

Andreas Knorr/Alexander Eisenkopf

Road Infrastructure PPPs in Germany:
Why Did the *F-Modell* Fail?
Two Case Studies



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Abstract

The Warnowquerung – a tunnel project under the river Warnow north of Rostock which opened for traffic in September 2003 – was Germany's first privately built and operated road infrastructure ever. Only 15 months later, in December 2004, the banks which had contributed 68 per cent of the capital, warned that on the basis of current contract provisions, a bankruptcy of the tunnel operating company would be unavoidable within one year due to the unexpectedly small number of users. A similar PPP-based tunnel project near Lübeck, the Herrentunnel, also spectacularly failed to attract the forecast number of users. In this paper, we will identify the causes behind the commercial failure of both projects and propose an institutional redesign of the underlying *F-Modell*.

1. Introduction

The Warnow tunnel¹ – a river crossing north of the port city of Rostock which opened for traffic in September 2003 – was Germany's first privately built and operated road infrastructure ever. Only 15 months later, in December 2004, the consortium of 14 commercial banks which had contributed 68 per cent of the capital, warned that, on the basis of current contract provisions, a bankruptcy of the tunnel operating company would be unavoidable within one year given the unexpectedly low number of users. The German government, embarrassed by the imminent failure of this show-case project, quickly came to the rescue and extended the contract duration by another 20 years to a total of 50 years. A similar PPP-based tunnel project near Lübeck, the Herrentunnel, also failed to attract the forecast number of users, with a vengeance, and its operators are lobbying hard for a similar contract extension.

In this paper, we aim to identify the underlying causes which led to the commercial failure of the first two German toll road projects. Our paper is subdivided into three parts. First, we will provide a detailed overview of the so-called *F-Modell*, the specific PPP variant chosen by the German government for both projects. Second, we will identify its substantial conceptual shortcomings which, in our view, doomed the two projects from the very beginning. Finally, we will derive proposals to improve the *F-Modell* for similar future road infrastructure PPP projects in Germany.

1 A draft version of this paper was presented on July 19th, 2008, at the joint Third International Conference on Funding Transport Infrastructure – 10th Journée Transport in Paris (France).

2. Backgrounder: Road Infrastructure Provision in Germany

2.1 Basic Network Data

Currently, Germany's non-local road network has a length of 231,480 kilometers. The *Autobahn* network – which handles about one third of all traffic – comprises 12,363 kilometers, with six or more lanes available on around 3,000 kilometers. In addition, 40,983 kilometers of *Bundesstrassen* (Federal trunk roads) link all major and most minor municipalities of the country. The remainder are state roads (88,553 kilometers) and county roads (91,581 kilometers).² However, the quality of the road infrastructure has sharply deteriorated over the past three decades, especially in former West Germany, due to the lack of sufficient public funding after reunification (a substantial amount of the transport budget was redeployed to and invested in former East Germany). The most visible indicator for this trend is the sizeable decline of the modernity level of roads and bridges from 85 per cent in 1970 to a mere 67 per cent in 2004.³

2.2 The Political and Legal Framework

Germany is no unitary state but a highly decentralized political entity. In short, the country is organized into three layers of government: the Federal level, the 16 Länder (states) and the 12,312 local municipalities, only 2,077 of which are cities.⁴ Only in a few fields have policy competences been exclusively assigned to a specific level of government. By contrast, it is estimated that around 70 per cent of all legislation must be jointly passed by the Bundestag – the German parliament (roughly equivalent to the U.S. House of Representatives) – and the Bundesrat (Federal Council, roughly equivalent to the U.S. Senate).

2 Cf. Statistisches Bundesamt (2007, 419).

3 Cf. Friedrich Ebert-Stiftung – Managerkreis (2006, 2); Wirtschaftsrat (2000).

4 For details see Statistisches Bundesamt (2007, 36).

Transport infrastructure policy is a case in point.⁵ According to article 90 (1) of the German Constitution, the Federal government is the legal owner of all Federal trunk roads, i.e. of *Autobahnen* and *Bundesstrassen*. However, their administration – including the competence for planning and completion –, rests with the respective state governments by proxy. Moreover, the *Länder* exert substantial influence throughout the entire planning process for Federal road projects (as well as for any other Federal transport infrastructures such as railway lines etc.). Formally, the responsibility for transport infrastructure planning at the Federal level resides with the Bundesministerium für Verkehr, Bau und Stadtentwicklung (BMVBS; Federal Ministry of Transport, Building and Urban Affairs). Since the 1970ies, the *Bundesverkehrswegeplan* (Federal Transport Infrastructure Plan) has provided a ranking of all Federal transport infrastructure projects, based on a thorough cost-benefit analysis (complemented by an environmental impact assessment and an assessment of potential regional development effects); it has been updated at irregular intervals, on average less than once in a decade. As a rule of thumb only projects with an estimated benefit-cost ratio > 3.0 will be realized. More often than not, however, it is the state governments that propose specific infrastructure projects for evaluation and inclusion in the *Bundesverkehrswegeplan*. Their motivation is not exclusively the desire to eliminate existing regional infrastructure bottlenecks. Rather, the successful lobbying for the inclusion of a proposed road project into the *Bundesverkehrswegeplan* does also shift much of the financing burden from the *Länder* budget to the Federal government, allowing the *Länder* effectively to ride free on the Federal budget.

Finally, until very recently, all road infrastructure projects in Germany have been financed out of general and, though to a much lesser degree, transport-specific tax revenues (such as the car tax and the gasoline tax). On January 1st, 2005, however, a selective electronic toll system was introduced. It subjects all heavy trucks with a gross vehicle weight in excess of 12 tons which travel on any *Autobahn* or one of three highly congested *Bundesstrassen* to a road user charge (which is primarily distance-based but also contains an emission-

5 For a detailed discussion see Institut für Mobilitätsforschung (2007, 84 ff.).

related component).⁶ Last not least, the *Fernstrassenbauprivatfinanzierungsgesetz (FStrPrivFinG)*⁷ – the Private Financing of Highway Construction Act – of 1994 created the legal prerequisites for levying a toll on all vehicles travelling on a *F-Modell* road infrastructure, the PPP variety which we will discuss in detail in the next sections of this paper.

3. Road Infrastructure PPPs in Germany

3.1 Excursus: PPPs – A Brief Definition

From a governance perspective, PPPs are best classified as hybrid organisations subject to specific incentive and risk schemes.⁸ However, a clear-cut line between PPPs on the one hand and the other forms of contractual relationships between the state and the private sector such as public procurement, contracting out and outsourcing on the other hand is difficult to draw.⁹ As a rule of thumb, PPPs encompass at least a few activities all along the value chain (planning/design, construction, financing, operation, transfer) – or, alternatively, over the entire life-cycle of the project – and include complex provisions governing the allocation of rights, obligations and options among the involved parties.

3.2 The Political Rationale Behind Road Infrastructure PPPs in Germany

While PPPs are a rather common investment model in most industrialized countries, especially in the Anglo-Saxon world¹⁰, Germany re-

6 http://www.toll-collect.de/mautsystem/tcrdifr002-012_schadstoffklassen.jsp;jsessionid=8BB9E90F08F2776B5EF79E334717AE30.

7 <http://www.bundesrecht.juris.de/bundesrecht/fstrprivfin/gesamt.pdf> (*full text in German*).

8 Cf. *Williams* 2003; *Eggers* 2004.

9 Cf. *Puwein* 2005, 184.

10 Cf. *Pollitt* (2000).

mains a clear ‘latecomer’ and ‘underperformer’ by international standards; a recent study by PricewaterhouseCoopers¹¹ reveals that PPPs only account for roughly 0.075 per cent of GDP as opposed to slightly more than 0.6 per cent in the UK and 1.2 per cent in Portugal.¹² Politically, there were four main reasons behind the recent attempts to promote private sector participation with respect to road infrastructure projects in Germany:¹³

- the unabated rise of road transport demand, combined with the increasing shortage of available public funding (especially due to the enormous fiscal burden of reunification) has given rise to ever more widespread infrastructure bottlenecks and/or a creeping degradation of road quality standards;
- the wish to correct the fundamental economic flaw of the traditional tax-based provision of road infrastructure: the lack of market-based scarcity signals to guide investment decisions;
- the (asserted) gains in (productive) efficiency due to private sector involvement; and finally
- the, at least in some political quarters, ideologically motivated will to reduce the size and scope of the public sector.

It is noteworthy in this context, however, that the expected economic benefits of PPPs, which, in a blatant and often uncritical manner, have been highlighted in the politically influential consultancy-driven or industry-sponsored literature on the topic, have rarely ever materialized in a real-world setting. This is because most of these studies completely ignored the often high transactions costs of PPPs and/or the welfare losses which are the result of opportunistic behaviour on both sides.¹⁴

11 Cf. *PricewaterhouseCoopers* (2005, 37)

12 During the 2000-2005 period covered by the report, in absolute terms the largest number of PPPs were closed in the UK, however. *Ibid.*, 37.

13 Cf. Bertelsmann Stiftung/Clifford Chance Pünder/Initiative D21 (2003); *Beckers/Hirschhausen* (2005, 3).

14 Cf. for many *Eisenkopf/Knorr* (2006); *Mühlenkamp* (2005); *Budäus/Grub* (2007).

3.3 PPPs in Germany – A Simplified Typology

In the German political context, at least three basic PPP types are being distinguished:¹⁵

- **Financing PPPs** exclusively transfer the funding of a project to the private sector, whereas the design and planning, as well as the operation of the infrastructure project in question will remain the responsibility of the state. Germany's first PPPs were all of the financing variety, although – due to the better investment grade rating of governments in comparison to private enterprises – it is questionable that this approach ever yielded any substantial economic benefits (the typical efficiency gains attributed to private sector involvement clearly could not unfold since all other project-related tasks were not transferred).
- In **operating PPPs** private firms are granted a concession which holds them responsible for the financing, the construction and the operation of an infrastructure project. The underlying contractual arrangement typically contains some provisions similar to rental or leasing contracts. In the case of the standard BOT (build-operate-transfer) model, infrastructure ownership will be transferred to the state at the end of the concession period. This contrasts with the BOO (build-own-operate) model, where the private firm owns the infrastructure outright and for an unlimited time. In either case, the political responsibility for infrastructure supply decisions rests with the state. Typically, the private operators are not allowed to levy user charges; instead they will receive a contractually fixed compensation from the state which – in turn – will or will not charge infrastructure users directly. Consequentially, it is also the state, not the private operator, which must fully bear any losses which may result from lower than forecast demand (i.e. from the so-called market, demand or volume risk).
- Finally, under the terms of a **franchise PPP**, a special variant of the operating (or concession) model, the private operator is granted the right to charge infrastructure users directly – more often than not, however, rates are subject to some form of governmental regulation – but must shoulder the full demand risk in return.

15 Cf. Deutscher Städte- und Gemeindebund 2002, 7 ff.

4. The *F-Modell*

Road infrastructure PPPs were illegal under German law until September 1994 when the Federal German government enacted the *Fernstrassenbauprivatfinanzierungsgesetz (FStrPrivFinG)* – the Private Financing of Highway Construction Act. For the first time ever, this new law formally permitted the transfer of all rights, including the explicit right to levy tolls and duties relating to the provision and operation of Federal (trunk) roads – *Autobahnen* and *Bundesstrassen* – to private investors. The act was amended twice in the meantime (in 2001 and 2006) and gave way to two alternative PPP variants for road infrastructure projects in Germany: the *A-Modell* and the *F-Modell*. The former – which is beyond the scope in this paper and will therefore not be discussed any further¹⁶ – refers to PPPs for road infrastructure expansion projects, e.g. the addition of lanes to an existing *Autobahn* (A is the abbreviation of *Ausbau*, the German word for expansion). Under the *A-Modell* the private investor will be able to recoup his investment through a share of the toll levied on all trucks using the relevant sector of the *Autobahn* network (plus a handful of parallel running lower-level *Bundesstrassen*, i.e. federal highways). The *F-Modell*,¹⁷ by contrast, was designed for PPP projects for so-called *Sonderbauten* – special structures –, i.e. bridges, tunnels, and mountain passes, but also some four-lane divided *Bundesstrassen*.¹⁸ Essentially a variant of a standard BOT-model, it boasts the following features:

- Carrying out a *F-Modell*-PPP requires the prior approval of both the Federal government and the affected *Länder* government, i.e. suitable projects are selected jointly. In practical terms, the Federal government is formally represented in the process by a specialist unit of the BMVBS, which, in turn, is supported by the *Verkehrsinfrastrukturfinanzierungsgesellschaft* (VIFG or, in English, Transport Infrastructure Financing Agency).

16 For a detailed discussion see *Beckers* (2005, 179 ff.); *Deutsches Verkehrsforschung* (2003).

17 Cf. *Balthaus/Keppel* (2000); *Beckers* (2005, 158 ff.); *Gawel* (2005, 175); *Verkehrsinfrastrukturfinanzierungsgesellschaft GmbH* (2008).

18 Cf. *Verkehrsinfrastrukturfinanzierungsgesellschaft GmbH* 2008.

- The selection process begins with a feasibility study. The objective is to assess the business case of every single proposed *F-Modell-PPP* beforehand by comparing the estimated project costs with the assumed revenue streams as a function of different toll levels and structures. In case of a positive assessment – i.e. the proposed project is deemed fit by the government for realisation as a *F-Modell* – this analysis also provides the basis for the calculation of the required Federal launch financing and the future toll level.
- A concession may be granted to the future private operator at either of the two following stages: during or after the formal planning approval procedure. The first option is referred to as the so-called *Ideenwettbewerb* (“idea competition”) and provides the concessionaire with the – albeit risky – opportunity to influence the final technical design of the project. Under option two – the so-called conventional planning approach – the concession is not awarded until after the approval procedure’s conclusion, depriving the concessionaire of any (legal) influence over the technical aspects of the project.
- Formally, the PPP contract is signed between the private party and the respective *Länder* government (or the local authority). It obliges the designated private party to build or expand the road infrastructure in question, to maintain and to operate it over a period of 30 years, and to transfer it back to the public authorities in a pre-defined condition afterwards.
- At this stage, the principal role of the Federal government remains to provide the launch financing for the project, which normally is limited to 20 per cent of the construction costs; in other words, the private party must raise 80 per cent of the funding required for the construction of the infrastructure.
- However, the administration of every *F-Modell-PPP* – subject to a managerial prerogative which rests with the Federal government – remains under the responsibility of the *Länder* government, or, in case the project is completely located within a municipal boundary, of the municipality.
- Most importantly, the toll – which accrues directly to the concessionaire – must be approved beforehand by the *Länder* government. It is noteworthy in this context that the toll approval process does not follow the internationally accepted economic princi-

ples of price regulation. Instead, and as required under the provisions of the *Fernstrassenbauprivatfinanzierungsgesetz*, it follows the traditional cameralistic accountancy principles still in ample use in Germany's public sector.

At the time of the conception of the *F-Modell* in the 1990ies, the BMVBS drafted a list of 32 potentially promising project. By the end of 2005, it had shrunk to a mere 10 projects.¹⁹ Only 2 of them – both of them tunnels – have actually been completed and have been fully operational for some time: the Warnowquerung (i.e. the Warnow river crossing) near Rostock and the Herrentunnel – a Trave river crossing – in Lübeck. A third *F-Modell*-project – the Strelasundquerung, a 4 kilometer-long suspension bridge which was proposed to link the island of Rügen, one of Germany's most popular seaside resorts on the Baltic Sea, with the mainland – failed to attract any viable private sector bid during the tendering stage. As a result, the bidding process was halted on April 29th, 2004. The bridge was built nevertheless but entirely financed the traditional way by the Federal government (with the European Union providing some additional funds).²⁰ Finally, a fourth project, the Hochmoselquerung – a bridge across the river Moselle – near the cities of Bernkastel and Wittlich – is currently on hold after the planning approval procedure was declared nil and void by a local court on environmental grounds.²¹ Obviously, the *F-Modell* strikingly failed to produce the politically desired results. Even the two show-case projects which have indeed been realised – the Warnowquerung and the Herrentunnel – have “not met the expectations of either the Ministry of Transport or the market”.²² In fact, both are now widely considered colossal failures in economic terms. Why this is so shall be the subject of the next two chapters of this paper which will provide detailed case studies of both projects.

19 Cf. *Alfen/Myrzedt/Tegner* (2004, 51); *Gawel* (2005, 174).

20 Cf. *Gawel* (2005, 174);

21 Cf. *Beckers* (2005, 166).

22 *Verkehrsinfrastrukturfinanzierungsgesellschaft GmbH* (2007, 20).

5. Two Case Studies: Warnowquerung and Herrentunnel

5.1 The Warnowquerung in Rostock

5.1.1 Project Background

The Warnowquerung – a 730 meters long tunnel – was the Federal Republic of Germany's first tolled road infrastructure based on the *Fernstrassenbauprivatfinanzierungsgesetz*. It opened for traffic on September 12th, 2003 and links, as part of *Bundesstrasse* B 103, the east and the west bank of the river Warnow, which divides the port city of Rostock. While the residential areas including the inner city are clustered in the western parts of the city, most industrial zones including the seaport are located on the eastern bank. As can be seen on the map²³ below, the peculiar geography of Rostock required long rides – up to 30 kilometers²⁴ – or a time-consuming ferry crossing (which was ended after the tunnel's completion²⁵) to travel between either part of town before the tunnel option was available. Moreover, transit traffic of up to 60,000 vehicles per day on *Bundesstrasse* B 105 clogged Rostock's inner city and caused long delays.²⁶

23 Source: <http://www.der-warnemuender.de/warnowquerung.shtml>.

24 For specific examples see <http://www.warnowquerung.de/routen.html>.

25 Cf. *Gawel* (2005, 175).

26 Cf. *Brantsch* (2004, 15).

Figure 1: The Warnowquerung



Source: <http://www.warnowquerung.de/routen.html>

It is therefore unsurprising that the idea for a tunnel solution was floated as early as the 1960ies in former East Germany. Even after reunification, it was repeatedly put on hold for lack of Federal funding as it was never classified as a priority project in the *Bundesverkehrswegeplan* due to an estimated benefit-cost-ratio of only 2.2.²⁷

Briefly after the entry into force of the *Fernstrassenbauprivatfinanzierungsgesetz*, Rostock's local government, the city council, opted for the realisation of the tunnel project as a *F-Modell* and kicked off an "idea competition" to select the concessionaire. All bidders were provided by the city with a – legally non-binding – traffic estimate which forecast 30,000 vehicle movements on every weekday and 15,000

²⁷ Cf. Beckers (2005, 161).

daily on weekends.²⁸ On July 25th, 1996, the contract was signed with the successful bidder, a consortium led by the French construction company Bouygues Travaux Public S.A. Ground was broken on December 1st, 1999. Bouygues which holds a 30 per cent share in the consortium today, and ETI Macquairie from Australia – which joined in in the late 1990ies, acquiring a 70 per cent share – together contributed 20 per cent of the € 219 million construction costs as equity. 68 per cent were financed as a loan by a banking consortium led by Deutsche Bank, NordLB and Kreditanstalt für Wiederaufbau (and guaranteed by the European Investment Bank). The remaining 12 per cent were state aids from the EU's TEN programme (€ 8 million) on the one hand and from the Land Mecklenburg Western Pommerania and the city of Rostock on the other hand. After the expiry of the concession the tunnel will be transferred for free to the city of Rostock.

5.1.2 Commercial Performance

From the very beginning, actual traffic figures trailed forecast demand by a substantial margin. According to an estimate made by the CEO of Warnowquerung GmbH, the tunnel operating company owned jointly owned by Bouygues and Macquairie, before of the official opening, the number of daily users required to recoup the investment costs would be 20,000 cars per day at the minimum,²⁹ based on the original toll levels. Depending on the season – with summer charges being higher – and type of payment these were initially set at € 1,50 (€ 2,50 in summer) per crossing for passenger cars and at € 9 (€ 17,50 during the summer season) for lorries. As the following table reveals, even today – almost 5 years after the opening – the actual number of users stills falls around 50 per cent short of the profitability threshold. Worse still, traffic growth rates are on the decrease, and absolute traffic figures seem to have hit their peak, too.

28 Ibid.

29 Cf. Hamburger Abendblatt (2003).

Figure 2: Warnowquerung – Average Number of Daily Users

Period	Daily users (average)	Target-Performance Comparison (Break-even point: 20.000 cars/day)
Sept 12 th – Oct 31 st 2003	6.471	-13.529
Nov 2003	6.124	-13.876
Dec 2003	6.151	-13.849
Jan 2004	5.681	-14.319
Febr 2004	6.292	-13.708
March 2004	6.907	-13.093
April 2004	7.956	-12.044
May 2004	7.870	-12.130
June 2004	7.878	-12.122
July 2004	8.224	-11.776
Aug 2004	9.022	-10.978
Sept 2004	8.179	-11.821
Oct 2004	8.218	-11.782
Nov 2004	7.800	-12.200
Dec 2004	7.928	-12.072
Jan 2005	7.302	-12.698
Febr 2005	7.397	-12.603
March 2005	7.888	-12.112
April 2005	8.806	-11.194
May 2005	9.017	-10.983
June 2005	9.122	-10.878
July 2005	9.278	-10.722
July – Sept 2005	9.750	-10.250
Oct – Dec 2005	9.190	-10.810
Jan – March 2006	8.447	-11.553
Apr – Jun 2006	10.160	-9.840
July – Sept 2006	11.082	-8.918
Oct – Dec 2006	9.742	-10.258
Jan – March 2007	9.167	-10.833
April – June 2007	10.662	-9.338
July – Sept 2007	11.372	-8.628
Oct – Dec 2007	9.897	-10.103
Jan – March 2008	9.549	-10.451

Source: Macquarie Infrastructure Group (several years).

The most important forecasting error was the way too optimistic demand estimate for lorries whose number failed to exceed 2 per cent of all users in the first months after the opening.³⁰ In fact, most trucking companies continue to direct their drivers to by-pass the tunnel and make a detour of about 10-15 kilometers on free public roads instead of paying a € 17,50 toll per ride during the summer peak season. As early as December 2004, the then 14 banks which had financed 68 per cent of the investment costs, publicly warned of the imminent bankruptcy of the tunnel operating company if traffic volumes were to remain at the unexpectedly low levels. After two years of negotiations, in June 2006 the city of Rostock agreed to prolong the concession by 20 years to a total of 50 years to enable the concessionaire to recoup its investment over a longer period of time.³¹ In other words, the tunnel will become toll-free only in 2056.³² In addition, as shown in table 2 below, the Warnowquerung GmbH was permitted to rebalance its toll structure by substantially increasing charges for passenger cars while lowering tolls for trucks as of January 1st, 2007. Another increase for passenger car tolls and the discounted toll for those users who agreed to direct debit authorisation was implemented in March 2008.

Figure 3: Warnowquerung – the Current Toll Structure

Sparen* Sie Zeit, Geld und Nerven! - WARNOWTUNNEL - <small>*roufenabhängig</small>							
Kategorie	Fahrzeugart (Beispiele)	Fahrzeugtyp (Beispiele)	Achsen	Höhe	TAG oder OSKAR (360 Tage) *1	Winter** (1.11. - 30.4.)	Sommer** (1.5. - 31.10.)
1		Motorrad, PKW, PKW mit flachem Anhänger	≥ 2	≤ 2,05 m	1,85 €	2,20 €	2,80 €
2		PKW mit hohem Anhänger, Kleintransporter, Wohnmobil	≥ 2	> 2,05 m < 2,60 m	2,50 €	2,80 €	4,00 €
3		LKW klein (ca. 12 t)	= 2	≥ 2,60 m	5,90 €	6,50 €	8,50 €
4		LKW mit drei Achsen (ca. 20 t)	= 3	≥ 2,60 m	7,85 €	9,00 €	12,00 €
5		LKW mit Anhänger, Sattelzug, Busse (> 16 Sitze)	≥ 4 <small>(nicht für Busse)</small>	≥ 2,60 m	9,50 €	11,50 €	13,00 €

*1: Die Preise für den TAG oder OSKAR sind nur für Nutzer, die eine Direktdebit-Autorisierung im Rostocker Warnowtunnel haben. **1: Die Preise für den Winter und Sommer sind nur für Nutzer, die eine Direktdebit-Autorisierung im Rostocker Warnowtunnel haben. **2: Die Preise für den Winter und Sommer sind nur für Nutzer, die eine Direktdebit-Autorisierung im Rostocker Warnowtunnel haben. **3: Die Preise für den Winter und Sommer sind nur für Nutzer, die eine Direktdebit-Autorisierung im Rostocker Warnowtunnel haben.

WARNOWTUNNEL
DIE Abkürzung in Rostock

Warnowquerung GmbH & Co. KG · Zum Südtor 8 · 18147 Rostock
Tel.: 0381-63 722-31 · Fax: 0381-63 722 99 · info@warnowquerung.de
Öffnungszeiten Kundencenter: Mo-Fr 8.00-16.30 Uhr, Mi 8.00-18.00 Uhr

schnell · günstig · sicher · bequem

www.warnowtunnel.de

Werkzeuge, Preislisten, weitere Bsp. Gültigkeit

Source: <http://www.warnowquerung.de/tarife.html>

30 Cf. Hamburger Abendblatt (2004).

31 Cf. Deutscher Bundestag (2007).

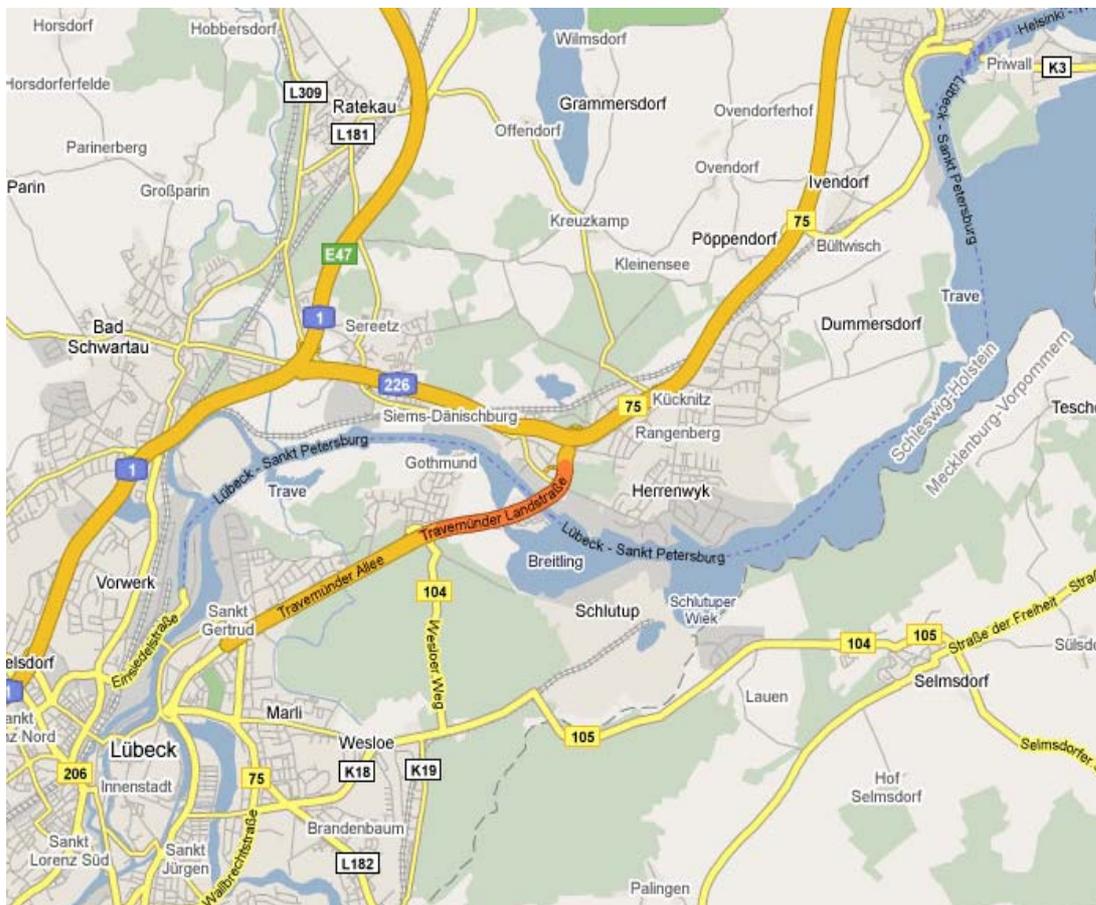
32 Cf. ver.di (2007, 12).

5.2 The Herrentunnel in Lübeck

5.2.1 Project Background

Before the opening of the Herrentunnel, the only road crossing the Trave river to link Lübeck and the neighbouring port city of Travemünde on the Baltic Sea was the Herrenbrücke, a bascule bridge. The bridge, an integral part of *Bundesstrassen* B75 and B104, was used by 38,000 vehicles per day on average, but had to be closed for road traffic several times a day to accommodate passing ships, resulting in frequent traffic jams.³³

Figure 4: The Travequerung³⁴



Source: <http://maps.google.de>

³³ Cf. Hamburger Abendblatt (2005a).

³⁴ The map was created by the authors with the Google's maps tool.

In 1995, the local authorities had found the bridge – which was opened in 1964 – to be in state of dilapidation. However, the Federal government as the owner refused to fund the more costly replacement tunnel proposed by the city, but accepted to finance a replacement bridge instead. To overcome the stalemate, the Federal government and the city of Lübeck agreed on a compromise which permitted Lübeck to realize the tunnel solution while the Federal government pledged to commit as much money to this project as the construction of a new bridge would have cost.³⁵ As was the case with respect to the Warnowquerung, the city of Lübeck, in 1998, also opted for an “idea competition” to select the concessionaire. On March 12th, 1999, the contract was signed with the successful bidders: the German construction companies HOCHTIEF PPP Solutions GmbH and Bilfinger Berger BOT GmbH, which jointly set up (and fully own) the tunnel operating company Herrentunnel Lübeck GmbH & Co. KG.

After the completion of the formal planning approval procedure in February 2001, construction began in mid-October 2001. The tunnel, which is 830 meters long, while the concession road has a total length of 2.215 meters, opened for traffic on August 26th, 2005. After September 2006, the old Herrenbrücke – which was kept open until then for the exclusive use by pedestrians and cyclists³⁶ –, was demolished. Total investment costs for the tunnel were € 179 million, € 89 million of which were shouldered by the Federal government as a lost grant, 34 per cent of the sum was financed by a private banking consortium on commercial terms and 11 per cent were raised by the concessionaires. The operating concession is valid until 2035 when the utilisation rights will be transferred to the city of Lübeck.³⁷

5.2.2 Commercial Performance

Commercially, the Herrentunnel turned out to be a similar ‘white elephant’ as previously the Warnowquerung. After a bad start – the toll could not be collected in the first weeks after the opening due to tech-

35 Cf. *Beckers* (2005, 163).

36 As the tunnel is not open to pedestrians and cyclists, the operator agreed to provide a free shuttle bus service at a cost of around € 500,000 per year. Cf. *Lübecker Nachrichten* (2007).

37 Cf. HOCHTIEF PPP Solutions (2005); *Beckers/von Hirschhausen* (2003, 6).

nical problems with the on-board units used by many frequent users³⁸ – demand remained substantially lower than forecast. By May 2006, only 22,000 cars were counted on average a daily basis, 10 per cent of which were trucks.³⁹ This is down from the 38,000 cars that had crossed the Herrenbrücke before and about one third less than the number of at least 30,000 forecast by the concessionaire⁴⁰ (the figures do not yet include another potentially steep decline after the opening of the toll-free *Eric-Warburg-Bridge* on the new northern ring road in 2007). Instead, the number of cars on toll-free by-passes such as the *Autobahnen A 1* and *A 226* – a 5 kilometer detour⁴¹ – rose by 16,000.⁴² Meanwhile, Bilfinger Berger opted for a complete write-off of its investment, while HOCHTIEF PPP Solutions was so far content with a write-off of two thirds of its share.⁴³ Moreover, in an attempt to reduce losses, the toll – initially set at € 0,90 per passenger vehicle instead of the originally announced € 0,51⁴⁴ – was increased twice, on October 1st, 2006 (with a consequential drop in demand to the tune of 1,000 cars a day),⁴⁵ and on January 1st, 2008. It now stands at € 1,20 (and at € 9,50 for heavy vehicles); discounts are available for the Quick-box electronic toll (see table 3 below). Finally, at the request of the concessionaires an extension of the concession from 30 to 50 years is currently on the negotiation table.⁴⁶

38 Cf. Hamburger Abendblatt (2005b).

39 Cf. Kieler Nachrichten (2006).

40 Cf. Hamburger Abendblatt (2006a and 2006b).

41 Cf. Spiegel Online (2007).

42 Cf. Hamburger Abendblatt (2006b).

43 DIE LINKE (2007).

44 Cf. *Kirchner* (2007, 5).

45 Cf. Lübecker Nachrichten (2007).

46 Cf. ver.di (2007, 12).

Figure 5: Herrentunnel – the Current Toll Structure

Die Gebühren ab 1. Januar 2008

Klasse	Fahrzeugart Beispiel	Höhe über Vorderachse*	Anzahl der Achsen	Barpreis	Quick-Box	Quick- BoxPlus
A		bis zu 130 cm	unbeschränkt	1,20 €	1,05 €	0,60 €**
B		höher als 130 cm	2	2,30 €	2,00 €	--
C		höher als 130 cm	3	6,00 €	5,15 €	--
D		höher als 130 cm	4 und mehr	9,50 €	8,15 €	--

* Höhe des Fahrzeuges, gemessen senkrecht vom Boden an der Vorderachse bis zur Oberkante des Fahrzeuges.
 ** In Verbindung mit Zahlung einer monatlichen Grundgebühr von 8,90 €, Mindestlaufzeit 12 Monate.

Der Trave-Pass bietet in der Klasse A einen Tarif von 1,15 Euro statt 1,20 Euro.

So schnell kann's gehen. 

Source: http://www.herrentunnel.de/index.php/file/download/1034/mauttabelle_080101.pdf

6. Critical Assessment – Why Did the *F-Modell* Fail?

The potential advantages of the *F-Modell* over the traditional tax-based public provision of road infrastructures are obvious. Not only is it the first step of the transition towards a user-pays system which should, at least theoretically, allow for more efficient infrastructure allocation decisions. Moreover, it has the potential to partly alleviate – though not nearly completely solve – the problem of chronic underinvestment in much-needed road infrastructures in Germany due to the bad shape of public finances in general (including the extraordinary fiscal burdens caused by reunification) and the lack of a legal requirement to fully reinvest the revenues generated by road-transport related taxes into the maintenance and expansion of the road network in particular. Finally, more widespread use of the *F-Modell* might, at least on paper due to the strong incentives for private investors to recoup the costs of their investment as quickly as possible, also speed up the completion of eligible road infrastructure projects.

Unfortunately, the practical lessons learned from the two operational *F-Modell*-PPPs and the fact that most other proposed projects simply failed to attract any private sector interest at all – especially after the first to show-case projects quickly turned out to be ‘white elephants’ rather than attractive investment opportunities –, gives rise to a pessimistic overall assessment of their merits, for the following reasons:

- To begin with, it remains doubtful that any meaningful cost savings compared to the traditional approach could be realised. On the one hand, due to their lower ratings, the private investors had to raise the necessary capital at higher interest rates than the government could have. On the other hand, contrary to what was expected beforehand, project implementation from the design stage until the official opening took nearly as long as for comparable strictly public infrastructure projects.
- More importantly, in order to increase the attractiveness of *F-Modell*-PPPs for the private sector, projects risks must be more evenly and fairly allocated between the public and the private parties. Due to the sunk cost characteristics of road infrastructure investments and the extraordinary long time span over which the – often substantial – investment costs must be recouped, their commercial viability requires the absence of incalculable political risks. In other words, private investors should be guaranteed some protection against (or compensation for) future political decisions which would have a massive negative impact on their investment. The tax-funded provision of competing toll-free infrastructures after the completion of the toll project – which actually happened in Lübeck and which effectively killed a third *F-Modell*-PPP, the Strelasundquerung, at a very early stage⁴⁷ – is a case in point.
- All parties involved massively overestimated future demand levels, resulting in actual traffic volumes falling way short of forecast ones – often by a factor of 100 per cent. Incredibly enough, the private investors failed to take into account some long-standing

47 The government of Mecklenburg Western Pomerania demanded that the Rügendamm – the old link between the mainland and the island of Rügen – remain open for traffic at no charge after the completion of the new (parallel) tolled suspension bridge. Predictably under these conditions, all potential private investors decided to drop out of the bidding process as a result.

and well-documented demographic and socio-economic trends which would later turn out to have a strong negative impact on their investment. For example, the city of Rostock – like most other East German cities – lost 20 per cent of its inhabitants during the first decade after reunification due to two-digit unemployment rates, and a further reduction by another 15 per cent by 2020 is likely.⁴⁸ Moreover, the number of users of the ferry link which was to be replaced by the tunnel, had shrunk from a peak of 3,500 vehicles per day to around 1,000 to 1,300 due to the expansion of the toll-free road network.⁴⁹

- In addition, in all cases the reluctance of potential users to pay for the use of a road was substantially higher than anticipated – though hard to explain rationally, given the fact that the additional costs of by-passing the toll road (time, extra fuel etc.) often are clearly in excess of the user charge. One possible psychological explanation might be that German motorists have grown accustomed to use the road network ‘for free’ – unaware that it has been financed by their taxes, including road transport-related specific taxes such as the car tax and the gasoline tax. Alternatively, there seems to exist a widespread feeling that due to already the high tax burden, any additional charge for using the road network is simply a rip-off without any benefits for the user and should therefore be avoided at any cost. It is open to debate whether the inclusion of passenger cars into the *Autobahn* toll system some time in the future, if it were combined with a compensatory reduction of the car and/or gasoline tax, might improve the public acceptance of road users charges – which would, in turn, brighten up the prospects of future *F-Modell*-PPPs as well.
- It is noteworthy in this context that the aforementioned acceptance problem is severely compounded by the specific legal rules which regulate the calculation of the toll (and the overall toll structure) the concessionaire is allowed to charge under the *F-Modell*.⁵⁰ As mentioned above, the formal procedure and legal requirements differ strikingly from the principles of price regula-

48 Cf. *Klingholz/Kröhnert/Olst* (2004).

49 Cf. *Brantsch* (2004/05, 18).

50 For a detailed discussion see *Beckers* (2005, 173 ff.); *Hirschhausen/Beckers/Klatt* (2006, 27); *Gawel* (2005, 180 f.) and *Kirchner* (2007, 3 f.).

tion in one crucial aspect: the toll is legally considered to be a user fee in the meaning of German administrative law (*Gebührenrecht*). This severely restricts the pricing strategies the concessionaire is legally allowed to pursue. To be more precise, the toll must include the actual cost of the service offered. Due to the high ratio of fixed to total costs which must be reflected by the calculation, short-run marginal cost pricing – e.g. in the guise of a toll-free passage during the late night period, when demand is extremely low – would run afoul of the law. By the same token, the concessionaire is not allowed to charge a below-cost introductory toll (i.e. to practice penetration pricing) after the opening of the facility in order to attract a large number of users and to familiarize them with the toll system. To conclude, the current legal requirements effectively prevent any meaningful price discrimination among different groups of users to exploit their varying willingness to pay or differential pricing over the life-cycle of the investment with low tolls initially, followed by higher tolls during later periods.

- Finally, there is a potentially harmful conflict of interest between the Federal government on the one hand and the affected Länder government (and/or local government) on the other which may effectively thwart a *F-Modell* solution – which it did at least in the case of the failed Strelasundquerung. While under the traditional system the Federal government provides all the funding but most of the economic benefits accruing to locals, under the *F-Modell* it is the local politicians who have to ‘sell’ the switch-over from a (publicly perceived) free-of-charge road system to a toll system which primarily affects their local electorate. For obvious reasons, local political and media support for a toll-based solution has so far been lacklustre at best in the case of most proposed *F-Modell*-PPPs (and, for that matter, *A-Modell*-PPPs as well).⁵¹

7. Conclusion and Outlook

In Germany, the track record of road infrastructure PPP projects so far has not only been disappointing, but outright dismal. Nevertheless,

51 Cf. *Gawel* (2005, 181) for some examples.

substantial private sector involvement will without any doubt be crucial to maintain a high-quality road network and to overcome the rapidly rising number of infrastructure bottlenecks which to a great deal reflect shifting trade and production patterns and the resulting increase in transit traffic after the 2005 Eastern enlargement of the EU. Under the current legal and institutional framework and given German motorists' persistent 'free-ride' mentality, it remains doubtful, however, that the role of the private sector in road infrastructure provision in Germany will grow as required any time soon.

References

Alfen, H. W./Mayrzedt, H./Tegner, H. (2004), PPP-Lösungen für Deutschlands Autobahnen. Empfehlungen für eine erfolgreiche Umsetzungen, Weimar et. al.
(<http://www.fh-biberach.de/studium/betriebswirtschaft/forschung/PPP.pdf>).

Balthaus, H./Keppel, A. (2000), Privatfinanzierung von Bundesfernstraßen nach dem Betreibermodell, in: Internationales Verkehrswesen, no. 11, pp. 508-509.

Beckers, T. (2005), Die Realisierung von Projekten nach dem PPP-Ansatz bei Bundesfernstraßen. Ökonomische Grundlagen und eine Analyse des F-Modells, des A-Modells sowie des Funktionsbauvertrags, Ph.D. thesis, Technische Universität Berlin
(http://opus.kobv.de/tuberlin/volltexte/2005/1170/pdf/beckers_thorsten.pdf).

Beckers, T./von Hirschhausen, C. (2003), Konzessionsmodelle für Fernstraßen in Deutschland: Eine ökonomische Analyse der Risikoallokation beim F- und A-Modell, Discussion Paper No. 388 of Deutsches Institut für Wirtschaftsforschung (DIW), Berlin
(<http://www.diw-berlin.de/documents/publikationen/73/41105/dp388.pdf>).

Beckers, T./von Hirschhausen, C./Klatt, J. P. (2006), Reformbedarf bei den Bundesfernstraßen und das Potential des PPP-Ansatzes, Center for Network Industries & Infrastructure Working Paper Nr. 2006-03, Berlin
(http://www.tu-dresden.de/wwbwleeg/publications/beckers_hirschhausen_klatt_2006-reformbedarf_bei_bundesfernstrassen_und_ppp-cni_wp_no_2006-03.pdf).

Bertelsmann Stiftung/Clifford Chance Pünder/Initiative D21 (2003), Prozessleitfaden Public Private Partnership. Eine Publikation aus der Reihe PPP für die Praxis, Frankfurt/Main
(http://www.ibl.uni-stuttgart.de/05forschung/ppp/pdf/Initiative_D_21/Prozessleitfaden_Public_Private_Partnership_06-2003.pdf).

- Brantsch, A.* (2004/05), Treffsicherheit von Verkehrs- und Erlösprognosen für bemaute Verkehrswege und -anlagen, Term paper, University of Applied Sciences Heilbronn (<http://home.arcor.de/abrant/daten/Verkehrsinfrastruktur.pdf>).
- Budäus, D./Grub, B.* (2007), Public Private Partnership: Theoretische Bezüge und praktische Strukturierung, in: Zeitschrift für öffentliche und gemeinwirtschaftliche Unternehmen (ZögU), vol. 30, no. 3, pp. 245-272.
- Deutscher Bundestag (2007), Antwort der Bundesregierung auf eine Kleine Anfrage der Abgeordneten Peter Hettlich, Winfried Hermann, Dr. Anton Hofreiter, Irmgard Schewe-Gerigk und der Fraktion BÜNDNIS 90/DIE GRÜNEN, Drucksache 16/4356, Berlin, February 20th, 2007.
- Deutscher Städte- und Gemeindebund (2002), Public-Private-Partnership – Neue Wege in Städten und Gemeinden, DStGB-Dokumentation Nr. 28, Berlin (http://www.dstgb.de/homepage/artikel/dokumentationen/nr_28_public_private_partnership/pdf/doku28.pdf).
- Deutsches Verkehrsforum (2003), Betreibermodelle für die Straßenverkehrsinfrastruktur: F- und A-Modell im Fokus, Berlin (http://www.verkehrsforum.de/fileadmin/dvf/pdf_downloads/pospap/pospap_gk_infra_betreibermodelle.pdf).
- DIE LINKE (2007), Die Privatfinanzierung von Straßen in Deutschland ist gescheitert, Press release, Kiel, September 20th, 2007.
- Eggers, M.* (2004), Public Private Partnership. Eine strukturierende Analyse auf der Grundlage von ökonomischen und politischen Potentialen, Frankfurt et. al.
- Eisenkopf, A./Knorr, A.* (2006), Engaging the Private Sector in Transportation Infrastructure – The Role of Public Private Partnerships, Presentation at the First International Conference on Funding Transportation Infrastructure, Banff (Canada), August 2nd, 2006.

- Friedrich Ebert-Stiftung – Managerkreis (2006), Podiumsdiskussion zur Präsentation des Thesenpapiers Zukunft des Verkehrs – Finanzierung und Mobilität, Berlin
(<http://library.fes.de/pdf-files/stabsabteilung/04152.pdf>).
- Gawel, E. (2005), Private Finanzierung von Fernstraßen – Erfahrungen und Probleme, in: Wirtschaftsdienst, vol. 85, no. 3, pp. 173-181.
- Hamburger Abendblatt (2003), Privattunnel-Premiere: Erst zahlen, dann fahren, September 3rd, 2003
(<http://www.abendblatt.de/daten/2003/09/03/203592.html>).
- Hamburger Abendblatt (2004), Autofahrer meiden den ersten Privattunnel, March 11th, 2004
(<http://www.abendblatt.de/daten/2004/03/11/272020.html>).
- Hamburger Abendblatt (2005a), Schneller nach Travemünde, August 25th, 2005
(<http://www.abendblatt.de/daten/2005/08/25/474841.html>).
- Hamburger Abendblatt (2005b), Herrentunnel verliert 28000 Euro Maut am Tag, August 31st, 2005
([http://www.abendblatt.de/daten/2005\(08/31/476885.html](http://www.abendblatt.de/daten/2005(08/31/476885.html)).
- Hamburger Abendblatt (2006a), Herrentunnel: Maut wird teurer statt billiger, August 29th, 2006
(<http://www.abendblatt.de/daten/2006/08/29/603768.html>).
- Hamburger Abendblatt (2006b), Lübecks Herrentunnel steckt in den roten Zahlen, May 29th, 2006
(<http://www.abendblatt.de/daten/2006/05/29/567419.html>).
- HOCHTIEF PPP Solutions (2005), Herrentunnel, Essen.
- Institut für Mobilitätsforschung (2007), Verkehrsinfrastruktur-Benchmarking Europa. Verkehrsinfrastrukturausstattung und verkehrspolitische Rahmenbedingungen in ausgewählten europäischen Staaten, Berlin
(http://www.ifmo.de/basif/pdf/publikationen/2007/Verkehrsinfrastruktur_Benchmarking_Europa.pdf).

- Kirchner, S.* (2007), Das Konzessionsmodell als Beispiel für Public Private Partnership-Projekte, Presentation at the Deutsche Hochschule für Verwaltungswissenschaften Speyer, May 31st, 2007.
- Klingholz, R./Kröhnert, S./Olst, N.* (2004), Deutschland 2020 – die demographische Zukunft der Nation, Berlin.
- Lübecker Nachrichten (2007), Seit der Maut-Erhöhung fahren täglich 1000 Autos weniger durch den Herren-Tunnel, January 5th, 2007 (<http://www.ln-online.de/artikel/2034334>).
- Macquairie Infrastructure Group (several years), ASX Release, Sydney (<http://www.macquairie.com.au/mig>).
- Mühlenkamp, H.* (2005), Public Private Partnership aus der Sicht der Transaktionskostenökonomik und der Neuen Politischen Ökonomie, in: D. Budäus (ed.) Kooperationsformen zwischen Staat und Markt, Baden-Baden, pp. 29-48.
- Pollitt, M.* (2000), The Declining Role of the State in Infrastructure Investments in the UK, in: T. Masatsugu/S. Berg/M. Pollitt (eds.): Private Initiatives in Infrastructure. Priorities, Incentives and Performance, Chiba: Institute of Developing Economies, pp.142-177.
- PricewaterhouseCoopers (2005), Delivering the PPP promise. A review of PPP issues and activity, 2005 (<http://www.adislab.net/docs/PWC05.pdf>).
- Puwein, W.* (2005), Effizienzsteigerungen in der Verkehrsinfrastruktur durch Privatisierungsschritte, in: WIFO Monatsbericht No. 3, pp. 175-189 ([http://www.wifo.ac.at/wwa/servlet/wwa.upload.DownloadServlet/bdoc/MB_2005_03_07_VERKEHRSINFRASTRUKTUR\\$.PDF](http://www.wifo.ac.at/wwa/servlet/wwa.upload.DownloadServlet/bdoc/MB_2005_03_07_VERKEHRSINFRASTRUKTUR$.PDF)).
- Spiegel Online (2007), Tunnelflop bringt Maut-Fans in Bedrängnis, October 4th, 2007 (<http://www.spiegel.de/wirtschaft/0,1518,druck-508539,00.html>).
- Statistisches Bundesamt (2007), Statistisches Jahrbuch für die Bundesrepublik Deutschland 2007, Wiesbaden.

- ver.di (2007), PPP im Straßenbereich. Stellungnahme der Bundesfachkommission Straßenbauverwaltung in ver.di. Bundesfachbereich Bund und Länder, Berlin
(http://bund-laender.verdi.de/fachgruppen/bundesverkehrsverwaltung_strassenbauverwaltung/strassenbauverwaltung/data/stellgn_strassenbau_april_2007.pdf).
- Verkehrsinfrastrukturfinanzierungsgesellschaft GmbH (2007), The work of the VIFG and the German PPP programme, Berlin.
- Verkehrsinfrastrukturfinanzierungsgesellschaft GmbH (2008), PPP im Verkehrssektor, Berlin
(<http://www.vifg.de/index.php?action=40#3>).
- Williams, T. P.* (2003), Moving to Public-Private Partnerships: Learning from Experience around the World, Arlington
(<http://www.businessofgovernment.org/pdfs/WilliamsReport.pdf>).
- Wink, R.* (1995), Verkehrsinfrastrukturpolitik in der Marktwirtschaft. Eine institutionenökonomische Analyse, Berlin.
- Wirtschaftsrat (2000), „Position Verkehrspolitik. Investitionen in die Verkehrsinfrastruktur für den Wirtschaftsstandort Bundesrepublik“, in: trend – Zeitschrift für Soziale Marktwirtschaft (online edition), no. 82
(<http://www.trend-zeitschrift.de/archiv/archiv82.html>).