

# Helsinki Metro

The **Helsinki Metro** (Finnish: *Helsingin metro*, Swedish: *Helsingfors metro*), is the metro system in Helsinki, Finland. It is the world's most northern metro system, and the only one in Finland. The system was opened to the general public on 2 August 1982<sup>[3]</sup> after 27 years of planning. It is operated by Helsinki City Transport (HKL) for Helsinki Regional Transport Authority (HSL) and carries 62 million passengers per year.<sup>[5]</sup>

The system contains a single forked line with seventeen stations along a total length of 21.1 kilometres (13.1 mi).<sup>[1]</sup> It primarily serves the tightly built suburbs of East Helsinki, but can also be used as a means of transport within the central parts of the city. The **Länsimetro** extension will continue the line into western Helsinki and the southern parts of the neighbouring city of Espoo, now served by buses only.

The local commuter rail network (overground) that serves north and northwest directions does not intersect with the metro network, but passengers can change trains at the Helsinki Central Railway Station (Metro station *Rautatientori*).

## 1 History

### 1.1 Planning phase

#### 1.1.1 1955–1967: Light rail plan

The initial motion for building a metropolitan railway system in Helsinki was made in September 1955, though during the past five decades the idea of a tunneled urban railway for Helsinki had surfaced several times. A suburban traffic committee (*esikaupunkiliikennekomitea*) was formed under the leadership of Reino Castrén, and in late 1955, the committee set to work on the issue of whether or not there was truly a need for a tunneled public transport system in Helsinki. After nearly four years of work, the committee presented its findings to the city council. The findings of the committee were clear: Helsinki needed a metro system built on separate right-of-way. This was the first time the term “metro” was used to describe the planned system. At the time the committee did not yet elaborate on what kind of vehicles should be used on the metro: trams, heavier rail vehicles, buses or trolleybuses were all alternatives. The city council's reaction to the committee's presentation was largely apathetic, with several council members stating to the press that they did not understand anything about Cas-

trén's presentation.<sup>[6]</sup>



*The Karia HM V trams built in 1959 were built with provisions for use on the originally planned light rail-type metro system.*

Despite the lacklustre reception, Castrén's committee was asked to continue its work, now as the metro committee,<sup>[7]</sup> although very little funding was provided. In spring 1963 the committee presented its proposal for the Helsinki Metro system. On a technical level this proposal was very different from the system that was finally realised. In the 1963 proposal the metro was planned as a light rail system, running in tunnels a maximum of 14 metres below the surface (compared to 30 metres in the finalized system), and with stations placed at shorter intervals (for instance, the committee's presentation shows ten stations between Sörnäinen and Ruoholahti, compared to the six in the realized system).<sup>[8]</sup> The Castrén Committee proposed for the system to be built in five phases, with the first complete by 1969 and the final by 2000, by which time the system would have a total length of 86.5 kilometres (53.7 mi) with 108 stations.<sup>[7][8]</sup> This was rejected after lengthy discussions as too extensive. In 1964 the city commissioned experts from Hamburg, Stockholm and Copenhagen to evaluate the metro proposal. Their opinions were unanimous: a metro was needed and the first sections should be built by 1970.<sup>[9]</sup>

Although no official decision to build a system along the lines proposed by Castrén was ever made, several provisions for a light rail metro system were made during the 1950s–1960s, including separate lanes on the Kulosaari and Naurissaari bridges,<sup>[7]</sup> and space for a metro station in the 1964 extension of Munkkivuori shopping center.<sup>[8]</sup> The RM 1, HM V and RM 3 trams built for the Helsinki tram system in the late 1950s were also equipped to be usable on the possible light rail metro lines.<sup>[10]</sup>

### 1.1.2 1967–1969: Heavy rail plan

In late 1967 Reino Castrén departed Helsinki for *Calcutta*, where he had been invited as an expert in public transport. Prior to his departure Castrén indicated he planned to return to Helsinki in six months and continue his work as leader of the metro committee. For the duration of Castrén's absence *Unto Valtanen* was appointed as the leader of the committee. However, by the time Castrén returned, Valtanen's position had been made permanent. Following his appointment Valtanen informed the other members of the committee that the plans made under Castrén's leadership were outdated, and now the metro would be planned as a heavy rail system in deep tunnels mined into *bedrock*.<sup>[8]</sup> Following two more years of planning, the Valtanen-led committee's proposal for an initial metro line from *Kamppi* to *Puotila* in the east of the city was approved after hours of debate in the city council on the early morning hours of 8 May 1969.<sup>[11]</sup> The initial section was to be opened for service in 1977.

## 1.2 1969–1982: Construction

Construction of a 2.8-kilometre (1.7 mi) testing track from the *depot* in *Roihupelto* to *Herttoniemi* was begun in 1969 and finished in 1971.<sup>[12]</sup> The first prototype train, units M1 and M2, arrived from the *Valmet* factory in Tampere on 10 November 1971, with further four units (M3–M6) arriving the following year.<sup>[13]</sup> Car M1 burned in the metro depot in 1973.<sup>[14]</sup>

Excavating the metro tunnels under central Helsinki had begun in June 1971. Most of the tunneling work had been completed by 1976, excluding the *Kluuvi* bruise (Finnish: *Kluuvin ruhje*), a wedge of *clay* and pieces of rock in the bedrock, discovered during the excavation process. To build a tunnel through the bruise an unusual solution was developed: the bruise was turned into a giant freezer, with pipes filled with *Freon 22* pushed through the clay. The frozen clay was then carefully blasted away, with *cast iron* tubes installed to create a durable tunnel.<sup>[15]</sup> Construction of the first stations, *Kulosaari* and *Hakaniemi* begun in 1974. The *Kulosaari* station was the first to be completed, in 1976, but construction of the other stations took longer.<sup>[16]</sup>

In summer 1976 *Teuvo Aura*, the *city director* of Helsinki, signed an agreement with *Valmet* and *Strömberg* to purchase the trains required for the metro from them. In doing so Aura bypassed the city council completely, reportedly because he feared the council would decide to buy the rolling stock from manufacturers in the *Soviet Union* instead.<sup>[17]</sup> By this time the *direct current* -based technology of the M1 series trains had become outdated. In 1977 prototypes for the M100 train series (referred to as “*nokkajuna*”, English: “*beak train*”, to differentiate from the M1 prototypes) were delivered. In these units the direct current from the power rail was converted to *alternating current* powering *induction*



One of the M100 series prototypes, number 106 (right) at *Kontula* metro station.

*motors*. The M100 trains were the first metro trains in the world to be equipped with such technology.<sup>[18]</sup>

*Aura*'s bypassing the city council in acquiring the rolling stock was not the only questionable part of the construction process of the Metro. On 3 June 1982, two days after the Metro had been opened for provisional traffic, *Unto Valtanen* came under investigation for taking bribes. Subsequently several members of the metro committee and Helsinki *municipal executive committee* in addition to Valtanen were charged with taking bribes. In the end it was found that charges against all the accused except Valtanen had expired. Valtanen was convicted for having taken bribes from *Siemens*.<sup>[17]</sup>

## 1.3 1982 onwards: In service

On 1 June 1982, the test drives were opened to the general public. Trains ran with passengers during the morning and afternoon rush hours between *Itäkeskus* and *Hakaniemi* (the *Sörnäinen* station was not yet opened at this time). On 1 July the provisional service was extended to *Rautatientori*.<sup>[12][19]</sup> *President of the Republic of Finland* *Mauno Koivisto* officially opened the Metro for traffic on 2 August 1982 – 27 years after the initial motion to the city assembly had been made.<sup>[19]</sup>

The Metro did not immediately win the approval from inhabitants of eastern Helsinki, whose direct bus links to the city centre had now been turned into feeder lines for the Metro. Within six months of the Metro's official opening, a petition signed by 11 000 people demanded the restoration of direct bus links. Subsequently the timetables of the feeder services were adjusted and opposition to the Metro mostly died down.<sup>[20]</sup>

On 1 March 1983 the Metro was extended in the west to *Kamppi*. The *Sörnäinen* station, between *Hakaniemi* and *Kulosaari*, was opened on 1 September 1984.<sup>[12]</sup>

The Metro was extended eastwards in the late 1980s, with the *Kontula* and *Myllypuro* stations opened in 1986, and



the Mellunmäki station following in 1989.<sup>[20]</sup> The construction of a westwards expansion begun in 1987 with tunneling works from Kamppi towards Ruoholahti. The Ruoholahti metro station was opened on 16 August 1993.

Another new station followed: the Kaisaniemi station, between Rautatientori and Hakaniemi, was opened on 1 March 1995. It had in fact been decided on already in 1971, and the station cavern had been carved out of the rock during the original tunneling works, but a lack of funds had pushed back the station's completion.

On 31 August 1998, after four years of construction, the last new section of line to date was completed, with the opening of a three-station fork from Itäkeskus to Vuosaari.<sup>[21]</sup>



*Helsinki Metro map.*



*M200 class metro train at Kulosaari metro station in 2009.*



*The entrance to Rastila metro station.*

The second generation of Metro trains to be used in passenger service (the M200 class) were delivered in 2000 and 2001 by Bombardier.<sup>[22]</sup> These trains are based on Deutsche Bahn's class 481 EMUs used on the Berlin S-Bahn network.<sup>[23]</sup>

On 25 September 2006, the city council of Espoo approved, after decades of debate, planning, and controversy, the construction of a western extension of the Metro. Under the plan, Metro trains will run to Matinkylä by the end of 2015.<sup>[24][25]</sup> (See section The future below.)

On 1 January 2007, the latest station, Kalasatama, between the Sörnäinen and Kulosaari stations, was opened. It serves the new "Sörnäistenranta-Hermanninranta" (Eastern Harbour) area, a former port facility that will be redeveloped as its functions are moved to the new Port of Vuosaari in the east of the city.

After 8 November 2009, the Rautatientori station, under the Central Railway Station, was closed to the public because a burst water pipe flooded it.<sup>[26]</sup> After renovations, the station reopened for public use on 15 February 2010.<sup>[27]</sup> The lifts were still under renovation, but they also reopened for service on 21 June 2010.<sup>[28]</sup>



*An interior view of a M100 metro train.*

## 2 Network

The Helsinki Metro system consists of seventeen stations. The stations are located along a Y shape, where the central line runs from the city centre towards the eastern suburbs. The line forks at the Itäkeskus metro station. The



A platform at *Kamppi metro station*.

six stations in central Helsinki are below surface, while the eleven eastern stations are surface stations.

Trains on the metro system usually run every four or five minutes, and they alternate between the **Mellunmäki** (northern) and **Vuosaari** (eastern) branches. The metro trains stop at every station, and the names of the stations are announced in both **Finnish** and **Swedish** (with the exceptions of **Central Railway Station** and **University of Helsinki**, which are also announced in English).

The metro is designed as a core transport facility, which means that extensive feeder bus transport links are provided between the stations and the surrounding districts. Taking a feeder bus to the metro is often the only option to get to the city centre from some districts. For example, since the construction of the metro, all daytime bus routes from the islands of **Laajasalo** terminate at the **Herttoniemi metro station**.

## 2.1 List of stations

Main article: *List of Helsinki metro stations*

### Ruoholahti - Itäkeskus:

- **Ruoholahti** (*Gräsviken*), below surface
- **Kamppi** (*Kampen*), below surface
- **Central Railway Station** (*Rautatientori / Järnvägstorget*), below surface
- **University of Helsinki** (*Helsingin yliopisto / Helsingfors universitet*), formerly **Kaisaniemi** (*Kaisaniemi*), below surface
- **Hakaniemi** (*Hagnäs*), below surface
- **Sörnäinen** (*Sörnäs*), below surface
- **Kalasatama** (*Fiskhamnen*)
- **Kulosaari** (*Brändö*)

- **Herttoniemi** (*Hertonäs*), below surface
- **Siilitie** (*Igelkottsvägen*)
- **Itäkeskus** (*Östra centrum*), below surface

### Itäkeskus - Mellunmäki: (northern branch)

- **Itäkeskus** (*Östra centrum*), below surface
- **Myllypuro** (*Kvarnbäcken*)
- **Kontula** (*Gårdsbacka*)
- **Mellunmäki** (*Mellungsbacka*)

### Itäkeskus - Vuosaari: (southern branch)

- **Itäkeskus** (*Östra centrum*), below surface
- **Puotila** (*Botby gård*), below surface
- **Rastila** (*Rastböle*)
- **Vuosaari** (*Nordsjö*)

## 2.2 Access

The fact that most of the stations are located on the surface makes the metro system more friendly for passengers with mobility problems. There are no stairs on most sub-surface stations, and one can access the stations from the street level via **escalators** or **lifts**.

The trains themselves have no steps, and the platforms are always at the same level as the train floor.

## 2.3 Ticketing

The ticketing scheme on the Metro is consistent with other forms of transport inside the city of Helsinki, managed by the **Helsinki Regional Transport Authority** (HSL) agency. The HSL travel card (*matkakortti*) is the most commonly used ticket, which can be paid either per journey or for a period of two weeks to one year. The metro lies entirely within the Helsinki zone. Single tickets can be bought from ticket machines at the stations or by **SMS**. A single ticket can be used to change for any other form of transport inside Helsinki city, and is valid for one hour. Regional tickets are likewise valid. There are no gates to the platforms, and a **proof-of-payment** system is in place.

## 2.4 Safety

Passenger safety instructions are inside train carriages above the doors and stations at ticket hall and platforms. These instructions direct passengers to use emergency phones and also include an emergency phone number to



traffic center. There is emergency-stop handles at platforms, which are used to stop the train either arriving or departing in cases such as person trapped between doors, or person fallen onto track. There are emergency brake handles inside the carriage next to the door and at both ends of carriage.

Especially for people with visual impairments, all platforms have a yellow line marking the safe area on platform. Additionally, there are fire extinguishers on trains and in stations.



*M200 class metro train interior*

## 2.5 Rolling stock

The trains on the Helsinki Metro are technologically quite similar to trains on the **VR commuter rail** network, which serves the northern and western suburbs of Helsinki. The **track gauge** is 1,524 mm (5 ft) (broad gauge), as in all Finnish railway traffic. The electricity used by the metro trains is a 750 volt direct current, and it is drawn from an electricity track (also known as **third rail**) on the side of the metro tracks.

There are two different models of Metro Train in service and one which will be in Helsinki in the next few years. The M100 series was built by **Strömberg** in the early 1980s and the newer M200 series was built by **Bombardier** and has been used since 2001. The next era is the M300-series which will be built by CAF in 2015-2020. Even though the system was built in the 1970s and 1980s, it is still modern compared to most other metros in the world.

The normal speed of the metro trains is 70 kilometres per hour (43 mph) inside the tunnels and 80 kilometres per hour (50 mph) on the open portion of the network. The **points** have a maximum structural speed of either 35 kilometres per hour (22 mph) or 60 kilometres per hour (37 mph). Technically the M200-series goes 120 km/h and the M100-series goes 100kmh but they have been restricted to 80 km/h.

## 2.6 The depot



*The old depot access line on-street running in Viikki*



*Inside the depot*

The maintenance and storage depot for the metro system is at Roihupelto, between **Siilitie metro station** and **Itäkeskus metro station**. The depot is connected to the metro line from both the east and western directions, with a third platform at Itäkeskus used for de-training passengers before returning to the depot. Both heated and unheated undercover storage areas are provided so that trains are ready for use without a lengthy heating period.

Behind Roihupelto depot is the metro test track, allowing testing at speeds of up to 100 km/h; the far end of this test-track was connected via a non-electrified 5 km long railway route to the **VR** main line at **Oulunkylä railway station**. Both the metro and mainline share a 1,524 mm (5 ft) **track gauge**. The old access line was mostly along the first half of the old Herttoniemi Harbour railway. Through the area of **Viikki**, this single line had **street running**. The Jokeri bus-line makes use of the depot line's railway bridges to cross **Vantaa river** and **Finnish national road 4**.

In 2012 the old depot link was closed and partially removed when a new 2 km metro link line was built from the then present end at Vuosaari metro station, to the VR

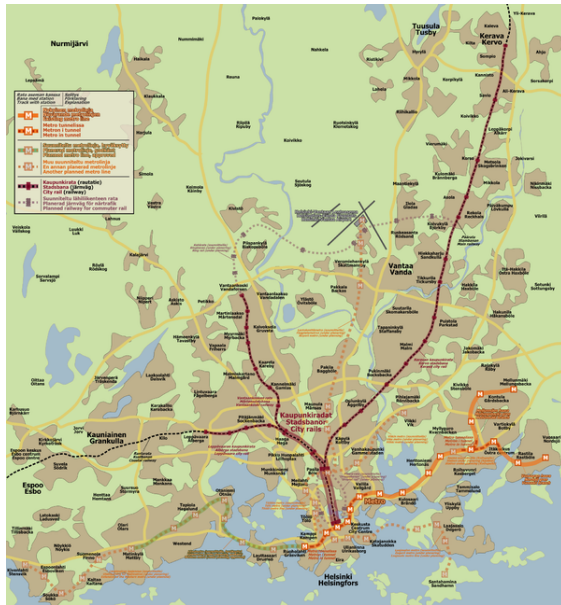
harbour railway in the new **Vuosaari** harbour. The old link line will be rebuilt for the light rail-based **Jokeri** line upgrade, scheduled for 2016 onwards.

## 3 Future

### 3.1 Western extension (*Länsimetro*)

Main article: **Länsimetro**

Plans to extend the Metro to the neighbouring



*Map of the Helsinki commuter rail network along with the metro line and their planned extensions*

municipalities of **Espoo** in the west and **Vantaa** and **Sipoo** in the northeast were first envisioned in the 1950s. While the national government and the City of Helsinki were ready to partly finance the extension from the 1990s, the Espoo municipal government continued to block the project and hold out for more funding. However, by 2005 public opinion had shifted, as a poll indicated that 75% of people in Espoo favoured building the western extension, and in September 2006, the Espoo city council approved the extension. The final formula agreed on was simply that each city would finance works on its own land, leading to a 72/28% split between Espoo and Helsinki.<sup>[29]</sup>

The construction work started with the excavation work of the tunnels at Ruoholahti in November 2009. Further excavation work started in Lauttasaari and Espoo in May 2010.<sup>[30]</sup> The extension is expected to be in operation in 2015 at the earliest.<sup>[31]</sup> (The metro now serves **Kamppi** bus terminal, where the buses via the highway **Länsiväylä** to Espoo leave.) The construction work of the extension from Matinkylä to Kivenlahti is going to get started soon.

### 3.2 Other

Main article: **Helsinki second metro line**

A second Metro line from **Laajasalo** via **Kamppi** to **Pasila** north of the city centre, and possibly onwards to **Helsinki-Vantaa Airport**, is also in the planning stages. This is being taken into consideration in city plans and has been discussed by the city assembly, but does not look likely to be seriously planned before the mid-2030s at the earliest. To prepare for this eventuality, a platform level for a crossing line was already excavated during the original construction of the **Kamppi** station.

The construction of the **Helsinki commuter rail Ring Rail Line**, which connects the airport to the rail network, began in May 2009. The current plans commissioned by the city recommend the extension of the tram network, instead of the metro, to **Laajasalo**. Thus construction of a second metro line along the **Laajasalo-Kamppi-Airport** route appears unlikely.

On 17 May 2006 the Helsinki city council decided that the current, manually driven metro trains will be replaced by automatic ones, operated without drivers.<sup>[32]</sup> Until this is done, expansion of the system will not be possible as new and replacement parts for the current system, built in the 1970s, are increasingly difficult to obtain.

There is a plan to extend the **Vuosaari** section of the line to the new **Vuosaari** harbour (see section **The depot** above).

A new station is being planned in **Roihupelto**, between **Siilitie** and **Itäkeskus**, to serve a possible future suburb.<sup>[33]</sup>

## 4 Unused stations

In addition to the metro stations already in operation, forward-looking design has led to extra facilities being constructed in case they are needed in the future.

**Kamppi** The current metro station lies in an east-west direction. A second metro station was excavated at the same time of construction in 1981. This station is perpendicular (north-south) to the first one and has platforms 100m in length, slightly shorter than those above.<sup>[34]</sup> Tunnels designed to eventually connect the two sets of lines curve off from the west-end of **Kamppi**. See also: **Helsingin Sanomat** published side elevation plan and photograph of second level.

**Hakaniemi** Two station boxes were constructed in **Hakaniemi**. Intended for future expansion, the second is now unused.<sup>[35]</sup>

**Kaisaniemi** A second area exists below the current platforms, with the intention to allow for future expansion.<sup>[35]</sup>

**Munkkivuori** The designers of Finland's first shopping centre were very enthusiastic about the rumoured plans for a metro system all over Helsinki—something that would not appear for another 20 years. Built in 1964, the station does not fit into any future metro lines and is unlikely to be used. The platform area is partially littered with building-rubble from more recent construction works in the area and the only visible evidence of the ahead-of-its-time station are a pair of large escalators. The escalators lead down from the main part of the shopping mall to the below-ground area where the ticket office would have been. The entrance to the lower level is behind the strange-shaped photographic shop.<sup>[36]</sup>

## 5 Statistics

According to the **Helsinki City Transport (HKL)** yearly report for 2003, the metro system had a total of 55.4 million passengers, who travelled a total of 404.1 million kilometres. The total **turnover** for the metro division of HKL was €16.9 million and it made a profit of €3.8 million.

The Metro is by far the cheapest form of transport in Helsinki to operate, with a cost of only €0.032 per passenger kilometre. The same figure for the second cheapest form - trams - was €0.211.

In 2002, the Metro used 39.8 GWh of electricity, though the figure was rising (from 32.2 GWh in 2001). This equals 0.10 kWh per passenger kilometre, and compares favourably with Helsinki's trams (which used 0.19 kWh per passenger kilometre in 2002).<sup>[37]</sup>

## 6 See also

- **Geography of Helsinki**
- **Helsinki Metropolitan Area**
- **List of Helsinki metro stations**
- **List of metro systems**
- **Public transport in Helsinki**

## 7 References

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## 8 External links

- [HKL Metro - Official Site \(English\)](#)
- [Helsinki City Transport \(Finnish\)](#)
- [Metro website of the Finnish Tramway Society](#)
- [Helsinki at \*UrbanRail.net\*](#)
- [Photos of the Metro of Helsinki](#)
- [Pictures of Helsinki Metro](#)



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