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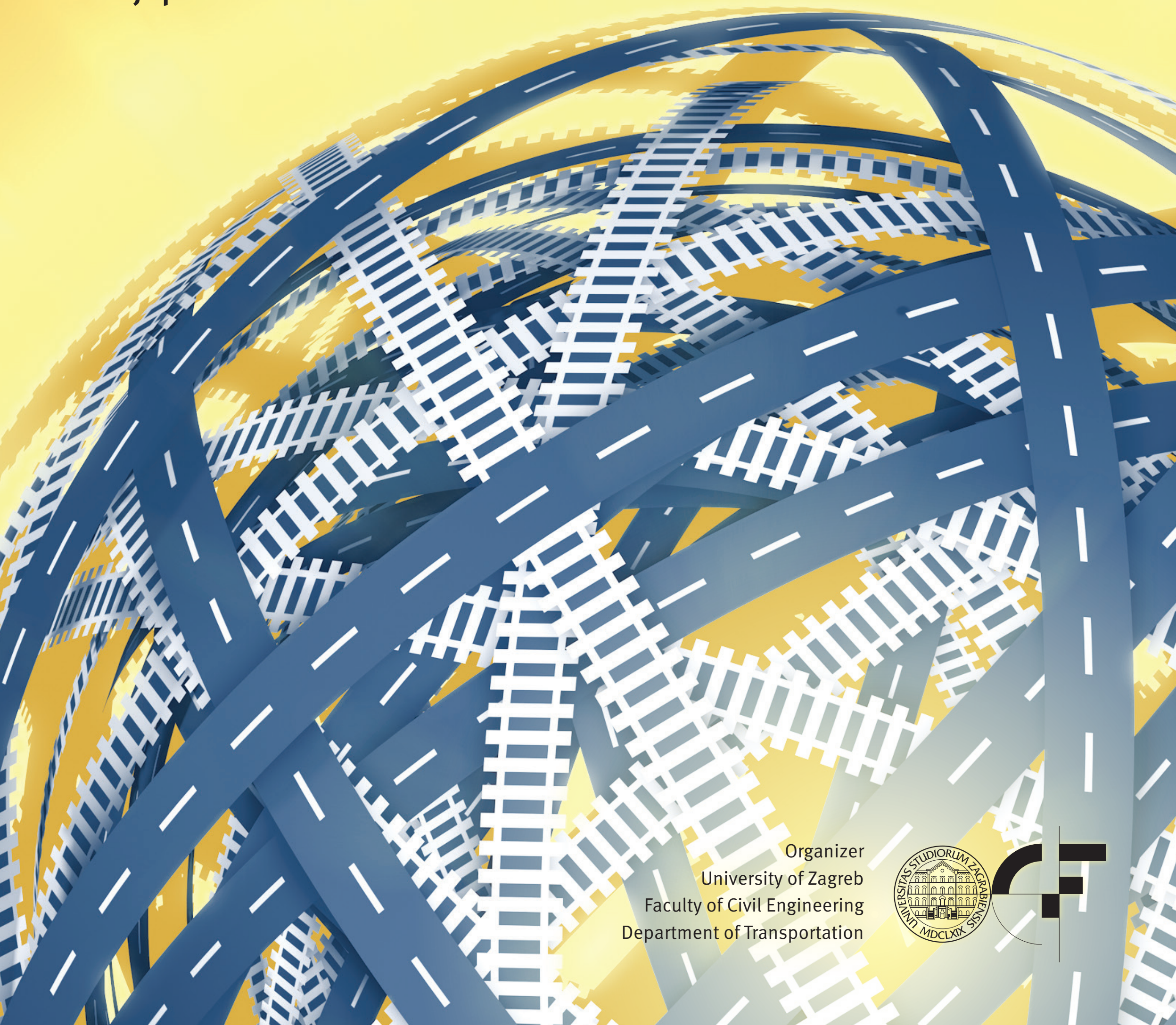
4th International Conference on Road and Rail Infrastructure
23–25 May 2016, Šibenik, Croatia

Road and Rail Infrastructure IV

Stjepan Lakušić – EDITOR



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Road and Rail Infrastructure IV

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THE EFFECTS OF FORECASTS ON THE LEVEL OF MOTORIZATION – A SELF-FULFILLING PROPHECY?

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Abstract

Besides the population growth, the level of motorization is an essential factor influencing forecasts on transport demand carried out with transport models. Results of such models are often used in transport planning for example to scale planned road infrastructure. Looking at the development of the level of motorization in the past, it becomes apparent that permanent transgressions of the prognoses have taken place. As a consequence the ever-increasing levels of motorization were treated as "law of nature", resulting in upward corrected prognoses. In the last decade this trend seems to be reversed. We present that in many countries worldwide the levels of motorization are stagnating or even decreasing. Especially in cities this development is obvious, showing the influence of transport policies on vehicle ownership. The common transport models did not predict this development. Additionally the strong influence of the level of motorization on the forecasts of transport behaviour is shown, based on two different scenarios. One of the scenarios is mapping the influence of transport and land-use policies on the level of motorization. In the second scenario the assumed growth of the level of motorization is fed externally into the model, therefore not being influenced by policy measures.

Keywords: level of motorization; transport demand models; prognoses

1 The level of motorization in transport demand modelling

Population growth and the level of motorization are both strong influencing factors in forecasts of transport demand. The population is directly influencing trip generation (first step of a classical four step approach) and the level of motorization is influencing trip distribution and mode choice (step two and three) via vehicle availability and finally also influencing traffic assignment. The level of motorization is often modelled or estimated by a Gompertz-function, with an assumed saturation point following an "S"-shape. Figure 1 presents the used Gompertz-curves in the Austrian transport prognosis 2025+.

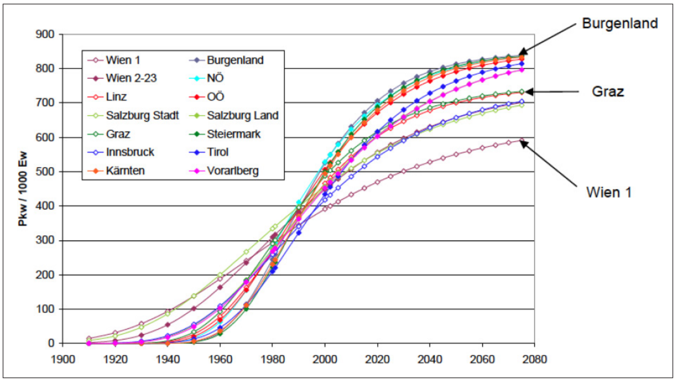

Figure 1 Development of the level of motorization in the Austrian transport prognosis 2025+. Source: [1]

2 The interrelation between prognoses and actual development

In the 1950ies the prognosis for Germany predicted the culmination of mass motorization with 63 vehicles/1,000 inhabitants. The development tough overtook this prognosis after a short period of time. Prognoses followed prognoses and the values for the level of motorization had to be corrected upwards several times [2]. Applying a rational thought it must have been obvious that the prognoses are not mapping the system correctly and appropriate measures should have been taken. Instead politicians and transport planners have looked blank on this momentum of development [3].

The Buchanan Report “Traffic in Towns”, which was produced in 1963 for the UK Ministry of Transport, suggested that traffic would saturate early in the 21st century. Rode et al.[4] are pointing out, that it has become increasingly difficult to operate with a traditional ‘predict-and-provide’ model of urban transport planning. Most importantly, it should be noted that there is a considerable risk of overestimating the growth of private vehicle stock and car use, as most growth projections simply extrapolate historic trends without adequately incorporating evidence on changing patterns of mobility and their relationship to income and economic growth [5, 6]. Analysis of recent traffic forecasting in both the UK (Figure 2) and US (Figure 3) has indicated that transport planners have consistently overestimated future car traffic growth in the previous two decades, with significant distortive effects on transport planning investments.

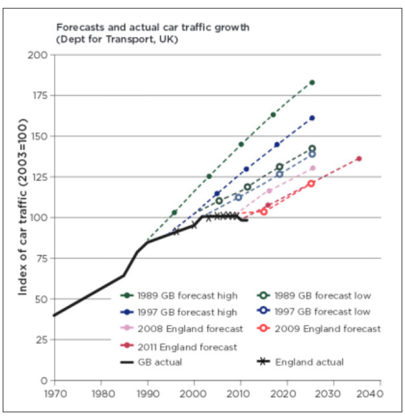

Figure 2 Forecast an actual car traffic flow for the UK. Source: [5]

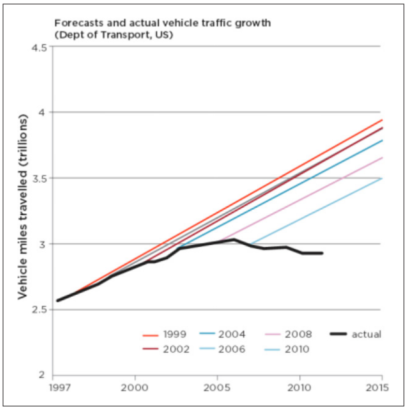

Figure 3 Forecast an actual car traffic flow for the US. Source: [6]

What was the reason for the ever-increasing level of motorization? Why did the actual development overtook the levels in the prognoses and required a correction upwards? The reason is, that the levels in the prognoses were the basis for the development of the road infrastructure, Figure 4. Based on the future level of motorization the infrastructure for the individual motorized transport was over dimensioned. With the permanent attempt to avoid congestion and to keep the current system speeds, the increased demand was answered by an increased supply (which again increased demand).

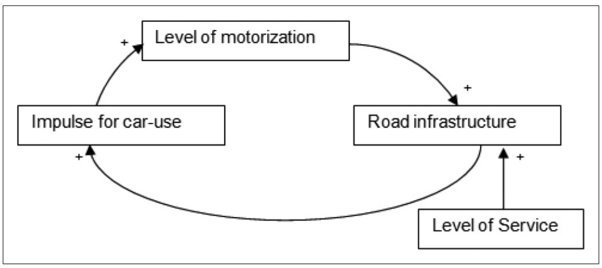

Figure 4 Feedback loop between level of motorization and the road infrastructure. Authors own representation

The structures were built alongside the developments in the prognoses. The changes in structures led to changes in behaviour, which became visible through data. The isolated consideration of car-data (level of motorization) and the orientation of transport planning led to car-structures and car-behaviour, which resulted in car dependence and a lot of so called transport problems, Figure 5.

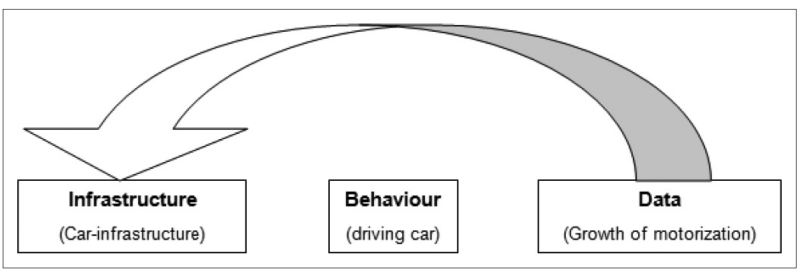

Figure 5 Data is reflecting the infrastructure in the transport system. Authors own representation

3 Actual developments of the level of motorization

The thesis in the past was, that there is a causal relation between the GDP growth and the development of the level of motorization. Till today the traditional transport planning assumes that an increase in income correlates with an increase in the level of motorization [3]. Instead it becomes apparent that in cities with a good public transport system and dense city structures even with high incomes the level of motorization is below the levels in rural areas, which make the possession of car necessary. The development of the level of motorization for cities like Hong Kong, Singapore or New York show a decoupling of GDP and level of motorization [7, 8].
The idea of banning, or at least reducing, the use of automobiles in city centres has become an increasingly hot topic among urban planners, especially in Europe and other industrialized countries dealing with issues as diverse as congestion and smog. A number of major cities, like Paris, London and even New York, have been exploring ways to reduce the number of vehicles on their streets [9]. Also in Vienna, looking at the development from 2003 till now, the level of motorization is decreasing, reaching 372 vehicles / 1000 inhabitants in 2015, a value similar to the values in 1991/92., Figure 5.

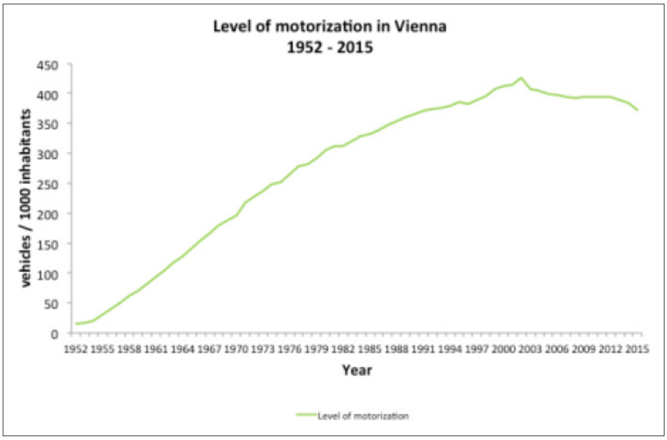

Figure 6 The development of the level of motorization in Vienna. Calculated from [10, 11], authors own representation.

Even if we assess the levels of motorization on a nationwide scale there are signs for "demotorization". In 2004 "peak car use" happened in the US, UK, Germany, France, Australia and Sweden and all saw the start of a decline in the number of kilometres the average person travelled in a car that continues till today. That year in Australia, car travel peaked in every city in 2004 and has been falling since [12]. It is a similar picture in the UK, where per-capita car travel is down 5 per cent since 2004.

4 Presentation of the use of the level of motorization in modelling

The lines of argument given above will be emphasised further by presenting the strong influence of the level of motorization on forecasts of transport behaviour, based on two different scenarios. These scenarios were modelled with a transport interaction model called MARS [13]. MARS was primary applied on a series of urban case studies. The MARS model was further developed to use it for the whole territory of Austria and to model the impacts of transport and land-use policies on a national scale in a forecasting approach [14]. The presented scenario results are taken from the thesis where starting from a "business as usual" scenario,

which depicts the development over time without any substantial changes, different policy scenarios were developed.
One of the scenarios is mapping the influence of transport and land-use policies on the level of motorization (450 ppm, ppm = parts per million). In the second scenario the assumed growth of the level of motorization is fed externally into the model, therefore not being influenced by policy measures (BAU).
Figures 7 and 8 present the results of the modelled scenarios as modal split for the years 2010, 2015 and 2050. In the BAU scenario the share of PMT is increasing till 2050 reaching 65 %. In the 450 ppm scenarios the implemented policy measures in combination with the decreasing level of motorization show a decrease of the PMT share to 53 % in 2050.

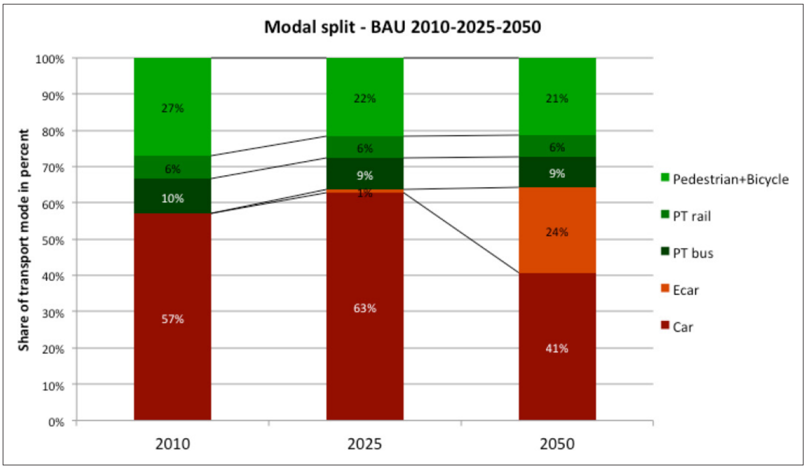

Figure 7 Modal split in total for the scenario BAU, years 2010, 2015 and 2050, source [14, p. 145]

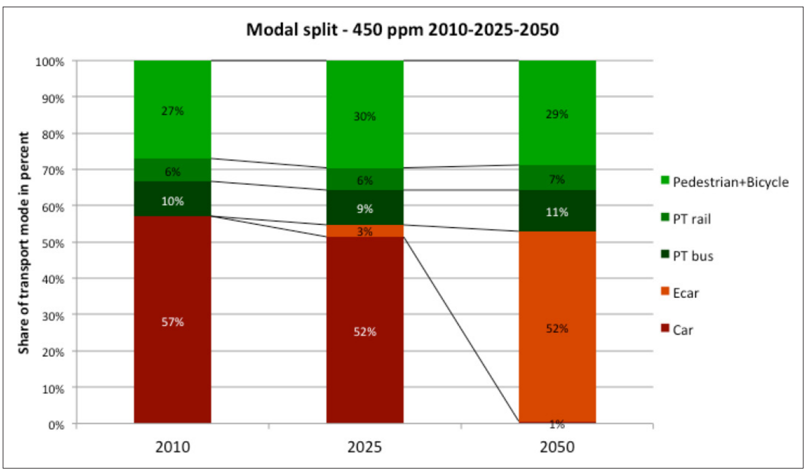

Figure 8 Modal split in total for the scenario 450 ppm, years 2010, 2015 and 2050, source [14, p. 167]

As it can be seen the modal split for the mode car/e-car is smaller in the 450 ppm scenario (where the influence of transport and land-use policies on the level of motorization is modelled) as in the BAU scenario (where an increase in the level of motorization is still assumed), also the share of the level of motorization is increasing till 2050.

5 Conclusions

The paper presents the influence of the level of motorization on forecasts and the usage of the forecasts in transport planning. When looking at the past, permanent transgressions of the prognoses have taken place, leading to ever increasing levels of motorization. The forecasts are based on model results produced by model structures, which are not capturing feedbacks between policy measures and the development of the level of motorization. Though we show that this trend seems to be reversed looking at developments in many countries and cities worldwide the common used transport models still don't predict this development.
Taking the development of motorization into account we can summarize, "we get what we expect", the positive feedback between belief and behaviour is obvious in the man-made exponential growth of motorization in the last decades. A break of this vicious circle is only possible if external targets and guidelines outside the transport system are set.

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