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THEMATIC ARTICLE

Budget performance and governance in infrastructure project management: the case of Brazilian inland waterway transport

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Abstract

Project management increasingly focuses on delivering benefits, considering institutional complexity and global challenges. Inland waterway transport (IWT) projects appear in the Brazilian Nationally Determined Contribution following the Paris Agreement. However, Brazilian IWT projects remain underdeveloped, and waterway freight transport capacity is underutilized. There is a literature gap on the links between budget performance, policy, politics, and project management. In particular, we know little about the effects of the interactions between governance mechanisms and public budget execution on the procurement of waterway transport infrastructure projects in Brazil. This paper aims to assess Brazilian waterway infrastructure budgetary execution and governance arrangements to determine the influence of these factors on policy failures. We performed a qualitative analysis of policy plans and investments made between 2014 and 2020 through interviews and documental research to examine 109 waterway infrastructure projects. All respondents pointed out the lack of planning as an obstacle to waterway projects, and 74% reported budget shortness. Nevertheless, we found USD 43.2 million available in budgets that were never utilized. The inability to invest is a bigger obstacle for Brazilian waterway projects than budget insufficiency. We recommend an adaptive management approach to allocate investments, in which stakeholders learn together to implement more effective project strategies.

Keywords: Project management. Inland navigation. Sustainable transport. Transport planning.

Desempenho orçamentário e governança na gestão de projetos de infraestrutura: o caso do transporte hidroviário interior brasileiro

Resumo

A gestão de projetos se concentra cada vez mais na entrega de benefícios, considerando a complexidade institucional e os desafios globais. Os projetos de transporte hidroviário interior (THI) aparecem na Contribuição Nacionalmente Determinada do Brasil, seguindo o Acordo de Paris. No entanto, os projetos brasileiros de THI permanecem subdesenvolvidos e a capacidade de transporte hidroviário de carga é subutilizada. Há uma lacuna na literatura sobre as ligações entre desempenho orçamentário, política, política e gerenciamento de projetos. Em particular, sabemos pouco sobre os efeitos das interações entre mecanismos de governança e execução do orçamento público na contratação de projetos de infraestrutura de transporte aquaviário no Brasil. Este artigo tem como objetivo avaliar a execução orçamentária da infraestrutura hidroviária brasileira e os arranjos de governança para determinar a influência desses fatores nas falhas das políticas. Realizamos uma análise qualitativa dos planos de políticas e investimentos realizados entre 2014 e 2020, por meio de entrevistas e pesquisa documental, para examinar 109 projetos de infraestrutura hidroviária. Todos os entrevistados apontaram a falta de planejamento como um entrave aos projetos hidroviários, e 74% deles relataram déficit orçamentário. Apesar disso, encontramos US$ 43,2 milhões disponíveis nos orçamentos, mas nunca utilizados. A incapacidade de investir é, portanto, um obstáculo maior para os projetos hidroviários brasileiros do que a insuficiência orçamentário. Recomendamos uma abordagem de gestão adaptativa para alocar investimentos, na qual as partes interessadas aprendam juntas para implementar estratégias de projeto mais eficazes.

Palavras-chave: Gestão de projetos. Navegação interior. Transporte sustentável. Planejamento de transporte.

Desempeño presupuestario y gobernanza en la gestión de proyectos de infraestructura: el caso del transporte fluvial brasileño

Resumen

La gestión de proyectos se enfoca cada vez más en la entrega de beneficios, considerando la complejidad institucional y los desafíos globales. Los proyectos de transporte por vías navegables interiores aparecen en la Contribución Determinada a Nivel Nacional de Brasil, siguiendo el Acuerdo de París. Sin embargo, los proyectos brasileños de transporte por vías navegables interiores siguen estando subdesarrollados y la capacidad de transporte de carga por vía fluvial está subutilizada. Hay un vacío en la literatura sobre los vínculos entre el desempeño del presupuesto, la política, la política y la gestión de proyectos. En particular, sabemos poco sobre los efectos de las interacciones entre los mecanismos de gobernanza y la ejecución del presupuesto público en la contratación de proyectos de infraestructura de transporte fluvial en Brasil. Este documento tiene como objetivo evaluar la ejecución presupuestaria de la infraestructura de vías fluviales brasileñas y los arreglos de gobernanza para determinar la influencia de estos factores en las fallas de las políticas. Realizamos un análisis cualitativo de planes de políticas e inversiones realizadas entre 2014 y 2020, a través de entrevistas e investigación documental, para examinar 109 proyectos de infraestructura de vías navegables. Todos los encuestados señalaron la falta de planificación como un obstáculo para los proyectos de vías navegables, y el 74% de ellos informó escasez de presupuesto. Sin embargo, encontramos US$ 43,2 millones disponibles en los presupuestos, pero nunca utilizados. La incapacidad para invertir es, por lo tanto, un obstáculo mayor para los proyectos de hidrovías brasileñas que la insuficiencia presupuestaria. Recomendamos un enfoque de gestión adaptable para asignar inversiones, en el que las partes interesadas aprendan juntas para implementar estrategias de proyecto más efectivas.

Palabras clave: Gestión de proyectos. Navegación interior. Transporte sostenible. Planificación del transporte.

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INTRODUCTION

Different scholarly backgrounds, empirical settings and theoretical angles currently increase links between project and management research (Geraldi & Söderlund, 2018). Positive or optimistic bias and strategic misrepresentation cause a tendency for project planners and managers to forecast unrealistic schedules, costs, and benefits (Love, Sing, Ika, & Newton, 2019). Project management has grown from a narrow-minded time, cost, and quality approach to a focus on the delivery of benefits to users, considering context, institutional complexity, and global challenges, such as climate change (Ika, Söderlund, Munro, & Landoni, 2020). Therefore, economic dynamics and the governance environment are crucial to understanding transport infrastructure development plans, which impact policy goals (Catalão, Cruz, & Sarmento, 2019).

The collaboration between government and stakeholders to increase public acceptability, with a focus on environmental aspects, can foster successful transport infrastructure projects (Locatelli, Invernizzi, & Brookes, 2017). The transport sector is responsible for 15.9% of global carbon dioxide emissions (World Resources Institute [WRI], 2020). Therefore, sustainable transport is a cross-cutting theme in the 2030 Agenda for sustainable development, which recommends freight capacity increase and cost reduction (SLoCaT, 2019). Inland Waterway Transport (IWT) has better energy efficiency and lower levels of emissions, when compared to highways and railways (Paris Process on Mobility and Climate [PPMC], 2017). However, investments in highway development are traditionally much higher, even in Europe, where IWT is largely utilized (Gherghina, Onofrei, Vintila, & Armeanu, 2018). With appropriate governance arrangements, waterways are a cheap, environmentally acceptable way to develop and connect regions in lower income countries (Casal & Selamé, 2015; Jiang, Lu, Cai, & Zeng, 2018).

The Brazilian logistics infrastructure network has 65,500 kilometers of highways, 20,500 kilometers of operational railways and 20,000 kilometers of commercially navigable stretches, spread over 8,515,767 km² (Departamento Nacional de Infraestrutura de Transportes [DNIT], 2020c; Empresa de Planejamento e Logística [EPL], 2018; Instituto Brasileiro de Geografia e Estatística [IBGE], 2020; Ministério dos Transportes, Portos e Aviação Civil [MTPA], 2018). Over the last three decades, the agricultural frontier consolidated in Brazilian central region (Araújo, Sano, Bolfe, Santos, & F. B. Silva, 2019; Costa, Caixeta, & Arima, 2001). Soybean and corn production doubled in the region within ten years, reaching 35% of Brazilian total yield (Companhia Nacional de Abastecimento [Conab], 2020). Waterways are strategic in the Brazilian bulk logistics strategy, as they are adequate to carry low value-added products (C. P. Barros, Gil-Alana, & Wanke, 2015; Melo, Alves, Perico, Guzman, & Rebelatto, 2018). Furthermore, increasing IWT figures in the Brazilian nationally determined contribution, following the Paris Agreement (Rathmann, Araujo, Cruz, & Mendonça, 2017). Nevertheless, Brazilian public investments are concentrated on highways, with waterway share in the transport matrix stagnated in 5% for decades (MTPA, 2018).

In general, investment planning and decision-making are politicized and there is little *ex post* analysis on whether projects reach their goals (Crescenzi, Cataldo, & Rodríguez-Pose, 2016; Short & Kopp, 2005). Moreover, public budgeting is not limited to formulation and approval, but includes execution and adjustment (Anessi-Pessina, Barbera, Sicilia, & Steccolini, 2016). Hackbart and Ramsey (1999) focused on how conflicts arise between executive and legislative branches and how the executive branch manages budget issues. Guzmán (2018) investigated the types of decisions during public budget execution, comparing different ministries. However, budget literature investigates little on budget execution figures and their impacts on project procurement. In general, recent changes in the Brazilian budgetary institutions had positive impacts on fiscal discipline but expanding the scope of analysis to the public sector as a whole is still required (Giuberti, 2015). As increasing public investments could raise economic growth, the use of an intertemporal framework could help analyzing the Brazilian public budget dynamics (Divino, Maciel, & Sosa, 2020). Analyzing the individual behavior of uncommitted payments in Brazil would also contribute to fiscal discipline (Aquino & Azevedo, 2017).

Therefore, our research question is: what are the effects of interactions between governance mechanisms and public budget execution on the procurement of waterway transport infrastructure projects in Brazil? This paper aims to assess budgetary execution and governance arrangements to determine their impacts on the fulfillment of 109 IWT infrastructure projects in Brazil in the previous decade. Assessing budget execution means to investigate the relations between policy, politics, and management, as well as between availability, formats and uses of budget formulation and implementation (Anessi-Pessina et al., 2016). In this paper, we refer to governance as a process by which rules, norms and strategies are formed, applied, interpreted and

reformed (McGinnis, 2011). In this sense, governance arrangements are the systems in which authorities act and interact, according to institutional conditions and constraints (McGinnis, 2011).

We add IWT to the body of project management literature that investigates criteria for project success and failure (Söderlund, 2011). Further, our paper shifts away from the theoretical perspective of cost overruns (Flyvberg, 2016; Shenhar & Holzmann, 2017; Themsen, 2019). We present a case of infrastructure in a developing country in which budget surplus is the main failure indicator. To the best of our knowledge, this is the first analysis of an IWT project portfolio in a developing country from a budgetary and governance perspective.

This paper is structured as follows: after introduction, section 2 presents the literature review on governance, project management, transport infrastructure investments and waterway investment decision-making. Section 3 presents methodological procedures and materials used. Section 4 presents and discusses data on waterway investments made in the previous seven years, including budget execution assessment and the current governance arrangements for Brazilian waterways. Section 5 presents conclusions, research limitations and suggestions for future studies.

LITERATURE REVIEW

In project management, not knowing real costs and difficulties from the start of projects leads to misallocation of scarce resources. Moreover, higher-than-estimated project costs lead, on average, to benefit shortfall (Flyvberg, 2016). In other words, the question of whether ignorance is beneficial or detrimental to project success is essential to project decision making and project behavior, especially at early phases (Ika, 2018). In fact, planners and managers are plural and paradoxical actors who are prone to bias and error. The challenge for researchers then is to draw and learn from experience, facing complexity and uncertainty to reach better outcomes, overcoming the success/failure duality (Ika, Love, & Pinto, 2020). The underestimation of costs and the "betrayal" of estimates previously approved lead to forecasting based on best guesses, as cost estimates are a network effect of the biased efforts of several actors. Therefore, facing the biases of those actors as a condition for the ability to deliver projects is more helpful (Themsen, 2019).

In an attempt to discover what makes a project successful, Shenhar and Holzmann (2017) consider complexity as a factor that inhibits a project from timely completion. Therefore, parameters other than efficiency, customer/user impact, financial/business issues and impact on society are research gaps to be filled (Shenhar & Holzmann, 2017). Project monitoring contributes to success, so performance measurement should focus on structural, institutional and project management conditions. In this sense, investigation on failed and successful projects would profit from more diverse samples of respondents, including project beneficiaries (Ika & Donnelly, 2017). The right leadership, the right team and the right management support are the basis for successful projects (Holzmann, Olson, Vendetti, & Shenhar, 2018). In transport infrastructure projects, instability in government policy results in delays or cancellation. Governments should then focus on intelligence systems to support decision making, shifting from a reactive to a more collaborative approach (Love, Ika, Matthews, Li, & Fang, 2021).

Budgets result from political bargains: they are governance and management devices to plan, decide and control, as well as an accountability channel when there is stakeholder involvement. Studying country-specific contexts helps to investigate how budgeting is affected by and affects the social, political and economic landscape (Anessi-Pessina et al., 2016). Building budgets is challenging, especially when planners do not have accurate data and cost estimation. Producing accurate cost estimates requires further inquiry on budgeting strategies (Love et al., 2019). Efficient operation of budgets for infrastructure policy purposes requires verifying investment effectiveness and management (B. Y. Heo, Kim, & W. H. Heo, 2020). In this sense, a generative culture would incentivize the procurement of transport projects, with negotiated contracts, alliance contracting, leadership and strategic resourcing (Love & Ika, 2021).

In Brazil, budget preparation institutions have greater control of government spending than execution institutions, and both have impacts on the country's fiscal results (Giuberti, 2015). Brazilian public investment is far below current expenditures, which is a flaw in the current fiscal policy. Increasing the share of public investment would raise economic growth, so future

studies should use an intertemporal framework (Divino et al., 2020). Further, the use of unpaid commitments as a mechanism to surpass the annual budget constraints is hurdling transparency in Brazilian budget execution (Aquino & Azevedo, 2017). Furthermore, insufficiencies in the execution ability can engender significant loss and delays in Brazilian federal budget availability (Vieira & Santos, 2018).

Therefore, public and private sectors should work together in a new procurement paradigm that includes shared leadership and value creation. In this sense, developing creative solutions to produce future-proof infrastructure assets requires challenging existing practices (Love et al., 2020). Transport planning decision-making processes can be marked by opacity when they emerge from the political domain (Legacy, Curtis, & Scheurer, 2017). Although strategic decisions in transport are based on their legacy value, little is said about costs, who should pay for it and who the main beneficiaries are. An open and clear debate on alternatives and priorities can help provide investment continuity and stability (Banister, 2018). Prioritizing the delivery of specific projects over the consistent production of detailed strategy documents means supporting a worldview in which transport infrastructure investment is a component of national competitiveness. However, it remains to be seen if this strategy of giving more scope of action to politicians, instead of bureaucrats, leads to change in transport policy (Docherty, Shaw, Marsden, & Anable, 2018).

The appraisal of transport projects has to combine relevance, which deals with what each project is supposed to achieve, and rigor, which relates to comparability across projects, in the sense of economics and welfare. While proximity, productivity and employment are well developed appraisal mechanisms, more research on coordination failure is still in need (Laird & Venables, 2017). The growing impact of transport on development pushes governments to improve logistics sustainability, by shifting away from road transport and its corresponding emissions (Saidi, Mani, Mehfteh, Shahbaz, & Akhtar, 2020). State and non-state investments in transport have distinct impacts on GDP and average employment (Rokicki, Haddad, Horridge, & Stępniak, 2020).

However, as transformative as infrastructure projects can be, they do not alone improve social systems to the extent they are believed (Rego, Irigaray, & Chaves, 2017). Transport improvements can contribute to shaping regional development patterns, but the selection and timing of projects should consider reducing income inequalities (Pokharel, Bertolini, Brömmelstroet, & Acharya, 2021). The major barriers in developing countries are administration on transport infrastructure, construction technology and cost management, along with insufficient funding (Nie & Ye, 2017). Meanwhile, simply increasing public investment will not lead to better results, without governance improvements in the accountability and capacity of the public administration (Kyriacou, Muinello-Gallo, & Roca-Sagalés, 2019). Ambiguous rules and procedures for participation of the general public, lack of guidelines and inadequate understanding by public officials are causes of delays in transport infrastructure projects (Navalersuph & Charoenngam, 2021). In other words, a robust institutional contexts helps delivering projects on time and on cost, strengthening the process against any kind of pressure that affects the selection and contract process (Moschouli, Soecipto, & Vanelslander, 2019).

Brazilian transport policy is vulnerable to political institutions and a lack of long-term planning that result in low investment, which is the dominant reason for the country's poor infrastructure performance (Armijo & Rhodes, 2017). Changes in the Brazilian freight mode share are part of a debate on the country's logistics model, especially after a trucker strike shutdown services in 2018. A stronger presence of government agencies influenced the restructuring of private companies, which organized themselves to interfere on policy (R. O. Silva, Macedo-Soares, & Bastos, 2020). However, the country's infrastructure gap increased in the past decade due to low public investment. Infrastructure investment must look forward to support successive higher levels of development, instead of meeting current needs. Expanding the transport network and improving access to infrastructure in an equitable way will be paramount for Brazilian development and competitiveness (Góes, Garcia-Escribano, & Karpowicz, 2018). In fact, Brazilian shippers point out increases in waterway infrastructure reliability as more attractive than cost reduction, when considering a shift to multimodal, more sustainable operations (Larranaga, Arellana, & Senna, 2017).

Learning from past failures is among the most promising ways to foster project procurement (Rhaiem & Amara, 2021). Poor planning, vague goals, and people factors, as poor interaction and work relationship, are the general causes for project failure. In this sense, elaborating warning mechanisms for future projects requires further investigation on more specific reasons for failure (Herz & Krezdorn, 2022). In order to improve the sustainability of waterway networks, the organizational learning process has to go beyond refining existing practices. Authorities can be stimulated to question dominant frames and incorporate more adaptive concepts and strategies (Willems, Busscher, van den Brink, & Arts, 2018). This presumes more collaborative planning practices, to overcome the technical-financial approach and include social, economic, and environmental issues (Willems, 2018).

Including stakeholders in the decision-making process is necessary to address power imbalances (Schulz, Martin-Ortega, Ioris, & Glenk, 2017). This could be a way of overcoming the traditional cost-effective sectoral approach to stimulate more inclusiveness. In this sense, further investigation on deployment mechanisms is required in contexts with not so developed waterway agencies (Hijdra, Woljter, & Arts, 2018). Behaving as corporate entities to facilitate private and foreign investments in the IWT industry is one possible strategy to push forward waterway development (Li, Notteboom, & Wang, 2016). There is a time lag between a batch of investments and increase in waterway capacity. Therefore, a more comprehensive consideration of the impacts of governance modes on investments is required (Jiang et al., 2018).

In developing countries, governance change is more necessary in order to improve government performance and, therefore, the regular provision of public goods, as infrastructure (Grindle, 2004). The goal of broadening participation in governance mechanisms is to guarantee a wide range of social and environmental concerns to guide state actions (Abers & Keck, 2009). Polycentric systems are a viable approach to organize capital-intensive, infrastructure projects, as collaborative structures encourage shared accountability for outcomes. Nevertheless, as planning choices are controversial, and the decision-making processes vary among countries, further investigation on different contexts is required (Gil & Pinto, 2018). Innovative governance arrangements foster value networks and changes in management, providing a framework for success (Martins, Mota, & Marini, 2019). However, interplay between governance modes seem to be a product of chance and politics, instead of deliberation among stakeholders. Therefore, context-sensitive analysis is a knowledge gap to be fulfilled to support processes of governance reform (Pahl-Wostl, 2019).

Overcoming cost estimation based on best guesses requires investigation on parameters that go beyond business and customer/user impact. Our approach questions dominant frames by focusing on the current Brazilian waterway transport infrastructure arrangements. Since increasing public investment does not guarantee better results, we inquire on the effects of the interactions between governance and budget execution in a specific context in order to support future processes of reform.

MATERIALS AND METHODS

We conducted interpretive research, a type of project study that aims at understanding the world with interesting cases that allow learning (Geraldi & Söderlund, 2018). Following Geraldi and Söderlund (2018) typology, we combine technical interest, focused on control, with the nature and dynamics of a social system (Söderlund, 2011). Therefore, we assess Brazilian waterway infrastructure budgetary execution and governance arrangements to determine the influence of these factors on policy failures.

To accomplish this task, we gathered three data sets. First, the Brazilian government transport plans. The National Logistics and Transport Plan - PNLT, in Portuguese – aims to present long-term solutions for a new national transport system, including an investment portfolio until 2031 (Ministério dos Transportes [MT], 2011). The National Waterway Integration Plan – PNIH – presents waterway transport projections and an investment portfolio dedicated to waterway terminals with forecasting to the year 2030 (Agência Nacional de Transportes Aquaviários [ANTAQ], 2013). The Waterway Strategic Plan – PHE – focuses on waterway development investments, with civil works as rock removal and lock building, as well as services like dredging and aids to navigation installing. It establishes eight priority waterways to receive investments by 2030 (MT, 2013). In what concerns IWT, the National Port Logistics Plan – PNLP – deals with inland access to seaports, forecasting port demand to

the year 2042 (Secretaria de Portos da Presidência da República [SEP], 2015). Finally, the National Logistics Plan – PNL (EPL, 2018) is the most recent document, and brings projections to the year 2025 for investments in all transport modes. After fully reading these documents, we identified every part that mentioned a project development, as well as project development prediction, dates and cost estimates. We have then systematized freight expansion estimates in these documents.

We also examined National Department of Transportation Infrastructure (DNIT) files, in order to assess responses to recommendations issued by the Federal Court of Accounts – TCU, in Portuguese (Bulhões, B. R. C. Barros, Moura, & Caldeira, 2016). These include the four annual reports that DNIT waterway directorate issued between 2016 and 2019. The documents respond yearly diligence sent by TCU and give detailed information on implementing procedures on TCU previous recommendations. In addition, we analyzed recent legislation, Decree n. 10.788/2021 (Decreto nº 10.788, de 6 de setembro de 2021), which modified the organizational structure of MINFRA, and the new DNIT statute (DNIT, 2020a). Moreover, we assessed publicly available data for budget prediction and execution by DNIT in the previous seven years (Controladoria-Geral da União [CGU], 2021). The reason for this timeframe is twofold: first, 2014 was the first year after publication of the two waterway-specific planning instruments (PNIH and PHE). Also, in 2014, waterway freight in Brazilian Northern region started to expand, as the paving of BR-163 highway advanced (ANTAQ, 2021). These documents were fully read and then we systematized every governance improvement requested by TCU in the recommendations and the corresponding solution given by DNIT in the official diligence responses, which we present in the results section.

Along with documental analysis, between February 12th 2020 and May 20th 2020, we conducted 27 semi-structured interviews with officials from the Ministry of Infrastructure (5); Logistics and Planning Company – EPL (4); DNIT (3); National Waterway Transport Agency – ANTAQ (3); navigation companies and private ports representatives (6); agricultural commodity producing sector representatives (2); federal environmental licensing agency (1); waterway transport federal university professor (1); Brazilian Navy (1) and the Federal Senate (1). All public sector interviewees are permanent federal officials. The experience of respondents in the inland navigation sector ranges from ten to forty years. At MINFRA, we have interviewed one director (number 3 in the chain of command), one coordinator-general, two project managers and one official who has been working with waterways since the 1970's. At DNIT, we interviewed one coordinator-general and two project managers, at EPL we interviewed four project managers, and at ANTAQ, we interviewed one superintendent and two coordinator-generals. Private sector representatives were the presidents of a port association and of a shipping company, the navigation manager of another shipping company, the president of an inland navigation shipowner union, the senior logistics consultant from the national agriculture confederation and the president of the logistics movement of soybean producers.

We selected a subjective communicability approach to investigate the subjectivity of respondents (Stephenson, 1980). Interviews lasted between 20 and 40 minutes, during which each respondent spoke freely to answer one single question: "In your opinion, what are the hurdles and the facilitators for implementing a sustainable inland waterway transport policy in Brazil?". The concern of our interviews were the conversational possibilities from the standpoint of individuals involved concretely in the situations to build a concourse (Stephenson, 1986). In other words, through the flow of communicability, new meanings arise, and discoveries are made (Brown, 1993). Through an inductive approach, transcripts were read to identify the core messages reported by participants (Thomas, 2006). They spoke about institutional arrangements, stakeholder participation, climate change and freight transport modal share. They also commented on technical issues such as hydraulic engineering and aids to navigation, as well as the interactions between the energy and the navigation sectors since Brazilian energy comes largely from hydropower. Specifically concerning project management and budgets, which we investigate in this paper, we identified the following themes: resource availability, resource insufficiency, budget, costs, planning, policy, plans and studies. Respondents' perspectives on these issues, which are ontologically subjective, will be hereafter complemented and confronted with information from databases.

RESULTS AND DISCUSSION

Of 27 interviewees, 20 pointed out the lack of public investments as a hurdle, and all of them mentioned lack of investment planning as a barrier to IWT in Brazil. Table 1 synthetizes the opinions of respondents.

Table 1
Synthesis of the opinions of interviewees on main hurdles to IWT sustainability

Participant filiation		Insufficient budget	Insufficient planning
State	Infrastructure agency	13	15
	Environmental licensing agency	1	1
	University	1	1
	National Congress	1	1
	Brazilian Navy	1	1
Non-state	Users	3	8

Source: Elaborated by the authors.

Only 37.5% of non-state agents mentioned shortage of public financial resources as a problem. Instead, these stakeholders point out lack of governmental planning as a hurdle for sustainable IWT development. Respondents associate lack of continuity as a cause for insufficient planning:

“One administration wants to approach one river, then the next doesn’t, we have great difficulties in planning due political and investment discontinuity”, said a DNIT project manager.

Deficiencies in information are another feature of current planning, as the professor explains:

“We see a lot of studies, about this and that, but we need something deeper, with the Ministry really analyzing the problems and issues”.

Political issues also have strong influence on decisions, as stated by the Federal Senate consultant, when referring to the role of congressmen in the budget preparation process:

“The financial resources end up with whoever is strong enough to place the money here or there, which, sometimes, from a purely technical, central planning perspective, would not be the most reasonable solution”.

Further, state investments prioritize highways over waterways:

“It is much easier to put the money on BR-163, the Ministry of Infrastructure decides on its own. The solution to invest in waterways is not purely of one ministry, it requires a public policy”, tells the representative of a private ports association.

Problems with planning are aggravated by insufficient financial resources:

“The budget is already small, and goes to political demands, then we cannot address logistics. No policy sustains itself if we do not have the resources and the budget”, tells a manager at the Ministry of Infrastructure.

Brazilian economic growth is a condition for more generous budgets:

“With better conditions, then we will have infrastructure budgets befitting our needs. In the next ten years, this will not happen, we cannot wait all this time”, predicts a manager at EPL.

Waterways would be less important than other modes:

“If I have much higher investments on highways, the space in the agenda of authorities for waterways is proportional, so it is difficult for shippers to find room to address the subject with them”, explains a superintendent at ANTAQ.

Highways are the current priority:

"You see at DNIT all the resources that are allocated for waterways, they are insignificant when compared to highways, where you spend much more money", compares another Ministry of Infrastructure manager.

This reflects into waterway cost estimation:

"Waterways are not a priority to engage enough technical personnel to estimate all costs, from projects start to finish", states a shipping company representative.

In this sense, deficiencies in information are main hurdles to budgeting:

"Nobody knows how to account for and appropriate waterway costs, we do not know how much dredging a river needs today", reveals a DNIT manager.

By selecting state and non-state actors involved in the waterway sector as participants, we aimed to profit from a more diverse sample of respondents (Ika & Donnelly, 2017). Among the 19 state agents interviewed, 17 mentioned insufficient financial resources in their interviews.

Nevertheless, one agent mentioned explicitly the current situation of sufficient budget availability for IWT:

"Now, at the moment that there will be money to be invested, we have to bid again for a rock removal paralyzed project, and we have dredging in the Madeira, which shippers themselves are questioning", says a Ministry of Infrastructure director.

As budgetary execution and resource availability are not matters of opinion, but a verifiable reality, these findings corroborate the plural, paradoxical nature of actors involved in decision making (Ika et al., 2020). Therefore, the first insight is to face their biases as a condition to project delivery, incorporating it to make forecasting more robust, as suggested by Themsen (2019), since the right leadership, the right team and the right management support are basis for success (Holzmann et al., 2018).

Policy plans and project delivery

The National Transport Policy sets parameters for a desired model for transport infrastructure and logistics (MTPA, 2018). Specific plans establish priorities for transportation modes: PNLT (MT, 2011), PHE (MT, 2013), PNIH (ANTAQ, 2013), PNLP (SEP, 2015) and PNL (EPL, 2018). Together, they prospect scenarios and recommend building dozens of infrastructures. Table 2 synthetizes predictions and investments on waterway infrastructure projects.

Table 2
Comparison of predictions and achievements of IWT investments

Plan/date	Investment prediction 2014-2020 (US$)	Number of projects planned	Number of projects finished
PNLT/2011	946.3 million	9	-
PNIH/2013	123.3 million	19	-
PHE/2013	6.14 billion	38	3
PNL/2018	119.3 million	1	-

Source: Adapted from ANTAQ (2013); MT (2011, 2013); MTPA (2018); and SEP (2015).

The PNLT predicted channel improvements in Teles Pires, Tapajós, Araguaia and Tocantins rivers, in addition to implementing the Marajó waterway, along with building two locks in the Tocantins River. The PNIH contains a list of 38 freight terminals in five river basins, but none of them were built. The PHE is the most comprehensive plan for IWT. It prioritizes eight waterways in which 38 projects should be developed by the year 2030. However, only 3% of the predicted investments were made so far (CGU, 2021). In PNL, the only waterway project has been in design phase for five years but should have already been delivered. It is the rock removal in Pedral do Lourenço, a canyon that hurdles navigation in Tocantins River (Tomas, Bleninger, Rennie, & Guarnieri, 2018). The PNLP does not figure in Table 2 because it does not mention any specific inland waterway project, but

only recommends to increase IWT share in seaport access in 7% by 2025 and 11% by 2035 (SEP, 2015). Plans present project overlap, as PNL is, in great extent, an update of PNLT, and both set priorities for road, rail and water transport. Meanwhile, the PNIH and the PHE deal specifically with waterways, the former being dedicated to terminals. In sum, out of the total of 54 waterway development projects planned, three were completed since 2014: installation of aids to navigation on Paraguai River, dredging on the Madeira River and dredging on the Taquari River (Table 3).

Table 3
Synthesis of the cost estimates in plans, costs in contracts and utilized budgets and the IWT projects started between 2014 and 2020 (US$ million)

Project status	River	Project type	Plan estimate	Contracted cost	Utilized budget
Finished	Madeira	Dredging	142.34	12.22	12.24
	Taquari	Dredging	88.96	1.71	0.75
	Paraguai	Aids to navigation	8.89	4.34	2.05
Discontinued	Amazonas	Aids to navigation	44.48	0.51	0.20
Paralyzed	Tietê	Rock removal	32.29	36.13	10.14
Ongoing	Tocantins	Rock removal	117.43	92.62	1.48

Source: Elaborated by the authors.

One possible explanation for the discrepancy between plan estimates and contracted costs is that contracts cover a waterway extension smaller than originally planned. Specific critical shoals have been addressed in reality, while policy plans predicted dredging in the entire navigable stretch. More, dredging needs to be performed during specific hydrological periods. If these periods are missed, dredging is not performed as predicted in all the critical shoals. Since dredging is a continuous service, once the contract is finished, even though partially accomplished, the government bids for another dredging contract. This is why we decided to identify the dredging services as delivered projects, as services were kept regularly throughout the period. As for the aids to navigation on Paraguai River, the contract predicted installation and continuous maintenance. As hydrological conditions also influence the need for maintenance, this explains why the utilized budget was inferior to contracted. In addition to the completed projects that were planned, other projects have been initiated and many have been finished. Table 4 presents a synthesis of all projects planned, ongoing and delivered, according to type and current status.

Table 4
Comparison between predictions on waterway plans and project implementing

Project type	Projects planned	Projects initiated	Current status
Dredging	7	3	2 delivered
Rock removal	7	1	1 in the design phase; 1 in civil works phase, paralyzed;
Freight terminal	19	0	-
Passenger Terminal	0	55	45 delivered; 10 in civil works phase, ongoing;
Lock building/ retrofitting	13	0	-
Aids to navigation installation	8	2	1 delivered; 1 partially installed, discontinued.

Source: Elaborated by the authors.

Among the 54 projects, three were initiated: rock removal in Tocantins River remains in the design phase since 2017 due to environmental licensing pendencies, rock removal in Tietê River has been paralyzed since 2020, and the installation of aids to navigation in the mouth of the Amazon River has been discontinued in 2019 through a management decision. In addition, three of the projects in the policy plans have been delivered, in the Madeira, Taquari and Paraguai rivers. Nevertheless, since 2005, DNIT has built 45 small passenger terminals in riparian communities where the river is the main or only access (Barnez, 2019). These projects are not mentioned in policy plans, which focus on freight transport. However, they figured in PAC and Avançar, the largest recent infrastructure development programs, and 55% of waterway investments from DNIT were destined to them since 2014 (CGU, 2021). These findings allow to infer instability in government policy as the cause for the planned projects to be delayed or cancelled, as suggested by Love et al. (2021). Instead of procuring planned projects, the Brazilian government chose to invest the available resources on the terminals, for reasons that remain unclear (Legacy et al., 2017). These infrastructures meet basic needs of riparian populations, evidencing a shift towards social concerns (Abers & Keck, 2009; Grindle, 2004). However, not following long-term planning results in low investment in performance improvements (R. O. Silva et al., 2020). Still, the choice helps to pursue equity in infrastructure access, which may be another way to achieve competitiveness (Góes et al., 2018).

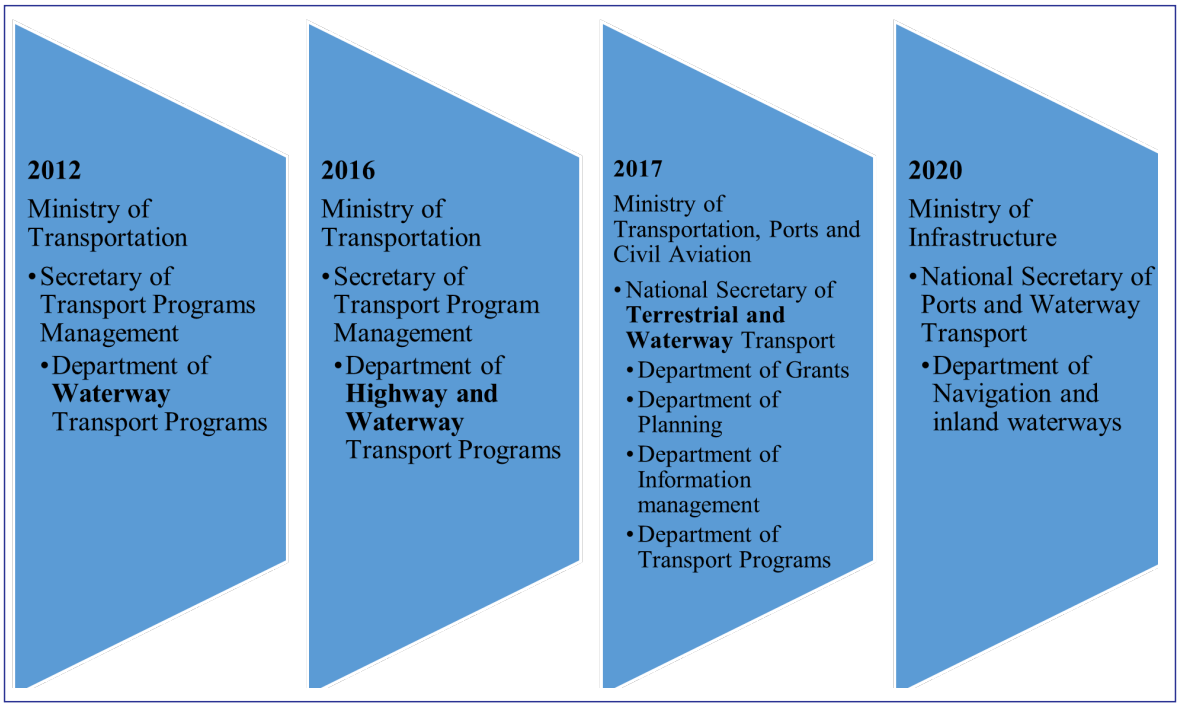
Meanwhile, waterway freight exceeded predictions: 120.2 million tons by the year 2031 (MT, 2013) and 17 million tons of soybean and corn on Northern region waterways by the year 2025 (Wilson, Koo, Taylor, & Dahl, 2005). From 2014 to 2020, Brazilian IWT freight grew 31%, reaching 109.2 million tons, and 25 million tons of grains were carried on the Amazon watershed in 2020 (ANTAQ, 2021). Freight growth was fostered mainly by private investments of logistics providers, who embraced profit opportunities instead of waiting for State projects (Friend & Lima, 2011). Therefore, the claims of shipping companies for waterway reliability improvements (Larranaga et al., 2017) have not been addressed through federal investments.

Waterway governance

Since 2003, the Federal Court of Accounts recommended DNIT to hire and train personnel, to form regional stakeholder participation groups, to reassess performance indicators and to foster feasibility studies (Bulhões et al., 2016). In 2013, DNIT started making feasibility assessments for waterways, but they remain to be completed (Aragão, Bracarense, & Yamashita, 2019). In Brazilian transport planning, feasibility studies are an intermediate stage between sectorial plans (i.e., PNLT, PHE, PNIH, and PNL) and project design phase.

The Ministry of Infrastructure (MINFRA), formerly known as Ministry of Transportation, is responsible for policy planning and financial resources allocation. DNIT is the infrastructure execution agency linked to MINFRA, responsible for feasibility studies, project design and civil works, along with maintenance services. In other words, MINFRA decides which projects will be procured, according to cost estimates and additional information provided by DNIT. Since 2012, the organizational structure of the Ministry changed four times (Figure 1).

Figure 1
Evolution of IWT organizational structure within ministries responsible for transportation



Source: Adapted from Moreira, B. R. C. Barros, and Bulhões (2019).

The organizational structure of policy execution offices also changed during the period: in 2015, former Inland Waterway Administrations that had been directly linked to MINFRA were allocated into DNIT (Moreira et al., 2019). Configuration changed again in 2020: eight Administrations were shut down and relocated into 22 federal highway offices (Decreto nº 10.367, de 22 de maio de 2020). Moreover, in 2021, DNIT opened a recruiting process for 23 job opportunities in the Brasília headquarters, but none of the approved candidates were actually admitted (DNIT, 2021).

In 2016, the National Council for Waterway Management was created, and later proposed to create regional development groups, to help policy making and follow-up on actions (Ministério da Infraestrutura [MINFRA], 2018a; Portaria nº 4.376, de 16 de novembro de 2017). In 2018, two groups were created, in Eastern Amazon and in Southern Brazil (MINFRA, 2018b, 2018c). Against good practices for well-adjusted governance systems (Abers et al., 2009; Grindle, 2004), the Brazilian Government extinguished the national council and regional groups in 2019 (Decreto nº 9.660, de 1º de janeiro de 2019). This finding shows Brazilian IWT organizational setting to be heading away from mechanisms that can foster inclusiveness (Hijdra et al., 2018). Such behavior makes addressing power imbalances more difficult (Schulz et al., 2017). In addition, the current arrangement hurdles accountability sharing in infrastructure project management (Gil & Pinto, 2018).

Besides previous information, project monitoring also contributes to success (Ika & Donnelly, 2017). Available on DNIT's website since 2019, the "Waterway Infrastructure Atlas" is a monthly publication that holds contract information (DNIT, 2020b). However, this monitoring focuses on financial contract execution, unlike the proposition of Holzmann et al. (2018) for strategic project leadership, which encompasses environmental, social, and political success indicators.

In sum, Brazilian IWT organizational structure has been changing since 2014. Moreover, the current situation does not collaborate to mitigate human cognitive flaws or organizational biases that affect project delivery (Themsen, 2019). Further, the governance arrangement steps away from innovative governance mechanisms that foster value networks in project management (Martins et al., 2019). In the following section, we present budget performance as an indicator of Brazilian IWT institutional context.

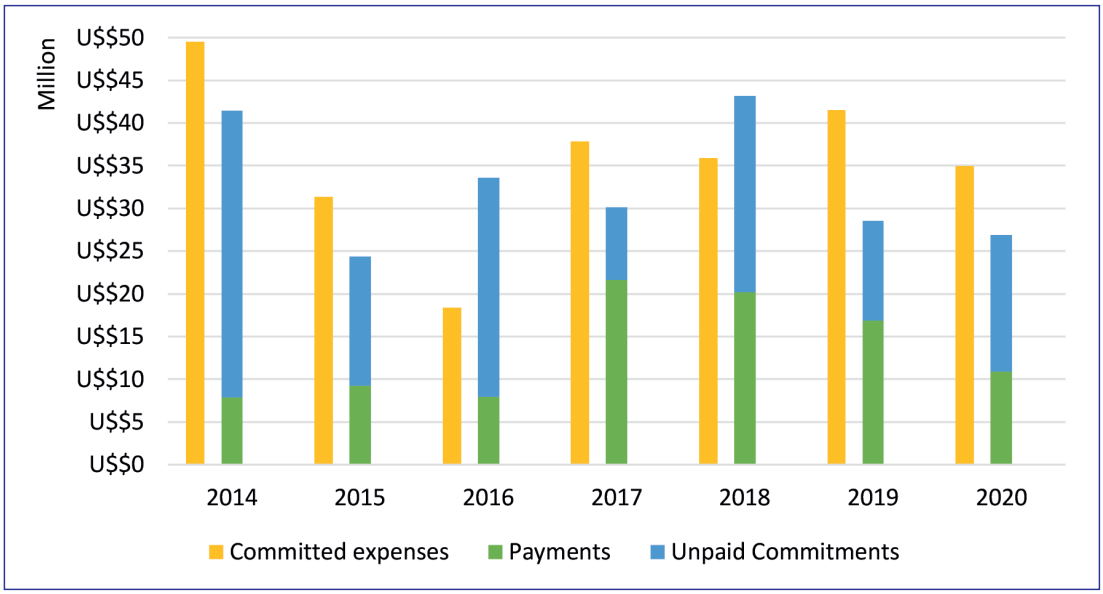
IWT investments

We analyzed budget execution data from DNIT since 2014. Average yearly budget for waterways has been R$ 213.9 million (≈US$ 38 million). Investment performance is timid. The Agency invested, in seven years, 84% of the available sum for waterways. In the 2014-2020 series, this means a total of R$ 1.49 billion (≈US$ 265 million) budget, out of which R$ 1.25 billion (≈US$ 222 million) were actually utilized (CGU, 2021). In other words, in seven years, DNIT wasted 111% of an entire year budget.

To understand these findings, we investigated how budgets were executed. We found R$ 185.13 million (≈US$ 32.59 million) average annual investment. The best year in the series was 2018, with R$ 238.15 million (≈US$ 43.14 million) available, and the largest sum utilized. There was a performance drop in 2019, notwithstanding the second largest budget in the series and the creation of a National Secretary of Ports and Waterway Transport. The downtrend accentuated to R$ 148.54 million (≈US$ 26.91 million) in 2020. However, regardless of the COVID-19 pandemic situation, MINFRA maintained all major terrestrial developments and project schedules (Kalinoski, 2020; G. G. N. Marinho, M. H. N. Marinho, Correia, Carvalho, & Albuquerque, 2020). Moreover, DNIT increased highway investments on US$ 42.56 million from 2019 to 2020 (CGU, 2021).

An expense commitment is an act that creates for the State an obligation to pay. Payment is money delivery for the creditor, after the hired party performed services. Unpaid commitments are expenses that are not paid until December 31st (Lei nº 4.320, de 17 de março de 1964). We noticed payments within a fiscal year to be much lower than committed, indicating mismatch between budget creation and project execution (Graph 1 and Table 5).

Graph 1
Waterway budget execution by DNIT between 2014 e 2020 (in US$)



Source: Elaborated by the authors, with data from CGU (2021).

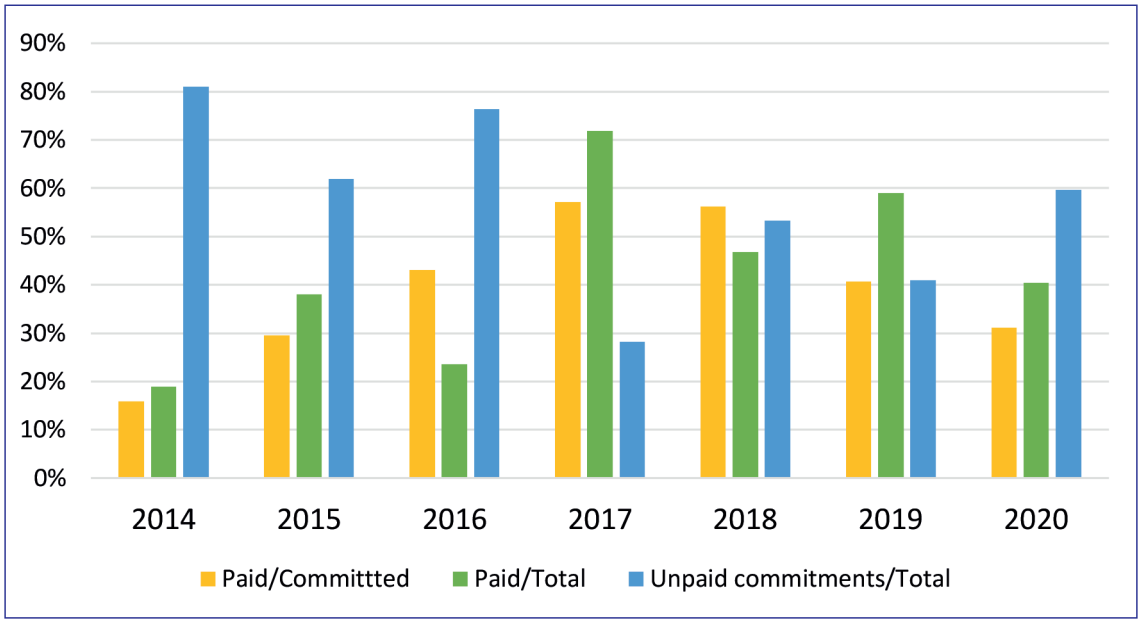
Table 5
Waterway budget execution by DNIT between 2014 e 2020 (in US$ million)

	Commited expenses	Payments	Unpaid commitments
2014	49,51	7,84	33,58
2015	31,36	9,27	15,09
2016	18,39	7,93	25,67
2017	37,87	21,65	8,49
2018	35,89	20,17	22,97
2019	41,55	16,88	11,70
2020	34,95	10,87	16,04

Source: Elaborated by the authors, with data from CGU (2021).

Shenhar and Holzmann (2017) summarize project success factors: a clear strategic vision, alignment between the stakeholders involved and adaptation to challenges. In the Brazilian IWT case, our findings indicate project overlapping and priority differences in the planning phase – the PNLT, the PHE, the PNIH and the PNL. These plans were elaborated by the Ministry (responsible for policy making) and ANTAQ (regulating agency). Then DNIT is to implement plans, with the budget allocated by MINFRA. Therefore, alignment deficiencies become evident in Brazilian IWT budget performance, as works and services have been slower than predicted on plans and on budgets. Meanwhile, mismatches between budget, commitments, unpaid commitments, and payments cause budget availability loss (Vieira & Santos, 2018). Commitments are frequently used as parallel budgets that allow some discretion in expenses (Aquino & Azevedo, 2017). Instead of adapting to the situation, the behavior repeated itself throughout the period investigated. It seems DNIT has been unable to follow policy guidelines and meet annual predictions, systematically postponing actions, therefore not delivering projects as planned (Graph 2 and table 6).

Graph 2
Commitments, payments, and unpaid commitments comparison between 2014 and 2020



Source: Elaborated by the authors, with data from CGU (2021).

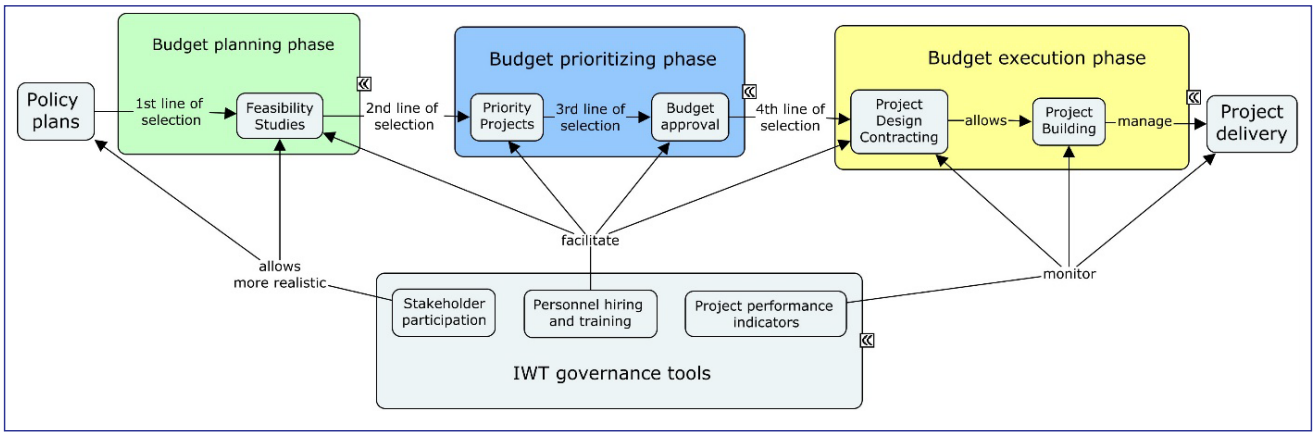
Table 6
Commitments, payments, and unpaid commitments comparison between 2014 and 2020

	Paid/Committted	Paid/Total	Unpaid commitments/Total
2014	15,85%	18,94%	81,06%
2015	29,54%	38,04%	61,96%
2016	43,10%	23,60%	76,40%
2017	57,16%	71,84%	28,16%
2018	56,21%	46,76%	53,24%
2019	40,62%	59,05%	40,95%
2020	31,12%	40,41%	59,59%

Source: Elaborated by the authors, with data from CGU (2021).

Budget execution data in Graph 1 and table 5 help to understand the lower percentage unpaid commitments over total investments in 2019 shown in Graph 2 and Table 6. If the reduction indicated better budget performance, one would notice increase in payments related to commitments made on that year. As this was not the case, the reduction in unpaid commitments was due to overall decrease in investment performance, which was 33.7% lower than in 2018. Moreover, unpaid commitments were the larger part of investments made in 2020, while payments related to commitments on that year were the second lowest in the series. We found Brazilian IWT budget execution had project times, costs and risks incorrectly estimated, as well as their benefits and success odds. So far, Brazilian IWT infrastructure managers have not learned from experience, repeating failure outcomes. Our findings show the Brazilian government is not focusing on intelligence systems to support decision making. Instead, policy makers cling to a reactive approach, unlike the recommendation of Love et al. (2021). Figure 2 depicts interactions between governance issues and project steps in the phases of budget preparation and execution.

Figure 2
Interactions between IWT Governance tools and budget execution from policy plans to outcomes



Source: Elaborated by the authors.

In our interviews, public managers attributed poor performance to budget insufficiency, which we proved not to be the case. This indicates problems in the project management process, as budgets were incorrectly built due to insufficient information. This reveals inaccurate data and cost estimation, which result in the failure of budgeting strategies (Love et al., 2019). Instead, we found budget surplus, as investments were never performed, since the decision-making process stagnated before the project design phase. Managers were unable to fulfill feasibility studies, hurdling project priorization and budget planning. In other words, in our case, insufficient knowledge led to misallocation of resources, corroborating Flyvberg (2016) and Ika (2018). Therefore, Brazilian IWT investments do not result from technical *ex ante* analysis. Instead, we found evidence of a decision process that lacks strategical features that Shenhar and Holzmann (2017) associate to adaptation capacity to complexity. In fact, investments dropped significantly since 2019, coinciding with the extinction of the National Waterway

Management Committee, along with regional development groups. Meanwhile, regional waterway offices were discontinued, and reduced to a part of DNIT highway offices. These findings corroborate the insufficient control of government spending by budget execution institutions pointed by Giuberti (2015). We also found generalized disconnection between plans, project prioritizing, contracting, execution and project delivery, due to the absence of stakeholder participation, personnel quantitative and qualitative insufficiency, along with poor performance monitoring. In other words, there are many points of opposition to the generative culture suggested by Love and Ika (2021), and to the budget operation efficiency features pointed by Heo et al. (2021).

We followed the research pathway pointed by Anessi-Pessina et al. (2016), by analyzing budgets from a managerial perspective, in which managers are assigned objectives, to be later held accountable for their achievements in a country-specific context. We chose the budgetary and governance perspective to go beyond efficiency, customer impacts and business impacts parameters (Shenhar & Holzmann, 2017). In this sense, following the recommendation of Love et al. (2019) to inquire on budgeting strategies helped clarifying the more challenging aspects that hurdle accurate estimates in Brazilian IWT policy planning and implementing. More, we investigate the management decision support mechanisms by inquiring the people who act on this system, along with the documental repertoire that supports and helps to explain their choices. We do this by adopting an intertemporal framework that goes back to as long as the current planning instruments have been available, in an effort to fill the gap pointed by Divino et al. (2020). We found a significant political accent on infrastructure investment, as 55% of IWT investments were assigned to building passenger terminals by the government's main infrastructure programs, despite no prediction on sectorial plans. Nevertheless, it is not possible to state this investment decision withdrew resources from other projects, as budget surplus remained. This finding adds waterways to the assessment on the distance between transport policy planning and implementing by Short and Koop (2005). We also build on Kyriacou et al. (2019), who previously found government quality as an efficiency driver of transport investments. By shedding light on the Brazilian IWT infrastructure budget management, we confirm financial availability as less important for project success than governmental decision-making robustness. Using budget performance as an *ex post* analysis indicator reveals that Brazilian IWT policy planning did not evolve to project design, building nor monitoring phases. Two of the main conditions for project success are related to management and institutional features (Ika, & Donnelly, 2017). In this sense, we found leadership, monitoring and organization capacity as the main insufficiency areas in Brazilian IWT policy, which resulted into poor budget performance and the absence of project delivery.

Our findings corroborate Crescenzi et al. (2016), who emphasized the need for *ex post* analysis – which, in our case, refers to examining policy failures, rather than evaluating implemented projects. By using budget underperformance as an indicator of poor project selection and contracting, we build on Moschouli et al. (2019), who presented institutional and financial contexts as factors that explain policy failures. As the efficient operation of budgets is essential to ensure policy efficiency, project supervisors, contract managers and policy makers are held accountable (Heo et al., 2020). Therefore, adequate budget investment is prone to meet the needs of Brazilian society while fostering economic growth (Divino et al., 2020). It also helps to reduce uncertainties and provide safety to public managers, users and private investors (A. A. A. Peixoto & A. G. Peixoto, 2017). We propose appropriate governance tools as means to produce adequate budget performance, which should bring better policy outcomes. We suggest improving the cognitive capacities of leaders, managers, and technicians to endow the process with a focus on not only technical aspects, but also complexity of the social system, in line with Love et al. (2021).

CONCLUSION

Our comparison between budgets and waterway investments explicitly rejects the notion that budget insufficiency is a major hurdle for Brazilian IWT project management. Instead, throughout seven years, DNIT failed to invest 111% of an entire annual budget. Therefore, the first policy implication our study offers is: the real issue is an inability to build realistic budgets. We also noticed all freight predictions in plans to have been or to soon be overcome before estimated dates. More, investments performed were much lower than planned, and a small fraction of these were made in projects that were predicted in policy plans. The second implication is: we advise updates on the waterway plans (PHE and PNIH) with a more down-to-earth approach, facing the new organizational arrangement.

More than increasing budgets, it is necessary to inforce project priorization and implementing. We did find improvements in management and budget increase, but other issues remain unresolved, like personnel recruiting and training. We acknowledge the Waterway Infrastructure Atlas as a way to implement contract performance monitoring. However, the indicators in the Atlas refer to contract managing, not to delivery performance, nor to levels of service provided for users. We recommend learning from experience, in an adaptive management approach to procurement strategies (Rhaiem & Amara, 2021). We believe our findings can help decision makers in Brazil to improve waterway project management by revealing that financial resources scarcity can no longer be used as justification for poor policy performance. We propose institutional change, based on a governance arrangement that fosters the participation of multiple stakeholders in project planning and execution.

One limitation in our research is the timeframe, as Brazilian inland waterway freight expansion is recent. Since there is a gap between transport infrastructure projects and their effects, it will be necessary to monitor further consequences of previous years and future project implementation. As we suggest adaptive polycentric governance as an alternative approach, further studies on perceptions of non-state actors on waterway projects will be necessary. The scope of this research was limited to public budgets. Since we found waterway freight increased in spite of insufficient public investments, we suggest a comparative analysis that includes private projects for further investigation.

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