Winkelmann *et al.*
Energy, Sustainability and Society (2023) 13:6
https://doi.org/10.1186/s13705-023-00385-5

Energy, Sustainability and Society

RESEARCH

Open Access

Boulevard of broken dreams: public audit, mobility infrastructure deficits and the limits of correction in Germany

Thorsten Winkelmann[1*], Julia Zimmermann[1] and Erik Vollmann[2]

Abstract

Background Traffic and transport infrastructure is a vital prerequisite for social and economic development as well as the socio-spatial integration of countries and regions' societal strata. It sets the course for the future of mobility and transport-related social and economic development and is thus inherently political. Deficiencies in traffic infrastructure provision, such as delays in project deployment and exceeding costs, increase the potential for public discontent. It is the mission of public audits to identify, diminish and remedy infrastructure deployment problems—and to encourage best practice models and policy learning. Despite their importance, shortcomings that audit offices identify as well as the reactions and follow-up measures of the addressees to official problem statements remain vastly under-researched. As the transport area is one of the core emitters of CO_2 and at the heart of many transition policies to tackle climate change, lack of knowledge regarding transformative change opportunities in the mobility sector is detrimental to the success of these adaptations. One major policy issue in this respect are reform strategies regarding transport and traffic infrastructure planning and project implementation. Our systematic analysis of public audit reports in Germany on traffic and transport infrastructure project deployment contributes to a better understanding of this issue.

Results We detect patterns of compliance and resistance to audit office assessments by the executing administrations in traffic infrastructure project deployment. While we witness at least the partial compliance and announcement of corrections in 51% of the cases, in about 19% of the cases, the responsible authorities acknowledge the audit's critique (partially), but do not signal concrete willingness for further corrections. In more than 20% of the identified audit statements, the audit's assessments are even rejected without corrections to the further projects' execution.

Conclusion We analyze the extents and limits of organizational learning and institutional adaptation of public control strategies in mobility and transport-related infrastructure provision. Our contribution discusses possible reasons for sustainable transport and traffic infrastructure development deficits as well as shortcomings in infrastructure planning and project deployment. We thus try to open new avenues for debate on improved sustainable infrastructure policy and planning.

Keywords Infrastructure, Exceeding costs, Planning deficits, Audit office, Construction management, Mobility, Learning, Green deal, German sustainability strategy

*Correspondence:
Thorsten Winkelmann
thorsten.winkelmann@fau.de
Full list of author information is available at the end of the article

Background

Sustainable mobility and transport futures: rocky road to Utopia

The prevention of further acceleration of global warming as well as the adaptation to already existing effects of climate change are expected to shape policy strategies and political negotiations in the years to come. As the second largest emitter of carbon dioxide globally (around 25%), the transformation of the transport sector is in the limelight of national and international policy discussions and debate. Institutional reforms regarding this sector are a hot topic not only, but especially in Germany where the automobile industry is one of the most prominent backbones of an export-oriented economy. The necessity for radical changes to the transport sector and to its respective traffic infrastructure is common consensus [1–4]. Both the European Union (EU) and the German Federal Government have released extensive roadmaps and strategic agendas, though assessments of those strategies meander in our opinion between (too) ambitious and long overdue.

More specifically, the EU's "Green Deal" strives to reduce 90% of all emissions in transportation by 2050. The plan contains the co-financing of innovation and transition to alternative drivetrains and a goal for increased autonomous driving capacities [5]. The green deal aims to reach the following goals by 2050:

- "nearly all new cars, vans, buses as well as heavy-duty vehicles will be zero-emission, rail freight transport will double,

a fully operational, multimodal Trans-European Transport Network (TEN-T) for sustainable and smart transport with high-speed connectivity should be realized [6]. The German counterpart to the Green Deal is the Federal Government's Sustainable Development Strategy (GSS) that includes a mobility and transport transition agenda.

As a metaphor, the term "Verkehrswende" ('transport system change', when translated literally) is prominent, which at least linguistically signals a turnaround of mobility and transport concepts and practices.

The GSS includes the goal to reduce transport emissions by 40% (reference year 1990) until 2030 and an (almost) zero-emission status of the German transport system until 2050 [7].

Germany also aims to reduce between 7 to 10 Mio tons of CO_2 in the mobility and transport sector. "With these measures, the German government is also pursuing the goals for the transport sector contained in the overall Energy Concept:

- to save around 10% of final energy consumption in mobility and transport by 2020 and around 40% by 2050 (reference year 2005) and,
- to significantly increase the market share of electric vehicles on the road to 1 million by 2020 and 6 million by 2030″ [8].

Since this change from the last conservative-led Federal Government coalition with to a the participation of Germany's green party at the end of 2021, policy priorities shifted further towards sustainable development goals. The new government currently envisions 15 million electric vehicles on Germany's roads by 2030 [9].

Common to all approaches towards a sustainable mobility and transport system is that they cannot rely solely on alternative powertrain concepts for automotive drives. To ensure the success of a change in the mobility and transport area, an efficient, reliable, resilient and integrated transport system and the respective traffic infrastructure are key.

The German Federal Government predicts major transport and traffic infrastructure spending to lay the foundations of the *Verkehrswende* [10]. Incentives to move transport volumes from the roads to railroads, to switch from individual car use to public transport and active mobility by cycling and walking, and to ensure the viability of alternative drivetrain concepts outside of urban areas are necessary, e.g., through a dense network of charging stations. This relies heavily on efficient and effective, well-planned, and timely implemented traffic infrastructure provisions.

Consequently, both the volume and the quality of traffic infrastructure investments in Germany are subject to public contestation. Several think tanks criticize the Federal Government's recent infrastructure investment plans as insufficient and call for a more profound use of fiscal and regulative policy instruments to ensure a meaningful impact toward climate protection [11–15].

Additionally, the German Economic Institute (DIW) argues regarding the status quo of transport and traffic infrastructure provision in Germany, that the policy network itself in this area is in dire need of institutional reform [16, 17]. As a result, the path to a sustainable future of mobility and transport in Germany leads along a rocky road marked by crumbling bridges, a thinned and partially outdated railroad network as well as insufficient financial budgets for immediate infrastructure maintenance and renovation. Therefore, all relevant public bodies should increase their budgets, fundamentally reform institutional regimes and change organizational structures to prepare for todays and future challenges in the area of provision for sustainable mobility and transport.

The mission of public audit offices is to identify, diminish and remedy inter alia public infrastructure planning and project implementation and encourage best practice models and learning. The audit system is an important safeguard in constitutional democracies as its institutional design tries to answer the question of "what institutional mechanisms allow elected officials to hold bureaucrats accountable for their administrative decisions?" [18].

Despite their importance, the shortcomings that audit offices identify in public administration action as well as the reactions and follow-ups to official problem statements remain vastly under-researched [19]. We try to advance the scientific discourse on this vital administrative foundation to successful transport and traffic infrastructure deployment by analyzing the German responsible authorities' capacity and efficiency in the creation and maintenance of sustainable mobility-enhancing infrastructure through the lens of public audits.

We examine how public audits function as watchdogs and assess transport and traffic infrastructure financial investments, and which specific types of political, institutional, and processual deficits such audits identify. The audit reports should ideally lead to corrections in organizational structures, financial and human resource allocation, policy incentives, intervention measures, and administrative procedures by the audited public institutions. Our analysis sheds light on the patterns of reflected and potentially changing bureaucratic behavior and mutual learning patterns, but also resistance to audit report outcomes. Hence, our analysis focuses most notably on the answering patterns of administrations that are responsible for traffic infrastructure planning and project implementation regarding changing behavior and mutual learning, but also resistance to the critique and suggested improvements proposed by audit offices.

We argue that a considerable habit of continuing along the previous routines despite criticism by auditors, which we identified in our data set of German federal and state (Bundesländer) audit reports, indicates a limited learning capacity. This has (1) serious consequences for the general capacity of control and adaptability of transport and traffic infrastructure provision and (2) may slow down or even hinder large-scale transformative change in transport infrastructure in Germany. Our analysis of German Federal Audit Office reports as well as State audit reports of a sample of six German Bundesländer between 2006 and 2020 is expected to contribute to a better understanding of these shortcomings and possible paths to correction. Based on quantitative and qualitative content analysis, we provide an insight into the core dimensions of traffic and transport infrastructure planning and project deployment deficiencies that audit offices identify at different levels of the German body politic. We further identify patterns of compliance but also resistance to audit office findings. While we witness at least the partial compliance and announcement of corrections in 51% of cases, in about 19% of cases, the responsible authorities acknowledge the audit's critique (partially) but do not signal a willingness for correction. In more than 20% of the identified problem statements, the audit's assessment is even rejected without corrections to the infrastructure projects' execution.

These results provide original and much-needed evidence on the capabilities and limitations of public control mechanisms with regard to transport and traffic infrastructure provision in Germany. Efficient and timely infrastructure project realization as well as clear-cut legal frameworks remains important preconditions for the successful transformation of the emission-intensive transport sector towards compliance with sustainable development goals and climate protection targets. We hope our work will advance the scientific discourse on sustainable mobility and transport transition strategies and the political debate on institutional reform and compel organizational change and learning in authorities responsible for infrastructure planning and provision.

Methods

Approach and study design

The Federal Court of Auditors ("Bundesrechnungshof", BRH) and the Länder Courts of Auditors conduct annual examinations of the Federal Republic and States government's financial management. They check if public funds on the federal or state-level are spent according to their intended purpose and scrutinize state involvement in private sector enterprises to ensure an all-encompassing control of publicly appropriated funds according to common regulations at the European level. The mandate and independence of the Federal Republic and Federal States Audit Office are enshrined in the German constitution (art. 114 GG) so as to account whether public finances have been properly (i.e., lawfully) and efficiently managed [20]. Accordingly, the Federal and State Audit Offices not only determine (1) whether all respective national and European laws and regulations are followed but also (2) whether the implementation is economically feasible [21, 22]. The audit reports shall provide a realistic overview of public spending and financial management as infrastructure project management and point out shortcomings, the reasons for and due effects of them, but as well possible avenues for their correction.

While the public auditors provide assessments of all state actions (i.e., also consumptive costs), our analysis focuses on the assessment of public investments in the Federal and Federal State Audit Office reports.

This includes public funding for management and planning, construction, and modernization of infrastructure facilities.

From this population, we analyze all cases that are thematically related to transport and traffic infrastructure. The infrastructure in question includes all means, routes, and services in all sectors of transportation (goods, services, people) [23]. Our dataset includes a diverse range of transport and traffic infrastructure projects from investments in local public transport, road building to barrier-free access to tramways. While our sample of public audit reports cannot account for Germany's overall investment and spending on transport infrastructure of about 30 billion € p.a., it encompasses a broad range of project budget volumes from around 250.000 € to 3 billion €.

Our analysis comprises all concerning German Federal Audit Office reports as well as state audit reports of a sample of six German States between 2006 and 2020. The Federal Court of Auditors (BRH) is the principal German audit office and an important focal point to better understand the dynamics of multi-level governance in the German political system. In general, public infrastructure investments are jointly procured by the Federal Republic, by the Federal States (Länder) and the municipalities. In practice, the federal and the state-level mostly co-finance infrastructure investments and contribute funds while responsible authorities at the state and the municipal level finally finance and execute most infrastructure construction and are responsible for subsequent maintenance and operation.

We also include a sample of State Courts of Audits assessment reports to (1) check differences and to include two of the most important inter-state cleavages in Germany: (2) The divide between West and East Germany which stems from Germany's division prior to 1990 between a liberal market-oriented, democratic western part and an autocratic socialist eastern country with a state-directed economy is still tangible regarding the socio-economic segmentation, political culture and potential government action between east and west [24, 25]. (3) Systematic differences are also regularly reported between the city states in Germany (Berlin, Bremen, Hamburg) and the other Länder with larger areas to cover by its transport system and traffic infrastructure network. This approach allows us to draw upon data that adequately reflect the landscape of multi-level governance and inter-federal state differences in German transport infrastructure politics.

To broaden our analysis from the federal level to the Länder tier, we have thus included the largest German states by population (North Rhine-Westphalia; NRW) and covered area (Bavaria; BV). We further include the east German Federal States Saxony (SN) and Mecklenburg-West Pomerania (MWP) to confirm East–West differences and the City States of Berlin (BE) and Hamburg (HH) to possibly identify variations from the larger Länder and those covering mainly urban mobility and transport infrastructure networks.

From the seven selected institutions, we identified 193 different cases of transport and traffic infrastructure audits in 115 reports through quantitative and qualitative content analysis [26–29]. Our analysis showed reoccurring problems, e.g., referring to planning and financial management or other complaints during the actual construction phase that we coded in a set of thematic categories (see Table 1 for an overview with description, and an example case). We regularly coded more than one category of project discrepancies per case.

To further analyze our sample, we used thematically comparative categories of complaints, and problems or deficits that were pointed out by the audit offices in their annual reports as an independent variable, which we extracted by qualitative-oriented content analysis (see Fig. 1). In our opinion, this approach makes it possible to combine individual subcategories that are comparable in terms of content. Cross-sectional as well as individual reviews reveal a heterogeneity that can hardly be generalized. The infrastructure areas addressed a range from roads, tunnels, and bridge construction to traffic calming measures and investments in rail infrastructure, to public investment in special structures such as wharves and floating docks. The approach identifies a range of functional, technical, legal, economic, planning, construction, and design weaknesses.

As our principal dependent variable, we continue to analyze the pattern of the responsible authorities' and executing administrations' reactions to the problems and complaints that were raised in the audit reports by the courts of auditors on the federal and the state scale. The 'defendants' shall give statements in a certain period of time which are then followed-up by a final statement from the auditors (see i.a. art. 97 BayHO). This procedure enables responsible authorities to react to the auditors' findings and suggest corrections to planning and project implementation deficits [45].

Existing laws formally finalize the assessment of a case only after the cause(s) of complaint by a court of auditors are corrected, if the executing administration agrees to corrections, or if a case is classified as such after a report to the federal or respective state (Länder) parliament.

We have identified 188 responsible authorities' statements as reactions to complaints in audit reports in our period of investigation. In five cases, the addressed authorities did not (yet) respond to the auditors and thus had to be excluded from our analysis.

Table 1 Coding scheme overview: categories, descriptions and example cases

Category	Description	Example
Overdimensioning	Too big; excessive user claims; creatively unnecessary measures	BRH (2011: 226) [30]
Lack of competition	Violations of procurement laws	LRBay (2006: 101) [31]
No requirement	Unnecessary investments	BRH (2013: 229) [32]
Inadequate needs analysis	Excessive standards; lack of cost awareness; planned workloads too low	LRNRW (2006: 305) [33]
Multi-level governance problems	Subordinate offices plan excessive standards	BRH (2015: 209) [34]
Economic feasibility	Insufficient or wrong calculations	BRH (2018: 236) [35]
Cost systematics	Improper booking; wrong accounting	LRS (2013: 135) [36]
Controlling	Controlling deficits; incorrect information	LRBay (2018: 99) [37]
Documentation	Overlapping spheres of authority; interface conflicts	LRM-V (2013: 85) [38]
Public procurement law	Allocation of supplements without competition; wrong procurement type	LRS (2017: 153) [39]
Follow-up costs	One-sided focus on investment costs	LRM-V (2013: 85) [38]
Planning deficits	Accompanying planning; inadequate service descriptions	BRH (2018: 224) [40]
Supplementary management	Costly supplements to the initial budget	BRH (2003: 21) [41]
Budget	Funding not sufficient for implementation	LRS (2011: 137) [42]
Maintenance	Budget for upkeep is too small	LRNRW (2016: 142) [43]
Problems with funding legislation	Double funding; different perspectives on existing general guidelines	LRH (2007: 120) [44]

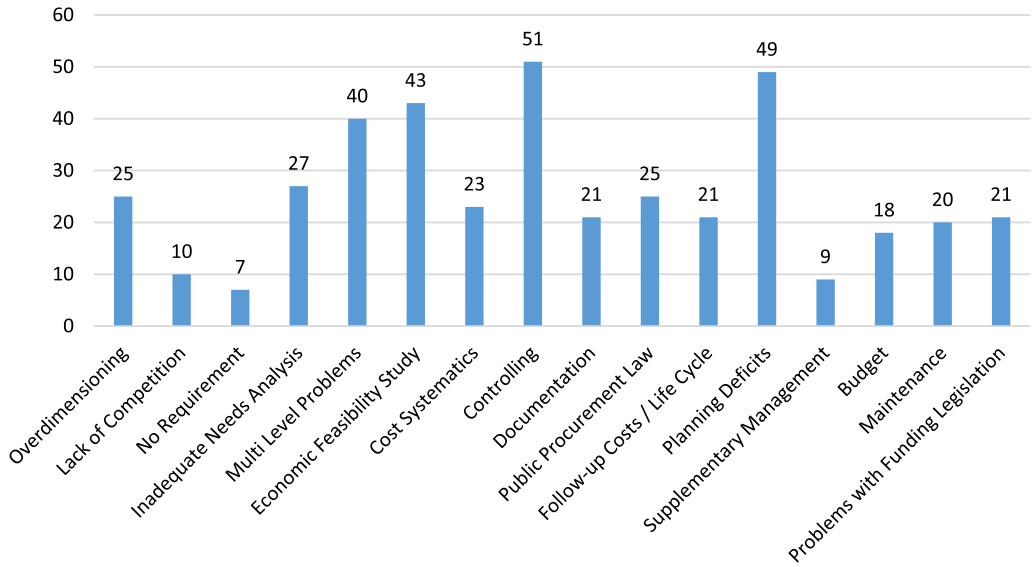

Fig. 1 Identified deficits, categorized. Own representation ($n = 413$)

For the remaining 183 cases, we have cross-tabled the different categorized complaints (auditors, IV) and reported reactions (responsible authorities, DV) to illustrate patterns of reactions from the authorities to whom the complaints were addressed to.

(Empirical) results

Deficits in Germany's Transport Infrastructure Planning and project implementation

Among the broad range of deficits that Federal Republic and State Audit Offices raise, four categories stand out (see Fig. 2): planning deficits ($n = 49$), controlling deficits ($n = 51$), economic feasibility deficits ($n = 43$) and multi-level governance issues ($n = 40$) are the most common problems and will hence be the focus of our in-depth analysis.

Planning deficits These complaints comprise all legal and economic deficits in the conception, tender offer and infrastructure construction or the building phase [46–49]. On the one hand, frequent errors occur because infrastructure deployment projects are insufficiently specified in the planning phase or contain contradicting

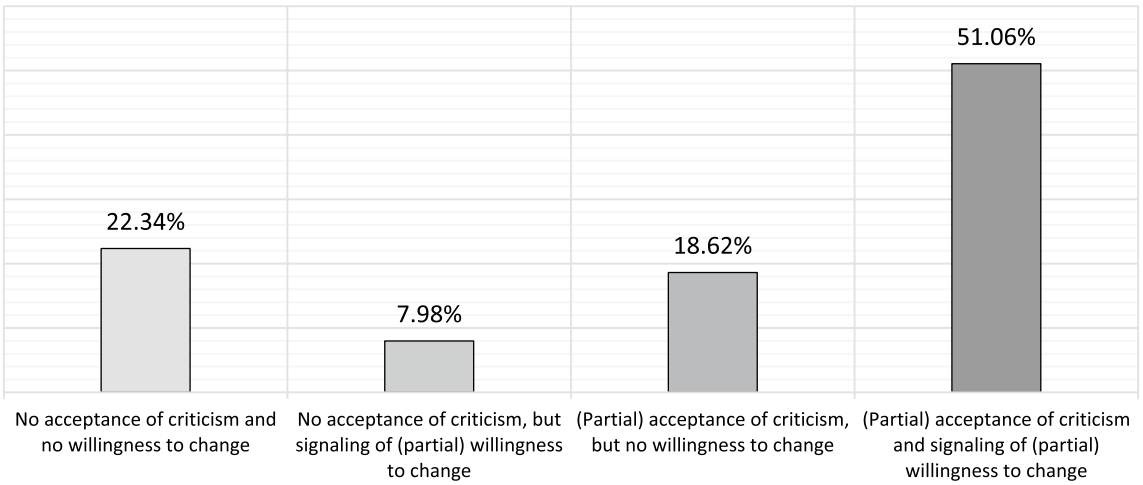

Fig. 2 Overall reactions to mobility-related public audit complaints. Ownrepresentation ($n = 188$)

subprojects. On the other hand, inadequate technical, legal, or political planning foundations frequently slow the planning and project implementation processes down. These subjects touch upon regulatory and economic issues during infrastructure construction, i.e., deadline conflicts referring to contracts with private contractors and issues regarding the regulatory and budgetary framework [50]. We found the following main causes in the critique raised by audit offices: the responsible authorities oftentimes update their project requirements, although the competitive bidding has already finished, and even during the implementation phase of the project—not seldom without extensive knowledge of the local situation and real-world context. The project specifications frequently lack details, are open to different interpretations, or do not properly fit with the initially negotiated project requirements [51, 52]. This often leads to significant time delays and budgetary expansions, in particular regarding highway and road infrastructure construction contracts [53].

More than once, the courts of auditors found public investments that were executed although the necessary funds were not yet guaranteed [54]. This violates the Federal Budget Core ("Bundeshaushaltsordnung" para. 24.1) The auditors also list many violations of the principles of regulatory compliance and expedience: Insufficient planning documentation leads for example to additional expenses [55] or errors in the structural analyses of projects in the project development phase and extend the duration of the project implementation, especially in transport infrastructure renovation and modernization projects [56]. The Court of Auditors of the Federal State of Bavaria for example assesses that 38% of roadside infrastructure in Bavaria needs renovation and an additional 22% are in critical condition [57]. At the same time, these auditors criticize that the Bavarian Ministry of Housing, Construction and Transport has no viable strategy on how to uphold and renovate the state-owned road bridges [58].

Planning deficits are evident when projects are started without guaranteed financing or with an insufficient co-funding budget by the federal government level. In some cases, the infrastructure project's execution deviates regarding its dimensions, or even from the location the project proposal was originally approved for. Missing conceptual planning in the run-up to infrastructure projects suggests insufficient preparation of the actual construction [59]. The auditors also pointed out cases where risk analyses regarding the local, technical, and environmental preconditions of infrastructure projects were incomplete [60] or initial project guidelines had been disregarded during the project execution [61].

Overall, the planning deficit category represents a type of structural deficit regarding the capacities of public authorities—as well as those of private sector companies they contract—to adequately plan the intended uses and allocate required space and appropriate equipment for specific infrastructure projects even after years of precursory planning.

If the authorities' visions remain vague—even at this stage—it is extremely difficult to identify the appropriate infrastructure project dimensions comprehensively. Later corrections and increased budgetary expenses are frequent.

Transport and traffic infrastructure planning often builds on unrealistic assumptions regarding cost developments, project timelines and future mobility and transport demand. Public authorities often have a rather

insufficient market overview. This can contribute to shortcomings: projection abilities and procedures are certainly suboptimal. Risk analysis and transport demand projection in infrastructure planning seems in many cases to be weak. This can lead to a costly proliferation between optimal, initially expected, and final infrastructure construction project execution costs.

Economic feasibility A wide range of laws, of regulations, and the German constitution (art. 114 para. 2) bind public administrations to the principles of budgetary austerity and economic feasibility. However, public administration, fiscal oversight and even the scientific debate lack a broad consensus regarding proper criteria and guidelines to assess economic feasibility as an austerity principle [62–64]. Thus, the imperative of economic feasibility in public policy and planning is at times more a reflexive mantra than a rule of law in practice [65]. In a narrow sense, the assessment of economic feasibility needs a range of alternative options, as the difference in effectiveness and efficacy can only be assessed comparatively. As a minimum precaution to guarantee austere and economically feasible public sector investment decisions, we expect responsible authorities to conduct comprehensive cost–benefit analyses.

However, even analyses which assess whether the designated construction site is suitable for the respective infrastructure project execution are not ubiquitous in German infrastructure provision [66]. Traffic and transport infrastructure authorities have a relatively large discretionary power on how to approach economic feasibility, which at times—at least in our opinion—warps the conducted economic analyses to political strategies rather than following economic rationales. Political pressure leads to deficiency analyses without comprehensive cost statements to speed up the start of, e.g., roadside infrastructure construction processes [67–69]. This results in our observation to a frequent critique by public auditors.

The courts of auditors identified shortcomings in the following categories: the responsible project planners sometimes did not carefully monitor potential alternative options to the project's mainframe or omitted a comprehensive economic feasibility analysis [66, 70]. At times, public authorities commissioned several contradicting analyses, or traffic infrastructure planning built upon outdated data and models [71, 72]. The criteria and methods as well as the rationales of choice were not clarified, which led auditors to suspect that some economic analyses were not open and transparent but conducted to legitimize already determined preferences and decisions.

Controlling The detailed overview of budgets, cashflows, expenditures or liabilities in infrastructure projects are an important dimension of financial management and control. Financial controlling verifies the economic and functional success of public infrastructure investment vis-à-vis external observers, e.g., politicians, courts of justice and the general public. The German courts of auditors identified controlling deficits in infrastructure provision in different categories: political decisions were based—following the court of auditors—on inappropriate economic analyses; the drafting of expenditures was tarnished because necessary information was incorrect or delayed. Planning steps were changed without the legally necessary approvals or blocked budgets were used. Financial transactions were not transparently revealed and missing in documentations.

A transparent and comprehensive controlling of the administration as well as the enforcement of legal regulations are principles of accountability in a democratic body politic [73, 74]. But our analysis shows that audit courts are not always well equipped to enforce these principles.

Their capacities to manage and control infrastructure construction processes are stretched thin. Responsible infrastructure authorities normally do not execute ex post evaluations of the project implementation. The monitoring of costs, budget limits and contracts is very often insufficient [75]. Splintered responsibilities between different authorities cause deficits in legal supervision. An overarching supervision responsibility is usually absent [76].

Accordingly, the differentiated and integrated administrative arrangement is often incapable of effectively managing the complex technical, legal, and economic issues regarding large infrastructure project implementation.

Multi-level governance issues Planning and implementation, maintenance and operation, and financing and funding of transport infrastructure asks for cooperation between the federal, the states (Länder), and the municipal level in the body politic [77–79]. Multi-level governance shortcomings that we identified are caused by the intertwined vertical decision-making processes and structures in the German federal republic and state system [80, 81]. The most relevant issues (35 out of 40) were identified by the Federal Court of Auditors which pointed out that state-level authorities erroneously caused costs at the federal level by planning infrastructure, which is over-scaled, and based on super-elevated standards and not suitable to respective demands. Federal state-level (Länder) authorities also charged the federal republic level unjustified in several cases [54, 82–84]. Delays in the infrastructure project implementation at the state-level (Länder) also led to a later transfer of maintenance costs to the federal state-level [85, 86].

Patterns of change and persistence: authorities' reactions to audits' critique

Our analysis and overview of the thematic nature and distribution of deficiencies regarding the planning and implementation of transport infrastructure in Germany signals that political decisions to achieve a sustainable mobility and transport transition are no guarantee for a smooth and quasi-automatic implementation.

Identifying shortcomings and pointing out problems is the intended safeguard function of public audits. If the audit reports lead to adapted behavior of the addressed responsible authorities—in the case here mostly traffic and transport infrastructure authorities—as well as organizational learning towards improved infrastructure project implementation in the future, the audit process could be regarded as successful. To check the potential for transformative change, institutional adaptation and organizational learning in transport-related infrastructure provision in Germany, we will now focus on the thematic response patterns of defendant authorities to the critique raised by the federal court of auditors and selected Länder courts of auditors. Do addressed authorities accept the auditors' critique or not? And do those authorities (significantly) change the questioned issues in the infrastructure projects they are responsible for?

Planning deficits The public auditors pointed out several technical, legal, personal, and conceptual shortfalls in the planning processes of transport infrastructure in the past years. More than 70% of the criticized administrations (partially) accepted the public auditors' verdict (see Table 2). In half of the cases, these authorities also agreed to reduce the performance gap and to improve the situations. However, most of the announced adaptation issues were small scale and specifically targeted to individual infrastructure projects which does not (yet) signal general organizational learning in the light of recurring deficits [87–89]. This also means that in 40% of all planning deficits identified by auditors, the addressed authorities did not indicate that they want to change their behavior. Responsible authorities accepted the audits critique. But at least in one-fifth of the cases no further adaptations were indicated.

Economic feasibility We see similar patterns of response concerning audit critique, which points at violated austerity principles or economically non-feasible patterns regarding infrastructure provision: More than two-thirds of the audit objections are accepted, and half of the critique is met by at least some signals of changing organizational behavior. However, the overall refusals to adapt raise to more than 46% of all cases in this category (see Table 3). The responsible authorities justify shortcomings with problems concerning methodological questions or problems regarding the integration of third parties into the projects. Deadline pressures are also a reoccurring justification of potentially reduced economic feasibility caused by missing and insufficient analyses [90]. A problematic aspect, according to the authorities, is the integration of future demand with vastly varying scenarios and respective economic evaluations [91]. The individual and highly specific nature of many infrastructure projects often defy comparability, in particular in the case of pilot projects [92]. This is another type of justification authorities express to explain the inability to change project specifications despite all economic inefficiencies. In addition, unchangeable requirements are determined by the legislature [93].

Controlling The public administrations also accept the auditors' critique of controlling deficit in most cases

Table 2 Public traffic authority reactions to auditors criticizing planning deficits (in percent)

	(Partial) acceptance		Total
	No	Yes	
Announced changes			
No	18.75	20.83	39.58
Yes	8.30	52.08	60.42
Total	27.08	72.92	100.00

Table 3 Authorities' reactions to auditors criticizing economic feasibility analyses (in percent)

	(Partial) acceptance		Total
	No	Yes	
Announced changes			
No	25.58	20.93	46.51
Yes	4.65	48.84	53.49
Total	30.23	69.77	100.00

Table 4 Public authority reactions to auditors criticizing controlling deficits (in percent)

	(Partial) acceptance		Total
	No	Yes	
Announced changes			
No	23.53	19.61	43.14
Yes	3.92	52.94	56.86
Total	27.45	72.55	100.00

Own representation ($n = 51$)

(over 70%) (see Table 4). Traffic and infrastructure authorities` acceptance is especially high when auditors criticize fundamental rules and procedures that lie outside of the public administrations' purview [94]. The same applies when controlling deficits are identified regarding insufficient human resources and capacities in public authorities. Many of these problems occur because administrative capacities are weak. Capacity increase would be in the interest of public authorities [95–99].

However, we still see relatively high degrees of resistance against adaptation and learning from the audit reports: In 30% of the cases, authorities reject the critique outright. In almost half of all cases and even in 21% of the instances in which they accept the auditors' verdict, the authorities do not indicate changes in their project controlling. Behavioral persistence is especially common when contracts with private parties (e.g., facility management) are touched [59, 100]. Administrative-internal blockades or vacancies of responsible functionaries also cause problems with public task fulfillment [101]. In some cases, the public administrators point to "administrative traditions", i.e., informal organizational rules and bureaucratic practices that might oppose learning attempts [102].

Multi-level issues While multi-level problems raised by the courts of auditors provoke comparably high nominal acceptance by German infrastructure authorities (71%), more than half of all cases and a quarter of the cases in which critique is accepted do not result in a willingness to change project parameters or remedy the situation (see Table 5). They do signal corrections in cases in which other territorial authorities received unjustified payments [103]. The Federal Court of Auditors consistently prompts the responsible Federal Republic Ministries to reclaim such erroneous transactions; the audits thus prevented several malinvestments [104–106]. However, in cases where infrastructure projects had already been fully implemented, the authorities seldom recalled already distributed payments [107].

Table 5 Public authority reactions to auditors criticizing multi-level problems (in percent)

	(Partial) acceptance		Total
	No	Yes	
Announced changes			
No	28.95	23.68	52.63
Yes	0.00	47.37	47.37
Total	28.95	71.05	100.00

Own representation ($n = 188$)

Discussion

The public courts of auditors in Germany identified various problems regarding the planning, construction and maintenance of traffic and transport infrastructure. While traffic and transport infrastructure authorities are responsible for planning, tender procedures and the management and controlling of infrastructure project implementation they cannot always ensure a correct or economically feasible project deployment. The insufficiencies in infrastructure planning and project deployment, which we identified in this contribution, point at administrative deficits. However, the steadily increasing number of rules that regulate infrastructure provision depend on massive capabilities in public administrations that stretch their organizational capacities, human resources, and available competences.

The reduced economic feasibility of infrastructure project implementation is one possible result, which is further elevated by the high number of cases where respective economic analyses are missing altogether. Accordingly, public audit offices regularly stress the need to establish a more austere spending mentality: "Analyze first, invest second" [108, 109].

Our analysis has shown that German transport and traffic infrastructure authorities are not (yet) well equipped for efficient, technical, and economic sound controlling measures that are tailored to individual transport traffic infrastructure projects. While some researchers stress the "boundless incompetence" [110] of public project management in transport infrastructure projects, our analysis also found best practice models for infrastructure project management and controlling: The Federal State of Hamburg reacted, i.e., to criticism by state audits by establishing improved guidelines for traffic infrastructure construction and maintenance projects, by harmonizing all relevant data and making it available to all responsible authorities [111]. The municipality and state of Berlin also reacted by announcing stricter and binding investment guidelines for the road traffic network renovation and maintenance works [112].

The quality and quantity of the identified complaints by public audit offices nonetheless strongly indicates that German authorities are neither conceptually nor organizationally well equipped to adequately react to increasingly complex questions of mobility and transport infrastructure futures. This becomes in our opinion visible when we analyze the German public administrations´ patterns of reaction and adaptation to audit critique to traffic and transport infrastructure construction and maintenance projects. While a (slight) majority of defendants consent to the auditors' "findings" and are announcing corrections (see Fig. 2), the latter are mostly small-scale adjustments without touching deeper

bureaucratic structures that caused the complained deficits [46, 113].

Besides the (often symbolic) signals of adjustment, about 30% of the complaints are rejected by the defendants, but 8% of the rejected complaints are still met by promises regarding at least partial corrections soon. In an additional 19% of cases, responsible authorities accept the public audit's critique, but do not offer contingent avenues of adjustment.

There could be serval reasons contributing to the results: individual and organizational blame avoidance and learning resistance as well as reform averse ritualized patterns of action and discourse practices in the responsible authorities might contribute to these findings [114]. Moreover, a more reform-oriented climate in traffic and transport infrastructure bureaucracies can only be established if met by pressure and support from the relevant political actors. The German Federal Government declared its intent to accelerate public infrastructure construction projects, to streamline organizational processes in bureaucracy and to simplify the legal and regulatory framework. But it remains to be seen if alone this "show of political will" is sufficient [115]. The frequency of reoccurring planning and infrastructure project implementation deficits could still point at learning-averse organizational environments in bureaucracies and intentional persistence of not sufficiently effective infrastructure project management and controlling routines [116]. The public administration's large aversion to correct their project management and controlling practices goes hand in hand with the insufficient enforcement capacities and the mandate of public courts of auditors to address the respective deficits in Germany.

Conclusions

Without adequate sustainable traffic and transport infrastructure provision, the European and German agenda to transform the mobility and transport area is expected to be delayed. Public transport is prospected to stay inefficient and to still lose attractiveness at least outside of already well-equipped urban areas. Our analysis of public audit reports identified common problem fields and shortcomings in the public traffic infrastructure provision in Germany which can be problematic for a smooth implementation of the *Verkehrswende*. We also provide evidence of limited learning as well as resistance of administrations to implement changes responding to the auditors' verdicts.

Some of the outlined difficulties might be out of the administrations' hands: Traffic and transport infrastructure planning and project implementation measures are highly individualized and subject to a plethora of unique political, geographical and (socio-)technical specifications which cannot be solved by one-size-fits-all approaches [117–120]. The quasi-unique features of many projects make it hard to foresee all possible technical, let alone potential political and societal default lines [121–123].

Moreover, the long project implementation horizon and the expected life cycles of public infrastructure investments lead to inflexibility: planning can often only fail to include reliable data or projections of future mobility patterns and transport demand trends. Lee [124] grouped planning and implementation problems into several major categories: changes in scope, delays during construction, unreasonable demand estimation and adjustment of project costs, and no practical use of the earned value management system. Studies by Flyvbjerg et al. [116] indicate that infrastructure provision failures are connected to the deficits in organizational structures as well as inadequate decision-making and planning processes. Consequently, infrastructure project managers deliberately underestimate costs to make projects financial planning look more attractive and thereby increase the chance of being selected in a tender. Various studies addressed different factors, such as lack of coordination, long-term financial commitment, discipline, inner-organizational and political pressure as well as asymmetric information [125–127].

Additionally, public authorities are not exclusively governing actors in infrastructure provision but are confronted by demands and interests of multiple actor groups, economic interest groups, local and regional citizen assemblies and various economic lobbyist groups including environmental activists with often contradicting expectations. Sustainable mobility and transport systems planning, and provision of traffic and transport infrastructure thus needs modern public management capabilities as well as clear-cut accountabilities and responsibilities. The political dimension of planning and implementation of infrastructure projects remains, however, absent in public audit reports. Shortcomings that face criticism by the auditors might be caused by necessary compromises between public administration and the manifold of economic and civil society actor groups.

Other possible hindrances to support sustainable transport infrastructure planning and project implementation are located in the bureaucratic rationales of current mobility and transport infrastructure policies. Despite vast societal impacts and unique requirements of many infrastructure projects, which would need special consideration, legal scrutiny generally binds administrative coordination capacities and personnel. The actual controlling of ongoing infrastructure project *deployment* processes then lacks organizational

capacities and human competences. This situation is referred to as lock-in effect at the decision-making level.

These deficiencies call for reforms to enhance capacities of many vital nodes in the political and administrative system as well as in the public procurement process. We discovered another crucial problem in the control of traffic and transport infrastructure provision: the willingness to correct shortcomings that were identified by the auditors. Our analysis shows evidence of learning deficiencies of responsible authorities as we witnessed a significant lack of signals of learning and adaptive behavior even when critique deriving from public audits was acknowledged by other public administration actors. Our data from public audit reports can, however, be only a first step to analyzing learning and adaptation in this area.

We used thematic categories of complaints, problems or deficits identified in the annual reports of public audit offices. Our manual analysis fills a blank space in the data available on traffic infrastructure procurement in Germany, but should influence future computer-assisted semi-automated content analyses to increase the scope and data sphere in the scientific discussion of the matter. Such studies may serve as a yardstick to compare respective bureaucratic practices in Germany with other countries and European regions.

Future research could also include surveys in courts of audits as well as qualitative data from inside the public administration and traffic and transport infrastructure authorities to better identify patterns and processes of organizational learning and institutional adaptation measures in such bureaucracies. Further research is also necessary to determine the causes of the administrative defiance which we identified.

The plethora of European, national, and state (Länder) legal and regulatory mandates in the European multi-level governance system reduce the margin for maneuver of all involved public policy actors and public administration parties. As stakeholders from all levels of this multi-level system show increased commitment to a sustainable transition in the mobility and transport area, they should work together to streamline and reduce the complexity of the legal framework to traffic and transport infrastructure planning, project deployment and implementation.

Acknowledgements
We are thankful to the two anonymous reviewers for their excellent suggestions as well as to the organizers and participants of the workshop "Renaissance der Verkehrspolitik" at Bielefeld University (18-19 March 2021), supported by the German Political Science Association's Section on Policy Analysis and Administrative Science as well as the Working Group on Politics, Science and Technology, for the fruitful discussions and helpful suggestions on previous versions of this contribution. We are also indebted to Katharina Nicolai for her extremely valuable notes and lectorate.

Author contributions
All authors made substantial contributions to all steps of the production of this manuscript. All authors read and approved the final manuscript.

Funding
Open Access funding enabled and organized by Projekt DEAL.

Availability of data and materials
The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate
Not applicable.

Consent for publication
Not applicable.

Competing interests
The authors declare that they have no competing interests.

Author details
[1]Institute of Political Science, Friedrich-Alexander-Universität Erlangen-Nürnberg, Kochstraße 4, 91054 Erlangen, Germany. [2]Institute of Political Science, Technische Universität Dresden, Bergstraße 53, 01069 Dresden, Germany.

Received: 30 December 2021 Accepted: 22 February 2023
Published online: 09 March 2023

References

1. Topp HH (2006) Trends, innovative Weichenstellungen und Hebel für Mobilität und Verkehr—von 2030 aus gesehen. Technikfolgenabschätzung Theorie und Praxis 15:12–20
2. Canzler W, Knie A (2011) Einfach aufladen: Mit Elektromobilität in eine saubere Zukunft. Oekom, München
3. Becker UJ (2018) Verkehr und Umwelt: Zu den übergeordneten Zielen der Verkehrspolitik und zur Bedeutung von Umweltaspekten. In: Schwedes O (ed) Verkehrspolitik: Eine interdisziplinäre Einführung, 2nd edn. Springer Fachmedien Wiesbaden, Wiesbaden, pp 71–88
4. Rammler S (2016) Nachhaltige Mobilität: Gestaltungsszenarien und Zukunftsbilder. In: Schwedes O, Canzler W, Knie A (eds) Handbuch Verkehrspolitik, 2nd edn. Springer Fachmedien Wiesbaden, Wiesbaden, pp 899–917
5. European Commission (2021) Mobility strategy: a fundamental transport transformation: Commission presents its plan for green, smart and affordable mobility. https://ec.europa.eu/transport/themes/mobilitystrategy_en. Accessed 16 Jun 2022
6. European Commission (2021) Sustainable transport: what do we want to achieve? https://ec.europa.eu/transport/themes/sustainable_en. Accessed 16 Jun 2022
7. Die Bundesregierung (2016) Deutsche Nachhaltigkeitsstrategie: Neuauflage 2016. https://www.bundesregierung.de/resource/blob/975292/730844/3d30c6c2875a9a08d364620ab7916af6/deutsche-nachhaltigkeitsstrategie-neuauflage-2016-download-bpa-data.pdf?download=1. Accessed 16 Jun 2022
8. Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (2014) Background paper: Climate Action Programme 2020. https://www.bmu.de/fileadmin/Daten_BMU/Download_PDF/Aktionsprogramm_Klimaschutz/aktionsprogramm_klimaschutz_2020_hintergrund_en_bf.pdf. Accessed 4 Oct 2021. Here: 3
9. Federal Ministry for Digital and Transport (2022). Elektromobilität mit Batterie. Förderrichtlinie Elektromobilität. https://www.bmvi.de/DE/Themen/Mobilitaet/Elektromobilitaet/Elektromobilitaet-mit-batterie/elektromobilitaet-mit-batterie.html. Accessed 16 Jun 2022

10. Bundesministerium für Verkehr und digitale Infrastruktur (2020) Bericht des BMVI zur Nachhaltigkeit 2020: Bericht des Bundesministeriums für Verkehr und digitale Infrastruktur über seine Aktivitäten im Sinne der Deutschen Nachhaltigkeitsstrategie, Bonn. https://www.bundesregierung.de/resource/blob/998006/1768596/affdc9026b6a435939049d06cf6ee7e6/bmvi-bericht-nachhaltigkeit-2020-data.pdf?download=1. Accessed 16 Jun 2022
11. Hochfeld C, Jung A, Klein-Hitpaß A, Maier U, Meyer K, Vorholz F (2017) Mit der Verkehrswende die Mobilität von morgen sichern: 12 Thesen zur Verkehrswende. https://www.agora-verkehrswende.de/12-thesen/. Accessed 16 Jun 2022
12. Gütter R, Hilgenberg J, Kaas Elias A, Lembke S, Müller-Zetzsche F, Nüsse V, Osswald L, Rieger D, Rußmann J, Verspoh I (2021) Wie wir das Klima schützen und eine sozial gerechte Mobilitätswende umsetzen können, Berlin. https://www.stiftung-mercator.de/content/uploads/2021/04/Buendnis-sozialvertraegliche-Mobilitaetswende_Broschuere_digital_Einzelseiten.pdf. Accessed 16 Jun 2022
13. Canzler W, Radtke J (2019) Der Weg ist das Ziel: Verkehrswende als Kulturwende: Oder: Zur schwierigen Entwöhnung vom Auto. Aus Politik Zeitgeschichte 69:33–38
14. Hendzlik M, Lange M, Burger A, Dziekan K, Fechter A, Frey K, Lambrecht M, Mönch L, Schmied M (2019) Kein Grund zur Lücke: So erreicht Deutschland seine Klimaschutzziele im Verkehrssektor für das Jahr 2030. https://www.umweltbundesamt.de/sites/default/files/medien/1410/publikationen/19-12-03_uba_pos_kein_grund_zur_lucke_bf_0.pdf. Accessed 16 Jun 2022. Here: 6
15. Greenpeace eV (2017) Verkehrswende für Deutschland: Der Weg zu CO2-freier Mobilität bis 2035: Kurzfassung. https://www.greenpeace.de/sites/www.greenpeace.de/files/publications/20170830-greenpeace-kursbuch-mobilitaet-kurzfassung.pdf.pdf. Accessed 16 Jun 2022
16. Institut der deutschen Wirtschaft Köln (2021) Infrastruktur zwischen Standortvorteil und Investitionsbedarf, Köln. https://de-1statista-1com-1000119qk02a6.han.ub.fau.de/statistik/studie/id/20145/dokument/studie-zur-infrastruktur-deutschland-2014/. Accessed 16 Jun 2022
17. Seibt C (2016) Mobilität, Verkehr, Globalisierung und Klimapolitik. In: Bergmann G, Daub J (eds) Alternative Mobilität? - Möglichkeiten neuer Wege in der Automobilgesellschaft. LIT, Berlin, Münster, pp 2–12
18. Moe TM (1984) The new economics of organization. Am J Polit Sci 28:739–777. https://doi.org/10.2307/2110997
19. Seyfried M (2011) Noch immer „Stiefkind der Sozialwissenschaften"?: Ein Plädoyer für mehr politikwissenschaftliche Forschung über Rechnungshöfe. Z Parlamentsfragen 42:537–549
20. Seyfried M (2018) Rechnungshöfe. In: Voigt R (ed) Handbuch Staat. Springer, Wiesbaden, pp 845–855
21. Geißler R (2013) Neue Steuerungsinstrumente in den Landesverwaltungen: kritische Beobachtungen der Landesrechnungshöfe. Der Modern Staat Dms Z Public Policy Recht Manage 6:485–506
22. Glatfeld M (1997) Die Auswirkungen effizienzsteigernder Massnahmen in der öffentlichen Verwaltung unter besonderer Berücksichtigung von Ausgliederungen bzw. Privatisierungen auf die Arbeit der Rechnungshöfe. Dissertation, Technische Universität Darmstadt. Here: 46
23. Ritter J, Gründer K, Gabriel G (2007) Historisches Wörterbuch der Philosophie: 1971–2001. Schwabe, Basel. Here: 704
24. Faus R, Mannewitz T, Storks S, Unzicker K, Vollmann E (2019) Schwindendes Vertrauen in Politik und Parteien: Eine Gefahr für den gesellschaftlichen Zusammenhalt? https://www.bertelsmann-stiftung.de/de/publikationen/publikation/did/schwindendes-vertrauen-in-politik-und-parteien/. Accessed 16 Jun 2022
25. Faus J, Hartl M, Unzicker K, Bertelsmann Stiftung (2020) 30 Jahre deutsche Einheit: Gesellschaftlicher Zusammenhalt im vereinten Deutschland, Gütersloh. https://www.bertelsmann-stiftung.de/de/publikationen/publikation/did/30-jahre-deutsche-einheit-all. Accessed 16 Jun 2022
26. Früh W (2007) Inhaltsanalyse: Theorie und Praxis, 6th edn. UTB. UVK-Verl.-Ges, Konstanz. Here: 20ff
27. Mayring P (2001) Combination and integration of qualitative and quantitative analysis. Forum Qualitat Sozialforschung Soc Res 2. https://doi.org/10.17169/fqs-2.1.967
28. Neuendorf KA (2002) The content analysis guidebook. Sage Publications, Thousand Oaks
29. Krippendorff K (2013) Content analysis: an introduction to its methodology, 3rd edn. Sage Publications, Thousand Oaks
30. Bundesrechnungshof (2011) Bemerkungen 2011 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/SharedDocs/Downloads/DE/Berichte/2011/bemerkungen-2011-volltext.pdf?__blob=publicationFile&v=1. Accessed 16 Jun 2022. Here: 26
31. Bayerischer Oberster Rechnungshof (2006) Jahresbericht 2006, München. https://www.orh.bayern.de/media/com_form2content/documents/c6/a325/f36/JB-Zusammenfassung2006.pdf. Accessed 19 Aug 2020. Here: 101ff
32. Bundesrechnungshof (2013) Bemerkungen 2013 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/1-archiv/2013/inhalt/2013-bemerkungen-gesamtbericht-pdf. Accessed 16 Jun 2022. Here: 229
33. Landesrechnungshof Nordrhein-Westfalen (2006) Jahresbericht 2006 des Landesrechnungshofs Nordrhein-Westfalen über das Ergebnis der Prüfungen im Geschäftsjahr 2005, Düsseldorf. https://lrh.nrw.de/images/LRHNRW/Jahresbericht/LRH_NRW_Jahresbericht_2006.pdf. Accessed 16 Jun 2022. Here: 305
34. Bundesrechnungshof (2015) Bemerkungen 2015 zur Haushalts- und Wirtschaftsführung des Bundes. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2015/inhalt/2015-bemerkungen-gesamtbericht-pdf/@@download/file. Accessed 16 Jun 2022. Here: 209
35. Bundesrechnungshof (2018) Bemerkungen 2018 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2018/inhalt/2018-bemerkungen-gesamtbericht-pdf. Accessed 16 June 2022. Here: 236
36. Sächsischer Rechnungshof (2013) Wir prüfen für Sachsen. Unabhängig, kompetent, nachhaltig. Jahresbericht 2013: Band I: Haushaltsplan, Haushaltsvollzug und Haushaltsrechnung, Staatsverwaltung, Leipzig. https://www.rechnungshof.sachsen.de/jb2013/JB2013-Band_I.pdf. Accessed 16 Jun 2022. Here: 135
37. Bayerischer Oberster Rechnungshof (2018) Jahresbericht 2018. https://www.orh.bayern.de/media/com_form2content/documents/c6/a581/f36/ORH-Bericht%202018.pdf. Accessed 16 June 2022. Here: 99
38. Landesrechnungshof Mecklenburg-Vorpommern (2013) Jahresbericht 2013: Teil 1: Kommunalfinanzbericht, Schwerin. https://www.lrh-mv.de/static/LRH/Dateien/Jahresberichte/KFB_2013.pdf. Accessed 16 Jun 2022. Here: 85
39. Sächsischer Rechnungshof (2017) Jahresbericht 2017: Wir prüfen für Sachsen. Unabhängig, kompetent, nachhaltig. https://www.rechnungshof.sachsen.de/JB2017-Band_I.pdf. Accessed 16 Jun 2022. Here: 153
40. Bundesrechnungshof (2018) Bemerkungen 2018 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2018/inhalt/2018-bemerkungen-gesamtbericht-pdf. Accessed 16 Jun 2022. Here: 224
41. Bundesrechnungshof (2003) Bemerkungen 2003 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/1-archiv/2003-bemerkungen-gesamtbericht-pdf. Accessed 16 Jun 2022. Here: 21
42. Sächsischer Rechnungshof (2011) Wir prüfen für Sachsen. Unabhängig, kompetent, nachhaltig.: Jahresbericht 2011, Leipzig. https://www.rechnungshof.sachsen.de/JB2011-Band_I.pdf. Accessed 16 Jun 2022. Here: 137
43. Landesrechnungshof Nordrhein-Westfalen (2016) Jahresbericht 2016: Über das Ergebnis der Prüfungen im Geschäftsjahr 2015, Düsseldorf. https://lrh.nrw.de/index.php/veroeffentlichungen/jahresberichte/jahresberichte-archiv. Accessed 16 Jun 2022. Here: 142
44. Rechnungshof der Freien und Hansestadt Hamburg (2007) Jahresbericht 2007 über die Prüfung der Haushalts- und Wirtschaftsführung der Freien und Hansestadt Hamburg mit Bemerkungen zur Haushaltsrechnung 2005, Hamburg. https://www.hamburg.de/conte

ntblob/255924/ff8b0830c301d70418f8b0c456b9cd94/data/jahresbericht-2007.pdf. Accessed 16 June 2022. Here: 120
45. Bundesrechnungshof (2019) Der Bundesrechnungshof. https://www.bundesrechnungshof.de/de/ueber-uns/informationsbroschuere/informationbroschuere-der-bundesrechnungshof. Accessed 25 Feb 2021
46. Winkelmann T (2018) Defizite bei der Bereitstellung öffentlicher Infrastrukturen im Lichte der Rechnungshofberichte. Der Moderne Staat 11:23–53. https://doi.org/10.3224/dms.v11i1.05.Here:23ff
47. Klatt JP (2011) Eine institutionenökonomische Analyse von Finanzierungslösungen für die Bundesfernstraßen. Nomos, Baden-Baden. Here: 70f
48. Heudorf F (2006) Erfolgsfaktoren für die Konzeption, Ausschreibung und Vergabe von PPP-Projekten. In: Racky P (ed) Innovative Abwicklungsformen für Bauprojekte: Partnering und PPP. Kassel Univ. Press, Kassel, pp 21–44. Here: 26f
49. Jacob D (2003) Erstellung eines Gerüsts für einen Public Sector Comparator bei 4 Pilotprojekten im Schulbereich: Forschungsendbericht Stand: 23.07.2003, Freiberg. Here: 55ff
50. Lederer M (2007) Die eigentlichen Projektverträge. In: Kapellmann KD, Bönker C (eds) Juristisches Projektmanagement, 2nd edn. Werner, Köln, pp 250–293. Here: 258ff
51. Bundesrechnungshof (2018) Pressemitteilung: Bemerkungen 2018 des Bundesrechnungshofes. Nachhaltige finanzwirtschaftliche Strategie für den Bundeshaushalt notwendig. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2018/rede-pressemitteilung/2018-pressemitteilung-12-bemerkungen-2018-1. Accessed 27 Feb 2021. Here: 224ff
52. Rechnungshof der Freien und Hansestadt Hamburg (2010) Jahresbericht 2010 über die Prüfung der Haushalts- und Wirtschaftsführung der Freien und Hansestadt Hamburg mit Bemerkungen zur Haushaltsrechnung 2008, Hamburg. https://www.hamburg.de/contentblob/2063042/b01b2beacbacacc0784436c0f78eabf3/data/jahresbericht-2010.pdf. Accessed 19 Aug 2020. Here: 138ff
53. Schulz S (2020) Jahresbericht 2020. Pressekonferenz am 03.02.2020.: Rede des Präsidenten zum Jahresbericht 2020., Hamburg. https://www.hamburg.de/contentblob/13546398/554cc0e34aa0025a9d9ad327b2905d4a/data/jahresbericht-2020-rede.pdf. Accessed 24 Feb 2021
54. Bundesrechnungshof (2006) Bemerkungen 2006 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/1-archiv/2006-bemerkungen-gesamtbericht-pdf/view. Accessed 19 Aug 2020. Here: 149ff
55. Rechnungshof der Freien und Hansestadt Hamburg (2007) Jahresbericht 2007 über die Prüfung der Haushalts- und Wirtschaftsführung der Freien und Hansestadt Hamburg mit Bemerkungen zur Haushaltsrechnung 2005, Hamburg. https://www.hamburg.de/contentblob/255924/ff8b0830c301d70418f8b0c456b9cd94/data/jahresbericht-2007.pdf. Accessed 19 August 2020. Here: 172ff
56. Bayerischer Oberster Rechnungshof (2007) Jahresbericht 2007. https://www.orh.bayern.de/media/com_form2content/documents/c6/a324/f36/JB%202007.pdf. Accessed 5 May 2022. Here: 98ff
57. Bayerischer Oberster Rechnungshof (2019) Jahresbericht 2019. https://www.orh.bayern.de/media/com_form2content/documents/c6/a664/f36/ORH-Bericht_2019.pdf. Accessed 14 Dec 2021. Here: 106ff
58. Bayerischer Oberster Rechnungshof (2019) Jahresbericht 2019. https://www.orh.bayern.de/media/com_form2content/documents/c6/a664/f36/ORH-Bericht_2019.pdf. Accessed 14 December 2021. Here: 114
59. Bayerischer Oberster Rechnungshof (2013) Jahresbericht 2013. https://www.orh.bayern.de/media/com_form2content/documents/c6/a318/f36/JB_2013.pdf. Accessed 14 Dec 2021. Here: 101ff
60. Bundesrechnungshof (2014) Bemerkungen 2014 zur Haushalts- und Wirtschaftsführung des Bundes. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/archiv/2014/inhalt/2014-bemerkungen-gesamtbericht-pdf/@@download/file. Accessed 5 May 2022. Here: 239ff
61. Sächsischer Rechnungshof (2017) Jahresbericht 2017: Wir prüfen für Sachsen. Unabhängig, kompetent, nachhaltig. https://www.rechnungshof.sachsen.de/JB2017-Band_I.pdf. Accessed 14 Dec 2021. Here: 153ff
62. Kyrer A (1972) Effizienz und staatliche Aktivität. Macroeconomica, vol 2. Braumüller, Wien
63. Derlien H-U (1974) Theoretische und methodische Probleme der Beurteilung organisatorischer Effizienz der öffentlichen Verwaltung. Die Verwaltung 7:1–22
64. Winkelmann T (2012) Public Private Partnership: auf der Suche nach Substanz: Eine Effizienzanalyse alternativer Beschaffungsformen auf kommunaler Ebene. Nomos, Baden-Baden. Here: 238ff
65. Mühlenkamp H (2003) Zum grundlegenden Verständnis einer Ökonomisierung des öffentlichen Sektors: Die Sicht eines Ökonomen. In: Harms J, Reichard C, Ambrosius G (eds) Die Ökonomisierung des öffentlichen Sektors: Instrumente und Trends. Nomos Verl.-Ges, Baden-Baden, pp 47–73. Here: 70
66. Bundesrechnungshof (2018) Bemerkungen 2018 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2018/inhalt/2018-bemerkungen-gesamtbericht-pdf. Accessed 19 Aug 2020. Here: 236ff
67. Rechnungshof der Freien und Hansestadt Hamburg (Ed.) (2017): Jahresbericht 2017 über die Prüfung der Haushalts- und Wirtschaftsführung der Freien und Hansestadt Hamburg einschließlich der Haushalts- und Konzernrechnung 2015. Hamburg. Available online at https://www.hamburg.de/contentblob/8090576/2970426e09d270ced71efcfb6aaef74a/data/jahresbericht-2017.pdf, checked on 8/19/2020. Here: 132ff
68. Bundesrechnungshof (2017) Bemerkungen 2017 zur Haushalts- und Wirtschaftsführung des Bundes: Ergänzungsband. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2017-ergaenzungsband/inhalt/2017-bemerkungen-ergaenzungsband-gesamtbericht-pdf/@@download/file. Accessed 5 May 2022. Here: 280ff
69. Rechnungshof von Berlin Jahresbericht 2018, Berlin. https://www.berlin.de/rechnungshof/aktuelles/veroeffentlichungen/artikel.357519.php. Accessed 14 Dec 2020. 296ff
70. Rechnungshof von Berlin (2008) Jahresbericht 2008. https://www.berlin.de/rechnungshof/aktuelles/veroeffentlichungen/artikel.357033.php. Accessed 11 Dec 2019. Here: 145ff
71. Rechnungshof von Berlin (2006) Jahresbericht 2006, Berlin. https://www.berlin.de/rechnungshof/aktuelles/veroeffentlichungen/artikel.357033.php. Accessed 11 Dec 2019. 192ff
72. Sächsischer Rechnungshof (2016) Wir prüfen für Sachsen. Unabhängig, kompetent, nachhaltig. Jahresbericht 2016: Band II: Kommunalfinanzen, Ergebnisse der überörtlichen Kommunalprüfung, Leipzig. https://www.rechnungshof.sachsen.de/JB2016_Band_II.pdf. Accessed 19 Aug 2020. Here: 105ff
73. Pfeifer A (1991) Möglichkeiten und Grenzen der Steuerung kommunaler Aktiengesellschaften durch ihre Gebietskörperschaften. Zugl.: Heidelberg, Univ., Diss., 1990. Rechtswissenschaftliche Forschung und Entwicklung, vol 306. VVF, München. Here: 13
74. Schmidt-Aßmann E, Ulmer P (1988) Die Berichterstattung von Aufsichtsratsmitgliedern einer Gebietskörperschaft nach § 394 AktG: eine aktien- und kommunalrechtliche Untersuchung ihrer Voraussetzungen und Schranken unter besonderer Berücksichtigung des nordrhein-westfälischen Gemeinderechts. Betriebs-Berater, vol 13. Verl-Ges. "Recht und Wirtschaft", Heidelberg. Here: 13
75. Bayerischer Oberster Rechnungshof (2018) Jahresbericht 2018. https://www.orh.bayern.de/media/com_form2content/documents/c6/a581/f36/ORH-Bericht%202018.pdf. Accessed 14 December 2018. Here: 99ff
76. Bundesrechnungshof (2012) Bemerkungen 2012 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/archiv/2012/2012-bemerkungen-gesamtbericht-pdf/@@download/file. Accessed 5 May 2022. Here: 239ff
77. Stüer B (2009) Handbuch des Bau- und Fachplanungsrechts: Planung - Genehmigung - Rechtsschutz, 4th edn. Beck, München
78. Bielenberg W, Runkel P, Spannowsky W, Reitzig F, Schmitz H (2010) Raumordnungs-und Landesplanungsrechtdes Bundes und der Länder
79. Scheller H, Walker B (2017) Municipal infrastructure policies in the federal republic—in between growing disparities and losing political autonomy? Eur Policy Anal 3:343–371
80. Sturm R (2012) Föderalismus, Effizienz und „Einheitlichkeit" der Lebensverhältnisse. Gesellschaft, Wirtschaft, Politik 61:231–236. Here: 231ff

81. Sturm R (2013) Der deutsche Föderalismus - nur noch ein Ärgernis? In: Gallus A, Schubert T, Thieme T (eds) Deutsche Kontroversen: Festschrift für Eckhard Jesse. Nomos, Baden-Baden, pp 297–308. Here: 297ff
82. Bundesrechnungshof (2015) Bemerkungen 2015 zur Haushalts- und Wirtschaftsführung des Bundes. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2015/inhalt/2015-bemerkungen-gesamtbericht-pdf/@@download/file. Accessed 5 May 2022. Here: 209ff
83. Bundesrechnungshof (2013) Bemerkungen 2013 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/1-archiv/2013/inhalt/2013-bemerkungen-gesamtbericht-pdf. Accessed 14 Dec 2021. Here: 232ff
84. Bundesrechnungshof (2011) Bemerkungen 2011 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/SharedDocs/Downloads/DE/Berichte/2011/bemerkungen-2011-volltext.pdf?__blob=publicationFile&v=1. Accessed 16 June 2022. Here: 232ff
85. Bundesrechnungshof (2016) Bemerkungen 2016 Band I zur Haushalts- und Wirtschaftsführung des Bundes: Teilband 2 von 3 Einzelplanbezogene Entwicklung und Prüfungsergebnisse. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2016/inhalt/2016-bemerkungen-band-i-teilband-2/@@download/file. Accessed 5 May 2022. Here: 368ff
86. Bundesrechnungshof (2011) Bemerkungen 2011 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/SharedDocs/Downloads/DE/Berichte/2011/bemerkungen-2011-volltext.pdf?__blob=publicationFile&v=1. Accessed 16 Jun 2022. Here: 228ff
87. Bundesrechnungshof (2019) Bemerkungen 2019 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/SharedDocs/Downloads/DE/Berichte/2019/bemerkungen-2019-volltext.pdf?__blob=publicationFile&v=1. Accessed 30 Dec 2022. Here: 234ff
88. Rechnungshof der Freien und Hansestadt Hamburg (Ed.) (2016): Jahresbericht 2016 über die Prüfung der Haushalts- und Wirtschaftsführung der Freien und Hansestadt Hamburg mit Bemerkungen zur Haushaltsrechnung 2014. Hamburg. Available online at https://www.hamburg.de/contentblob/5038644/3bd40d7729b400d19e5facc2a8f09c8b/data/jahresbericht-2016.pdf, checked on 8/19/2020. Here: 111ff
89. Bundesrechnungshof (2008) Bemerkungen 2008 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/1-archiv/2008/2008-bemerkungen-gesamtbericht-pdf. Accessed 14 Dec 2021. Here: 101ff
90. Bundesrechnungshof (2017) Bemerkungen 2017 zur Haushalts- und Wirtschaftsführung des Bundes: Ergänzungsband. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2017-ergaenzungsband/inhalt/2017-bemerkungen-ergaenzungsband-gesamtbericht-pdf/@@download/file. Accessed 5 May 2022. Here: 37
91. Bundesrechnungshof (2016) Bemerkungen 2016 Band I zur Haushalts- und Wirtschaftsführung des Bundes: Teilband 2 von 3 Einzelplanbezogene Entwicklung und Prüfungsergebnisse. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2016/inhalt/2016-bemerkungen-band-i-teilband-2/@@download/file. Accessed 5 May 2022. Here: 426ff
92. Bundesrechnungshof (2016) Bemerkungen 2016 Band I zur Haushalts- und Wirtschaftsführung des Bundes: Teilband 2 von 3 Einzelplanbezogene Entwicklung und Prüfungsergebnisse. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2016/inhalt/2016-bemerkungen-band-i-teilband-2/@@download/file. Accessed 5 May 2022. Here: 2
93. Bundesrechnungshof (2017) Bemerkungen 2017 zur Haushalts- und Wirtschaftsführung des Bundes: Ergänzungsband. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2017-ergaenzungsband/inhalt/2017-bemerkungen-ergaenzungsband-gesamtbericht-pdf/@@download/file. Accessed 5 May 2022. Here: 255
94. Landesrechnungshof Nordrhein-Westfalen (2016) Jahresbericht 2016: Über das Ergebnis der Prüfungen im Geschäftsjahr 2015, Düsseldorf. https://lrh.nrw.de/index.php/veroeffentlichungen/jahresberichte/jahresberichte-archiv. Accessed 4 Dec 2019. Here: 156f
95. Rechnungshof von Berlin (2016) Jahresbericht 2016, Berlin. https://www.berlin.de/rechnungshof/aktuelles/veroeffentlichungen/artikel.357519.php. Accessed 19 Aug 2020. Here: 58
96. Rechnungshof der Freien und Hansestadt Hamburg (2017) Jahresbericht 2017 über die Prüfung der Haushalts- und Wirtschaftsführung der Freien und Hansestadt Hamburg einschließlich der Haushalts- und Konzernrechnung 2015, Hamburg. https://www.hamburg.de/contentblob/8090576/2970426e09d270ced71efcfb6aaef74a/data/jahresbericht-2017.pdf. Accessed 19 Aug 2020. Here: 155ff
97. Rechnungshof der Freien und Hansestadt Hamburg (2010) Jahresbericht 2010 über die Prüfung der Haushalts- und Wirtschaftsführung der Freien und Hansestadt Hamburg mit Bemerkungen zur Haushaltsrechnung 2008, Hamburg. https://www.hamburg.de/contentblob/2063042/b01b2beacbacacc0784436c0f78eabf3/data/jahresbericht-2010.pdf. Accessed 19 Aug 2020. Here: 134ff
98. Rechnungshof der Freien und Hansestadt Hamburg (2013) Jahresbericht 2013 über die Prüfung der Haushalts- und Wirtschaftsführung der Freien und Hansestadt Hamburg mit Bemerkungen zur Haushaltsrechnung 2011, Hamburg. https://www.hamburg.de/contentblob/3813658/d5aa15f5fd6cb26b71e9f30a2d274801/data/jahresbericht-2013.pdf. Accessed 19 Aug 2020. Here: 150ff
99. Rechnungshof der Freien und Hansestadt Hamburg (2011) Jahresbericht 2011 über die Prüfung der Haushalts- und Wirtschafts- führung der Freien und Hansestadt Hamburg mit Bemerkungen zur Haushaltsrechnung 2009, Hamburg. https://www.hamburg.de/contentblob/2780204/9634e728f3304c646a336ac27b164425/data/jahresbericht-2011.pdf. Accessed 14 Dec 2021. Here: 179ff
100. Bundesrechnungshof (2012) Bemerkungen 2012 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/archiv/2012/2012-bemerkungen-gesamtbericht-pdf/@@download/file. Accessed 5 May 2022. Here: 237f
101. Bundesrechnungshof (2018) Bemerkungen 2018 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2018/inhalt/2018-bemerkungen-gesamtbericht-pdf. Accessed 19 Aug 2020. Here: 224ff
102. Rechnungshof der Freien und Hansestadt Hamburg (2016) Jahresbericht 2016 über die Prüfung der Haushalts- und Wirtschaftsführung der Freien und Hansestadt Hamburg mit Bemerkungen zur Haushaltsrechnung 2014, Hamburg. https://www.hamburg.de/contentblob/5038644/3bd40d7729b400d19e5facc2a8f09c8b/data/jahresbericht-2016.pdf. Accessed 19 Aug 2020. Here: 111ff
103. Bundesrechnungshof (2011) Bemerkungen 2011 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/SharedDocs/Downloads/DE/Berichte/2011/bemerkungen-2011-volltext.pdf?__blob=publicationFile&v=1. Accessed 16 June 2022. Here: 228f. and 229f
104. Bundesrechnungshof (2011) Bemerkungen 2011 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/SharedDocs/Downloads/DE/Berichte/2011/bemerkungen-2011-volltext.pdf?__blob=publicationFile&v=1. Accessed 16 June 2022. Here:228f
105. Bundesrechnungshof (2008) Bemerkungen 2008 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/1-archiv/2008/2008-bemerkungen-gesamtbericht-pdf. Accessed 14 Dec 2021. Here: 160f
106. Bundesrechnungshof (2007) Bemerkungen 2007 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/1-archiv/2007/2007-bemerkungen-gesamtbericht-pdf. Accessed 19 Aug 2020. Here: 249ff
107. Bundesrechnungshof (2018) Bemerkungen 2018 zur Haushalts- und Wirtschaftsführung des Bundes, Bonn. https://www.bundesrechnungshof.de/de/veroeffentlichungen/produkte/bemerkungen-jahresberichte/jahresberichte/2018/inhalt/2018-bemerkungen-gesamtbericht-pdf. Accessed 19 Aug 2020

108. Hessischer Rechnungshof (2015) Bemerkungen 2014 Pressemitteilung: Erst analysieren, dann investieren -Wirtschaftlichkeitsuntersuchungen alternativlos bei Investitionsentscheidungen. https://rechnungshof.hessen.de/sites/rechnungshof.hessen.de/files/content-downloads/HRH_2014_Bemerkungen_PM.pdf. Accessed 24 Feb 2021
109. Sächsischer Rechnungshof (2010) Jahresbericht 2010: Rechnungshof des Freistaates Sachsen, Leipzig. https://www.rechnungshof.sachsen.de/jb2010/JB2010.pdf. Accessed 19 Aug 2020. Here: 26
110. Angermeier G (2015) Viel Kommission – wenig Reform?: Öffentliche Großbauprojekte: Erst planen, dann bauen! Projekt Magazin. Here: 4
111. Rechnungshof der Freien und Hansestadt Hamburg (2019) Jahresbericht 2019 über die Prüfung der Haushalts- und Wirtschaftsführung der Freien und Hansestadt Hamburg einschließlich der Haushalts- und Konzernrechnung 2017, Hamburg. https://www.hamburg.de/contentblob/10411270/5a7e743de2f615177a215b9eb17d7a89/data/jahresbericht-2018.pdf. Accessed 19 Aug 2020. Here: 108f
112. Rechnungshof von Berlin (2015) Jahresbericht 2015, Berlin. https://www.berlin.de/rechnungshof/aktuelles/veroeffentlichungen/artikel.357519.php. Accessed 19 August 2020. Here: 72ff
113. Gratz W (2011) Und sie bewegt sich doch: Entwicklungstendenzen in der Bundesverwaltung. Neuer Wissenschaftlicher Verl, Wien
114. Winkelmann T, Zimmermann J (2020) An der Sache vorbeigeplant?: Aktions- und Reaktionsmuster der deutschen Bauverwaltung im Lichte ausgewählter Rechnungshofberichte. Z Politik 67:389–417
115. Presse- und Informationsamt der Bundesregierung (2018) Ein neuer Aufbruch für Europa. Eine neue Dynamik für Deutschland. Ein neuer Zusammenhalt für unser Land: Koalitionsvertrag zwischen CDU, CSU und SPD. 19. Legislaturperiode. https://www.bundesregierung.de/resource/blob/656734/847984/5b8bc23590d4cb2892b31c987ad672b7/2018-03-14-koalitionsvertrag-data.pdf?download=1. Accessed 24 Feb 2021. Here: 75
116. Flyvbjerg B, SkamrisHolm MK, Buhl SL (2003) How common and how large are cost overruns in transport infrastructure projects? Transp Rev 23:71–88. https://doi.org/10.1080/01441640309904
117. Odeck J (2019) Variation in cost overruns of transportation projects: an econometric meta-regression analysis of studies reported in the literature. Transportation 46:1345–1368. https://doi.org/10.1007/s11116-017-9836-5
118. Cantarelli CC, Flybjerg B, Molin EJE, van Wee B (2010) Cost overruns in large-scale transportation infrastructure projects: explanations and their theoretical embeddedness. Eur J Transp Infrastruct Res 10:5–18
119. Ahiaga-Dagbui DD, Love PED, Smith SD, Ackermann F (2017) Toward a systemic view to cost overrun causation in infrastructure projects: a review and implications for research. Project Manage J PMJ 48:88–98
120. Budäus D (2013) Fehlentwicklungen bei öffentlichen Großprojekten: Ursachen und Maßnahmen zu deren Vermeidung unter Berücksichtigung des Projekts "Elbphilharmonie" und der öffentlichen Beschaffungsvariante PPP. Gutachterliche Stellungnahme. http://docplayer.org/20385954-Fehlentwicklungen-bei-oeffentlichen-grossprojekten.html. Accessed 24 Feb 2021
121. Roquette AJ (2007) Der Streit um des Kaisers Bart: Sind Bauzeitclaims noch justiziabel? In: Liebchen JH, Viering MG, Zanner C (eds) Baumanagement und Bauökonomie: Aktuelle Entwicklungen, 1st edn. Teubner, Wiesbaden, pp 305–315
122. Sturm R, Winkelmann T (2014) Contested Infrastructures: Citizen Protest and the Response of Political Parties in Germany. In: Cordenillo R, van der Staak S (eds) Political parties and citizen movements in Asia and Europe. International Institute for Democracy and Electoral Assistance (International IDEA), Stockholm, Sweden, pp 23–37
123. Kostka G, Anzinger N (2016) Large infrastructure projects in germany: a cross-sectoral analysis. In: Kostka G, Fiedler J (eds) Large infrastructure projects in Germany: between ambition and realities. Palgrave Macmillan, Switzerland, pp 15–38
124. Lee J-K (2008) Cost overrun and cause in Korean social overhead capital projects: roads, rails, airports, and ports. J Urban Plann Dev 134:59–62. https://doi.org/10.1061/(ASCE)0733-9488(2008)134:2(59)
125. Wachs M (1989) When planners lie with numbers. J Am Plann Assoc 55:476–479
126. Odeck J (2004) Cost overruns in road construction—what are their sizes and determinants? Transp Policy 11:43–53. https://doi.org/10.1016/S0967-070X(03)00017-9
127. Winkelmann T, Zimmermann J (2020) Die Planung von Schlaglöchern? Fehlermanagement der öffentlichen Hand im Bereich der materiellen Infrastrukturbereitstellung. Yearbook Swiss Administr Sci 11:196–217. https://doi.org/10.5334/ssas.150

Publisher's Note