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# **International Comparison of Transport Appraisal Practice**

## **Annex 2 Germany Country Report**

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April, 2013

Project Funded by the Department for Transport, UK



Institute for Transport Studies

# INTERNATIONAL COMPARISON OF TRANSPORT APPRAISAL PRACTICE

## GERMANY COUNTRY REPORT

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# 1. Introduction

## 1.1. Planning levels and appraisal methods

Due to its federal system, responsibilities for transport infrastructure planning and funding in Germany are shared between the national level (“Bund”), federal states (“Länder”) and local authorities (“Gemeinden”).<sup>1</sup> In line with these responsibilities, specific appraisal procedures and methods are applied at each level:

- The economic appraisal for the federal infrastructure plan covering federal roads, railways and inland waterways (“Bundesverkehrswegeplan”, short BVWP),
- the recommendations for economic appraisal for roads (“Empfehlungen für Wirtschaftlichkeitsuntersuchungen an Straßen”, short EWS) for state and local roads, and
- the standardised appraisal method for regional and local public transport investments (“Standardisierte Bewertung von Verkehrswegeinvestitionen des öffentlichen Personennahverkehrs”, short Standardisierte Bewertung).

Airport, seaport and inland port planning are part of regional planning and thus under the responsibility of federal states, usually in co-operation with local authorities who are often also owners or partial owners. Standardised appraisal guidelines for these do not exist. Projects which are co-funded by the European Regional Development Fund (ERDF) have to undergo an appraisal procedure that is determined by a procedure defined by the European Union.

## 1.2. BVWP - National infrastructure planning and appraisal

The federal government is responsible for the planning and funding of the strategic network of federal roads (Motorways and trunk roads), for railways and for inland waterways. Federal transport infrastructure plans with prioritised lists of projects are periodically created (see Figure 1).<sup>2</sup> These plans need to be approved by the national parliament (“Bundestag”) and the Federal Council representing the federal states at national level (“Bundesrat”). Through this procedure, approved projects are given a legal status, i.e. a ‘requirement’ for them is stated based on national interest and they may enter into the legal planning process at state and community level. In 2009/2010, a plan review of the plans developed in the 2003 BVWP was undertaken in order to comply with requirements set by the Federal Court of Auditors (“Bundesrechnungshof”) and the Audit Committee (“Rechnungsprüfungsausschuss”) of the Bundestag. Projects that were not shortly before completion were subject to an economic appraisal which used updated traffic forecasts and unit cost values. As a result, some rail projects achieved a BCR of less than one, for other rail projects a renewed design was necessary to achieve a BCR of at least 1. Overall, the review concluded that no update of the infrastructure plans was necessary.

The core of the appraisal is a cost benefit analysis that is complemented by non-monetary Spatial Impact Assessment (SIA) and Environmental Risk Assessment (EIA) with Habitats Directive Assessment (HDA). A standardised approach to the cost-benefit analysis was introduced with the 1985 BVWP and has been updated and reformed since.<sup>3</sup> The latest

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<sup>1</sup> For a detailed description of the planning and funding responsibilities between levels see Rothengatter (2005), Gühnemann (2006).

<sup>2</sup> The first statutory investment plan was produced in 1957, followed by a period of investments focused particularly on the completion of the motorway system. The first long-term integrated plan for all modes introducing the use of transport models was produced in 1973, followed by updates in 1980 and 1985, partly triggered by changes in government. A revised plan was published after unification in 1992, followed by the last update in 2003 (Schwarzmann, 2011).

<sup>3</sup> See Rothengatter (2005).

method, which is described in this report, was developed for the BVWP 2003. Currently, research into updates to the general methodology and unit values is carried out as a basis for a new BVWP 2015. Where information is publicly available, the scope of these projects and results from the research will be reported here. However, it has to be stressed that these are not being approved as official guidance yet.



Figure 1: Planning process for federal transport infrastructure in Germany (source: BMVBS)

### 1.3. EWS – State level road infrastructure planning and appraisal

The EWS were published in 1997 by the Forschungsgesellschaft für Straßen- und Verkehrswesen (FGSV).<sup>4</sup> It provides recommendations for cost benefit analysis of road investments, in particular at state and local level, but is not binding.<sup>5</sup> Generally, federal states apply the EWS or, in some cases, the BVWP approach for the economic assessment of road investment projects, but usually complement it by non-monetary assessments (e.g. Bavaria<sup>6</sup>) or even integrate it into a multi-criteria assessment framework (e.g. North Rhine-Westphalia<sup>7</sup>). The development of the EWS is driven by a working group of the FGSV, but partly financed through the local transport research programme (“Forschungsprogramm Stadtverkehr”, FOPS) of the Federal Ministry of Transport, Building and Urban Development (Bundesministerium für Verkehr, Bau und Stadtentwicklung, BMVBS). A publication by the FGSV in 2002 summarised experiences with the application and further developments of the

<sup>4</sup> The FGSV is a non-for-profit road and transport research association. Members of the FGSV are academics, consultants, planners from state and federal transport departments and practitioners. The FGSV develops and publishes technical guidelines in the areas of road construction, traffic engineering and transport planning. It thus serves a similar purpose as the Chartered Institution of Highways and Transportation, but does not offer qualifications.

<sup>5</sup> Previous versions from 1970 and 1986 were published as guidelines and had a stronger binding character.

<sup>6</sup> See Muveda, AVISO (2011); the non-monetary components follow the BVWP approach with SIA and ERA. Project priority rankings are based on all three, however, the synthesis does not follow a formal procedure.

<sup>7</sup> See Röhling & Walther (2005); The approach uses 3 main impact areas (society, economy, environment) and 35 quantitative and qualitative indicators reflecting sub-objectives, e.g. improvements in accessibility, regional location factors, environmental impacts and resource consumption. These indicators include those of the CBA, which were monetised using the BVWP 2003 methodology. All indicators are then transformed into scores (utility values) using linear value function or qualitative classifications and aggregated using the linear summation approach. The resulting overall utility values is basis for the project rankings.

EWS. According to the leader of the responsible FGSV working group, Prof. Walther, a new version of the EWS is under development, but no public information on this is available yet.

#### **1.4. Standardisierte Bewertung – Appraisal of regional and local public transport**

Since the end of the 1970s the Standardisierte Bewertung serves as a formal appraisal tool for the cost benefit analysis of investments into public transport projects that are funded through the Local Authority Traffic Financing Act (“Gemeindeverkehrsfinanzierungsgesetz”, GFVG)<sup>8</sup>. Federal states can apply for co-funding through the GFVG for projects with a funding volume above € 50 million. This includes road and public transport investments. A CBA is required by law for rail projects. The standardised approach has been developed by the University of Stuttgart (Prof. Heimerl) and the consultant Intraplan Consult GmbH on behalf of and sponsored by the BMVBS. The approach combines cost-benefit, multi-criteria and qualitative assessment elements. The most recent version from 2006 is currently being updated in on-going research projects with results being expected in 2013/2014.

## **2. Current appraisal practice for the BVWP in Germany**

### **2.1. Appraisal elements and scope of this report**

The above appraisal guidelines are in parts following the same methodology, partly elements are included that are only relevant for the specific level. An overview is shown in Table 1 in the appendix. In parts the approaches are using different methods for the appraisal of the same costs or benefits. This is due to different time scales at which the methodologies are updated as well as different responsibilities for their development. This report focuses on the appraisal methodology for the BVWP, but will comment on specificities of the other approaches where appropriate. The main sources of information are the reports on the BVWP 2003 and its economic appraisal methodology by the Federal Ministry of Transport, Building and Housing (2003a,b)<sup>9</sup> and the report on the update of unit costs by BVU et al. (2009) for the review of the BVWP in 2010.

### **2.2. BVWP appraisal approach**

The procedure for the development and appraisal of the BVWP consists of the following steps (situation for 2003 plan):

1. Registration of project applications by stakeholders (Federal government, federal states, DB AG, Federal Waterways and Shipping Administration, Interest groups)
2. Development of data basis and appraisal methodology
3. Development of background scenarios
4. Forecast of traffic demand and assignment to networks
5. Assessment of project impacts (CBA and complementary non-monetary)
6. Classification of projects and development of priority ranking
7. Revision after consultation with federal states and other stakeholders
8. Cabinet decision and presentation to parliament by Federal Government
9. Parliamentary decision by Bundesrat and Bundestag on infrastructure development acts.

Until and including the BVWP 2003, no pre-screening or sifting of projects was undertaken. This meant, for the 2003 plan more than 1800 projects had to be fully appraised. The currently ongoing registration process for the BVWP 2015 makes considerably stricter requirements on the depth and amount of information that has to be submitted to the

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<sup>8</sup> For more information on local public transport funding see Gühneemann (2009).

<sup>9</sup> available in English

BMVBS for road projects. This includes information on costs, design, expected impacts and what alternatives were evaluated before submission. This is possible because the planning for roads is executed by the federal states, whose responsibility it is to collect project proposals and submit these to the BMVBS. Similar requirements cannot be made for rail projects as these can be submitted by anybody.

As first steps of the appraisal process, regionally differentiated forecasts of the socio-economic development, including e.g. population growth, car ownership and economic growth, as well as alternative scenarios which differ in the assumptions on future transport policy are developed. The scenarios serve the purpose to inform about the potential range of impacts of transport policies on traffic demand, which is estimated based on initial high-level forecasts. Of these scenarios the one that is best reflecting the policy objectives of the government is chosen as a basis for the appraisal of projects. The underlying assumption is that this scenario would best reflect the future conditions under which investments are done.

For the 2003 BVWP, two scenarios, 'Laissez-faire' and 'Integration' were developed, of which the 'integration' scenario was used as a basis for user costs and detailed demand and traffic forecasts. The forecasts of socioeconomic conditions for the BVWP 2015 has recently been completed (BVU et al., 2013): this includes one core scenario with assumptions on economic development and political developments influencing user costs, e.g. ambitious environmental regulations will increase user costs in air and road freight transport against past trend developments. It also includes a 'corridor' of variation of demand by  $\pm 3\%$  while user costs are kept constant.

The appraisal of projects is then based on a comparison of the situation with investment to that without investment for the forecast year, i.e. 2015 for the last BVWP and 2030 for the upcoming plan. A further extrapolation of forecasts beyond 2015 or a calculation of intermediate results was not undertaken, implying that growth rates between projects are comparable.

For the traffic forecasts, a conventional four stage modelling approach has been applied. Based on the socio-economic forecasts, network level demand and modal split forecasts and project specific network assignments are carried out. The demand forecasts include trans-boundary and transit traffic flows to/from zones outside Germany (337 district regions in Germany, 101 regions abroad for passenger transport, 47 regions abroad plus 19 seaports for freight). The demand matrices cover traffic flows for all modes including non-motorised traffic within German district regions. These flows are then assigned to the transport networks for routes that are likely effected by the proposed projects. The appraisal is link based for the results of detailed network assignments for each project. A special procedure was developed to take interdependencies between projects into account.

Overall CO<sub>2</sub> results were calculated after appraising all projects for the 'Laissez-faire' and 'Integration' scenario with all first priority projects included in order to assess network impacts.

All forecasts and modelling is carried out by consultants on behalf of the BMVBS. A national transport model or demand model do not exist. The BMVBS specifies requirements and is intensively involved as client in the progress of the projects, but does not carry out technical work themselves.

### **2.3. BVWP unit costs and parameters for the cost benefit analysis**

The main appraisal metric of the BVWP is the ratio of annualised benefits and costs. Unit values are based on resource costs. The reference date for the annualisation is 2000, the forecast year 2015. Specific services lives for each investment component are applied,



ranging from 10 years (e.g. asphalt, signage) to 100 years (e.g. tunnel, channel bridges), leading to specific annuity factors for each component. A discount rate of 3% is used that was reviewed in BVU et al. (2009). It was initially based on a study by Rothengatter et al. (1984) which took into account long-term productivity as well as an economy with finite resources. No shadow prices of public funds or of unskilled labour are applied.

**Vehicle operating and standby costs** include the material costs, fuel costs as well as mode specific personnel costs. The latter include the time costs of occupants of passenger vehicles during commercial journeys. A specific benefit element is applied for changes in operating costs due to modal shifts in order to take into account impacts on other modes than the appraised project. The benefit element **transport infrastructure preservation** covers changes in maintenance and infrastructure renewal costs for existing infrastructure.

Changes in accident costs due to increased **traffic safety** include property damages as well as costs of personal injury and loss of life. The approach was updated for the BVWP 2003 based on the more recent values used in the EWS-97. Accident costs are calculated for two types of accidents, those with material damages and those involving personal injury or death. The monetary values for injury or death as shown in Table 1 include direct and indirect reproduction costs (costs of treatment, policing etc.), lost production, humanitarian costs based on court awards and value added losses for unpaid labour. They have been determined using a model of the Federal Highways Agency (BAST, 2000). Together with road type specific the accident rates, accident costs of e.g. €36,000 in built-up areas and €128,000 on country roads result for the BVWP 2003. Similarly, passenger and freight transport specific accident rates and costs are provided for rail transport.

Table 1: Monetary values for accidents with personal injury by accident severity (Höhnscheidt et al., 2002; update of EWS-97 values)

Accident Severity	Unit Costs [€ /Person 2000]
Killed	1,250,000
Seriously injured	85,000
Slight injuries	3,750

The benefit element **improved accessibility of destinations** covers travel time savings for non-commercial trips in road transport and commercial and non-commercial travel for rail transport. There is no further distinction between drivers of commercial vehicles and persons travelling on business purpose. Because of the link-based methodology, consumer surplus from induced traffic is not included in this calculation. The unit values used in the BVWP 2003 have evolved historically from older studies in the 1980s and 1990s and only updated to take into account price and income increases. The BVWP 2003 applied a 30% deduction to account for small travel time savings in private road transport. For the review in 2010, BVU et al. recommended to apply the procedure from the Standardisierte Bewertung which applies a declining function for time savings below 5 minutes. The non-reduced time cost value is also applied to value time losses for pedestrians due to **community severance**.

Table 2: Monetary values for travel time savings

	BVWP 2003	Review 2009/2010
Price Base	1998	2008
Travel purpose	Unit value [€/hr]	
Commercial	19.97	23.50
Non-commercial		
> 5min and rail	5.47	6.30
< 5min (road only)	3.83	declining function

Under the benefit element **spatial advantages** employment effects from the construction and operation of infrastructure are calculated. Data basis are input-output tables for Germany. An employment effect of 2350 person years per € 100 million investment volume has been estimated, reduced to 1630 person years for the 2010 review due to productivity gains, of which 40% are attributed regionally. The benefits are then valued with a shadow price approach based costs for regional economic development programmes, resulting in an alternative cost unit rate per job per year of €13,000 in 2003. In order to calculate employment effects from the construction of infrastructure, this rate is multiplied with the investment volume and regionally differentiated factors that take variations in unemployment into account. For employment effects from the operation of infrastructure, region specific employment effects are calculated dependent on the improvement in link quality and multiplied with the alternative unit cost rate.

A further spatial benefit is applied to infrastructure projects that produce significant benefits for cross-border traffic under the assumption that these create additional national macroeconomic benefits due to a more efficient allocation of production factors and promotion of international trade. These are given an additional bonus of a maximum of 10% of operating cost and travel time savings.

Changes in **noise exposure** are included in the cost benefits for noise levels above 37 dB(A) at night and for changes above 2 dB(A). Noise level weightings are applied to the noise exposure in order to calculate resident noise equivalent values. The monetary value for the noise exposure for the BVWP 2003 was updated from the previous versions that only included costs of soundproofing to one that applies a willingness to pay value of those affected. In addition to residential noise, noise outside built up areas is valued using an avoidance cost approach with assumptions on costs for noise screening to reduce noise levels to below 59 dB(A) in recreational areas and protected sites and below 64 dB(A) in open space.

Impacts from **exhaust emissions** differentiate between global air pollution, local air quality in built-up areas, carcinogenic pollutants and climate change. The quantification of air quality impacts is based on resident equivalents, of carcinogenic pollutants on cases of illnesses and of global pollution and climate gases on emissions of NO<sub>x</sub> equivalents / CO<sub>2</sub> respectively. The monetary valuation for climate change is based on an avoidance cost approach, while the other three apply damage costs approaches. The resulting unit costs are displayed in

Table 3. A methodological guideline for the evaluation of pollution impacts was published by the German Federal Environmental Agency in 2007 (UBA, 2007). These recommend a significantly lower central value for CO<sub>2</sub> than the €205 / tCO<sub>2</sub> as applied for the BVWP 2003 which was based on a highly cautious approach based on the state of knowledge in the nineties. For the 2010 update, the central UBA value was recommended.

Table 3: Monetary values for gaseous emissions

		BVWP 2003	Review 2009/2010
	Price Base	1998	2008
Type of Pollution	Unit	Unit Value	
Global pollution	€/ t NO <sub>xe</sub>	365	420
Local air quality	€ / yr per resident equivalent	3.37	4.05
Carcinogenic	€ million per death	0.79	1.24
Climate change	€ / t CO <sub>2</sub>	205	70 central 20 low 280 high

Because the traffic demand forecasts use a fixed matrix, a special procedure was introduced for the 2003 BVWP to take into account impacts from **induced traffic** for road projects. This includes primary induced traffic, i.e. demand directly generated due to improved infrastructure, but not secondary impacts from land use changes. The procedure was developed based on a study by STASA et al. (2000) who analysed the impacts of primary induced traffic on benefits and cost elements for representative case studies. Based on the finding that the increase in mileage driven shows a near linear relationship to the total time savings achieved without generated traffic, a mark-up cost factor was developed that was multiplied with the travel time savings for the project, dependent on type of vehicle, region and project, see Table 4.

Table 4: Mark-up factors for induced traffic for road investments (BMVBS, 2003b)

Vehicle type	Areas of high density (≥ 300E / km <sup>2</sup> )		Areas of low density / rural areas	
	New construction	Upgrading	New construction	Upgrading
Car	-1.526	-1.334	-1.749	-1.558
HGV	-1.393	-1.369	-1.596	-1.572

As part of the regional benefits, investments that provide **improved links to and from seaports and airports** undergo a specific assessment of their contribution to improve the competitive situation of German seaports and airports. To do so, theoretical market shares and corresponding volumes of goods handled with and without the improvement of seaport hinterland connections are calculated as functions of the change of transport costs. The procedure and the seaport and cargo type specific function parameters were developed in a study by PLANCO & Intraplan (2000). These factors include competitor seaports outside Germany. Employment benefits inside Germany are then quantified based on estimated port specific employment effects per increase in cargo volume handled and valued with the alternative cost unit rate per job and year as described above. In addition, changes in social transport costs due to changes in port choice are calculated and included in the benefit calculations. For improved road and rail links tests on specific links did not reveal significant changes so these impacts were not included in BVWP 2003.

In exceptional cases, transport infrastructure investments produce extra benefits by providing **non-transport function**, e.g. installations from inland waterways that are used for electricity generation or flood control or recreational functions. In these cases, cost savings based on the alternative cost approach are calculated as part of the regional benefits.

## **2.4. Non-monetary BVWP elements**

### **2.4.1. Spatial Impact Assessment (SIA)**

The SIA assesses the contribution of transport infrastructure investments to the achievement of spatial goals that are considered unsuitable to be included in the cost benefit analysis.<sup>10</sup> The principal procedure of the SIA is a multi-attribute utility theory based multi-criteria analysis, in which 'regional planning points' are awarded based on the contribution of projects towards fulfilling spatial objectives. These are: 'distribution and development objectives' and 'relief and modal shift objectives'. The methodology was developed by the BBR (Bundesamt für Bauwesen und Raumordnung, Federal Office for Building and Regional Planning), see Würdemann & Sieber, 2004.

Distribution and development objectives are based on the German constitutional mandate to provide equal living conditions throughout the country. Each project receives regional planning points based on its contribution to improve links to regions that are characterised by structural backwardness and accessibility deficits. The procedure is shown in Figure 3 in the annex.

Based on the Regional Planning Act, in areas and corridors with particularly high density, conditions for a modal shift towards more environmentally friendly modes should be improved. Accordingly, projects that contribute to a relief and modal shift in these corridors receive regional planning points if a shift of traffic from road to rail or inland waterway has been achieved, see Figure 4 in the appendix. In addition, effects on the urban environment are captured under relief at the local level. The methodology was developed by Baum et al. (2003), based on Huber (1990) and classifies road projects according to the change in the potential of urban development projects to be implemented in the vicinity of the projects based on changes in traffic volume and the quality of the existing urban facilities.

Both parts then integrated into one score (regional planning points) based on the most favourable principle, i.e. the maximum impact value is applied. Scores vary between 1 (not very significant) and 5 (of outstanding significance).

### **2.4.2. Environmental Risk Assessment (ERA) and Habitats Directive Assessment(HDA)**

The first part of the qualitative environmental assessment of projects was a sifting phase in which projects were selected for which the ERA and HDA were deemed necessary. This was carried out by the BfN (Bundesamt für Naturschutz, Federal Agency for Nature Conservation). The potential impacts of projects were scored based on the protection category of sites potentially impacted, how severely natural conservation areas would be affected by them (severance, skirting, > 10km distance) and what type of project was planned (upgrade or new build). As a result, projects were assigned to one of four risk categories (low to very high) and ranked for each federal state. After applying a uniform, nationwide scale for the sifting the ERA and HDA were applied for about 700 of 1800 road, all rail new construction, individual rail upgrade and all waterway projects.

The Environmental Risk Assessment consists of a spatial analysis to determine the sensitivity of sites (four classes from low to very high), an assessment of degree of pressure from projects (five classes from very low to very high) and a classification of the environmental risks by overlaying both parts (five classes from very low to very high), see Figure 5 in the

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<sup>10</sup> In the BVWP 1992 evaluation procedure, regional planning benefits were part of the CBA. Benefits from projects in regions with low prosperity prospects were weighted higher by applying a bonus to them.

appendix. The procedure follows a common approach applied in environmental impact assessments. Criteria for the spatial analysis are the protection status of sites, land cover / land use type, whether sites are of national or international significance and regional planning objectives. The project impacts are classified according to type of project (new construction or upgrade), size of project and traffic volume. The classification of projects is then finally based on the combined environmental risks and the share of areas affected by the project. The final project evaluation includes verbal descriptions of critical issues and planning instructions.

The purpose of the Habitats Directive Assessment is to evaluate potential impacts on Natura 2000 areas, but does not replace more detailed Habitats Directive compatibility assessment of projects at later planning stages. The HDA takes a verbal argumentative form and classifies projects into three evaluation levels based on whether adverse impacts on the conservation objectives for Natura 2000 sites are probable, cannot be ruled out or can be ruled out.

## **2.5. Integration of results**

Based on the results of the CBA and the non-monetary evaluations ERA, HDA and SIA, economically viable projects are classified into two categories: Urgent Need and Further Need. Projects are assigned to the Urgent Needs category in order of their BCR ranking as long as the aggregate investment volume does not exceed the anticipated financial budget between 2001 and 2015 per mode plus a planning reserve. All other projects that achieve a BCR above 1 are classified as Further Need.

The integration of the non-monetary environmental assessments ERA and HDA follows the procedure as depicted in Figure 6 in the appendix. Projects with the highest environmental risks (ERA=5) and unavoidable significant adverse impacts on Natura 2000 sites (HDA = 3) are considered as critical, and a case by case review is carried out to establish whether information is available that proves that solutions exist to mitigate the identified conflicts. If not, projects are marked with a special planning requirement and cannot be included in investment plans until these requirements are met. The planning mandate for these projects includes investigations whether alternative plans, e.g. upgrading of the existing network, could be realised. For projects with less critical environmental scores it is assumed that the environmental conflicts can be mitigated and are addressed in subsequent more detailed planning stages, in particular through environmental impacts assessments.

Projects with the highest BCR and additionally highest regional planning points (SIA above 3) are defined as 'flagship' projects (amounting to an investment volume of €6,5 bn.) and the federal states are recommended to give higher priority to their realisation in the subsequent investment plans. In addition a special financial pool of a volume of just under €1.5 bn. was established to fund road infrastructure investments with the highest spatial benefits but whose BCR alone would not have been sufficiently high enough to be included in the Urgent Need category. This was not necessary for rail projects as all projects with high spatial impacts were already included in the highest priority class while for waterway projects the achieved spatial benefits did not warrant such improvements of ranking.

## **3. Recent progress in appraisal**

Several research projects are on-going or have recently been finalised for the update of the BVWP appraisal methodology. Table 6 in the appendix and Figure 2 provide an overview of the projects and their status.

Of particular interest for the DfT are likely these completed projects:

- analysis of the traffic forecast instruments (Nagel et al., 2010), in which the inconsistencies and lack of feedback between different instruments, in particular transport demand and further modelling stages, and lack of transparency were identified as an important area for improvement for the future modelling work
- the development of non-monetary elements, in particular the role of strategic environmental assessment (Bosch und Partner, 2010), which incorporates the former ERA and HDA procedures and makes recommendations for procedural aspects such as public consultation and involvements of other authorities, and an updated evaluation procedure for effects on the urban environment (VSU, 2012)
- a scoping study on reliability (significance et al., 2012) which suggested to develop a procedure based on standard deviations

The findings and recommendation of these research projects influenced the descriptions for the contracts for work on the new BVWP 2015, which has already started. E.g. traffic forecasts and scenario development are currently underway. It is to be expected that e.g. the fixed matrix will be replaced by a variable approach.

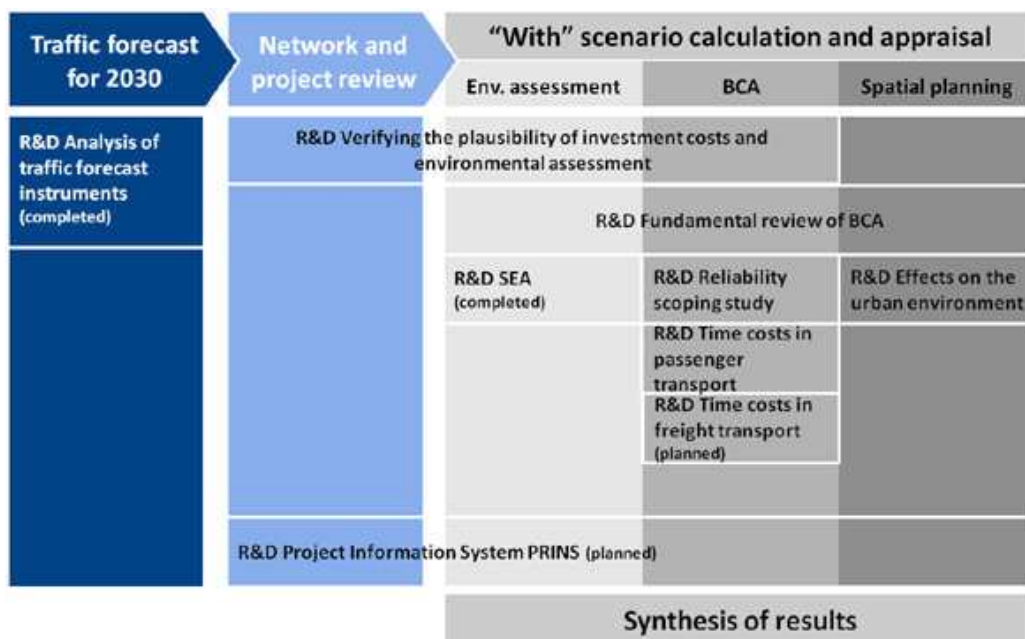


Figure 2: Overview of research projects for BVWP 2015 (as of January 2012).  
Source: www.bmvbs.de

Further research projects are ongoing for the update of the EWS and Standardisierte Bewertung, however, more detailed information on these is currently not available.

#### 4. The role of appraisal in the decision making in Germany

The results of the appraisal process have a high importance for the decision about transport infrastructure investments in Germany. They are used for an initial priority ranking of projects that is produced by the BMVB for each mode according to the procedure described above. The federal states can then change priorities within their lists according to own preferences in hearings and co-ordination meetings which can include other stakeholders such as NGOs (Rothengatter 2005), however, they cannot include projects which are not deemed economically viable. The appraisal results from the non-monetary environmental evaluations can also influence the subsequent planning stages through specific planning requirements.

The appraisal methodology for the BVWP has evolved over time into a relatively comprehensive and holistic approach, which integrates transport policy with regional planning objectives and gives consideration to spatial distribution as well as environmental aspects. In addition, specific appraisal methodologies have been developed that are suitable for application at the state and local level and take the specific requirements into account. Due to the legal implications when projects are categorised to be “needed” based on the appraisal results, the approach has to and fulfils minimum requirements on robustness and transparency. This means, that the BVWP planning process includes a significant amount of technical work in preparation of the evaluation and decision making.

The BVWP evaluation approach itself is not prescriptive, but serves as a decision supporting tool in political negotiations between the federal and state level, including other stakeholders like the Deutsche Bahn, other federal agencies and NGOs. Because of these complexities, an appraisal methodology has been developed that is accepted on all levels of decision making (national, federal states, local) (Rothengatter, 2005).

The existence of different evaluation methods creates some competition or even inconsistencies but also cross-fertilisation between the approaches.

However, there has also been significant critique of the BVWP 2003 appraisal methodology and planning process. In particular criticised (see e.g. Günemann et al., 1999, Wissenschaftlicher Beirat, 2000, Willeke, 2003, Beckers et al., 2005) have been the:

- lack of sifting in the application process for projects, which meant too many projects went into the appraisal procedure,
- lack of focus on clearly defined structural objectives, leading to suggestions to introduce a more goal orientated planning procedure,
- lack of consideration of network effects,
- use of a fixed matrix and crude procedure for dealing with generated traffic which do not represent state of the art in transport modelling,
- inferior role of non-monetary criteria, in particular the lack of trade-off between spatial and environmental criteria,
- lack of transparency of the modelling instruments, where large parts of the data and intelligence on the models are kept within the consultancies or DB AG and not available for the BMVBS, which means there is limited possibility for quality control and assessment of robustness and validity of results,
- outdated unit costs, which are partly based on studies which are more than 20 years old,
- lack of sensitivity tests and lack of inclusion of project risks.

Many of these points of criticism have been taken up in the development of the new BVWP 2015 (see Figure 7 Appendix). New elements in addition to the research updates as described in section 3 and revised procedures are in particular

- a stronger focus on upgrade and renewal of existing infrastructure than on extension due to limited financial budgets, a large funding gap for infrastructure renewal due to the age of the German infrastructure and the already well developed networks;
- a requirement to take into account stricter environmental standards, in particular achievement of CO<sub>2</sub> reduction targets;
- significant changes in public consultation, which are partly driven by SEA requirements
- the introduction of criteria for project selection during the application phase to reduce the number of projects going into the appraisal process;
- the development of an information system on appraisal results and methodologies to improve transparency;
- the inclusion of an independent co-ordinator (Prof. Christoph Walther, PTV and University of Weimar) whose role is to support the BMVBS in the quality management of work and to ensure the consistency between different methodological elements.



## **5. Acknowledgement**

The author would like to thank Prof. Christoph Walther for providing information on the state of development of the EWS 97 and BVWP.

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## Appendix 1

Table 5: Overview of appraisal methods in Germany

	<b>BVWP</b>	<b>EWS</b>	<b>Standardisierte Bewertung</b>
<b>Scope</b>	Federal roads, railways, inland waterways	State and local roads	Public transport investments
<b>Latest version</b>	2003 (unit values updated for review in 2009/2010)	1997	2006
<b>Cost elements</b>	<ul style="list-style-type: none"> <li>• Investment costs including all expenditures for e.g. compensation payments or measures to mitigate adverse environmental impacts</li> <li>• Mode specific price index series</li> </ul>	<ul style="list-style-type: none"> <li>• Investment costs including all expenditures for e.g. compensation payments or measures to mitigate adverse environmental impacts</li> <li>• Infrastructure operating costs</li> </ul>	<ul style="list-style-type: none"> <li>• Public transport capital costs               <ul style="list-style-type: none"> <li>○ Costs for investments and provision of fixed infrastructure</li> <li>○ Investments, depreciation and time dependent operating costs of public transport vehicles</li> </ul> </li> </ul>
<b>Monetised benefit elements</b>	<ul style="list-style-type: none"> <li>• Reduction in transport costs               <ul style="list-style-type: none"> <li>○ Vehicle operating cost</li> <li>○ Intermodal changes in transport costs</li> </ul> </li> <li>• Reduction of costs for infrastructure preservation               <ul style="list-style-type: none"> <li>○ Infrastructure maintenance</li> <li>○ Infrastructure renewal</li> </ul> </li> <li>• Increased traffic safety</li> <li>• Improved accessibility of destinations</li> <li>• Spatial advantages               <ul style="list-style-type: none"> <li>○ Employment effects from construction and operation of infrastructure</li> <li>○ Promotion of international relationships</li> </ul> </li> <li>• Reduction of environmental impacts               <ul style="list-style-type: none"> <li>○ Noise exposure</li> <li>○ Exhaust emissions</li> <li>○ Community severance</li> </ul> </li> <li>• Impacts from induced traffic</li> <li>• Improved links to and from seaports and airports</li> <li>• Fulfilment of non-transport functions</li> </ul>	<ul style="list-style-type: none"> <li>• Vehicle operating costs</li> <li>• Traffic safety</li> <li>• Travel time savings</li> <li>• Noise exposure</li> <li>• Air pollution</li> <li>• Impacts on climate</li> <li>• Community severance</li> <li>• Land availability in built-up areas</li> <li>• Further components</li> </ul>	<ul style="list-style-type: none"> <li>• Travel time saving in public transport, including access, transfer and waiting times</li> <li>• Car operating cost savings</li> <li>• Public transport operating costs               <ul style="list-style-type: none"> <li>○ Personnel costs</li> <li>○ Energy and performance dependent operating costs of buses</li> <li>○ Route and performance dependent operating costs for rail vehicles</li> <li>○ Energy costs dependent on stops</li> </ul> </li> <li>• Traffic safety</li> <li>• Exhaust emissions</li> <li>• Noise exposure</li> </ul>
<b>Non monetised elements</b>	<ul style="list-style-type: none"> <li>• Spatial Impact Assessment</li> <li>• Environmental Risk Assessment with Habitats Directive Assessment</li> </ul>	no guidelines	<ul style="list-style-type: none"> <li>• Quantitative as part of MCA: Monetised benefits in their original measurements plus accessibility, energy consumption, land use</li> <li>• Qualitative: Punctuality, comfort, impacts on protected areas (water, nature, landscape), contribution to regional development axis, impacts on landscape and recreational sites, community severance, impacts on regional economic and social structures and on townscape</li> </ul>

## Appendix 2

Table 6: Research projects for the update of the appraisal methodology for BVWP 2015  
(Source: www.bmvbs.de)

<b>Study</b>	<b>Status</b>
Analysis of traffic forecast instruments	Completed June 2010 (Nagel et al., 2010)
SEA: Developing a blueprint for integrating a strategic environmental assessment into federal transport infrastructure planning	Completed July 2010 (Bosch und Partner et al., 2010)
Effects on the urban environment	Completed March 2012 (VSU, 2012)
Reliability scoping study: capturing the "reliability of traffic flow" indicator in the federal transport infrastructure planning evaluation method	Completed Mai 2012 (significance et al., 2012)
Verifying the plausibility of investment costs and environmental assessment: developing a combined method for estimating investment costs and assessing the environmental and nature conservation impact of transport infrastructure projects in federal transport infrastructure planning	ongoing
Fundamental Review of the BCA: a fundamental review and evolution of the benefit-cost analysis in the federal transport infrastructure planning evaluation method	ongoing
Time costs in passenger transport: identifying evaluation approaches for journey times and reliability on the basis of the estimation of a model for modal shifts in non-commercial and commercial passenger transport for federal transport infrastructure planning	ongoing
Time costs in freight transport	ongoing
Project information system	ongoing

### Appendix 3

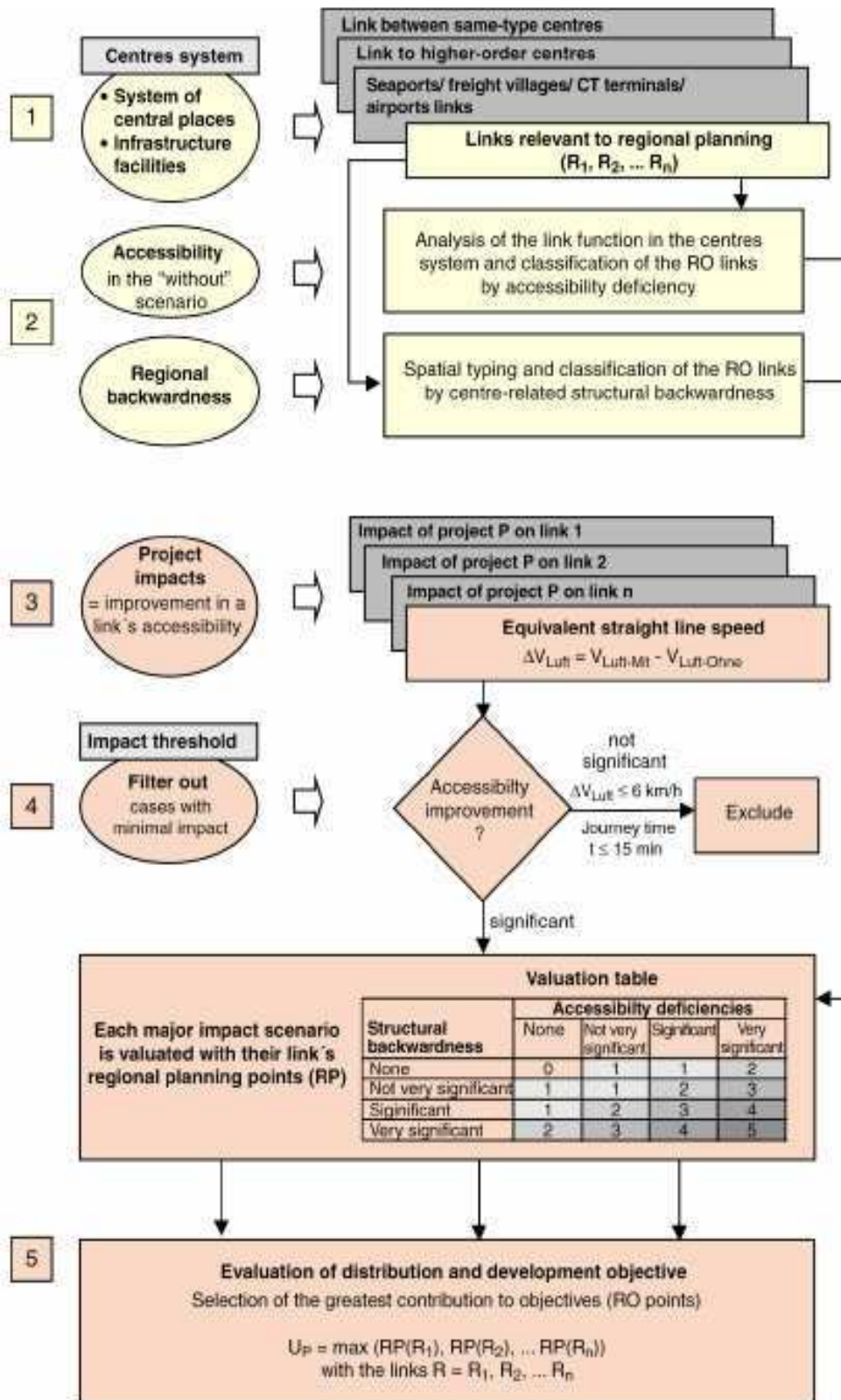


Figure 3: SIA procedure for distribution and development objectives (BVWP 2003b, p.54)  
 (RO = 'Raumordnung' = regional planning)

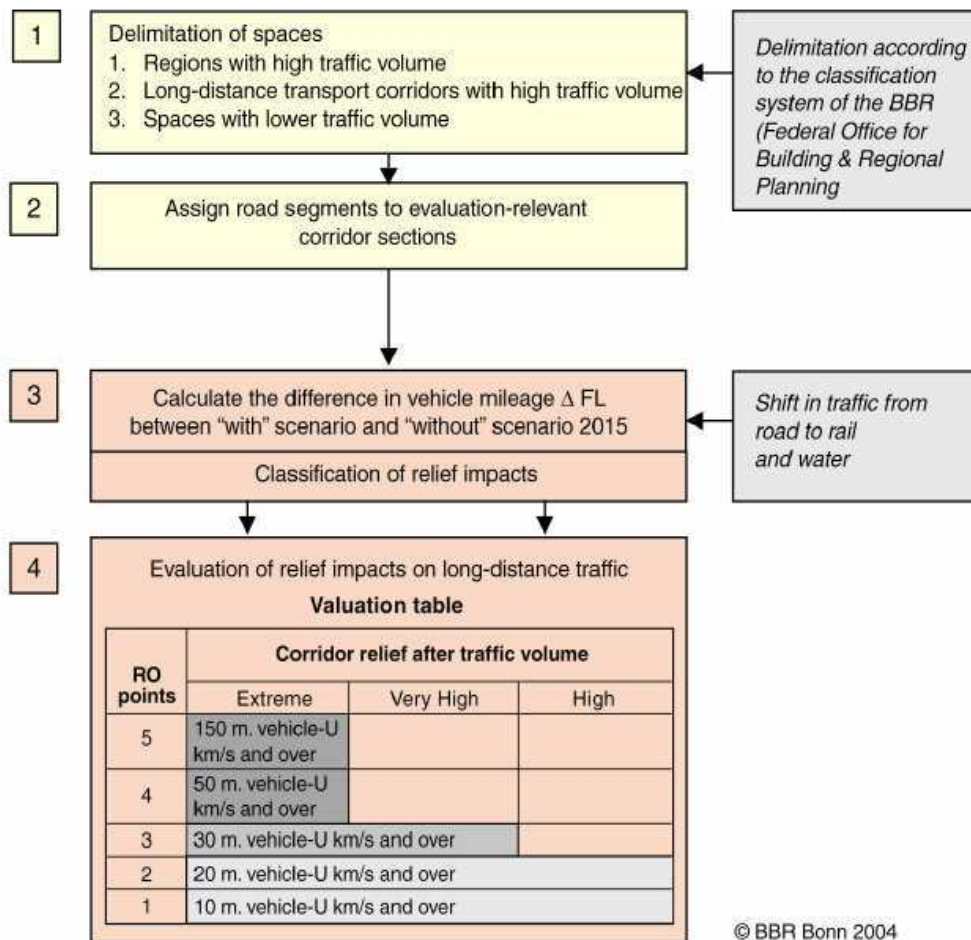


Figure 4: SIA procedure for relief and modal shift objectives (BVWP 2003b, p.60)  
 (m. vehicle-U km/s means million car equivalent vehicle km per year)



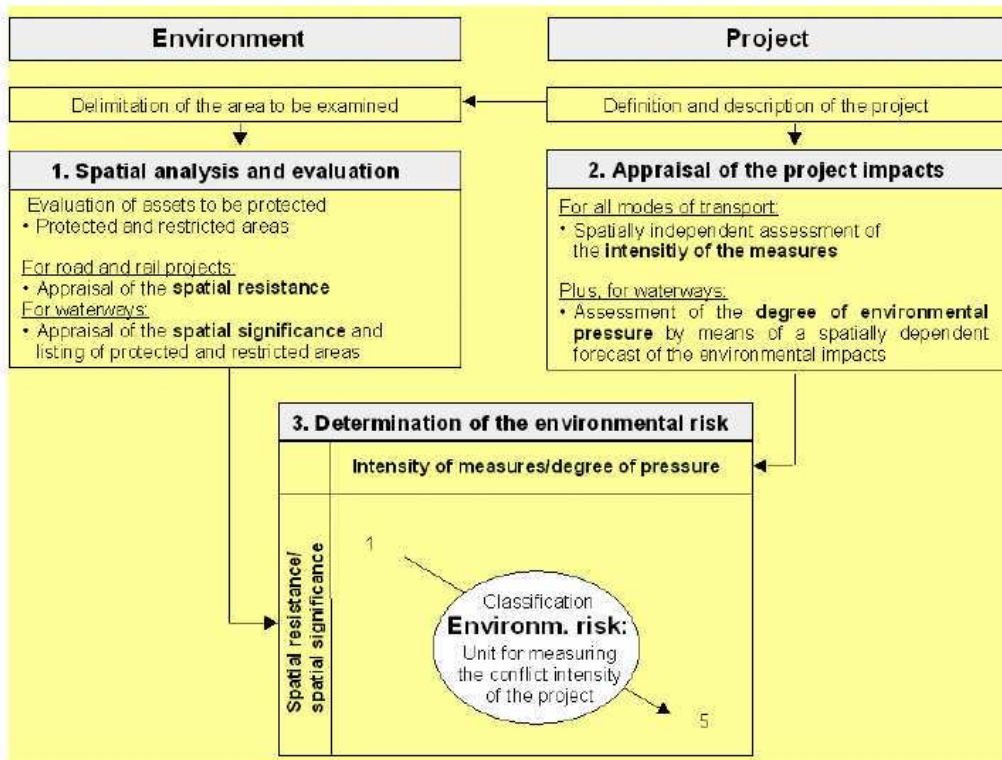


Figure 5: Environmental Risk Assessment procedure (BVWP 2003b, p.44)

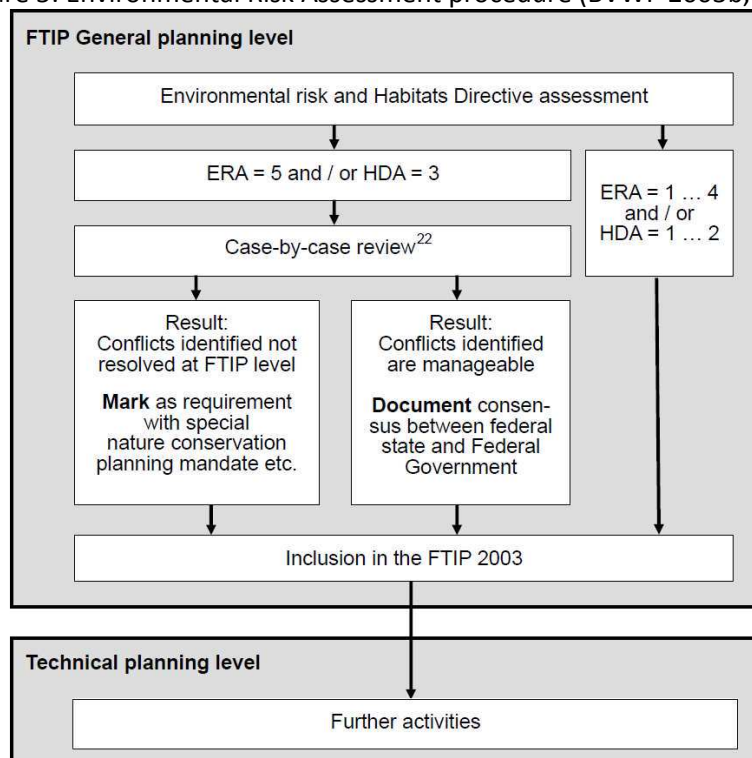


Figure 6: Integration of results from ERA and HDA into appraisal results

## Appendix 4

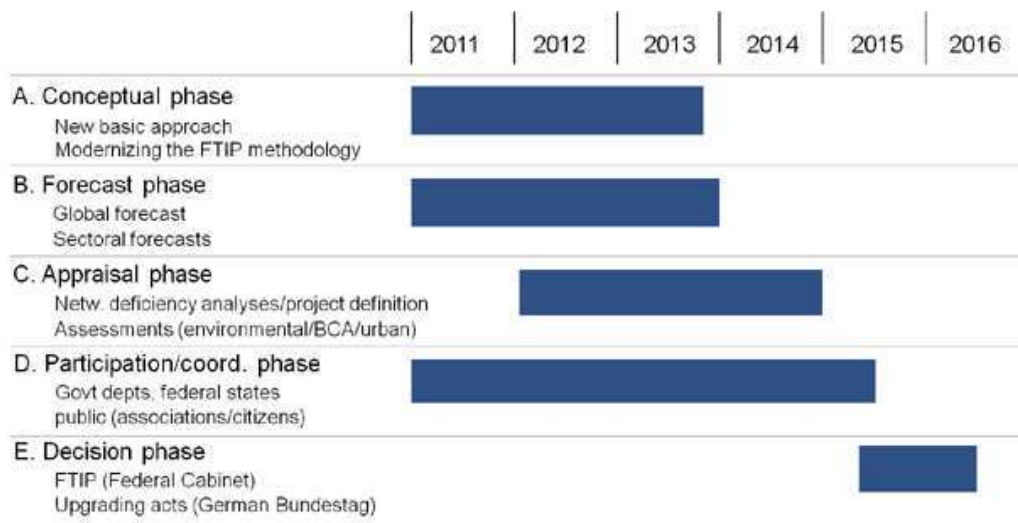


Figure 7: Timetable of preparation for BVWP 2015. Source: BMVBS website

## Appendix 5

### List of Acronyms

BAST	Bundesanstalt für Straßenwesen (Federal Highways Agency)
BBR	Bundesamt für Bauwesen und Raumordnung (Federal Office for Building and Regional Planning)
BCR	Benefit Cost Ration
BfN	Bundesamt für Naturschutz
BMVBS	Bundesministerium für Verkehr, Bau und Stadtentwicklung (Federal Ministry of Transport, Building and Housing)
BVWP	Bundesverkehrswegeplan (Federal Transport Infrastructure Plan)
CBA	Cost Benefit Analysis
DfT	Department for Transport
EFRD	European Fund for Regional Development
ERA	Environmental Risk Assessment
EWS	Empfehlungen für Wirtschaftlichkeitsuntersuchungen von Straßen (Recommendations for economic appraisal of roads)
FGSV	Forschungsgesellschaft für Straßen- und Verkehrswesen (Road and Transport Research Association)
HDA	Habitat Directive Assessment
SIA	Spatial Impact Assessment
UBA	Umweltbundesamt (Federal Environmental Agency)