

Making distribution logistics
in big cities more sustainable:
rail transport solutions

Francesco Filippi
Centre for Transport and Logistics
University of Rome La Sapienza

Current trends

The correlation between economic **growth** and transport **demand** can hardly be questioned.

Technological innovation in propulsion systems and fuels can only partially offset the growth of environmental impacts from growth of transport demand, in particular CO₂ emissions.

The SPRITE project

SPRITE, Separating the Intensity of Transport from Economic Growth, addressed the issue of **decoupling** of transport growth from economic growth.

Funded by the European Commission within the Key Action on Sustainable Mobility and Intermodality of the Fifth Framework Programme.

Decoupling as a policy objective

It means separation of economic growth from the negative externalities of transport.

This objective together with that of improving **economic efficiency** ensures that society as a whole is better off.

Any policy intervention leaves winners and losers. Thus, there is a third objective, **equity**.

The villain

Road traffic causes the most negative externalities.

Trucks are the **worst** air and noise polluters.

The presence of trucks in communities and neighbourhoods is ranked high on lists of factors that cause concern.

Road-traffic emissions and decoupling strategies

Total
impact

=

Traffic volumes
vkm

x

Environmental
Efficiency
Environment load
vkm

Strategies

Remove trips

Reduce distance

Switch to more
sustainable modes

Improve load factor

Improve traffic flows

Improve vehicle
energy efficiency

Switch to more
sustainable energies

Improve human factor

Can rail save the city?

Yes, **if** the rail is a “more sustainable mode”:

- Better energy efficiency
- More sustainable energies for traction
- Less noise
- Fewer accidents

But also **if** it is economically efficient and does not pose equity problems.

Comparing rail and road freight

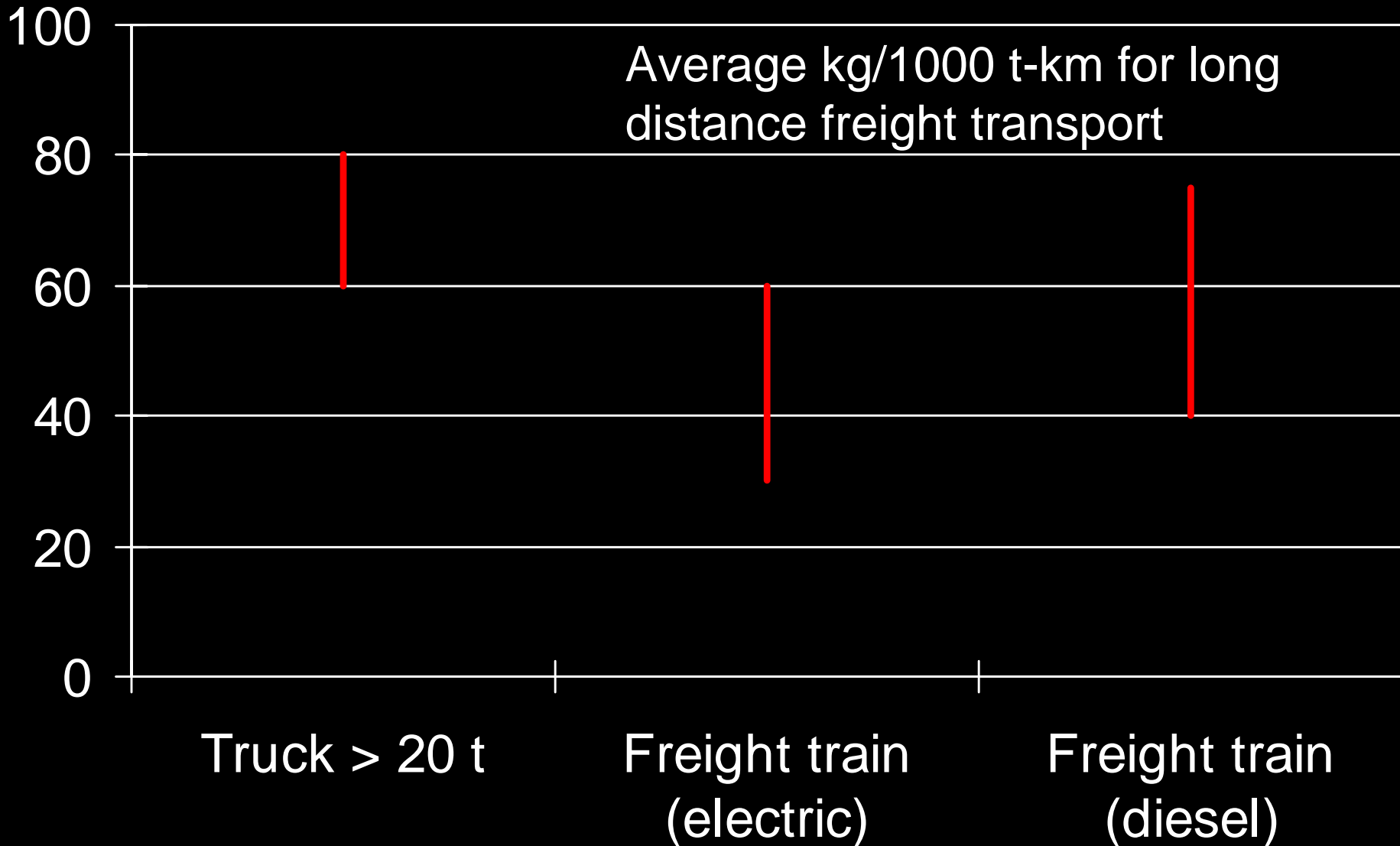
Mode	Cost	Fuel	HC	CO	NOx
	<i>Cents</i>	<i>Gallons</i>	<i>Lb</i>	<i>Lb</i>	<i>Lb</i>
Rail	2.53	0.005	0.46	0.64	1.83
Truck	5.35	0.017	0.63	1.90	10.17

Unit ton-mile

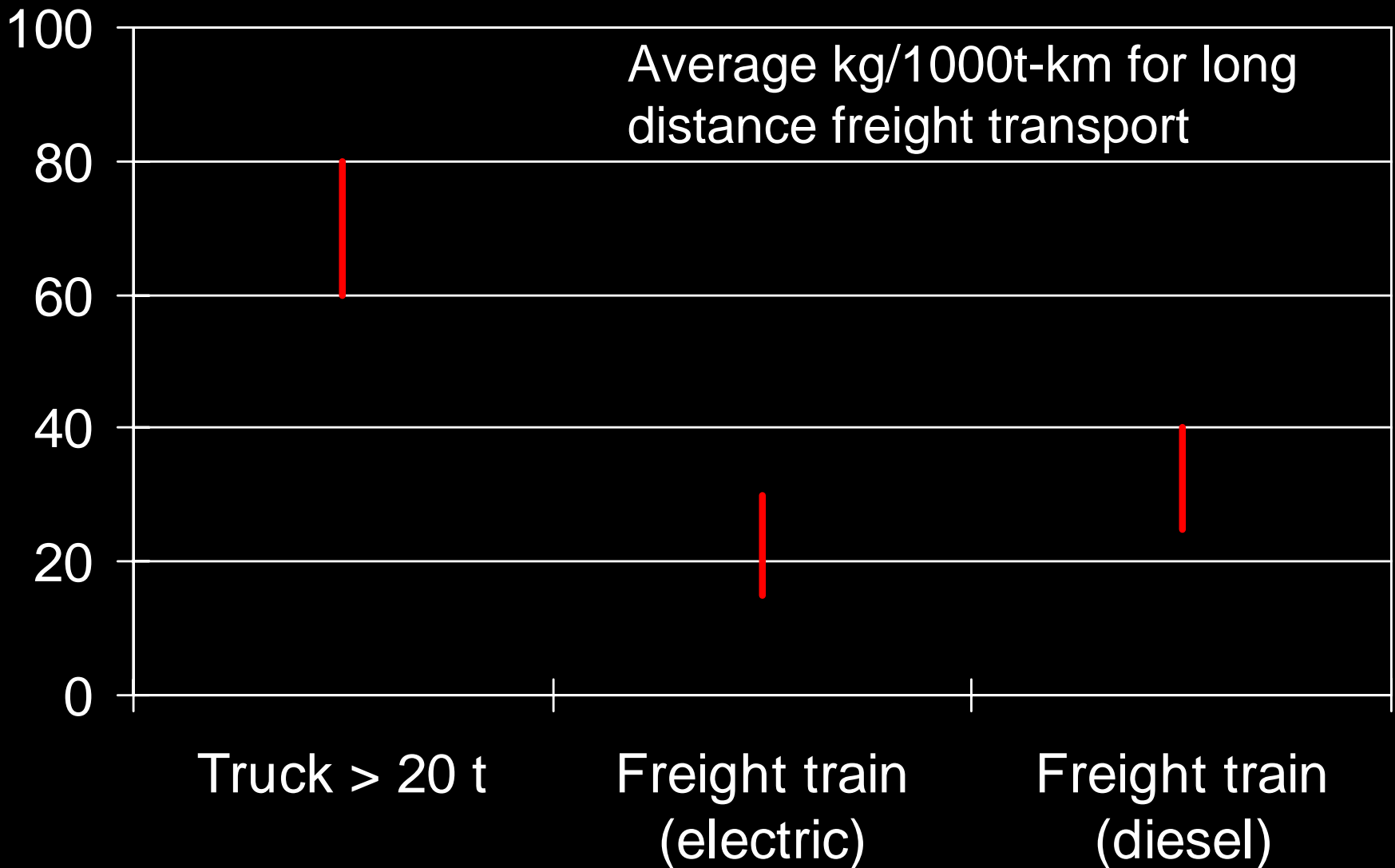
The right comparison

- well-defined, homogeneous, and competing markets;
- complete transport chains;
- anticipated future environmental performance of the two modes.

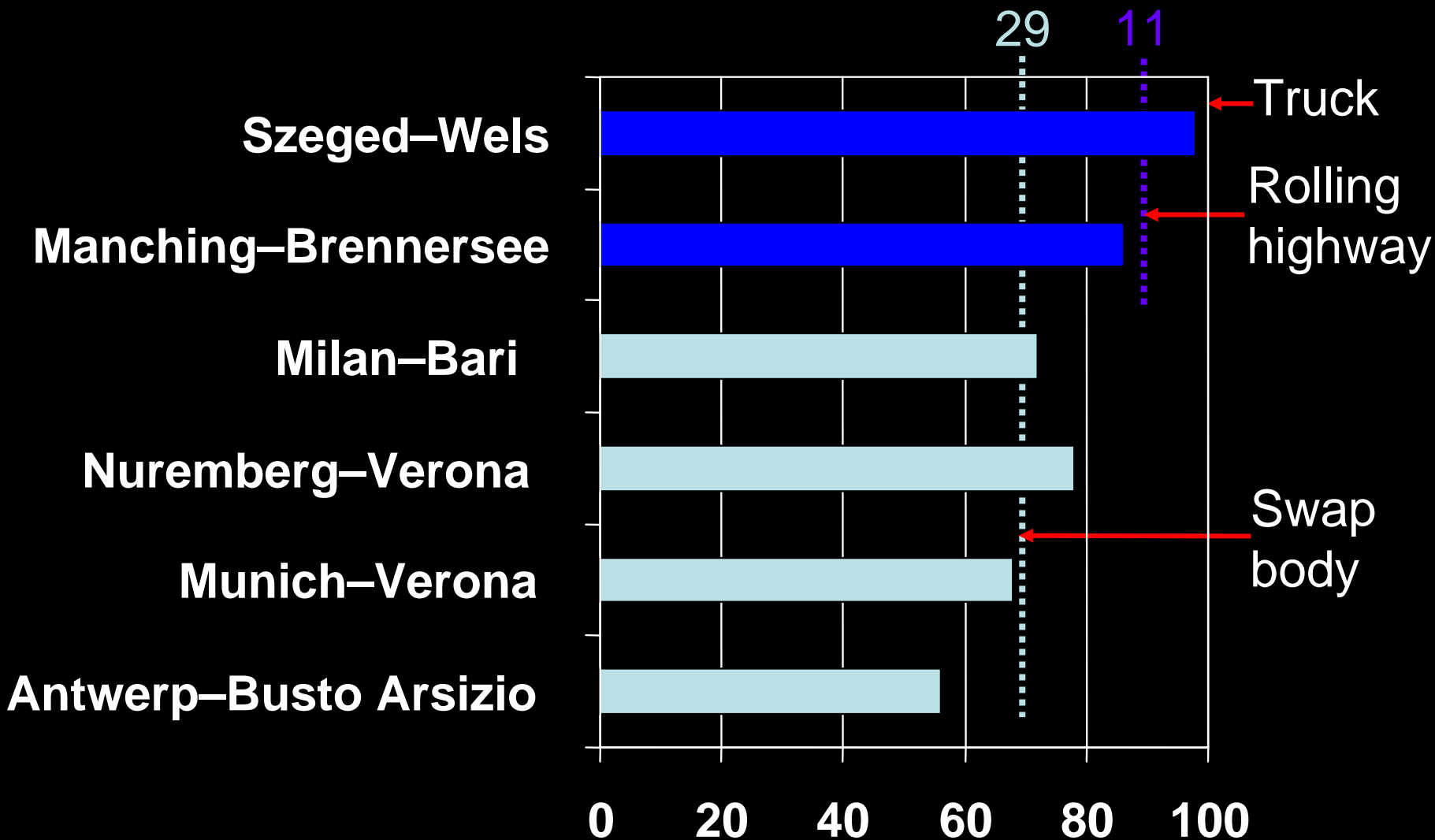
CO₂ emissions (bulk goods)



CO₂ emissions (non-bulk goods)



Primary energy consumption



Noise

Trains and trucks have **comparable** levels of noise.

Although at high speed trains can be louder, the noise can easily be contained and the corridor insulated. It cannot spread like the noise of trucks on the street.

Safety

- Rail accidents, much rarer than road, on the order of 1/100 per tkm, are sometimes more catastrophic and always get more media coverage.
- The drive to make rail even safer adds costs and constraints that are not consistently applied to roads.
- Road vehicles have the 'privilege' of being allowed to operate at much higher levels of risk. This is one reason why they are often quicker, cheaper, and more convenient.

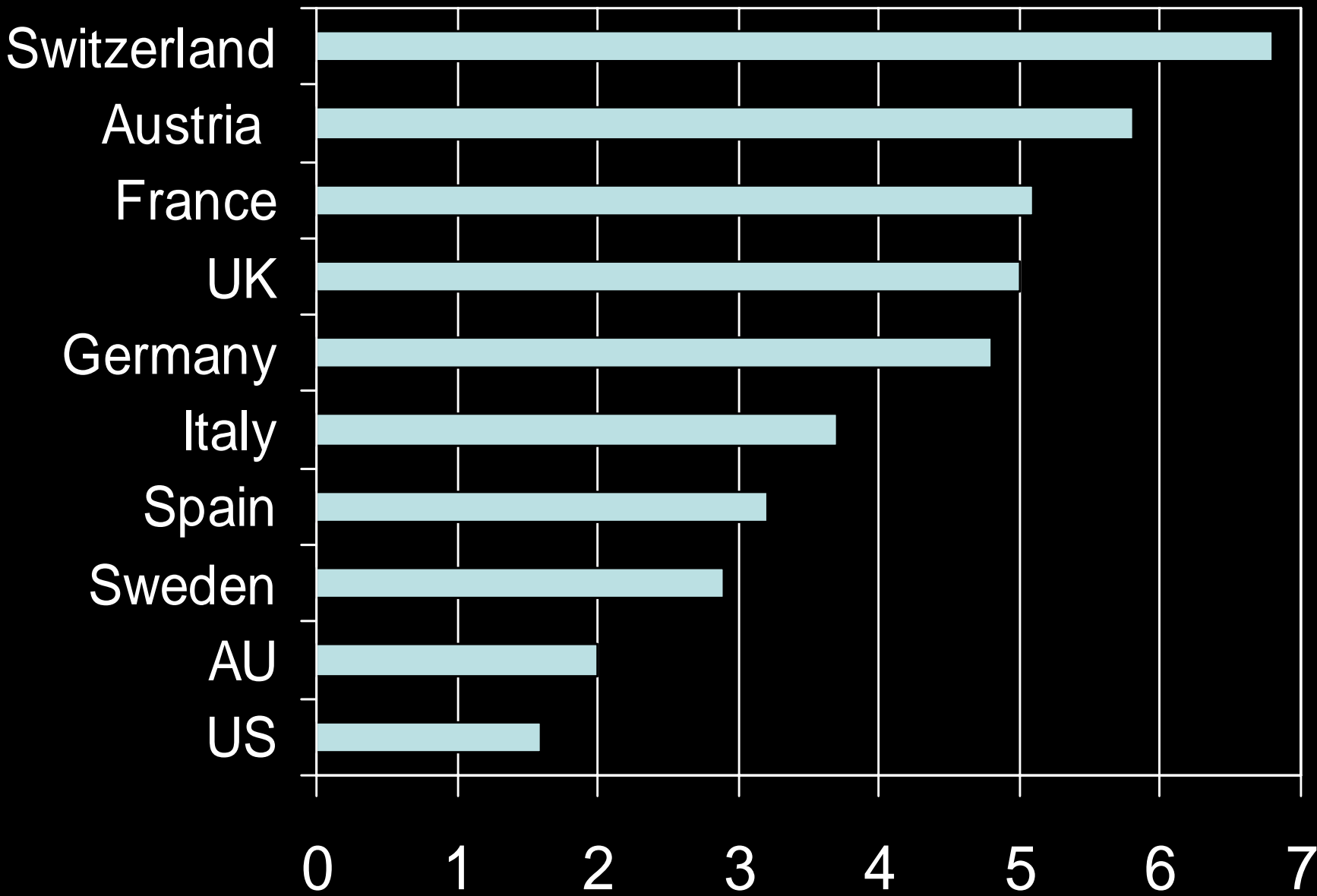
Rail economic efficiency in EU

- a fluid, cross-border has not been realized;
- decline of market share is continuing under open access;
- few new entrants and little competition;
- failure to respond to changing market;
- offer of undifferentiated, non-transparent, and—in shippers' eyes—inflexible transport service;
- governments subsidize large unmet costs.

Rail economic efficiency in US

- strong competition for almost 25 years;
- mergers have produced savings in administration, operations, and capital asset requirements;
- legislation has encouraged shedding unprofitable traffic and more investment;
- changed labour environment has allowed massive technology improvements;
- operators are addressing intermodal, door-to-door customer solutions.

Rail freight charges (US cents per tkm)



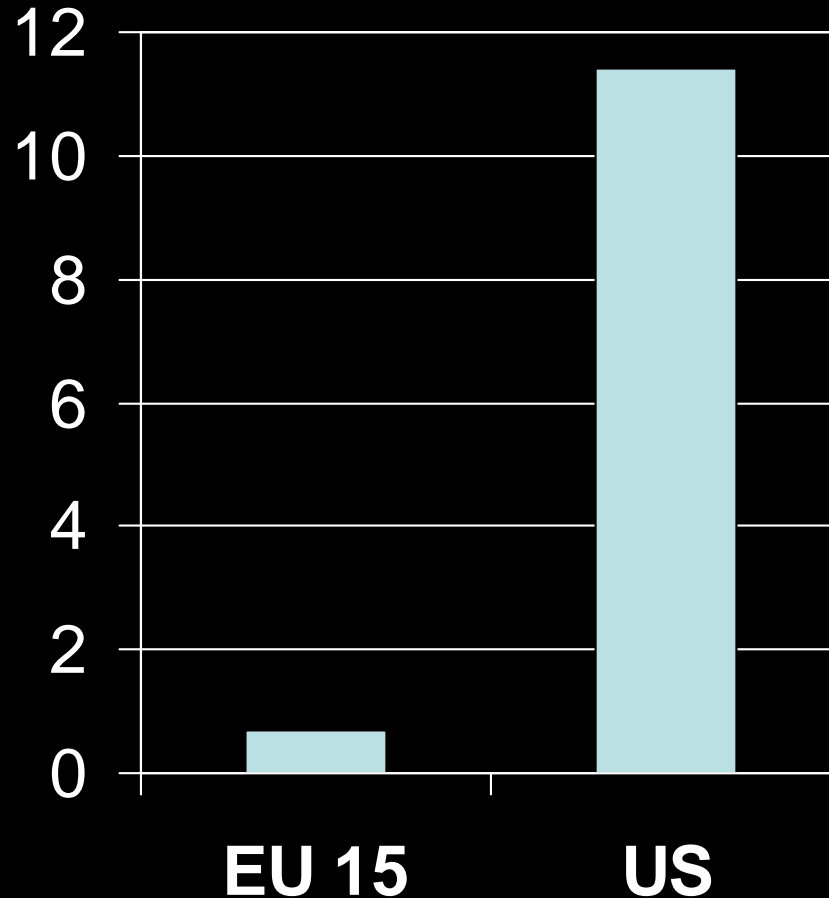
Source: UIC International Railway Statistics 1998; Mercer analysis; company annual reports.

EU and US railway trends

- EU** Rail's share of the freight market has dwindled by almost 1% each year to just 8%, as against 30% three decades ago.
- US** In the same period, rail traffic has increased by more than half, with a market share of around 42%.

Rail productivity in EU and US

Million UT/employee 1998



The equity objective

Rail's productivity is related to the high concentration of traffic.

The impact of the **road-traffic generation** of rail-linked city terminals is a constraint on the wider acceptance and implementation of a rail strategy.

Rail's capabilities and environmental credentials can be undermined by **city-planning concerns** about the level of road traffic around a terminal in an urban area.

Some international rail initiatives

ACTS Abroll Container Transport System CH

Cargo Domino CH

SNCF-Fret Freight stations F

Waste Material Transport J

Waste Material Transport I

Urban Distribution I

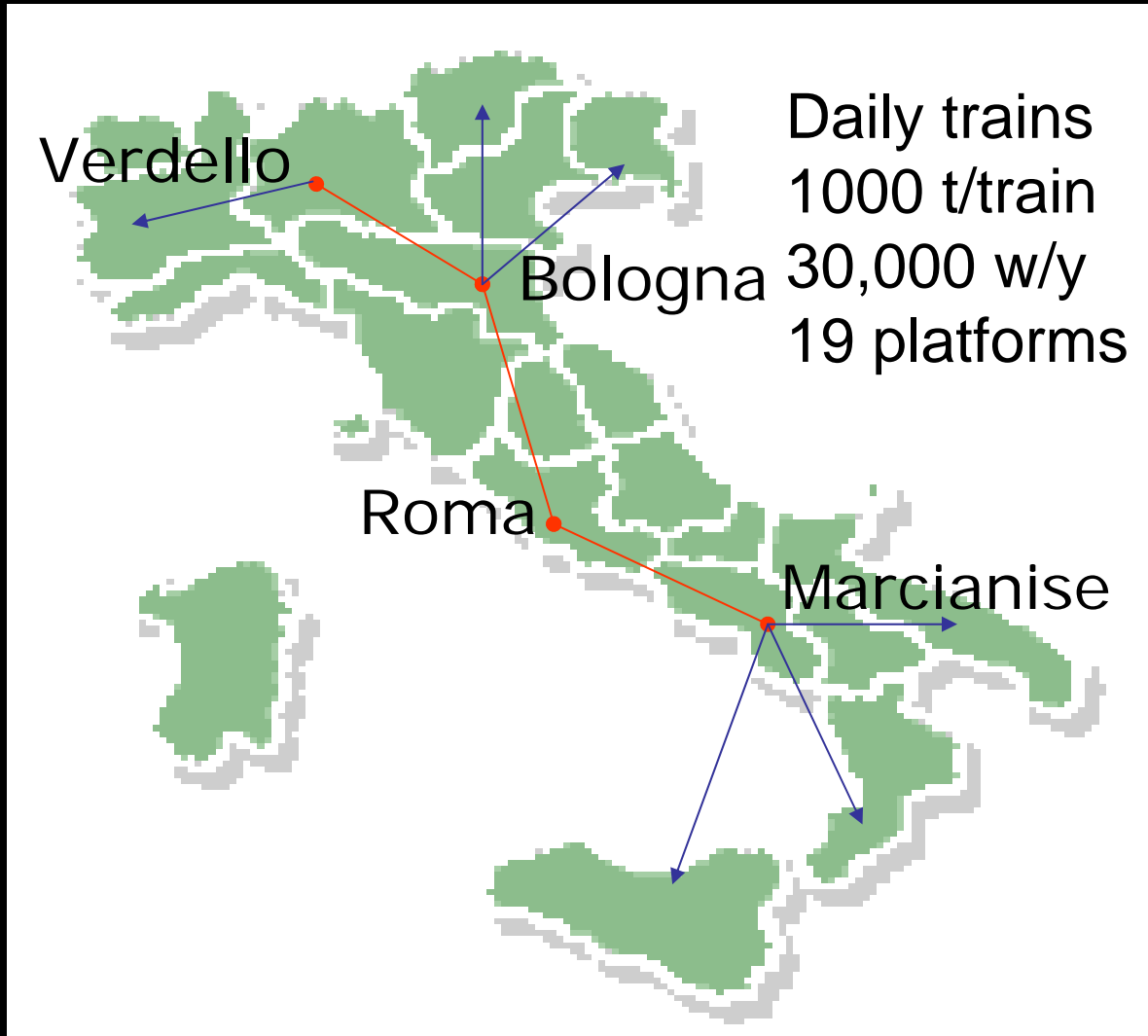
A rail solution in Italy

Italian State Railways

The services

- Rail transport with block trains
- Door-to-door service with capillary distribution
- Loading/unloading operations, handling, and warehousing
- Reverse logistics

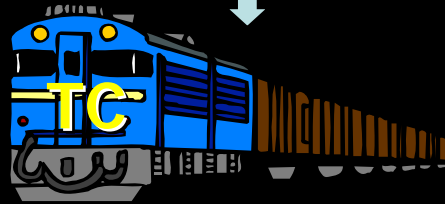
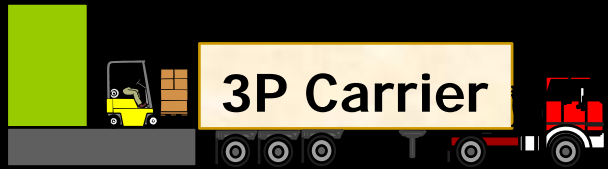
Block train North South



Main kinds of freight

- Mineral water
- Paper and products
- Fruit juice and preserved foods
- Misc. non-food products for large retailers
- Cement

The supply chain

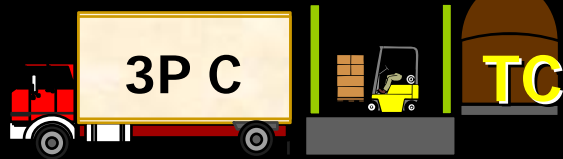


Bologna freight village
wagon loading and
composition of a Trenitalia
Cargo (TC) train

Train from Bologna to
Roma S. Lorenzo
freight terminal



Rome city center
Distribution

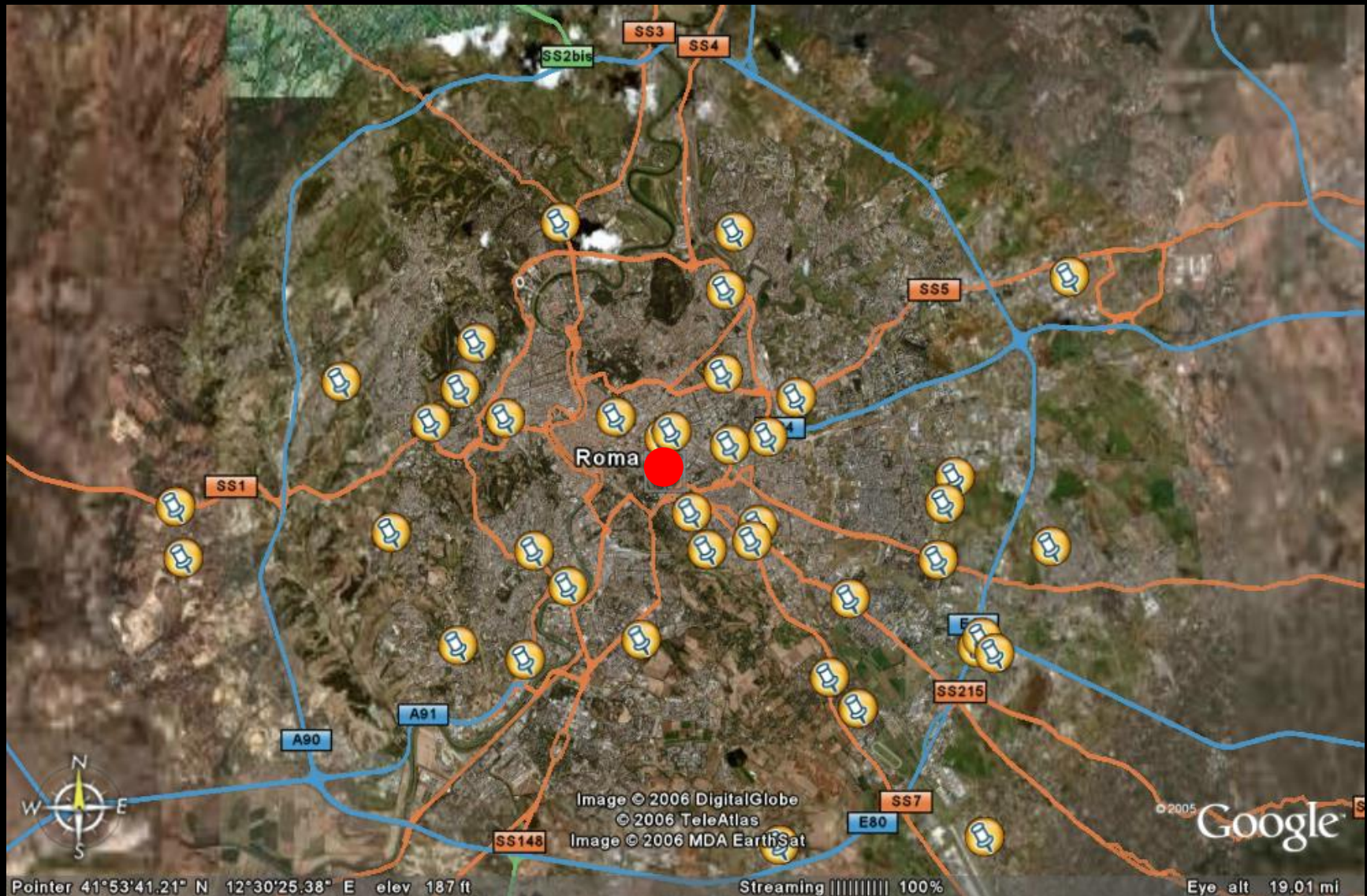


Roma S. Lorenzo freight
terminal wagon unloading,
truck loading for distribution

HQ and warehouses in Rome



Delivery points in Rome



Deliveries in Rome (2005)

- Pallets moved per day: 100
- Total surface area of warehouses (m²): 5500
- Number of vehicles in fleet: 6
- Maximum number of deliveries per day: 21
- Maximum number of turnarounds per day: 17
- Delivery schedule: 10:00–12:30/15:30–19:00

Delivery truck

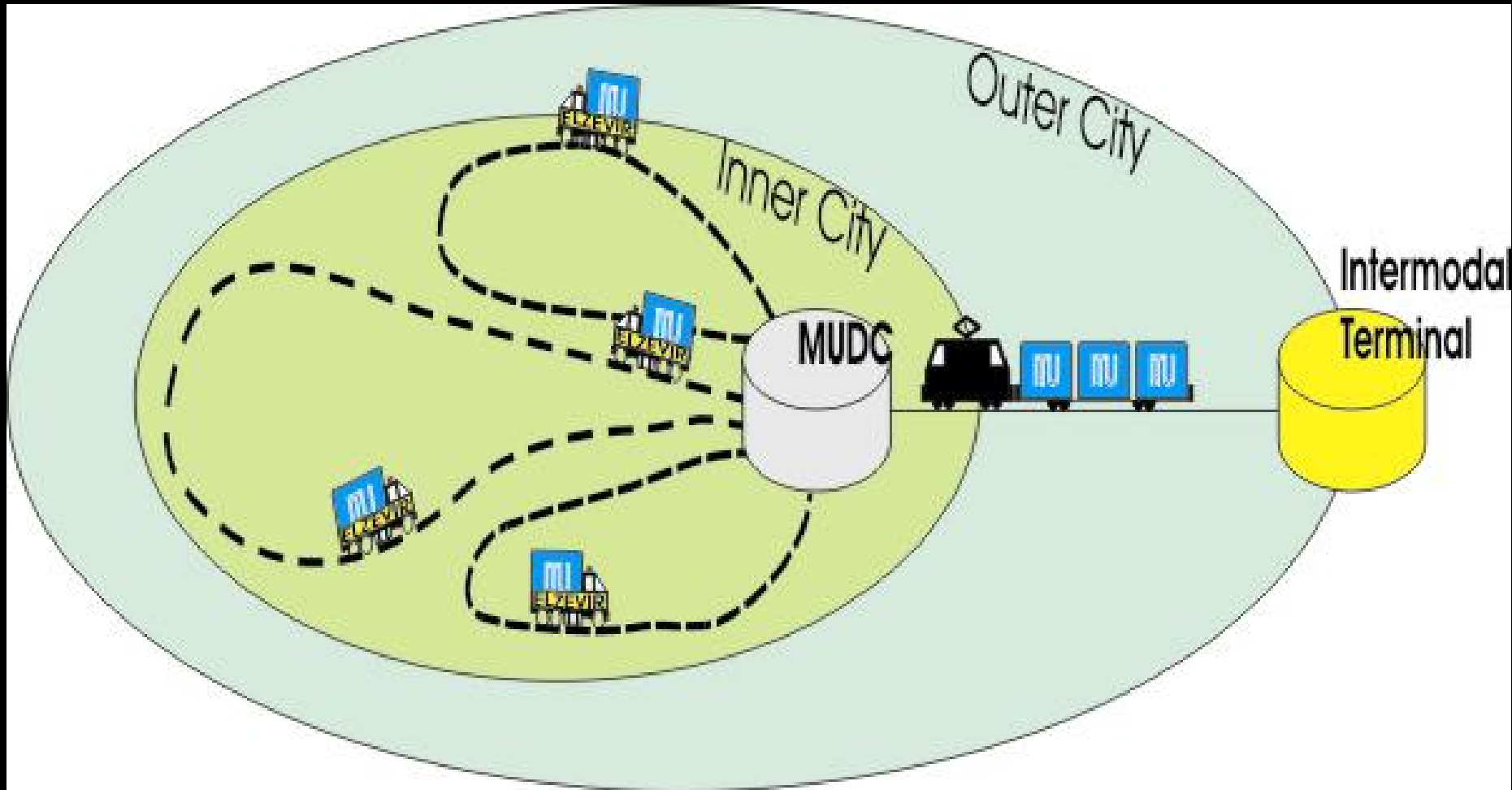
- Capacity (tons): 8
- Capacity (no. pallets): 12
- Type of fuel: diesel
- Consumption (declared): 4 km/l

The HOST Project

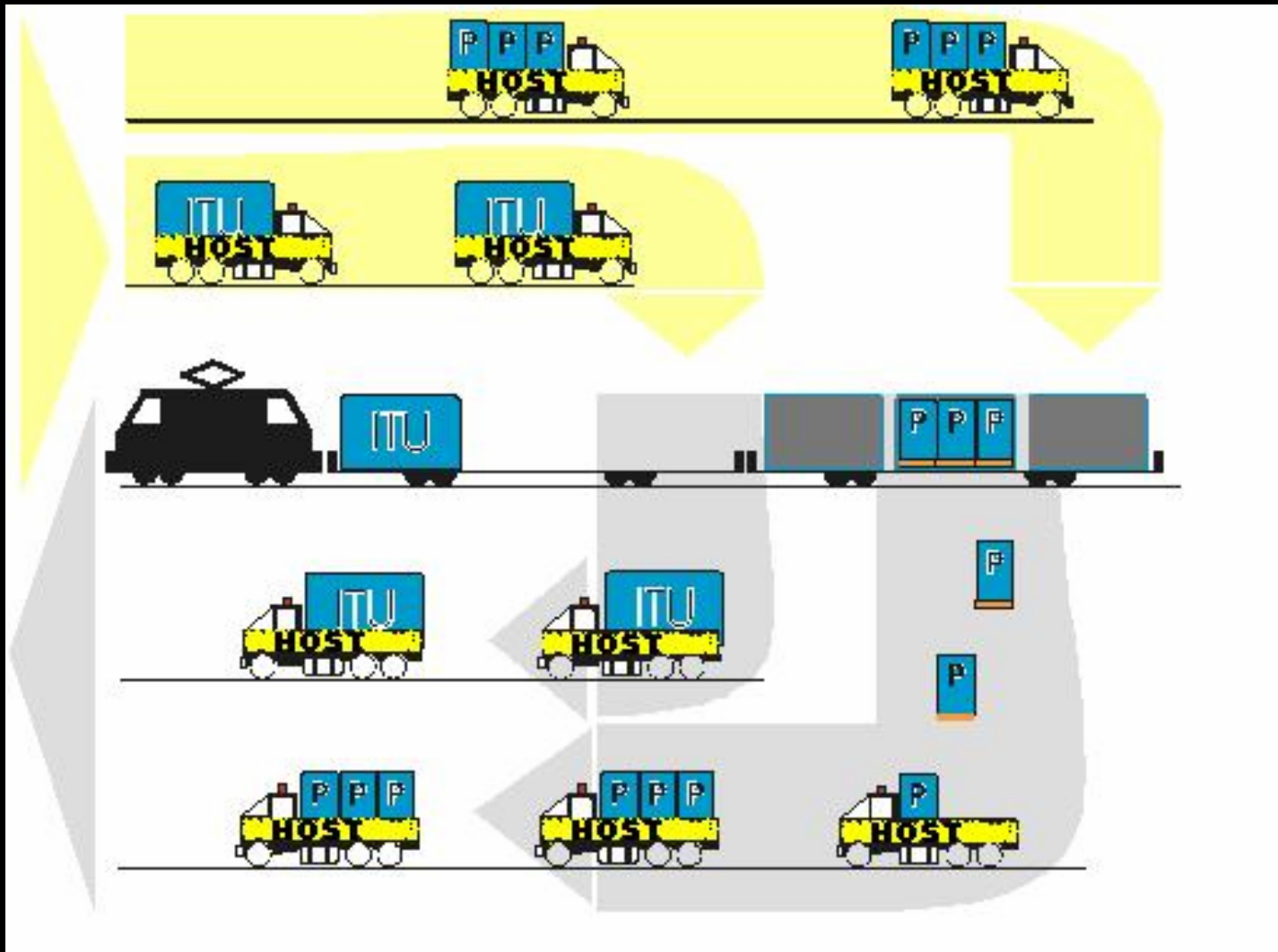
HOST, Human Oriented Sustainable Transport, addressed **hybrid wheel motor vehicle** featuring horizontal transshipment for cross docking operations.

Funded by the European Commission within the Key Action on Sustainable Mobility and Intermodality of the Sixth Framework Programme.

Multimodal Urban Distribution Centre



Horizontal transshipment for cross docking operations in MUDC's



Conclusions

- Rail externalities have fewer impacts, but sometimes with slight margins.
- EU rail economic efficiency is very poor; the institutions and organizations are to blame.
- Rail terminals impact strongly on the area and can meet strenuous opposition.
- Environment, economic efficiency, and equity are interconnected.

To switch or not to switch?