WOLF TIETZE, D. Sc.
MARIE-LUISE STEINMANN-TIETZE
Magdeburger Str. 17, 38350 Helmstedt, Germany

Traffic Policy
Preliminary Communication
U. D. C.: 656:338.47(4)"20"
Accepted: Feb. 12, 2001
Approved: Feb. 26, 2001

TASKS FACING EUROPEAN TRANSPORT POLICY IN THE 21st CENTURY

ABSTRACT

The remarkable rise of Europe following the Napoleonic Wars during the early 19th century favouring the spread of the railway systems and - subsequent to this new mode of transport - leading to almost complete industrialisation and urbanisation in the political frame of nation states has suffered severe setbacks during the 20th century deplorably highlighted by World War I and World War II, by various civil wars and the Cold War, by large scale expellations, and substantial alternations of political borders. At the same time much has changed, too throughout the extensive continental regions around Europe. Consequently, prospects for future development in the 21st century differ widely. Extraordinary effort is demanded to satisfy social expectations not known so far avoiding, however, both new warlike conflicts and additional exploitations of the natural environment. To solve this task traffic plays a key role by optimal evaluation of all its modes and by application of the best technical achievements along with stepwise adaptation of the urban settlements which represent the most important locations of living and working.

KEY WORDS

Europe, transport, population and economic growth, 21st century

To whatever extent the views on the purpose and issues concerning the state and its policies may differ, there is widespread agreement that there are fields in politics which are best tackled at community level because they exceed the capacity of individuals. This is one of the very reasons for justifying the existence of states. Together, laws can be codified and executed, which are binding for every individual whilst also regulating relations with other communities. The most important task of all state and legal systems is to underline a reliable safety of living. The instruments of this guarantee are diplomacy and military, jurisdiction and police. They provide secure framework, which is further assisted by instruments for order in specific areas, such as currency, or the setting up and maintenance of infrastructure of the living space (in harmony with the natural environment) so that the individual can make optimal contributions to the common economic creation of values. Nutrition and maintenance of human health enable people to do so just as much as training, continuing education as well as social security, when failing to provide for themselves.

This rough sketch of the institution of the state serves to show where transport policy fits in, preserving, as it does, the infrastructure of the living space, i.e. the territory of the state and those complimentary spaces which are opened up and linked by trade, thus benefiting all those involved in it. Traffic is the circulation of the bloodstream, which enables the human settlements, be they intended for residence or as places of work, to live, i.e. to become productive. An increasing proportion of traffic is predominantly consumerist: the leisure activity. Apart from some additional variants it avails itself of the same means as commercial traffic. This differentiation does not play a substantial role as far as transport policies are concerned. Understanding and evaluation of transport policy, however, do consider how efficient it is in providing for the demand for transport at all times by making use of the most appropriate forms and means of transport in particular circumstances. Unfortunately, the demand is not always fully met.

There are several reasons for this deficiency. One may be seen in the fact that transport policy represents government action (or the lack of it). As a result, "responsibility" is directed almost exclusively to the area of the state concerned, and compartmentalised according to different modes of transport: road, rail, air, etc. From the start, they have been subject to rules and regulations which have meanwhile become fixed in a regulatory straight-jacket. Opportunities for flexibility and innovation are poor. Additional factors, which are difficult to define, hamper developments appropriate to the timely demand, as for example:

- the prevailing zeitgeist; it presents a strong, often rather wilful influence on the interpretation of past experiences,
- opportunity – often seen from the point of view of short-lived expectations of political advantage,
- popular perceptions of the state of technology,
- myths.

Myths play a surprisingly powerful role in a society which, though regarding itself as well educated and excellently informed (the "knowledge and information society"), has in fact little understanding, and is therefore very susceptible to self-delusion and fashion trends. The "dying forests", "ozone hole" and "climatic warming" are well known topics of this sort, which have and still are at times pursued with the fanaticism of sects, have opened up a lavish flow of public support and have already led to predominantly hasty decisions at the highest levels, although there is as yet insufficient knowledge of these phenomena. Particularly gross distortions of the kind are currently affecting the energy economy.

In order to arrive at a transport policy for Europe which is equal to the demands of the 21st century, these causes need to be recognised and to be defused. To assist orientation it might be helpful to start with a brief retrospective and follow it up with a prospective view of the 21st century.

1. POSITION AT THE TURN OF THE 20th –21st CENTURY

In the 20th century, in addition to some limited, though locally devastating wars, Europe suffered a 75 year world war with two "hot" phases (1914–1918 and 1939–1945), a so-called inter-war period (1919–1938/39) and the "cold war" (1945–1989). War actions affected diverse regions of Europe to a greatly varying extent. Some experienced severe, frequently very extensive destruction, at times even repeatedly so, whilst others found their destruction was predominantly affecting their cities. During the "cold phases" large parts of the continent were forced into economic impoverishment, partly due to the prevailing external power constellations, partly as a result of the ideological line ruling domestic politics. For two thirds of Europe, even the collapse of the four empires (the Habsburgs, the Hohenzollerns, the Romanovs and the Osmans) which had marked the end of the first "hot phase", had resulted in entirely new structures with respect to political territory and economic policy, with greatly altered borders many regarded as being forced upon them, with numerous new, predominantly rather weak currencies, and subsequently, withering or totally severed economic relations. Recovery was difficult under such circumstances. In those parts of Europe which experienced the worst setbacks, including Turkey and other successor states of the Osman Empire, seeds of a more or less rigorous totalitarianism soon began to grow. It was balm to the wounds of national injuries; in places it facilitated a certain amount of economic stabilisation, and promoted revisionist endeavours.

The situation was very different in those smaller parts of Europe which had emerged victorious from the "First World War" (1914–1918), thanks to the American support, or had profited from the situation through a cleverly handled policy of neutrality. They experienced flourishing of feelings of national superiority, in part turning away from Europe (or the idea of European common ground) and hanging on to a final flourishing of the centuries old mood of colonial imperialism. The (Soviet) Russian inclination towards expansion merely presents a continental version of this, which has not yet come to an end. At times it makes use of subversive means, as it had already done in Spain during the inter-war years where it caused the cruel civil war which soon attracted open military support from outside (1936–1939). In 1939 and 1940, immediately after the outbreak of the "second hot phase", the Soviet Union availed itself of the fact that the attention of other European powers was diverted by other, war-related priorities, and annexed parts of Poland, Finland and Romania, and incorporated the entire Baltic states against their will. After the "hot phase" of the Second World War, backed up by her army, the Soviet Union continued to satisfy her desire for expansion by forcing all of Eastern Central Europe as well as South East Europe into a satellite status. This power policy concerned at least 25 million people by expulsions and genocide.

Determining the overall political climate which affected the entire second half of the 20th century, this situation permitted "normal" development in Europe only at times, and in relatively small areas. In comparison with general performance and the wealth of inventions, innovative progress remained poor. Some tried to make the most of their own national traditions, others to find a way out through the European Union.

The result of this development is the consolidation of numerous European differences in language, economic structure, technology, and logistics The European Union (EU) is to standardise a lot, but is continually faced with the need to tackle the problem of curbing national preferences. Nonetheless, some targets have been formulated which point to the future, and a common currency has nonetheless been established. That amounts to one of the most important "switching of the points" for the creation of a large unitary economic area with at present already c. 370 million inhabitants, and an institution to expand so as to include 470 million, or even substantially more, even if in part subject to the status of graded association. Innumerable political and administrative details need to be classified for this. However, all that remains outside the borders of the EU must attract the attention of the EU insofar as the borders ought not to become demarcation lines for a drastic drop in living standards, in order to avoid creating zones of conflict.

The highest priority must be to bring about and to maintain peaceful neighbourly relations, no matter which party political orientation happens to prevail at the time. The borders within Europe, on the other hand, are losing in importance, and are at last increasingly limited to a purely administrative character.

2. THE SCENARIO IN AND AROUND EUROPE IN THE 21st CENTURY

Whatever Europe suffered and achieved under the conditions of the 20th century encourages great expectations for the future. Any prospective view needs, however, to include the entire European "Umfeld" (area) extending from the countries of the opposite coast of the Mediterranean in North Africa by way of the Near East and far into the interior of the Eurasian continent. In contrast to Europe, most of these countries expect a considerable population increase by the middle of the 21st century. The 100 million mark will have been passed in the Maghreb (Morocco, Algeria, Tunisia), in Egypt, in the seven states of the Near East (Cyprus, Lebanon, Israel, Palestine, Syria, Jordan and Iraq) along with the seven states of the Arabian Peninsula (Kuwait, Bahrain, Qatar, United Arab Emirates (UAE), Yemen and Saudi Arabia). Another one hundred million will be living in Turkey, in Iran, and possibly in the Ukraine. Russia might well pass beyond the 200 million level and another total of 100 million may be shown in the statistics of the three Trans-Caucasian and five central Asian states. Beyond these regions there are the really large agglomerations: Pakistan, Bangladesh and Indonesia, each with c. 350 million, as well as India and China with 2 billion people each.

This implies that, within a few decades, the just under 500 million Europeans will be faced by c. 1 billion people in their immediately contiguous zone, and another 5-6 billion beyond that. All these people require water, food and consumer goods, which they cannot regularly provide by themselves in the requisite quantities in spite of all the hoped for and likely developments. Even their own contribution to the production of investments and high technology increasingly has to rely on considerable supplements from America, Japan, and above all Europe. These urgently needed supplements are the obvious and soundest justification for the relatively high per capita consumption of energy in the industrially advanced countries.

The bare population figures provide only a basic indication for the assessment of demand and the ability for its supply. A glance at age structures leads on. Allowing for minor regional variations, Europe can be described as having an increasingly accelerating decrease in its indigenous population, which is rapidly ageing at the same time. Increasing life expectation to about 80/85 years for men/women respectively, by the mid-century does in no way bring relief, but more likely the opposite, insofar as it has hitherto not been linked to extended performance capacities. Major forces in politics (a still effective section of the trades unions) do not even want an extension of such capabilities. The burden on social services required by the elderly part of the population, which arises from the situation, is statistically known as the "age quotient". It is defined by the proportion of pensioners to the number of the working population; estimates for Germany for the year 2050 are 57:100, for EU 49:100. The age quotient provides an imperfect image of the problem. A more comprehensive form is the "support quotient", which includes the proportion of young people in the total population, together with otherwise not gainfully employed persons (including those not able to work for their living). Though the proportion of young people in the population of Europe is in drastic decline, the support quotient is not reduced, since ever-longer training periods work against the demographic trend and are charged to the working section of the population – which is in any case shrinking as a result of the increasing need for refresher courses, updating training, further education, as well as a growing desire for time off, increasing demand upon social nets, and the totally inappropriate demands for shorter working weeks and an earlier retirement age. Summed up, all these factors lead to a worrying decline in the total economic achievement, which in the long run cannot be concealed by indebtedness.

Freedom of movement, which is customary in Europe, has triggered extensive immigration, and there are politicians who continue to support large-scale immigration in the mistaken belief that it would remedy the drop in the productivity on which the social security systems depend. This hope assumes that the mass of immigrants would achieve an increase in productivity without making corresponding demands on the social benefit systems. Such a hope is unworldly. If it were fulfilled it would impoverish the countries of origin, while limiting the sovereignty of the indigenous population in the countries of their destination. There is ample empirical evidence that immigrants are not satisfied with being mere guests for very long. Instead of increasing the potential for conflict in this way, it is necessary to find different ways of resolving it.

The currently foreseeable reduction in the working population of Europe in the course of the 21st century compels people towards a more than proportional increase in their own productivity. This must be first of all the achievement of the indigenous population. The complete lifting of all restrictions concerning working hours per week or years of working life is the simplest step in that direction. This will not be sufficient, though. In particular cases, and for a limited period of

time, immigration of qualified personnel may contribute to the easing of tension. But in general, this way is no good, for the net product balance is likely to be negatively influenced by subsequent demands upon the social services, the extent of which is difficult to calculate in advance. The unfavourable interaction with the countries of origin could also contribute to a questionable result. It will, however, be decisive, whether, how fast and in how far the following three conditions are met:

1. Considerably better and broader training for the domestic and immigrant population.
2. Supplementing the human achievements by unimpeded energy supplies (no "artificial" price increases for energy!).
3. Re-ordering of productivity locations, with the aim of maximising synergy effects throughout the continent.

The essential prerequisites for fulfilling these conditions do exist. Europe has good education systems which can be built up further. Ways of improvement are in the main well known (1) Blanket coverage networks of energy distribution are available too, together with sufficient knowledge for achieving continually improving adaptations to changing demand (2) The third point (3) concerning regional planning, requires most effort. All the locations of production and achievement, of significance beyond the immediate local market, have to adapt to the rapidly developing unified European Economic Area and its global integration. Many activities will therefore have to find new locations, or automation in and between factories, i.e. the manufacture of parts and their delivery, must be decentralised to an extent which allows the optimal utilisation of cost advantages. The territories of the present national economies are disintegrating thanks to the effect of far greater mutual inter-penetration than had hitherto been the case. The currency policies as well as the level of communication systems which has already been attained, make this process much easier. It has been accepted that it is irreversible. Worries arise from the adjusting of transport systems. It is dragging and largely lacking in conception, as if the problem had not been recognised.

3. OUTLINE OF THE TRANSPORT GEOGRAPHY OF EUROPE

There is no other continent where the dovetailing of land and sea is as intricate as in Europe. No point west of the Urals is more than 600 km away from the sea. Most of European towns and cities are situated on the coast or only a short distance away from it in the interior, and then often on a navigable river. At all times coastal or inland navigation, together with overland traffic in keeping with developments of different ages, has linked cities and facilitated lively trade. An extraordinary leap in innovation has taken place since the construction of railways began in the middle of the 19th century. Similar strong impulses in the 20th century were telecommunications, electrification, motorised road transport, as well as air traffic. In this, telecommunications and road transport play a special role insofar as they are the only types of intercourse which permit direct house-to-house contact. Moreover, it is not only possible to operate them individually, but they are also available at all times. Both of them are masters of the "last mile"; when it is a matter of convenience there is no other transport to equal road transport.

Since time immemorial, it has been largely accepted that the setting up of highways is a matter for the community. As a rule, the military, the prince, the state acted as commissioning authority, who subsequently also took over the maintenance and safety of the transport routes. In Europe, apart from a few exceptions, even the railways used to be operated by the state. In the course of time the system has become inflexible, not at all well suited to the pace of modern innovation, and as consequence increasingly subject to privatisation policies, though often only with a modicum of success in respect to really fundamental innovation. National rail systems – as indicated by their name – are attached to particular national territories. Techniques, logistics and labour laws are subject to change at every border crossing. Technical solutions and bureaucratic rules, which allow borders to be crossed in the first place, continue to be so time-consuming, so costly and so involved that in the scheme of things concerned with cross-European transport railways are increasingly losing ground, chiefly to road haulage (for goods traffic) and to road and air transport (for people). Although this tendency has been in evidence for decades, there does not seem to be an end to it. Railway administrations have not proved equal to the unstoppable expansion of the economic area and of the continuingly increasing traffic volume.

4. ERRORS OF THOUGHT AND MISTAKEN APPROACHES

Every section of the transport system goes its own way when seeking to improve its competitiveness. Lobbying is eagerly used to move politicians to intervene in the competition through the imposition of regulations, by burdening the competitors with some additional costs, to limit operating hours, to hit them with exaggerated safety regulations and so forth. The sky is the limit for inventive action of this kind. At

times even the trade unions enter the fray by using these debates as their battleground. It is obvious that in this kind of quarrel factual arguments tend to have fewer chances than emotions. After a short time a maze of possessions and mutual blockades have developed, all of which reduce the efficiency of transport and block the way for innovation. Each branch of the transport system fights all the others. There is no transport policy to create order or see to it that demand is met by the branch best qualified to do so.

The railways want to keep their market share in goods traffic and increase it, if possible. When it comes to fighting inland navigation, for example, which transports coal and ore from the coast to Salzgitter and which had, according to many of the arguments, specifically built a canal parallel to the river Elbe in the 1970s for this purpose, the railways responded by aggressively offering lower tariffs. In this case the railways were "successful" in the sense of achieving greater turnover and additional tonnage/kilometre, albeit at a price: lower profit and additional pressure on the heavily-used line from Hamburg via Lüneburg--Celle to Lehrte by ponderous (i.e. up to 5400 t) and cumbersome trains had to be admitted on a line which is thus exposed to more wear and tear although, due to intensive high speed (ICE) traffic, it is already sensitive to this. Inland shipping, on the other hand, was the loser as regards transporting bulk goods.

The efficiency of a line may be prematurely exhausted if it has to accommodate heavy train traffic with substantially varying speeds. This makes it necessary to build entirely new routes (hereafter NBS) for demanding high speed trains doing more than 160 km/h, usually referred to as high speed traffic (hereafter HGV). The first NBSs to be built ran from Hanover to Würzburg and from Mannheim to Stuttgart. This was followed by another one from Berlin via Stendal to Lehrte (Hanover). Further sections, Cologne-Frankfurt, as well as Nuremberg-Ingolstadt--Munich are under construction, and the transit of the Thuringian Forest from Erfurt via Coburg to Nuremberg has been commenced. In all these cases the estimates on which the decision to build was based proved to be grossly inaccurate, including deviations of 80 % and possibly exceeding 100 % (Table 1). Even in the North German plain the intended maximum speeds, which were the reason for constructing the multi-billion NBSs, can only be attained over relatively short sections, due to the demands of mixed types of trains. It follows that line frequencies are reduced, and intermediate stops avoided. As a result regional capitals like Potsdam and Magdeburg, as well as Brunswick on the way from Berlin to Hanover are left out. Even Stendal, the old traditional railway junction, where five main lines used to offer interesting possibilities of changing, is by-passed without stopping. Gaining time through by-passing important stations, that is, major towns, is also envisaged on other lines – for example, to the disadvantage of Koblenz, Mainz and Wiesbaden, and of Karlsruhe and Pforzheim, as well as Coburg. For Stendal, Wiesbaden and Coburg there are alternative options on offer.

In building these new routes, the railway lines of the regions of the German Central Uplands have abandoned their traditional valley routes. This is the reason why many costly bridges and tunnel constructions were required on the NBS line from Cologne to Frankfurt; even the risk of a 4 % gradient has been accepted. Should a modern ICE 3 train come to a standstill on this particular stretch, it would be unable to resume motion on its own. Frequent tunnel changes on the stretches in the Central Uplands imply – if the weather so determines – frequent changes from wet to dry conditions, for the contact between wheel and rail, which is in any case pushed to the limit of its mechanical tolerance by the gradient as well as by speed: it will be worse for tilting trains. And even if the necessary safety were to be maintained, extreme wear and tear would be sure to occur. Another problem is posed by the sensitivity of the modern high-speed trains to side winds – a reason why circumstances may require speed reductions before tunnel exits. These are factors which make punctual and safe operation difficult. That the safety standards even of recently constructed tunnels are questionable has meanwhile been established, but can hardly be changed.

Several railway companies have introduced so-called tilting trains in order to be able to obtain

Table 1 - Construction costs of double high-speed tracks (except stations) in million DM/km. - Sources: DB AG and Transrapid International GmbH.

1988	Hannover - Würzburg	(ca. 330 km)	36	traditional railway (wheel-to-rail technique)
1988	Mannheim - Stuttgart	(ca.100 km)	42	
1997	Oebisfelde - Staaken	(ca. 152 km)*	34	
1998	Köln - Frankfurt	(ca.190 km)**	47	
1998	Berlin - Hamburg	(ca. 292 km)***	33	magnetic levitation Transrapid

* particularly easy section between Berlin and Hanover
** further rise of costs beyond 50 Mio DM/km is most likely
*** thoroughly planned section of a Transrapid net

greater speeds on the existing track. In Italy they are known as "Pendolino", in Spain as "Talgo", and in Germany as "ICET". Tracks with especially many bends or gradients are set to profit from this expensive technology, which makes carriages tilt slightly towards the inside of a curve in order to mitigate the unpleasantness of the centrifugal force. Its effect, however, makes itself fully felt by the wheel-rail contact, which results in increased wear and tear, and correspondingly more noise. One can be sure that in practical terms the running of the train takes place ever closer to the safety limit defined by the built-in obsolescence than, say, to the initial state. The tilting technique gives rise to a fresh problem in cross-border traffic, as for example in Switzerland where the distance between two track routes is so small that tilting trains pass one another without sufficient space in between. Specially designed and somewhat narrower trains are employed here. Even logistically these trains lead to disadvantages: in order to be able to take advantage of their greater ability to travel fast on slow stretches, the trains require greater time intervals between one another. It follows that the slower trains stop even more frequently on sidetracks in order to be overtaken. The goods traffic in particular is affected by this development. The tempo of transport as such will become even slower and it will consume more energy to get started again and to be restarted more often, and it requires longer working times since staff on duty must be paid whether the trains are moving or stationary. Utilisation of rolling stock and tracks are reduced, and the railway customers have to put up with longer travel times.

In comparison to goods traffic on the roads the railways have not managed in decades to install modern truck-trains and the stations that go with them for loading and unloading every 200 km or so, or even to introduce such a network across the continent. Instead, goods trains with insufficient acceleration continue to be interspersed between passenger trains to local, regional or long-distance destinations.

This state of affairs has now led to the demise of railways as a transporter of postal and courier consignments, which have been taken over by a night network of air routes – to the chagrin of residents near airports and with the consequence of considerable feeder and distributor lorry traffic and an exorbitant increase in distances every letter has to travel!

The winners in this competition are the road hauliers, although for predominantly ecological reasons and pretexts they are extremely unpopular, and they are burdened by regulations and trumped-up costs. But they keep on rolling from house to house at all times, as long as they are allowed to do so. Their flexibility is the main reason for their ability to reach destinations almost three times faster than the railway.

Strange tendencies may also be observed in the efforts to "increase the attractiveness" of stations. This is not only a matter of cleanliness, security and openness. On the contrary, the function of stations, especially of large central stations, is "updated" to that of "all-round shopping and experience (leisure) centres". This may suit local politicians and town planners. They have high hopes for a noticeable revitalisation of city centres, and for a better, fuller use of local urban transport facilities, which tend to be focussed on the central station. Moreover, the investment volume (several hundred million Deutschmarks as a rule), which tends to be supplied by the railway company and private investors, is positively attractive.

In all this it tends to be entirely forgotten that this is the very way not to be of service to the transport function of central stations, for at best it is the commuters who can pick up some trifles on the way to work, whereas there are no transport facilities for major purchases which could compete with the shopping malls on the outskirts of towns (usage of private cars and availability of free parking space). Local public transport is not known for being designed for this purpose. In any case, the public in search of leisure and entertainment has nothing in common with the function of a station, and is more likely to contribute to the excessive strain which is put upon the local public transport, to the disadvantage of genuine train passengers. It is also a disadvantage to the fast and individual feeder service, important for the long distance traveller, which taxis perform. In summary: the entire concept militates against its function.

In a similar way airports, too, have recently gone over to a functionally contradictory development of being modish, on the assumption that they are the right location for particularly large leisure facilities. The obstructions which they are likely to cause on the feeder traffic (and other essential functions) are minimised.

There are other respects in which airports serve to highlight serious shortcomings in transport policies. Air traffic is on the increase, as it has been for decades, and there is no end to this in sight. That is the reason why airports require regular enlargements and cause familiar, acrimonious, costly and lengthy debates over the "pros and cons". All in all, little attention is paid to the fact that 60–80 % of all takeoffs and landings involve intra-continental connections to destinations less than 2000 km distant (excluding charter flights and island connections). This pattern applies to North America as much as to Europe. The majority of flights cover distances of about 1000 km. Their advantage, in terms of time in comparison to transport on the ground, is based on non-stop flights and on the fact that as a rule neither the long waiting periods on the ground nor the time taken to reach the airport (in Eu-

rope, on average >200 km) are taken into consideration. Most of the common values available for comparison are therefore misleading. Should stopovers or even change of aircraft be required, the time advantage of flying as against road and rail transport drops to, or even below, nil. This leads to the question whether the increase in air travel is an acceptable development, considering that much of it takes place over short distances, and whether the difficult and expensive plans for enlarging airports are justified.

5. URGENT NEED TO MAKE USE OF INNOVATIVE TECHNOLOGY

An end must be put to the helplessness of transport politics. This requires all transportation branches to co-operate, to acknowledge their limits, and to be ready to apply new epoch-making technical solutions, such as the magnetic transport technology which has reached the application stage within the Transrapid System.

The railways ought to drop their ambition of achieving high speeds using the traditional wheel-to-rail system. Occasional maximum speeds prove nothing. Given the constraints of heavily used rail track, travel speeds substantially in excess of 200 km/hour, and on occasion of even 250 km/hour, cannot be achieved. Moreover, operational parameters (Table 2) of speeds of that kind are highly unfavourable. Considering transport policy as a whole, it is much more important for the railways to be prepared to take over a noticeably larger share of long distance goods traffic by, among other things, the introduction of standardised truck-trains across the Continent, together with stations at about 200 km intervals, where loading can take place by the waggon and requires no more than 10 minutes. Even the Alpine transit could be managed much better in this way than with the time-consuming motor rail (piggyback) service where individual loading is not possible.

On all sides it can be clearly seen that in Europe the long distance transport of persons and goods by road and rail, and even by air, is – to take a medical analogy – threatened at any time by sudden "infarct" situations. In some places it could occur every day. Attempts have been made to calculate the resulting economic loss, but they have been few and far apart, and incompetently handled. Cost-benefit analyses of business management type, or even of a branch-specific nature cannot tackle this dilemma. There have been repeated attempts to claim conscientiousness and accuracy on the basis of such partial calculations, and fundamentally flawed decisions have been made. They appeal to a certain convenience of persisting with well-tried structures and save the effort of involving forward-looking innovations. This kind of politically directed failure impedes the urgently needed revision of the European infrastructure, one of the most important keys to enable the EU to expand and for the wider "Umland" of the EU to facilitate economic advancement. In view of the emergence of extraordinary population increase around Europe, we are facing a task of the utmost priority for several generations to come.

The numerous European railway networks, which have been created in the course of the past 150 years on the territories and under greatly varying conditions of nation states, are certainly able to contribute to the resolution of these problems. But even in smaller sub-regions considerable modernisation, with at times disproportionate expenditure, is required in order to achieve even somewhat enhanced compatibility.

But it is no longer a matter of the dimensions of the relatively small European nation states. What is at stake is the entire Continent and its rapid progress towards dovetailing with extremely vigorous major regions of Asia. This requires novel spatial thinking. Nor is there correspondingly more time available for coping with much longer distances. This is the reason why the more modern technical achievements must be brought into play. This is an economic commandment! Moreover, we are fortunate that the magnetic levitation technique has provided a means of transport which even puts others ecologically into the shade. Are we to castigate ourselves with blindness, and ignore these opportunities?

6. SUMMARY: THE TASKS OF FIRST AND LASTING PRIORITY

1. Creation of a continent-wide network of standardised magnetic tracks for the European long distance traffic within 40 to 50 years. The notion pursued hitherto of managing this traffic by the old wheel-to-rail technology is recognised as having been technically overcome, and therefore no longer applied.
2. The future high speed network in Transrapid technology is increasingly taking over the long distance transport of people, postal and courier services, as well as JiT services, thereby opening up the possibility of entirely new locational patterns of industrial involution. In this way, even the conventional rail-bound goods traffic can be transformed to the level of modern international communications and financial services, and contribute to alleviating the disadvantages of the marginalising of an economic area.
3. Depending on the particular case in question, stations of the Transrapid Net break away from the

Table 2. - Comparison of technical parameters (German high-speed trains). updated August 2000

System	Transrapid	ICE 1	ICE 2	ICE 3	ICE-T[6]	Freight trains
Technology	Non-contact electromagnetic levitation, attractive principle	Steel wheel on rail				
Propulsion	Synchronous longstator linear motor, mounted on guideway	Asynchronous AC motors in power cars				
Energy supply	110 kV 50/60 Hz	AC 15 kV 16 2/3 Hz	AC 15 kV 16 2/3 Hz	AC 25 kV 50 Hz[5]		
Operation control	Fully automated communication control system, digital radio transmission, driver optional	Automatic train control (LBZ), driver required				
Design speed	550 km/h	280 km/h	280 km/h	330 km/h		
Operating speed	300 - 500 km/h	280 km/h	276 km/h	300 km/h		
Acceleration performance						
0 - 200 km/h	1715 m 62 s	6975 m 150 s	7500 m 219 s	4200 m 129 s		
0 - 300 km/h	4340 m 104 s	32204 m 567 s	64220 m 1006 s	21500 m 367 s		
0 - 400 km/h	8820 m 160 s					
0 - 500 km/h	17800 m 225 s					
Braking performance						
200 - 0 km/h	1930 m 69 s			2184 m 79 s		
300 - 0 km/h	4340 m 104 s			4956 m 119 s		
Energy comsumption, Wh/P 1 km[1]						
Standard speed					no data published	no data published
200 km/h	26	29		29		
250 km/h	31	42		42		
300 km/h	38			69		
400 km/h	58					
500 km/h	85					
speed profile with max.[2]						
160 km/h	25	23				
200 km/h	29	32				
250 km/h	33	44				
300 km/h	43	71 (280 km/h)				
400 km/h	64					
500 km/h	93					
Noise emission 25 m distance dB(A)[3]						
160 km/h	71	83				
200 km/h	72	84				
250 km/h	75	88				
300 km/h	79	91 (280 km/h)				
400 km/h	88					
	non-contact - no resp. wear and tear	likely more noise due to wear and tear				

System	Transrapid	ICE 1	ICE 2	ICE 3	ICE-T[6]	Freight trains
Temperature	- 25° C up to + 40° C				no data published	no data published
Continuous gusts	up to 125 km/h					
Construction stability	up to 215 km/h					
Snow	10 cm pm deck plate					
Ice	up to 10 mm on deck plate, up to 5 mm on guidance rails and stator packs					
Train size[4]: (End / middle section)						
Section length	26.99 m / 24.77 m	25.68 m / 24.78 m				
width	3.70 m / 3.70 m	2.95 m / 2.95 m				
height	4.16m/ 4.16m	3.84 m / 3.84 m				
Alignment parameters						
Guideway / track gauge	2800 mm	1435 mm				
Top of guideway, Double-track, center-to center distance	1.25 m bis 20 m	0.40 m				
	300 km/h 4.4 m	4.70 m				
	400 km/h 4.8 m					
	500 km/h 5.1 m					
Grade climbing ability	> 10 %	4 % (Passenger traffic) 1.25 % (Mixed traffic with freight)				
Superelevation (cant)	12° to 16°	6.9° Passenger traffic (planned) 5° Mixed traffic with freight				
Curve radii						
Minimum	350 m					
200 km/h	705 m	1400 m				
300 km/h	1590 m	3200 m				
400 km/h	2825 m	(Mixed traffic: 5100 - 7100 m)				
500 km/h	4415 m					
Vertical radii (crest:sag)						
Minimum	600 m					
200 km/h	5145 : 2575 m	1600:1400 m				
300 km/h	11575 : 5790 m					
400 km/h	20575 : 10290 m					
500 km/h	32150 : 16070 m					
Ride comfort						
Max. lateral acceleration	1.5 m/s^2	1.0 m/s^2 (0.85 m/s^2-Mixed traffic with freight)				
Max. vertical acceleration	crest 0.6 m/s^2	0.2 m/s^2				
	sag 1.2 m/s^2	0.2 m/s^2				
Route data double track						
Foundation area	1.5 - 11.8 m^2/m	13.7 m^2/m				

System	Transrapid	ICE 1	ICE 2	ICE 3	ICE-T[6]	Freight trains
Total ground area	12 - 22.8 m^2/m	31.2 m^2/m (Average for new rail lines)			no data published	no data published
Earthworks during constuction	13.7 / 47.2 m^2/m	201.9 m^2/m (Average for new rail lines)				
Tunnel profile	(< 300 km/h) (< 400 km/h)					
single track	39 m^2 70 m^2	56 m^2				
double track	78 m^2	88 m^2				
Max. daily circulation of trains	6000 - 8000 km	1600 -1800 km				

A comparison of the systems shows the superiority of the magnetic levitation technique over the older wheel-to-rail system. With less energy consumption, less use of land and less noise, a clearly higher capacity is achieved; building and running costs are also less, the adaption of the track to the terrain is much simpler.

1) Wh/1 Pkm = watthours per seat and kilometer; with Transrapid the energy used on board is included, with the conventional railway the on-board energy (heating and air-conditioning) is not included.

2) The "max. speed profile" shows the time taken in normal service from stationary, accelerating to a maintained running speed and then, with braking, back to stationary.

3) In the interest of comparison this shows sound generation measurements for level track. All systems generate wind noise. This can be better controlled in the Transrapid system than by ICE. The wheel-to-rail systems (ICE 1-3) additionally generate considerable noise from the rail: wheel contact, as well as wind and frictional noise from the electric power contacts. These two additional noise sources rise steeply with increased wear and tear. The magnetic levitation technique, with no actual contact between track and train is free from these additional sources of noise. A rise of 10 dB (A) (decibels) corresponds with a doubling of the sound strength.

4) Transrapid can seat 88 persons per carriage (section); ICE 53 - 60.

5) ICE 3 is propelled by asynchronous AC motors mounted to the axles, instead by locomotives. Additional transformers permit operation on different railway systems in Europe. The axles also carry large disk brakes which, unfortunately, are also fly-wheels.

6) Modernization of railways by tilting trains (ICET, Pendolino, Talgo) creates additional disadvantages by remarkably increased wear and tear and, consequently, more noise and, subsequently, more repairs. Tilting trains demand longer time slots to the disadvantage of slower traffic (local trains and freight) which reduces the capacity of the bending and climbing routes in uplands which are sensitive in this respect anyway thus adding even more to the costs of personnel and material.

Sources: System data for Transrapid (Thyssen Henschel Magnetfahrtechnik) Testing and Planning Company for the Magnetic Levitation System (MVP), official publications of the German Railways (DB). Much of the data from various sources revealed slight variations. Compiled by W. Tietze.

old central station location in cities, which are being suffocated by overcrowding, are linked up with airports and trade fair sites, and are given superior road links in order to facilitate mono-modal feeder services. The Transrapid Net thus embodies a contribution to the relief of the historic town centres and follows the trend towards a metropolitan urbancontinuum which began a long time ago.

4. Thanks to its superior capabilities, the Transrapid System achieves a dramatic reduction by c. 50 % in air transportation of people, postal and courier goods, thus in many cases rendering the enlargement of airports superfluous.

This summary of the programme for a new infrastructure in only four major points allows the question of financing it to be addressed by combining the billions earmarked for, but only too often mistakenly invested, transport solutions with some of the regional and urban construction funds and having a clear target in mind. Approximately the same amount as is needed for investment could additionally be found if the largely overblown planning procedures were to be tidied up. There is no shortage of labour – in Germany alone there are 17 transport ministries, as well as an overall transport ministers conference. This is mirrored by a similar administrative pattern in the urban and regional (Land) planning sectors. What is more, this structure is replicated in all the European countries as well as the EU authorities. What matters is the political will to direct all these considerable financial and human resources towards a single goal and to apply them usefully. To recognise a goal is a task of prime importance for every politician, followed, however, by pointing out the way the target will be reached. Far-sightedness and energy together make both things possible.

LITERATURE

[1] **L. Bertolini** (1999) *Future of Transport - Future of Cities!* Promet-Traffic-Traffico, Vol. 11, No. 2-3, 89-95.

[2] **S.-Y. Chu** (1999) *Transrapid - New Thought to China's Traffic Confusion*. Promet-Traffic-Traffico, Vol. 11, No. 2-3, 135-137.

[3] **Č. Ivaković, I. Legac, I. Mavrin** (1999) *Traffic Linking of the Baltic and the Central European Countries with Adriatic*. Promet-Traffic-Traffico, Vol. 11, No. 2-3, 147--156.

[4] **W. Ritter** (1999) *A Transrapid Network for the Near East?* Promet-Traffic-Traffico, Vol. 11, No. 2-3, 129-133.

[5] **St. Siedentop** (1998) *Verkehrsvermeidende Siedlungsentwicklung unter Schrumpfungsbedingungen*. Materialien 24, pp. 57-78. Ints. f. Kulturgeogr., Universität, Frankfurt am Main

[6] **W. Tietze** (ed.) (1998) *Transrapid-Verkehr in Europa*. GeoColleg, 11, 107 pp., 39 Figs., 5 Tabs., Appendix. Borntreager, Berlin-Stuttgart.

[7] **W. Tietze** (ed.) (1999) *Epoch-Making Innovations in Transport Technology and Geopolitical Perspectives for Europe and Beyond*. Promet-Traffic-Traffico, Vol. 11, No. 2-3, 202.

[8] **W. Tietze, M.-L. Steinmann-Tietze** (1999) *Technical and Structural Innovations to European Transport in 21st Century*. Promet-Traffic-Traffico, Vol. 11, No. 2-3, 41--55.

[9] **G. Wackermann** (1999) *Changes in the Regionalisation of Transport and New Orientation of Centrality in Europe*. Promet-Traffic-Traffico, Vol. 11, No. 2-3, 83-87.