cavern projects. Furthermore, a number of technical guidance documents facilitating rock cavern developments in Hong Kong has been released by the GEO or under the steer of the GEO.

Cavern Master Plan

This shows 48 Strategic Cavern Areas (SCVAs) in the territory Strategic Cavern Areas (SCVAs) in the territory that are suitable for rock cavern development that meet the existing or future community needs of the adjoining districts. The Plan serves as a reference for project proponents of rock cavern developments.

<https://www.cedd.gov.hk/eng/topics-in-focus/index-id-27.html#download>



Geoguide 4 : Guide to Cavern Engineering (2nd Edition)

It presents a recommended standard of good practice for the civil engineering aspects of rock cavern developments in Hong Kong, and serves as a reference document for non-specialists involved in the planning and administration of cavern projects.

<https://www.cedd.gov.hk/eng/publications/geo/geoguides/geo-g4/index.html>



Hong Kong Planning Standards and Guidelines, Chapter 12

It includes planning standards and guidelines of rock cavern developments. Key planning considerations and potential land uses of rock caverns are provided. It serves as a reference document for the planning study of cavern projects.

https://www.pland.gov.hk/pland_en/tech_doc/hkpsg/full/pdf/ch12.pdf

