Inefficiencies in Germany’s Federal Transport Infrastructure Plan
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Abstract

In Germany, a federal transport infrastructure plan (FTIP) is drawn up every 10 to 15 years as a basis for decision-making as to which infrastructure projects should be realized in the upcoming years. A point raised in relevant debates is that less economically efficient new construction of motorways in regions with light traffic is sometimes preferred by political leaders over economically more efficient upgrading of motorways in congested regions. This contribution gives background information on the FTIP and presents results of a study in which 199 planned motorway construction projects from the Federal Transport Infrastructure Plan of 2003 in Bavaria were analysed. Benefit-cost ratio and political prioritisation were examined. The study gives explanations for inefficient prioritisation and discusses possibilities how to increase efficiency. A reasonable prioritisation of projects and a long-term financing system for motorway infrastructure could help to improve the situation faster and would also be more cost-effective. This also leads to better environmental sustainability.

Keywords: Inefficiencies; federal highways construction plan; incentives in infrastructure planning; prioritisation of infrastructure projects; environmental sustainability; highway maintenance.

Résumé

En Allemagne, un plan fédéral des infrastructures de transport (FTIP) est établi tous les 10 à 15 ans en tant que base pour la prise de décisions quant aux projets d'infrastructures devraient être réalisés dans les prochaines années. Un point soulevé dans les débats pertinents, c'est moins rentable la construction de nouvelles autoroutes dans les régions à faible trafic est parfois préféré par les dirigeants politiques au cours économiquement plus efficace amélioration des autoroutes dans les régions congestionnées. Cette contribution donne des informations générales sur la FTIP et présente les résultats d'une étude dans laquelle 199 projets de construction d'autoroutes prévues dans le Plan d'Infrastructures de Transport fédérale de 2003 en Bavière ont été analysés. Ratio avantages-coûts et la priorisation politique ont été examinés. L'étude donne des explications pour la hiérarchisation inefficace et discute des possibilités comment accroître l'efficacité. Une hiérarchisation raisonnable de projets et d'un système de financement à long terme pour l'infrastructure de l'autoroute pourrait contribuer à améliorer la situation plus rapidement et seraient aussi plus rentable. Cela conduit également à une meilleure durabilité de l'environnement.

Mots-clé: Inefficacités; plan fédéral d'autoroutes de la construction; incitations à la planification de l'infrastructure, la hiérarchisation des projets d'infrastructure, la durabilité environnementale, l'entretien des routes.

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Nomenclature

FTIP  Federal Transport Infrastructure Plan
Federal Waterways and Shipping Administration  Highest administration for waterborn transport in Germany

1. Introduction

In Germany, not enough money is made available for sufficient maintenance of motorways. Not only logistics companies and car driver associations are complaining about this. Environmental groups, as well, criticize that new-build of motorways is too often preferred to maintenance and upgrading of existing motorways.

An issue currently discussed in Germany is whether road infrastructure should be funded by private or by public funders. But even if a new and a more profitable system of funding is implemented, an old question remains:

How can transport infrastructure be planned, built and maintained more efficiently than today and, in particular, how can we prioritize infrastructure projects in a way that economically more efficient ones have a higher priority than less efficient ones. In addition environmental aspects should play a bigger role – that’s good for the economy as well.

1.1. Research background and theory

1.1.1. Legal background to the FTIP

The federal transport infrastructure plan (FTIP) forms the basis for the development and upgrading of transport infrastructure. A federal transport infrastructure plan is prepared by the Federal Ministry of Transport, Building and Urban Development and is adopted by the Federal Cabinet. It includes all planned road, railway and waterway projects. It is valid for the period stated (usually 10 to 15 years) or until a new federal transport infrastructure plan is published. The current Federal Transport Infrastructure Plan is the FTIP 2003.

When the Federal Transport Infrastructure Plan is being drawn up, the Federal Government must prove that a project under consideration is beneficial to the whole economy and that it is necessary. Upgrading and new-build needs are determined on the basis of the volume of traffic predicted in traffic forecasts. The basis of the FTIP 2003 is the traffic forecast for 2015.

The FTIP forms the basis for the Federal Government's bill to amend the acts governing the upgrading of federal railway infrastructure and federal trunk roads with the related requirement plans. The German Bundestag takes a decision on the inclusion of the projects of the FTIP, and possibly other projects, in the requirement plans of the upgrading acts (implies upgrading and new-build). In this way, the need for the selected projects becomes enshrined in law. A separate construction act must be passed for each mode of transport. There is no integrated planning.

To deliver the upgrading projects set out in the requirement plan, the Federal Ministry of Transport, Building and Urban Development draws up five-year plans. In 2006/2007, for the first time, the Ministry developed a cross-modal framework investment plan for federal transport infrastructure. This plan establishes the investment priorities for the structural maintenance, upgrading and construction of transport infrastructure. (German Ministry of Transport, 2013a)

1.1.2. Mid-course review

At regular intervals after the Federal Transport Infrastructure Plan has been drawn up (every five years), the Federal Ministry of Transport, Building and Urban Development reviews the requirement plans for the federal waterways and federal trunk roads to determine whether they need to be adapted to current economic and traffic trends. The most recent review of the requirement plans was completed in 2010. The reviews of the requirement plans do not have any direct impact on the FTIP, but they may prompt the preparation of a new federal transport infrastructure plan in order to refocus Germany's cross-modal infrastructure policy. (German Ministry of Transport, 2013a)
There is little mid-course adjustment in the content of the FTIP. Adjustments in priorities are possible.

1.1.3 Role of the Federal States in developing the FTIP (stakeholder participation)

The Federal States have a key role to play in developing the FTIP. The Federal States, the Deutsche Bahn AG (for train infrastructure) and the Federal Waterways and Shipping Administration (for waterborne transport) apply for new projects. Many of these projects have been encouraged by local organisations, local authorities, chambers of industry and commerce and other stakeholders. Projects are applied for without a systematic analysis of bottle-necks by the Federal Government.

1.1.4. Cost-benefit analysis

The methodology used to carry out the benefit-cost analysis is very complex because many aspects are taken into account – namely: reduction of transport costs, transport infrastructure preservation, increased traffic safety, improved accessibility of destinations, spatial advantages, environmental benefits, impacts from induced traffic, improved links to and from seaports and airports, fulfillment of non-transport functions, and investment costs. (German Ministry of Transport, 2013b)

The benefit-cost analysis is the most important element of the FTIP evaluation method. The Ministry of Transport is planning to update the calculation methodology and the monetarisation approach of the benefit-cost analysis. The aim of a current R&D project commissioned by the Ministry of Transport is not only to appraise the overall approach, but also to examine every component to determine whether it is necessary. (German Ministry of Transport, 2013c)

1.2. Research gaps and research questions

1.2.1 Research gaps

Many motorways in Germany are in bad condition. There is not sufficient money made available to maintain streets. In times of small public budgets it is very important to use available money as efficient as possible. Money should be spent in projects with the best benefit-cost ratios. The prioritisation of motorway projects should therefore follow a economical rationality.

According to the Ministry of Transport, “the priorities for the inclusion of evaluated projects in the FTIP 2003 are basically a result of the benefit-cost ratio, network design considerations, the status of planning and the level of investment that is likely to be available over the lifetime of the plan. A basic distinction is made between two priority categories: "first priority" and "second priority" projects.” (German Ministry of Transport, 2013d)

But it is not always comprehensible how the investment priorities have been established.

A second aspect is that the Federal States often underestimate the costs of projects they apply for. The result is a false benefit-cost ratio. That is why a new method to estimate costs will be developed by the Ministry of Transport. (German Ministry of Transport, 2013e) A third drawback is Article 6 of the Federal trunk road upgrading Act. It allows the Federal Minister of Transport to issue planning orders for projects independently of the FTIP and the requirement plan. With this instrument the minister can - in exceptional cases – issue a planning order without control by the parliament. (Federal Ministry of Justice, 2013)

But even when costs have been estimated correctly and Article 6 is not applied, there are cases where less economically efficient (lower benefit-cost value) new-build of motorways in regions with light traffic is assigned “first priority” and economically more efficient upgrading projects in congested regions are only in “second priority”.

1.2.2. Research questions

Have economic aspects been partly ignored in FTIP 2003? Has political efficiency more influence on the prioritisation of motorway projects than economic efficiency. If so, what are reasons for this and what does this mean for environmental aspects? Finally, recommendations are given, how to improve the situation.
2. Methods and results

2.1. Benefit-cost ratios of upgrading and new-build projects

There are 199 planned motorway projects (upgrading projects and new construction) in the Federal Transport Infrastructure Plan of 2003 for the federal state of Bavaria (for the whole of Germany there are much more). I used the example of Bavaria because it is a well-known Federal State of Germany which has a manageable number of motorway projects for the first part of my analysis. In this first part, benefit-cost ratios of upgrading and of new-build projects are compared. For each project the following indicators were examined on the basis of the project description: cost-benefit ratio, calculated overall costs, and political prioritisation. (German Ministry of Transport, 2013f) Figure 1 below considers the cost-benefit ratio and the calculated overall costs. The focus is on the cost-benefit ratio or, more precisely, on the different cost-benefit ratios of upgrading and new-build projects.

The circular area equates to the project budget. Bigger circles represent more expensive motorway projects than smaller circles. The red circles are planned new-build projects and the green circles are planned projects for upgrading existing motorways. New-build projects have on average a benefit-cost ratio of 3.4 and upgrading projects have on average a benefit-cost ratio of 5.5. You can see that the green circles have on average higher values on the Y-axis in Figure 1 than the red ones. This is because upgrading projects have on average a higher benefit-cost ratio than new-builds.

![Figure 1. New construction projects have a lower benefit-cost ratio.](image)

2.2. Prioritisation

After illustrating the average size of benefit cost-ratios of upgrading and new-builds, the second part of the analysis now focuses on prioritisation. The tables below (German Ministry of Transport, 2013f and Deutscher Bundestag 2006) show (extreme) examples of inefficient prioritisation. This time the examples are not only from Bavaria but from all over Germany. Table 1 shows 3 examples of “first priority” new-build projects in regions with (anticipated) very light traffic which have relatively low benefit-cost ratios or (in the case of the finished project) high costs.
Table 1. “First priority” projects and finished projects

<table>
<thead>
<tr>
<th>Motorway</th>
<th>Construction activity</th>
<th>Average daily traffic volume</th>
<th>Costs or benefit-cost ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>“first priority”</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A20 Lübeck-A26</td>
<td>new-build: 4 lanes</td>
<td>Forecast 2015: 21,000</td>
<td>benefit-cost ratio: 2.6</td>
</tr>
<tr>
<td>A14 Magdeburg-Ludwigslust +</td>
<td>new-build: 4 lanes</td>
<td>Forecast 2015: 16,000</td>
<td>benefit-cost ratio: 3.4</td>
</tr>
<tr>
<td>A39 Wolfsburg-Lüneburg + B190</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Finished project</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A20 Lübeck-Prenzlau</td>
<td>new-build: 4 lanes</td>
<td>2006: west and 19,000 east of Rostock</td>
<td>costs: € 1.9 billion</td>
</tr>
</tbody>
</table>

Table 2 shows “second priority” upgrading projects with very high benefit-cost ratios in very congested regions. The first two projects comprise an upgrading from 6 to 8 lanes; the last two projects, an upgrading from 4 to 6 lanes. Even though these examples have benefit-cost ratios of between 20 and 27 they have a lower prioritisation than those in Table 1.

Table 2. “Second priority”

<table>
<thead>
<tr>
<th>Motorway</th>
<th>Construction activity</th>
<th>Forecast 2015: average daily traffic volume</th>
<th>benefit-cost ratios</th>
</tr>
</thead>
<tbody>
<tr>
<td>A1 Hamburg/SoA25-S (A255)</td>
<td>Upgrading from 6 to 8 lanes</td>
<td>129,000</td>
<td>27.3</td>
</tr>
<tr>
<td>A8 München/Brunnthal-Holzkirchen</td>
<td>Upgrading from 6 to 8 lanes</td>
<td>115,000</td>
<td>20.6</td>
</tr>
<tr>
<td>B10 Stuttgart-Plochingen</td>
<td>Upgrading from 4 to 6 lanes</td>
<td>81,000</td>
<td>24.9</td>
</tr>
<tr>
<td>A5 Darmstädter Kreuz-Heidelberger Kreuz</td>
<td>Upgrading from 4 to 6 lanes</td>
<td>90,000</td>
<td>26.8</td>
</tr>
</tbody>
</table>
3. Discussion

3.1. Criticism of own method
A new federal transport infrastructure plan (FTIP) will take effect in 2015. The FTIP 2003 is therefore old data, and therefore, so are the prioritisation of these projects and their benefit-cost ratios. However, since there is no new FTIP and new contents to the present day, the available data must be used. The FTIP 2015 will bring improvements, but until then the current political practice deserves to be discussed.

3.2. Discussion of results

3.2.1. Environmental aspects
Less economically efficient new construction of motorways in regions with light traffic is sometimes preferred by political leaders to economically more efficient upgrading in congested regions. It seems that economic aspects are partly ignored in the current FTIP. Furthermore the government is working against their own environmental goals with their current practice of motorway construction. New-builds affect the environment much more than upgrading or maintenance of existing road infrastructure. New-builds increase fragmentation and land-sealing. The German government’s environmental goal of reducing land-take to 30 hectares per day (for transport and housing) by 2020 is very difficult to achieve. Between 2008 and 2011, land-take was still at 81 hectares per day. (Federal Statistical Office, 2013)

In addition, upgrading projects, but above all transport infrastructure new-builds, produce so called “induced traffic”, meaning that they cause an increase in transport volume which would not have materialised without them (Verron, H. et al, 2005). So the efforts to mitigate emissions from transport are thwarted especially by new-builds.

3.2.2 Three possible theses for inefficient prioritisation (political versus economic rationality)

Thesis 1: Uncritical trust that new infrastructure promotes economic growth

Decisions on infrastructure investments are also influenced by distributional concerns, especially ones relating to geographic differences in access, but also to regional employment concerns. Such considerations may explain the apparent overprovision of infrastructure in rural areas, where projected benefits of investment are often lower than cost. (Brathen and Odeck, 2006) To trust that new infrastructure leads to positive regional economic growth is often too uncritical. In some cases even the opposite effect is possible. New infrastructure in very remote regions can reinforce loss of population and companies there and lead to destabilization. The main argument – economic growth – is no longer valid. (Nuhn, H.; Hesse, M.; 2006)

The official website of the state of Saxony-Anhalt (the area around Magdeburg in Figure2) contains information that traffic volumes have decreased on nearly all roads in the region. This is the case even for major motorways passing through the state. (Federal State of Sachsen-Anhalt) Building new road infrastructure in these (in Figure 2 deep blue) regions is mostly an example of political rationality strongly influencing the prioritisation.
Future population trends on a low territorial level

Trend from 2010 to 2030

Estimated population change from 2010 to 2030 (%)

- less than -20
-20 up to less than -10
-10 up to less than -3
-3 up to less than 3
3 up to less than 10
10 and more

Source: Spatial Monitoring System of the BBSR, BBSR-Population-forecast 2009-2030/ROP
Geometric basis: BKG, Forecast areas 2010

Fig. 2. Future population trends in Germany.
Thesis 2: Misinterpretation of the Regional Planning Act

The postulate of equal living conditions (mentioned in the Regional Planning Act) is outdated and misinterpreted. According to the Ministry of Transport, the outstanding importance which the Ministry accords to the A14/A39 new-build project is due to the fact that the Magdeburg area has an accessibility deficit in comparison to other regions in Germany. This means that not the economic reasons are dominant but the adjustment to regions which have better accessibility. The problem is that the spirit of the Regional Planning Act dates from a time which had other demographic, economic and sociopolitical general frameworks. But today – unlike the situation in West Germany in the 1960s and 1970s – Germany is heavily indebted and has a shrinking population which is increasingly concentrated in some areas. In addition, the concept of equal living conditions has never meant equality in general and never embraced all areas of life.

Thesis 3: Perverse incentives in the organization of financing infrastructure

All the 16 Federal States in Germany have a certain budget contingent. This budget is independent of real necessity. These budgets are often given to municipalities which build e.g. bypass roads which have high benefits for the local population. This is a typical case of political rationality of spending money. This is one reason why there are so many bypass roads in the first priority category in the FTIP 2003. But bypass roads do not solve causes of transport problems and bypass roads should not be a main task of the FTIP. The FTIP should focus on long distance transport. The present prioritisation is preventing the abatement of bottlenecks because money is being spent on less important local road projects.

Another point is the annuality of the financing system: Budgets must be spent completely by the end of each year. Otherwise the budget will be shorter next year. This leads to inefficiencies as well.

3.3 Recommendations and Further research

Financial resources should be concentrated on maintaining the existing transport infrastructure network. Investment to maintain the existing network should be reliably and permanently assured.

Up to now, too much money has been spent on less beneficial and more prestigious projects. This spending policy thwarts urgent measures to maintain the network and remove bottlenecks. Therefore, projects with a high benefit-cost ratio and low environmental risk should be consistently preferred over projects with a smaller benefit-cost ratio.

Up to now, transport policy has neglected to set transport and environmental targets which it could have met through federal transport infrastructure planning. Federal transport infrastructure planning should therefore be integrated into a sustainable overall transport strategy. The German government’s environmental goals (e.g. emissions reduction, reduction of land consumption, modal shift to rail) should also be binding in developing the overall strategy.

Expansion and new construction should be limited to a core infrastructure network with very high levels of traffic. On the other hand, for roads drawing very little traffic even deconstruction can be an option from the viewpoint of sustainability.

Goal-oriented and effective participation of the public can enhance acceptance and thus prevent duplication, lengthy procedures and lawsuits. The Federal Environment Agency in Germany published the recommendations mentioned above and further ideas of improving FTIP. (Umweltbundesamt, 2012)

The results from the present study could be compared with those of a future study dealing with the next, 2015, federal transport infrastructure plan in order to track improvements.
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Note: Detailed information on every highway project is no longer available on the website of the Ministry of Transport (for governmental explanation see: Deutscher Bundestag 16. Wahlperiode Drucksache 16/2492 01. 09. 2006, p.19+20 at http://dipbt.bundestag.de/dip21/btd/16/024/1602492.pdf). But the author still has all the detailed information which used to be available on the internet and can make it available.

