The challenge
Up until the end of the eighties, the main means of transport in Hanoi were bicycles and trams, both particularly suited to this relatively flat city with its narrow streets. Since the last tram line was closed in 1991, Vietnam has undergone a period of major economic growth leading to a boom in property and urban development in the capital city. This means that by 2030 the population is forecast to reach over 8 million. Future urban development will certainly occur on the rural areas to the west of the city and on the left bank of the Red River, as the centre is already densely populated.

The rise in living standards has led to a huge surge in motorised transport: bicycles have almost entirely given way to mopeds and scooters. While this type of transport has made it possible to achieve one of the highest densities of traffic anywhere in the world and to cope with the poorly developed road network, it has led to major environmental problems, especially with regard to noise.

At the start of the decade, the Hanoi authorities, with the support of international financial institutions, put in place policies to develop public transport, with significant results. Today, by renewing the fleet of buses and redesigning the bus network, they have enabled public transport to achieve a 10% share of the market. However, the recent increase in the number of cars has led to a deterioration of traffic conditions in the city and average speeds for buses have fallen sharply, making them less attractive.

Only an efficient public transport system on private right-of-way can now avert the catastrophic consequences of the impending congestion.

Between 2004 and 2005, SYSTRA carried out two pre-feasibility studies which identified the East-West corridor as a priority and recommended that a metro be built along this axis. In 2006, the local authorities and the government officially agreed to launch construction of a pilot metro line between Nhon Industrial University and Hanoi Railway Station, a popular commuter route. A new Urban Masterplan was approved in 2008. This sets out plans for the creation of 6 new metro lines and 3 Bus Rapid Transit lines by 2030.

The pilot line is the first metro line to be built in Vietnam and will run East-West across the city. It will serve three centres of higher education, the Temple of Literature - symbol of the city and an important site of historical interest - and Hanoi Railway Station, the terminus. Extensions are planned to Hoan Mai in the south around 2020 and, in the longer term, to Son Tay to the west of the city.

At the start of revenue service, the line will transport 8,600 passengers per hour and per direction at peak times with plans to reach 23,900 on its busiest section by 2030. This puts it into the category of medium-capacity metro systems.

CIVIL WORKS
The project comprises several types of infrastructure, depending on the section:
- an 8.5 km single track U-viaduct which is better adapted to installation in urban areas and will generate considerable savings in construction costs compared to a standard viaduct,
- a 4 km tunnel aimed at preserving the urban environment in the center of the city. To meet the challenging geological conditions and minimise the risks, SYSTRA has proposed a twin tube structure. This will be the first urban tube to be built in Hanoi.

VENTILATION AND SMOKE EXTRACTION IN STATIONS AND TUNNEL SECTIONS - AIR CONDITIONING IN STATIONS
The (double tube) tunnel ventilation is composed of units fitted to each station tympanum, and equipped with two axial reversible flow fans with a throughput of approximately 100 m³/s each. The overall design of the systems, contributing to station and tunnel safety, was carried out in compliance with international standards.
**INTERCHANGE HUBS**

Phase 1 of the line will serve several transport hubs including Nhon and Cau Giay bus stations, Cat Linh rail station for connections to the Hanoi-Hadong suburban line and Hanoi Railway Station, where the pilot line, line 1 of the metro, national rail lines and many bus lines will all interconnect. The Hanoi Pilot Metro line will eventually be connected to all the other metro lines, forming the backbone of the Hanoi transport network.

**ROLLING STOCK**

A 4-cars, 80 m long train was recommended. As passenger traffic increases, after around 30 years of operation, a fifth car will be added, raising the capacity of a train to 1,155 passengers.

**DEPOT AND WORKSHOP**

Located at Nhon terminus, the depot and workshop will cover an area of 15 hectares. It is designed to house 24 trains as well as the operational control centre, administrative buildings, the maintenance workshop and a site for routine servicing of rolling stock and fixed equipment.

**SYSTRA’s role**

Since November 2007, SYSTRA has been acting as General Consultant to the Hanoi Metropolitan Rail Transport Project Board (HRB) and managing the project on behalf of the Hanoi People’s Committee (HPC).

As such, SYSTRA is responsible for all design studies for the project as well as preparation of tender documents including assistance for bids review and contracts awarding. SYSTRA also helps the client with financial management of the project and will be responsible for supervision of works during the construction and installation phase.

Finally, prior to commissioning and launch, SYSTRA will provide training on operation and maintenance. SYSTRA has set up a project office in Hanoi with dozens of Vietnamese and French personnel. The team is in charge of all aspects of the project: coordination with the client and the authorities, managing the design phase for designs from head office, drawing up and revising technical documents, translations…

**AT A GLANCE**

- **CHARACTERISTICS**
  - Length: 12.5 km
  - Underground: 4 km
  - Viaduct: 8.5 km
  - Stations: 12
  - Trips (2030): 754,000 per day
  - Speed: 37 km/h
  - Total Costs: € 750 Million

- **ORGANISATIONS INVOLVED**
  - Funding Organisations: The French Government (Ministry of Finance and Industry, DGTPE), French Development Agency (AFD), European Investment Bank (EIB), Asian Development Bank (ADB)
  - Local Institutions: The Vietnamese Government, Hanoi People’s Committee (HPC), Hanoi Metropolitan Rail Transport Project Board (HRB)

- **PREVISIONS (MARCH 2009)**
  - 2009: completion of technical studies and launch of calls for tender
  - 2010: start of works
  - 2014: commissioning of the line