Multi-Utility Tunnels

Old-fashioned or Necessary?

Analysis of Environmental Engineering Factors that Create the Potential for Improving the Technical State of the Underground Infrastructure of Urban Areas

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Plan of presentation

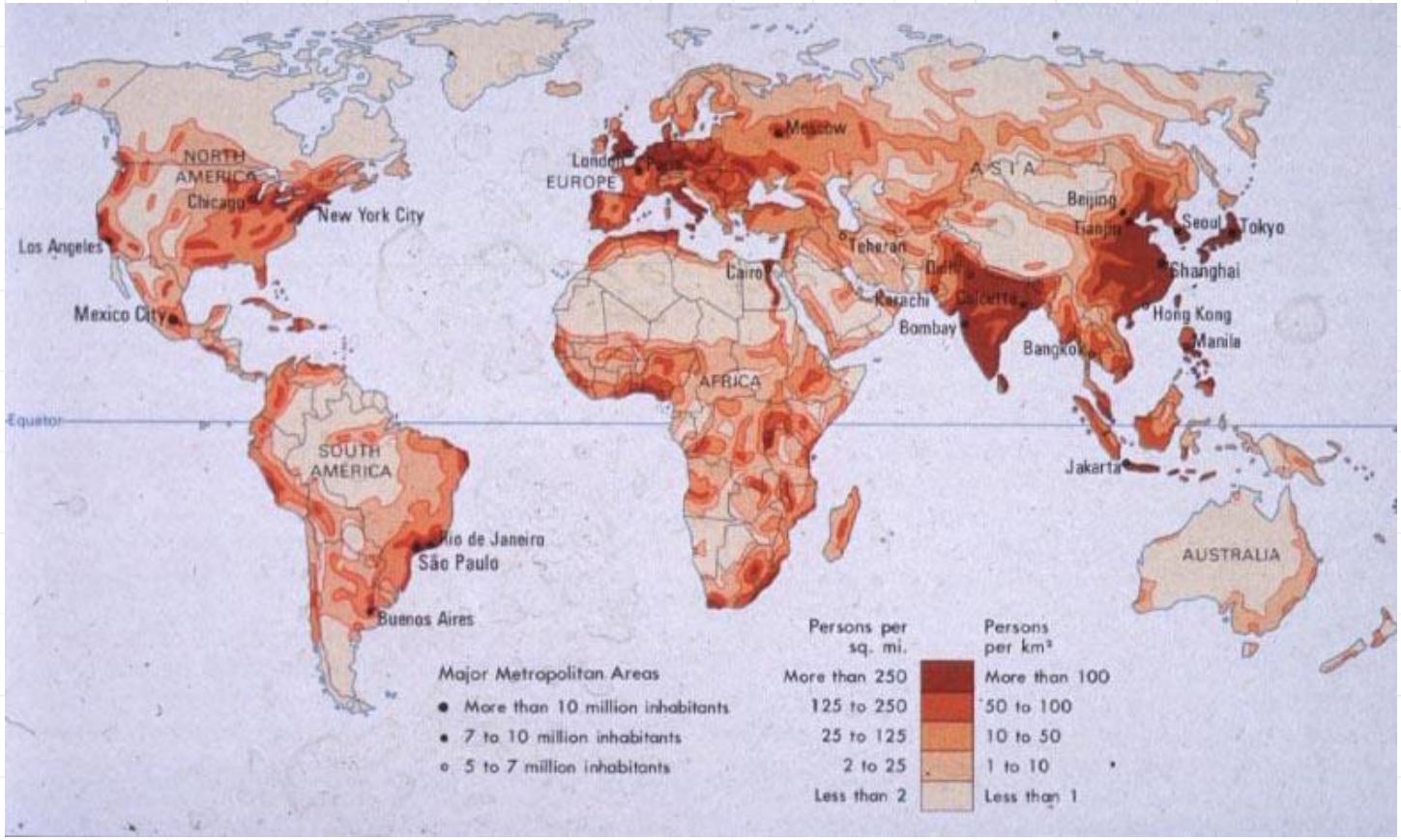
- Introduction
- General Remarks on Multi-Utility Tunnels
- Case Study of Multi-Utility Tunnels
- Conclusions

Why am I discussing this problem?

- **because in 2000 the urban population of the planet exceeded 50 %,** which is why we have to place more technical infrastructure in the underground space of cities.
- **there is a dynamic development of trenchless methods,** especially tunnelling, microtunneling and the relining of sewage tunnels with a large cross section:

  - this offers a less disruptive implementation of new investments, and helps to overcome natural obstacles (e.g. rivers), as well as already existing structures,

  - this creates new opportunities for increasing the application of multi-utility tunnels and also lets investors who administrate underground infrastructure networks in cities consider their widespread use.



Total Population	1950	2.5 mld
	2000	6.25 mld
Urban Population	1900	13%
	2000	**over 50%**

It is known, however, **that a city without a developed underground infrastructure has no future**

The main elements of the underground infrastructure of urban areas

- Basements and underground garages
- Network infrastructure
- Automobile tunnels and underpasses for pedestrians
- Commercial buildings and other services
- Underground facilities for the metro, tram and rail
- Laboratories and special purpose buildings
- Tanks and storage (gases, liquids and solids)
- Buildings and military facilities
- Cemeteries and burial
- Other….

Underground **cities**

Fantasy or a real need in the near future?

This is not known

What is one of the

most important technical barriers

for the development of the underground infrastructure of urban areas?

Chaos in the network

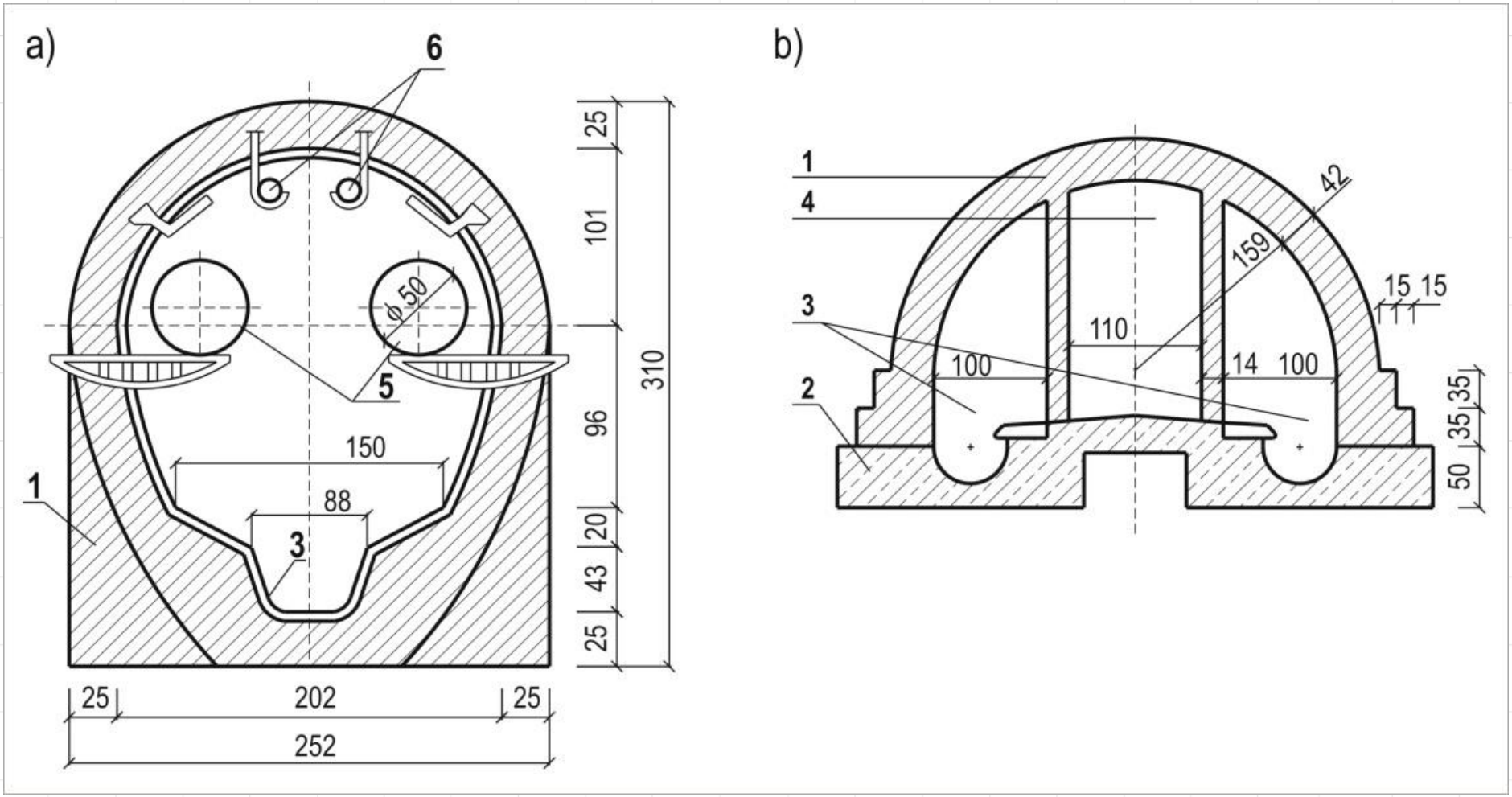
Infrastructure and its localization

Where to look for technical solutions to solve the problem ?

Among others, in the construction of multi-utility tunnels and the integration of infrastructure networks to free up space for other underground structures

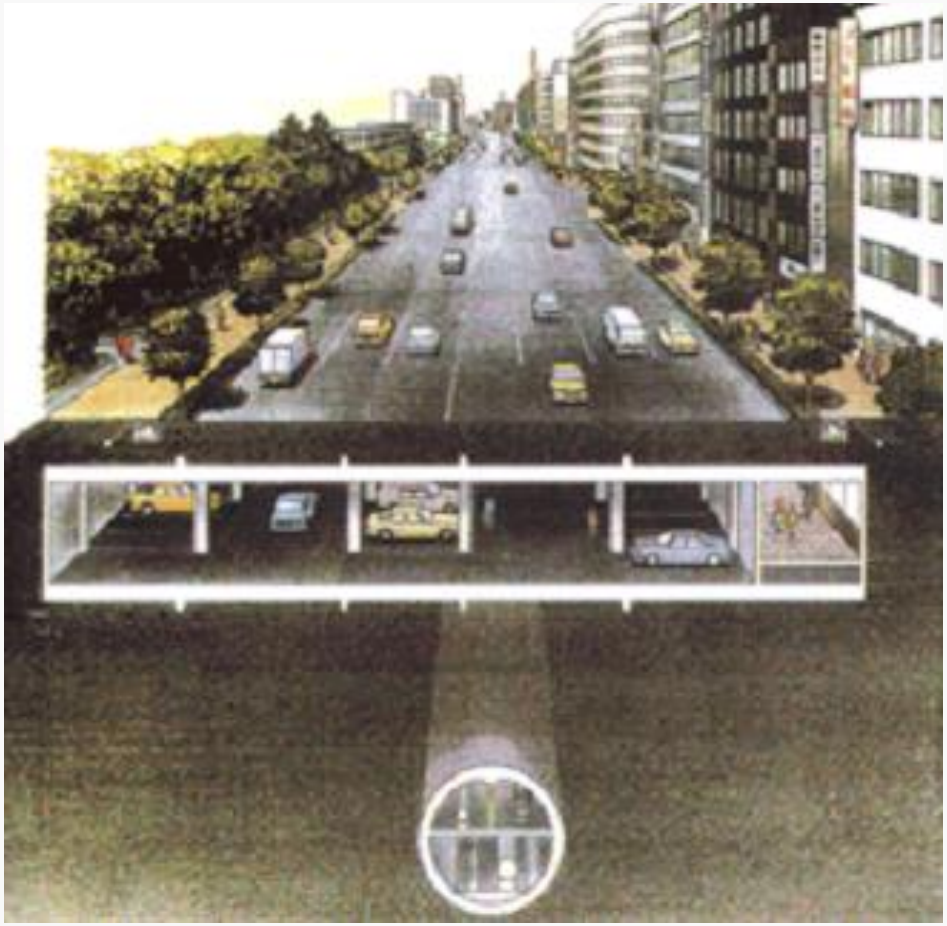
Multi-utility tunnels: a) Paris, b) Madrid

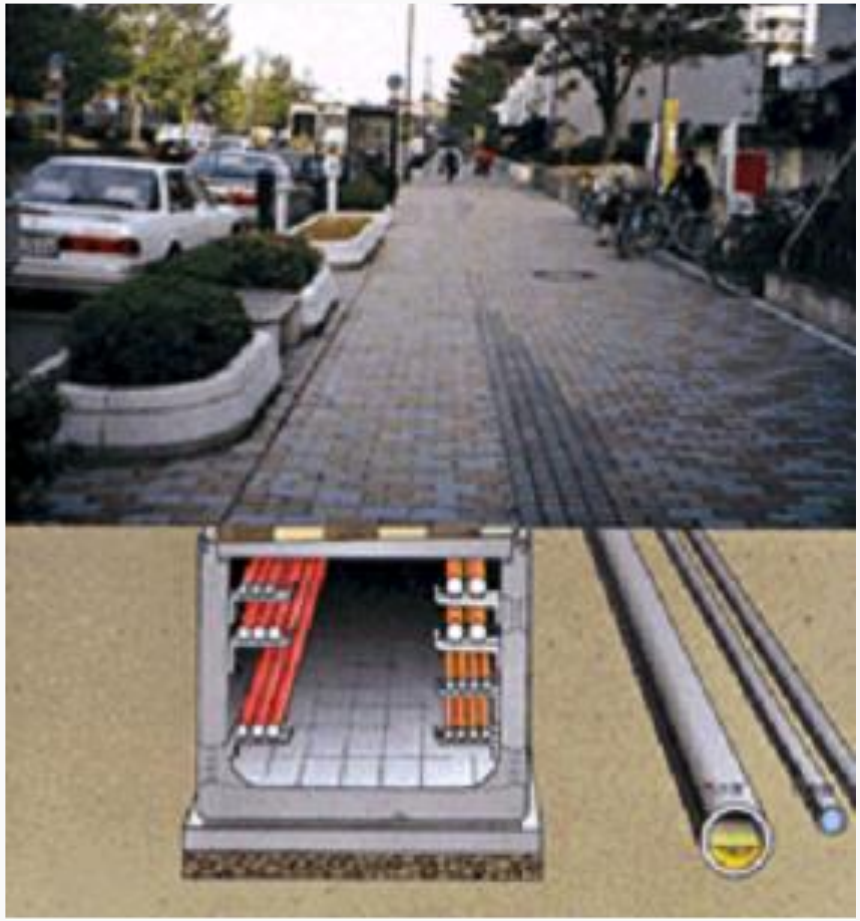
1 – brick wall, 2 – concrete, 3 – sewer, 4 – space for cables, 5 – water pipes, 6 – electroenergetic cables



A multi-utility tunnel made in an open trench

Making space for an underground garage – a concept





Microtunneling

View of the TBM machine

used in Warsaw for the installation of a multi-utility tunnel under the Vistula river

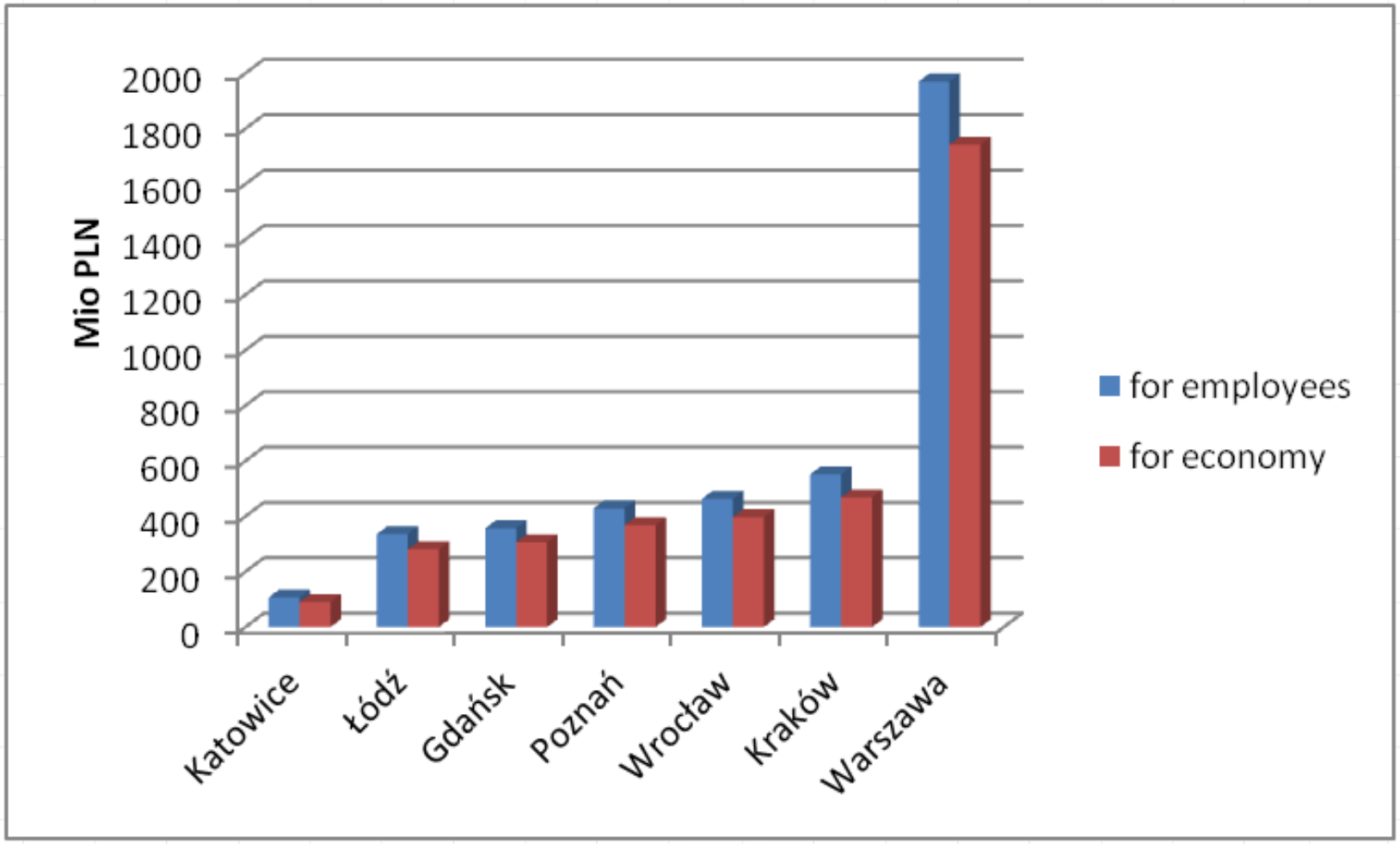
Selected benefits resulting from the use of multi-utility tunnels

Benefits of using multi-utility tunnels:

- **Integrates underground networks** and lowers costs during a structure's complete service life.
- **Makes underground space** available to other structures.
- **Provides better maintenance conditions** for pipes and conduits (suitable temperature and humidity, elimination of: static loads from soil, dynamic loads from means of transportation, impact from mining operations, corrosive impacts of the soil-water environment on the pipes, etc.).
- **Allows faults in** current networks and their sections to be repaired without the use of trenches.

The annual cost of traffic jams

in million zlotys according to Deloitte



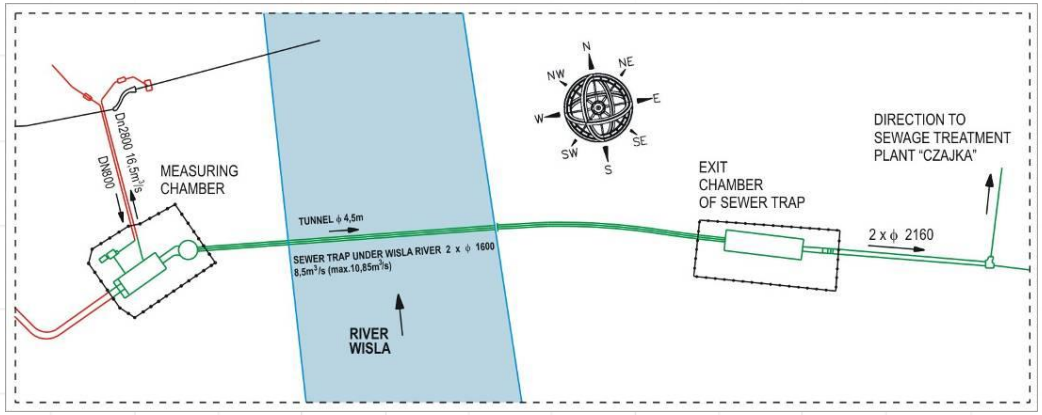
Rzeczpospolita 14 stycznia 2011

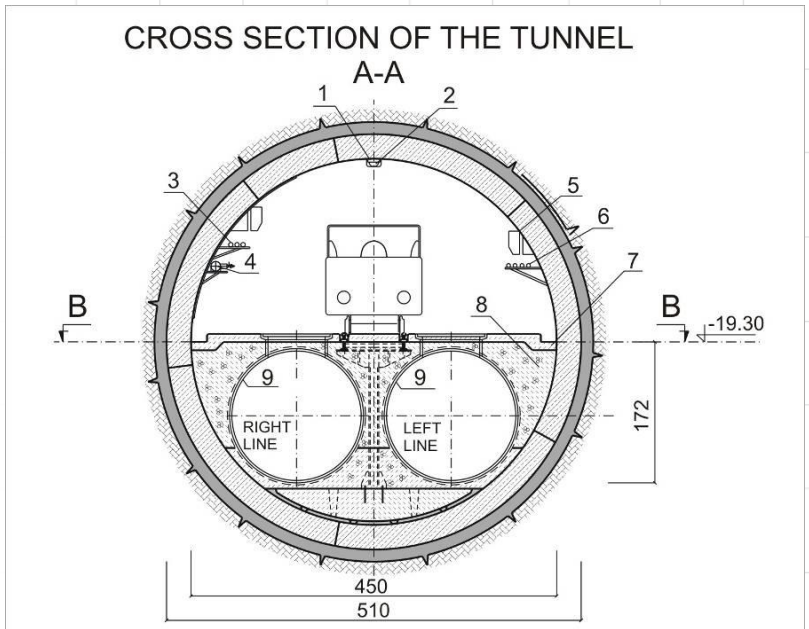
Failures of pipelines laid underground – the intensification of traffic difficulties

http://investmap.pl/wiadomosci/wielka-awaria-wodociagowa-we-wroclawiu,6185.html
http://www.iswinoujscie.pl/artykuly/15631/

Main characteristics **of the multi-utility tunnel under the Vistula river in Warsaw**

Tunnel:
Inner diameter = 4500mm, lenght = 1.3 km
Internal pipes: 2 x GRP DN 1600, PN 6





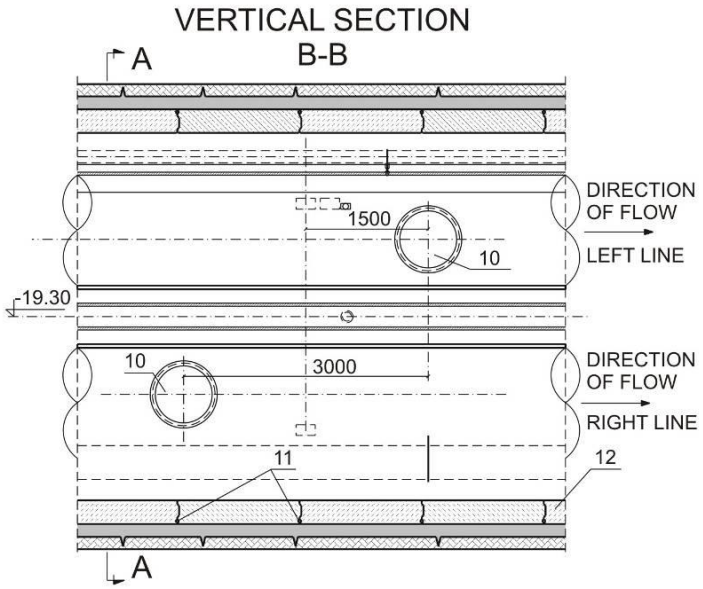
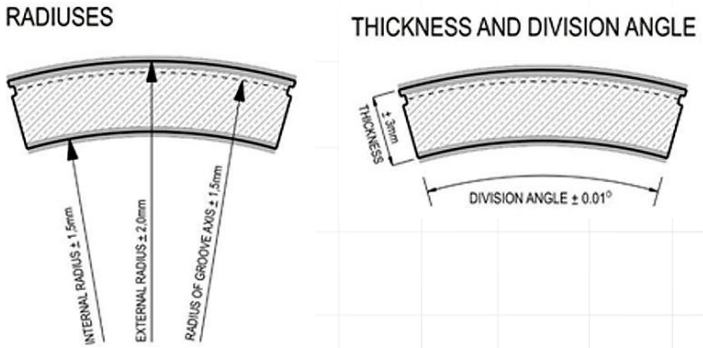


Diagram of tubing

and the view after prefabrication

The building has been designed as a reinforced concrete structure made of tubings using a TBM.



Starting chamber

Exit chamber

The biggest multi-utility tunnel in the World

The SMART Tunnel

Stormwater Management And Road Tunnel




The SMART Tunnel in Kuala Lumpur

S-252 and S-253 | SMART | Kuala Lumpur| Malaysia

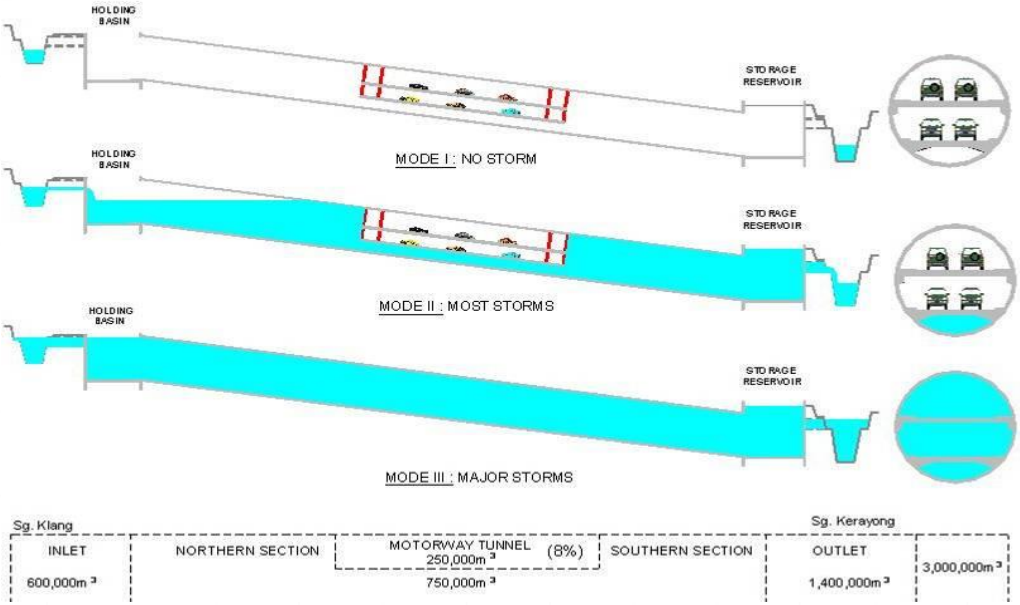
2x Mixshields

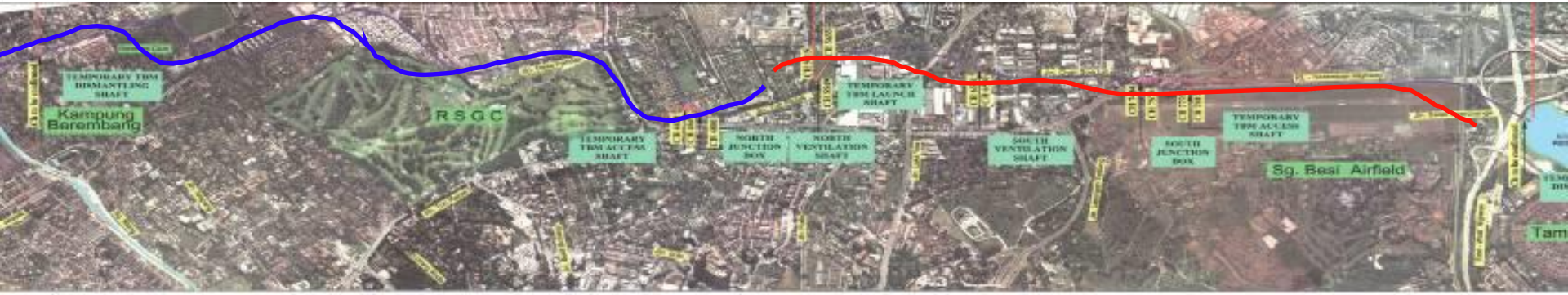
TBM: 13,210mm

Length of tunnel: 9,35 km

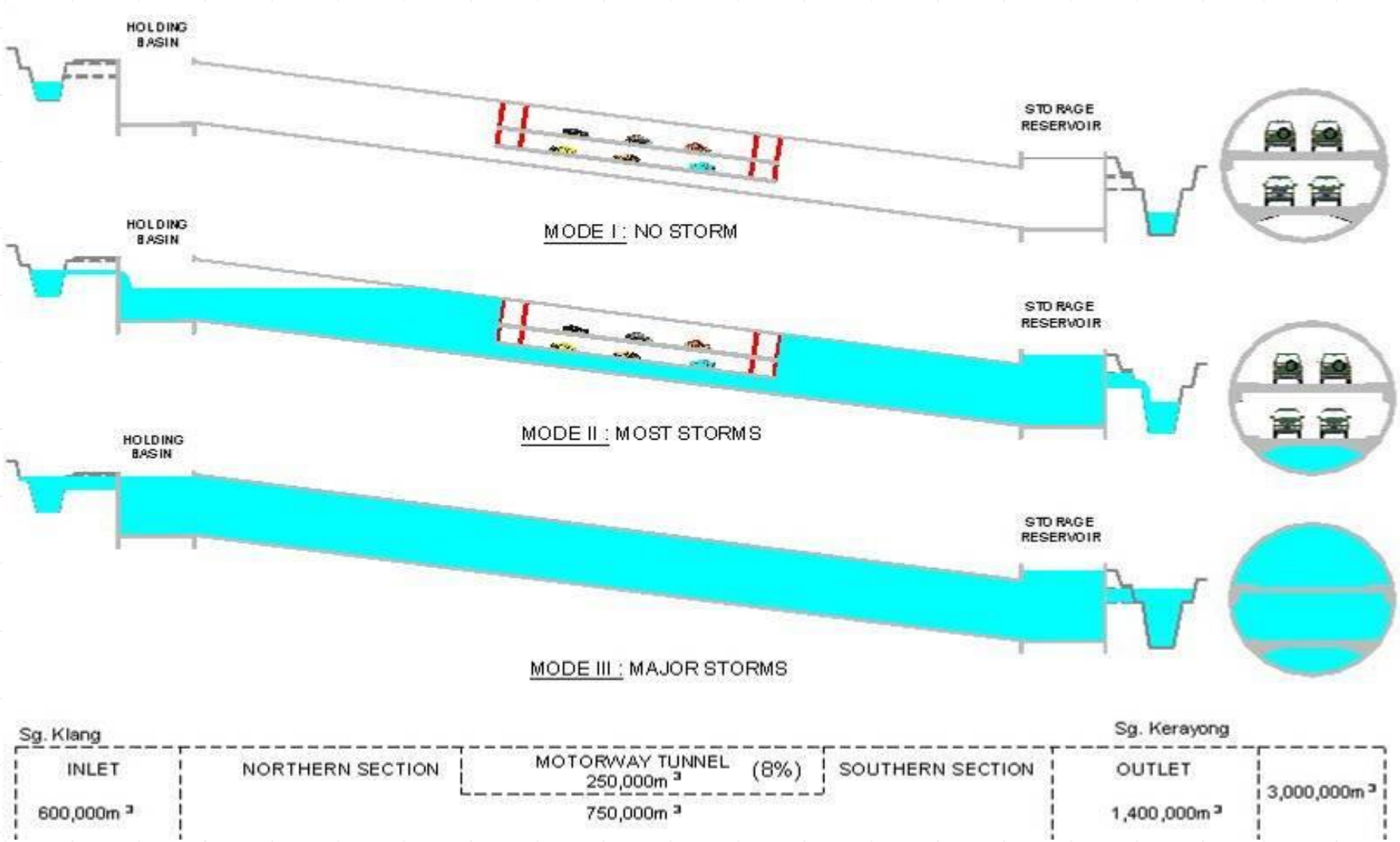
Geology: limestone, sand, marble

The SMART Tunnel in Kuala Lumpur





The SMART Tunnel in Kuala Lumpur



Maybe this is the best solution to the presented problems?

Someone will ask: What is the role of this car on this small island?

It is the beginning of future problems.

Thank You Very Much!

Used to develop the presentation's graphic materials:

- own drawings and photographs of objects,
- Die Zukunft liegt unter uns.
  Bauen und Leben unter der Erde, CCH Hamburg, 1997

Drawings and photographs of objects made available to the author by:

- Prof. Ray Sterling (Trenchless Technology Center, Louisiana Tech. University),
- Hobas Polska,
- Herrenknecht A.G.,

Publicly available materials on the Web.