

Faculties and studies of transport and traffic engineering in Europe

Following the blind or opening the eyes

History

European engineers have invented all kinds of mechanical modes: different kinds of railways, including cable cars, motorcars and airplanes. The bike was also a European invention. Information technologies have been developed mainly by the Americans. During the last 200 years the Challenge for Transport and Traffic Engineering was the construction of an appropriate infrastructure for all kind of modes to provide fast, reliable and safe physical transport. The demand for mechanical modes came from the society, the economy, especially from lobbies, politics. The European tradition of civil engineering was very deep rooted in engineering ethics and responsibility for the functionality and efficiency of engineers work. Planning, construction of infrastructure for vehicles with a big mass and high speed was the main issue followed by needs for proper maintenance and safe operation. Design, planning and maintenance of different kinds of infrastructure were the main engineering business in the first half of the 20th century. After World War Second the whole transport and traffic engineering field in Europe got a bias from US. It was uprooted and displaced by US fashioned traffic engineering. Traffic was reduced to car traffic. Traffic flow epistemology and highway capacity manual principle became important in education and traffic engineering. American figures and standards were taken over and European textbook followed the American example – at least the so called Western countries.

Transport and traffic engineering became a discipline serving automobile industry as well as road construction industry and later telecommunication industry. Due to the dynamic development of technologies and techniques in the transport field transport science had never time to reflect on its own work and question the basic principles of its own work. Dogmas like “Growth of Mobility”, “Time Saving by Increasing Speed”, “Freedom of Modal Choice” and later the “City of the Short Distances” became an unquestioned slogan in parts of the textbook.

Car Traffic growth was impressive and had to be fulfilled by traditional civil engineering principle of thinking by providing more and more space for cars. This is still the case in many of the faculties in transport and traffic engineering of Europe of today. The increasing problems with safety, the environment and congestion could be only a lack of infrastructure. The only answer engineers gave to the increasing problems was: build more infrastructures or manage the car and truck traffic better.

Engineers didn't recognize, that they are intervening in a much more complicated system they haven't thought about. The construction of infrastructure is the intervention into the living system of the planet, the nature. Traditional civil engineering education has not recognized the complexity and vulnerability of the system and has destroyed in its ignorance huge amount of this life supporting systems in many regions and places of the globe. Traditional transport and traffic engineering is running more and more into conflicts with the society, the environment, the local economy, the people and quality of life. The dominating answer to the arising problems was: "more of the same". More roads for more cars, more rails for more goods, more harbors for more ships and more airports for more airplanes. If the society doesn't allow building all these things, then the hope is on "more information". If we invest in so called "intelligent transport systems" ITS we will solve the problem. If you don't have a capacity you will be able to compensate it by more information.

I think more of the same is not the appropriate answer for the changes of today. The gap between the development of life supporting system and the technical driven society is increasing dramatically. All scientific based simulations of development show us a traditional extrapolation of indicators that will not both be valid any more for the next generations of engineers.

The need for transition

Transport and traffic engineering have not taken into account the effects of their work on the whole environment, not on the society, not on the economy and not on the right balance between different system users. Pedestrians have not treated seriously as important transport system users, neither cyclists and priority have been set under the impression of high speed and maximization of individual opportunities for car drivers not taking into account the whole system effects. The much broader approach to the transport system as it used to be at the end of the 19th century was given up for a over simplification of the whole transport system as it was successful in principality country as the United States of America. Europe is a dense populated country with a rich urban history and different culture and the need for local optimization also for transport solutions. The more different solution as Europe can invent and experience, the more opportunities the continent will provide to master the uncertain hiss of the future.

The European commission tries to treat Europe by copying the American way of treating transport systems. The European richness is not the richness in long-term, it has a much higher value, because the pressures of European culture and European region cannot be paid by any amount of money. This has been forgotten since the indicator to measure success for the first period of an economy the Gross National Product (GNP), has no sense any more in mature

economies. The feeling of people, their wealth is much more reflected by the Index of Sustainable Economic Welfare (ISEW) which has diverted from the GNP in most of the Western countries already in the 70s.

This has also effects on transport and traffic engineering. Transport and traffic engineering have to question for whom it works: for the people or for the big corporations or for a worth while life in the future or for shorter profit seeking.

If traffic engineering and transport stuck on construction, equipment, management, operation and eventually finance and managements of the infrastructure, as it has been done during the last 50 years no transition will be necessary. Transport and traffic engineering will be a low level servant discipline controlled by environmentalists, economists, lawyers and managers. This will be not the discipline for a university, it will fit into an engineering school. If transport and traffic engineering want to stay on the university level it will be necessary to make a basic transition from the very narrow transport engineering field of the past to a much more universal approach of engineering, understanding the transport system in the much wider and broader context. This does not mean, that the content of the traditional textbooks have to be rewritten, but it has to be reordered, restructured as a subsection within in a much wider view. This is a necessary precondition, but not a sufficient one. It will be necessary to educate engineers to be responsible for the effects on the society, the environment, the economy and the culture. Caused by the artifacts they build and organize. In the past transport engineers were driven by so called transport demand. Their business was not demand management. The main focus of transport engineering will be demand management. This can only be done, if engineers are able to manage structures, functions, economy and information.

New techniques have to be learned to cope with the complexity of the system as a result of traffic engineering intervention. Knowledge and treatment of complex system behavior will be necessary as well as knowledge about human behavior, society behavior in the urban and rural context. The straight line of construction engineering (Hook's straight line) is not any more the life space of transportation engineering. Non linear feedbacks have to be taken into account, as well as interdisciplinary approach and dynamic modeling of introductions of the transport system taking into account the effects on (all) other parts of structures built by human beings and the nature. If we look at the profiles of the courses of today in a University like the Technical University of Vienna, steps into this direction have been done already, but there is still a long way to go. Sometimes Construction Engineers do not understand these dynamic changes in the transport sector, especially in transport engineering fields. This can bring some tensions into faculties between the construction oriented branche of civil engineering and the much more

dynamic oriented branche of transport engineering, resource management and water management. To overcome these tensions between different branches of civil engineering at least two bachelor study plans must be available and even more branches for the master plans.

We have to answer the question, who else can and should take the responsibility for our transportation and traffic engineering work? If we don't cover the field and cope with the effects or work trades who will do it?

We can take the position: This is not our business, we are just doing simple engineering work, we build, maintain the infrastructure, we operate the vehicles, we calculate the demand, we make some forecasts on some assumptions, we do a lot of excellent jobs to increase the safety, we fulfill the transport demand – if we get the money to build what is necessary (what is really necessary?). Should this be the future of transport and traffic engineering?

We train our students perfectly to provide convenient movements of cars and learn them to use assignment models to calculate traffic flow (of cars), and networks for public transport modes, we prepare our students to become responsible managers for the administration in the old public transport sector, in harbors and even for airports. Is this the profile we want to have? Or do we want to produce academics with a full responsibility and a critic thinking to what the own profession understanding the role of transport and traffic engineering in a broader context, not only carrying out some duties, but also designing systems, building, operate or reject them if they find out that the whole system was stupid or even endanger human's life. If we give a positive answer to this question, the whole curriculum for transport and traffic engineering has to be rewritten to a certain amount at least. A basic civil engineer background is needed of course - much more methods, much more understanding complex systems, much more interdisciplinary understanding and work, much more on self criticism and much more on openness to all the other disciplines and the society as a whole. Will the universities be able to fulfill this need?

Transition into this field is not supported by the existing lobbies of today. If the disciplines of transport and traffic engineering are looking for short term profits and rewards and awards from dominating traditional powers, no transition can occur. Transitions are always risky for everybody. But the transition which transport and traffic engineering has to do is a transition to the good scientific roots which are the only acceptable background for the transport and traffic engineering of the future. If we leave the speculative unproved, simplified assumptions of US driven transport planning and come back to the much more sophisticated and challenging self consciousness the European way of transport system it will be a benefit for the European Union, the European economy and the variety of European cultures. What is needed is a much more open space for variety is that uniformity. The European Union can support this opening for the

future if they give up their tendency to uniformity and their wrong assumptions about the effects of the transport system.