The Use of Underground Space in Hong Kong

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Abstract:

The territory of Hong Kong lies at the mouth of the Pearl River on the coast of southern China and comprises a mountainous piece of the Chinese mainland and a number of hilly islands in the South China Sea (see Figure 1). Though the territory is small (60km by 45km), its population amounts to 5.8 million and its economy, based on trading, financial and business services, manufacturing and tourism, counts for 20% of China's GDP. Hong Kong ranks as the eighth largest trading entity in the world.

Two of the islands are much bigger than the rest - Hong Kong Island, the centre of government and commerce, and across the main channel of the Pearl River, Lantau Island. The city developed around the deep water port, along the northern shore of Hong Kong Island and on the Kowloon Peninsula, population reading 1.6 million at the outbreak of the Second World War. With the influx of immigrants after the revolution in China in 1949, population pressures grew in the old city, leading the Government in 1972 to adopt a building programme for new towns in more distant parts of the territory (see Figure 1). Since the mid-1980s, the emphasis of public infrastructural investment has shifted to serve the needs of a rapidly growing economy. Guangdong Province with 60 million people has the highest GDP growth rate in the world and the port for its products and those of adjoining provinces is Hong Kong. Container throughout has doubled since 1989 and air freight is increasing by about 18% each year. To keep pace with demand, a replacement airport and a new container port are being built on reclaimed land off the coast of the mountainous and still largely uninhabited Lantau Island.

With population growth and a strong economy, development has greatly intensified a long the coasts and has encroached upwards onto steeper ground and outwards onto land reclaimed from the sea. This is well illustrated in the 1988 aerial photograph of Hong Kong Island at Figure 2; a similar pattern of growth is evident in the new towns.

Many of the road and rail-links between the territory's population centres are provided in hard rock tunnels, and all kinds of utilities are now conveyed through the mountains in this way, including electrical power, telephone, fuel gas and both water supply and waste water. The igneous rocks underlying much of the territory have proved in general to be an excellent tunnelling medium, below the soil mantle. Though weathering can extend to a depth of 100m, sound rock crops out in many parts of the built-up area and is rarely far from the surface in the hillslope areas.

Given the severe shortage of land and the favourable topographic and geological conditions, the use of rock caverns for suitable applications appears logical in Hong Kong, especially as underground space, in the form of deep basements and tunnels, is already widely utilized.

The earliest civil rock caverns in Hong Kong were constructed in the early 1980s but it was not until 1988 that thorough studies of cavern usage were conducted by the Government. Promising results were obtained, leading the Government in 1991 to adopt a policy of encouraging development in rock caverns, where appropriate. The underground option has recently been selected for certain environmentally unattractive facilities and various cavern schemes are now under construction.
Keywords: History of Cavern Usage in Hong Kong; The SPUN Study; Technical Aspects of Cavern Schemes under Construction; Planned Cavern Schemes; Institutional Arrangements to Encourage and Facilitate Cavern Usage; Design Guides; Prospective Cavern Projects; Private Sector Applications.