

WHY THE RAILROAD IS NEEDED MORE THAN EVER IN THE 21st CENTURY.

The world population is metropolizing

Currently more than 6 billion people are living on earth. Depending upon the scenarios, 9 to 15 billion people are predicted until 2050. More than this quantitative aspect, it is a qualitative factor which is coming to the fore: The growth of the world population coincides with increasing urbanization, even with a migration to metropolises, a metropolization.

The number of urban population compared to the number of rural population is increasing absolutely as well as relatively. This urbanization trend does not focus mainly on small and medium-sized towns, but on urban agglomerations comprising millions of inhabitants, the metropolises. It is a fascinating fact that most of these super cities that will have developed by 2050 are still unknown today – simply because they do not exist yet.

Another aspect is speeding up the metropolization on the planet: The demographic change, i.e. at first the aging of the population and later its slow, but certain decrease in numbers. This phenomenon does not only occur in developed industrial states as in Europe, for example. In fact it can be observed in some emerging countries such as China (“one-child policy”). An aging population prefers urban lifestyles (“the convenience of short distances in the city”).

Vice versa urbanization is a reason for demographic change – city dwellers usually have less children and live longer due to better medical care available everywhere in the cities than agrarian-oriented country people.

Cities are places where public space is scarce. But of all things the traffic volume is the biggest there. Insofar it is doubtful whether the metropolitan world population will satisfy its mobility needs on land mainly by using the space-consuming car, as this has been and still is common in the North American and most European cities since the second half of the 20th century. Instead space-saving, but highly efficient transport systems are high in demand – urban means of transport.

Metropolises require slender transport systems

Since Henry Ford the car is the means of transport on land per se, and not only for long distances, but also in the (large) cities. There it is becoming more and more of a handicap: Even when highways and freeways cut ever-wider swaths through the urban jungle, even when ever-larger parking lots, multi-story garages and underground garages are sprawling – the space requirements of the traveling and even more of the parking individual vehicles can hardly be met. If the metropolises of the future are to offer urban quality, the major part of the intra-urban and intermetropolitan transport of passengers and freight will have to be shifted to a far more “slender” system.

Such a system has existed for a long time: the railroad. Its most important characteristic, the tracking, gives it unique qualities.

- *This means of transport has, unlike any other vehicle, extreme proportions. At about 3 m width and about 4 m height, trains are longer by the factor 100 and more. The capacity for passengers resp. freight is mainly created via the length dimension, while the horizontal and vertical dimensions can practically be neglected. More slenderness and consequently more urban affinity can hardly be imagined.*

- *Only for this means of transport the vehicle adapts to the track line, since trains are designed like a chain. Especially this feature is irresistibly alluring for many people – what is more “sensual” than a long snake of engine and railcars following the railroad curves by retracing them?*
- *Only this means of transport permits high-speed traffic in the range of 300 km/h to 350 km/h with energy consumption still being justifiable. As the seat rows are arranged one after another and the front surface of the engine resp. the traction unit which determines aerodynamic resistance is just over 10 m², energy consumption is distributed to many seats resp. passengers and therefore the energy consumption per seat resp. passenger kilometer is limited even in case of high speed.*
- *Only this means of transport represents a constructed “spatial structure”. The service hierarchy usual in long-distance, regional and local passenger traffic is an authentic representation of the system of central places – ICE for regional centers, IC for secondary centers, RE for low-order centers and RB resp. suburban trains for places without centralizing function in rural resp. suburban areas. The railroad does not only create centrality, but it is also the backbone for development axes. In contrast the MIV and the road network abet the unstructured sprawl despite similar hierarchization.*

If city planners and land use planners wanted to invent “their” ideal means of ground transport – it could not be anything but the railroad.

A prime example thereof is the urban railroad of Berlin opened in 1882, a four-track urban, regional and long-distance system which meanders on innumerable brick arches right through the center of the federal capital city. While the arched vaults are used commercially, more than 1,000 trains transport several hundred thousand passengers per day – and this on a line which is hardly 20 m wide. No urban freeway can come even close to that.

The railroad – the ideal means of transport on land, but ...

If the 21st century experiences the renaissance of the rail, this means:

The railroad reaches an output-related modal share in passenger and freight traffic of 30 % and more in each case. Millions of kilometers of lines need to be built, thousands, hundred thousands, even millions of engines, railcar train-sets, passenger and freight cars have to be produced and to be set onto these new railroad lines.

China and India alone each need several 100,000 km of railroad, only to reach the inhabitant-specific network density of Germany. Other focal points of similar importance might be located in Southeast Asia (Indonesia), in Central America (Mexico), at the South American east coast (Brazil – Uruguay – Argentina) as well as in the so far hardly developed Africa (Mediterranean coast, Upper Guinea, axis Cape-Cairo).

Wouldn't that be great.

In fact the railroad is on the decline worldwide. When end of the 70s there were almost 1.5 million km of railroad lines on the globe, the railroad network decreased to a bit more than 1.0 million km until today, this in spite of spectacular new development projects in Europe (TGV, ICE and more), in spite of the enormous expansion of the Chinese railroads. Almost everywhere the output-related modal share is far below 10 %, for instance in Germany it is 8 % for passenger traffic and about 13 % for freight traffic. Only the freight traffic in North America (about 30 %) and the passenger traffic in Japan (more than 40 %) are significant exceptions.

And the trend is moving more towards further decline than towards growth. All reform efforts in Europe, especially in Germany (1994/1996) could not change that. The institutional separation of net-

work and operation required by the EU, which is meant to increase competition among carriers and therefore increase of transport output, did not go anywhere. If the European railroad companies enjoy temporary increase of their modal shares, this is mostly due to the high prices of fuel which have a negative impact on automobile traffic and prompt some car drivers and a few forwarders to switch to the railroad.

What are the reasons thereof?

Like inland waterway transportation or the Transrapid, railroads are among the means of transport which are “track-oriented”. Their invested capital is mainly in the infrastructure. In contrast road traffic, ocean seafaring and air transportation are “vehicle-oriented” traffic carriers, whose acquisition value is concentrated in rolling resp. flying material.

“Track-oriented” and “vehicle-oriented” systems differ significantly in several aspects: The first are expensive, loss-making, therefore depend on subsidies by the governments and suffer from decreasing modal shares, while the latter are cost-effective and usually profitable, therefore can do without government grants and – perhaps exactly for that reason – enjoy increasing modal shares.

Currently the railroad is too expensive to be competitive on a wide front worldwide. If it is to become the traffic carrier of the 21st century, it has to become far more cost-effective. Only then it can increase in intermodal competition, moreover reduce the general demand threshold concerning investments in transport systems and thus capitalize the economic resources which are available on itself.

The railroad is too expensive because its infrastructure is too expensive (steep, many and huge earth-movings resp. line routing parameters which require the construction of costly structures, costly components for line installations). This means that the investments for new development, replacement, maintenance and operation of the track system must be reduced by orders of magnitude. The key hereto are “intelligent” railcars, which activate the efficiency potential hidden in the “vertical” technical-operational dialog rail car / track system. Such rolling stock can do with flexible line routing parameters (line routing adapted to the landscape, without many and major earthmovings resp. structures) and does not require any equipment on the rail (without overhead contact line, only wireless signalization).

In this respect the North American freight railroad companies are a model. For they are the only railroad traffic system worldwide that operates independently, i.e. without any government subsidies. It is necessary to transfer the cost-effective heavy freight traffic practiced by them to the other sectors (passenger high-speed, regional and local traffic, lightweight and high-speed freight traffic).

If the railroad companies do not achieve such cost-effective operation, they will not experience a new boom in the 21st century but they will become an episode of traffic history.

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