City of Helsinki
**City Planning Department**

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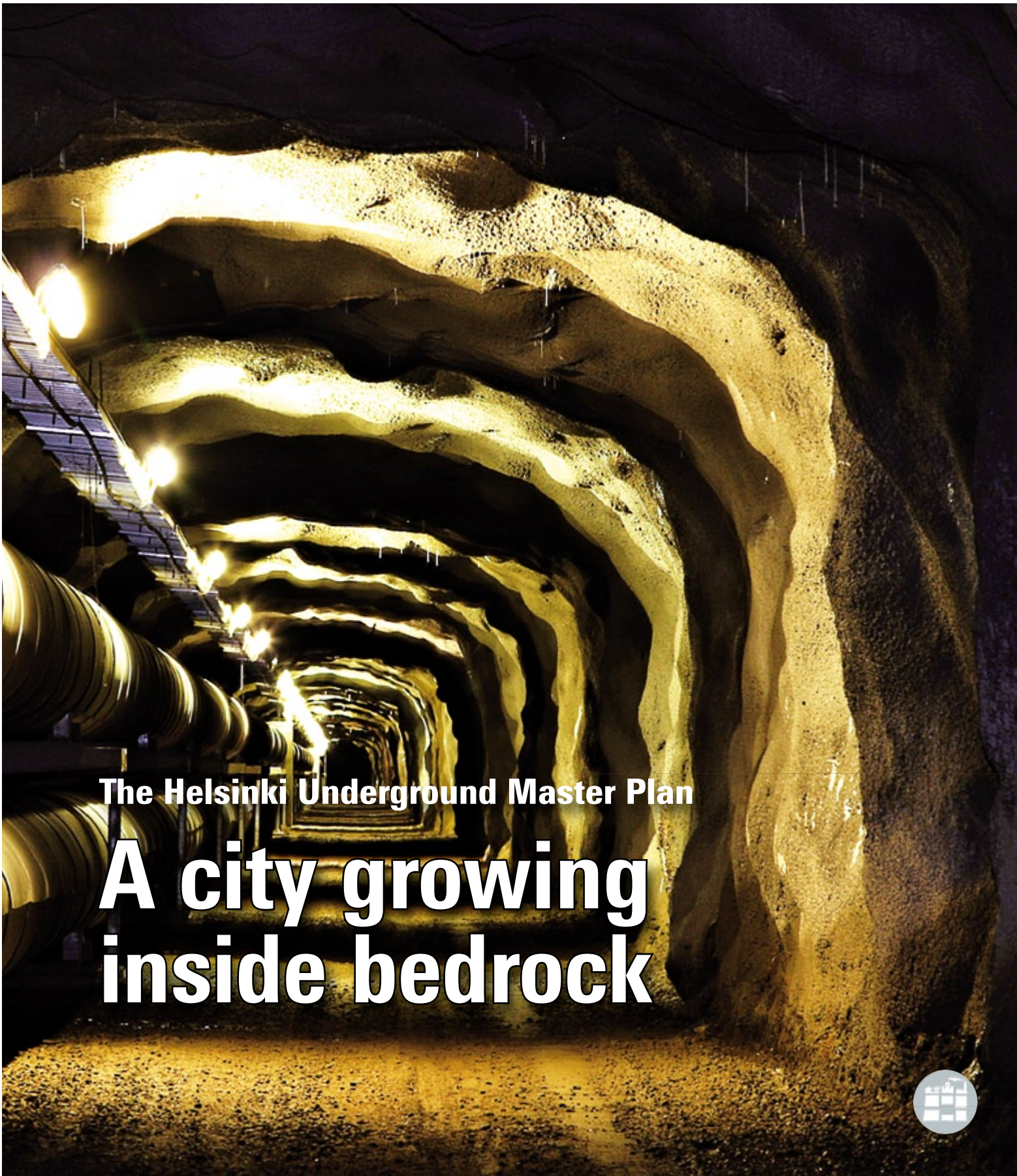

## The Helsinki Underground Master Plan

# A city growing inside bedrock

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# A city growing inside bedrock

Since the 1960s, Helsinki has systematically benefited from the possibilities offered by underground construction. Helsinki is well suited to rock construction because its bedrock is hard and located near the ground surface. In recent years, the demand for underground facilities has grown dramatically in Helsinki's central city area. As the urban structure becomes increasingly dense, various functions are being placed underground more often. Helsinki's intent is to safeguard the continued utilisation of its bedrock resources in connection with, for example, important traffic and infrastructure construction, as well as significant commercial projects. For this reason, the Underground Master Plan has been drafted in Helsinki.

### The first Underground Master Plan

Space allocations for long-term projects such as traffic tunnels must be maintained for future construction. The same applies to those resources that are worth of conserving for future projects. The exploitation of such resources must be carried out according to plan. Excavating bedrock is a one-off action.

These reasons have led to the need to draft the Helsinki Underground Master Plan. As far as is known, no similar town plan regulating underground construction at this scope has been prepared anywhere else in the world; new types of planning regulations suitable to the purpose had to therefore be developed in connection with the drafting of the plan. The Helsinki Underground Master Plan controls the locations, space allocations and mutual compatibilities of the newest, largest and most important underground rock caves, facilities and traffic tunnels. The Helsinki Underground Master Plan also safeguards the permanency and functionality of facilities already constructed. In terms of societal functioning, the long-term safeguarding of strategic allocations for underground spaces and tunnels is considered absolutely essential.

### Over 100 new locations for rock construction

The heavy demand for centralised underground facilities has been balanced by reserving new rock resource areas outside the central city area. The Underground Master Plan contains 40 new areas reserved as rock resources and 100 new space allocations for future rock construction. Approximately 9 million cubic metres, consisting of about 400 separate facilities or tunnels, have already been built under the city. The more important facilities are listed and classified by theme in connection with the Helsinki Underground Master Plan.

The Helsinki Underground Master Plan is a juridical plan binding property owners and public officials. The plan also serves as a guide when preparing aboveground zoning plans. Besides the space allocations

① The Viikinmäki Wastewater Treatment Plant completed in 1994 has been hollowed out of bedrock.
② Earth-movers underground.
③ District heating and cooling pipes, as well as large cables for electrical and telecommunications networks, pass through Helsinki's common-use tunnels.
④ Runtunnel.
⑤ The Itäkeskus (East Centre) Swimming Pool is one of Helsinki's underground recreational facilities.
⑥ The Kamppi Metro Station is the deepest Helsinki Metro station excavated into the bedrock.

indicated in the town plan map, other construction is allowed as long as it does not conflict with the main underground functions indicated in the master plan.

## Tunnels for traffic and servicing

The Helsinki Underground Master Plan includes vehicular and railway tunnels, as well as the Metro network's tunnel sections and links to the airport. The Pisara railway connection under the centre, the Jokeri II tunnel sections, Western Metro and Central Tunnel allocations are presented in the plan. Over 30 new traffic tunnels and 10 tunnels already constructed are indicated in the plan. Most of the parking projects presented in the master plan are located in the city centre area. The total number of built and planned parking facilities is approximately 30.

Helsinki has several underground space allocations for storage and servicing activities. Service facilities for a street running under Aleksanterinkatu's properties are currently under construction. When it is completed, the system will switch service traffic from the city centre's streets underground, leaving more space for light traffic and improving the realisation of a pedestrian precinct.

Underground facilities can also be used as civil defence shelters; existing facilities have also been fitted for protective use.

## Underground utility infrastructure servicing

The servicing functions safeguarding the city's vital utility infrastructure are protected in rock caves and tunnels under the city. Servicing takes place without disturbing aboveground functions. Passing through the common-use tunnels are district heating and cooling pipes, as well as large cables for electrical and telecommunications networks; the total length of the lines running under the Helsinki area is 300 kilometres. Water management facilities, heating plants, electrical substations, support bases, depots as well as coal and oil storages are also located underground.

New underground facilities are being designed as multi-purpose complexes in which several parallel functions can be located in the same space. Helsinki's underground recreational facilities include the Hartwall Arena's practice hall, the Itäkeskus (East Centre) Swimming Hall, and sports facilities at Merihaka. A sports tunnel has also been excavated in connection with the Olympic Stadium.

## Safety in underground facilities

When planning underground facilities, extremely close attention is paid to safety. Besides architectural, structural, mechanical and electrical considerations, the systems ensuring fire and rescue safety are among the most important factors affecting safety in underground facilities. Automatic surveillance, alarm and extinguishing systems support well-designed and implemented facilities. In fire situations, it is essential that workable smoke exhaust and fire compartmentation systems have been implemented. Underground facilities must also have well designed address systems and clearly indicated emergency exit routes to ensure that any evacuation to the surface, or rescue operations, can be managed effectively and in an orderly manner. Ventilation equipment and other technical systems will be designed to also function in fire situations. Public transportation-related underground safety is particularly important.

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