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Economic analysis of loss-making urban railways aiming at an innovative concession model: a study applied to CBTU-JP

Análise econômica de ferrovias urbanas deficitárias visando modelo inovador de concessão: um estudo aplicado à CBTU-JP

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ABSTRACT
Urban passenger rail transport in Brazil faces recurring structural challenges, such as the lack of integrated planning, ineffective public policies, poor infrastructure conditions, and low levels of investment. In this context, concessions have been adopted as the main strategy to enable investments in the sector. However, the traditional concession model presents significant limitations, including high upfront costs, delayed and uncertain remuneration, and the complexity of contract management over time. As an alternative, Territorial Engineering proposes a new approach by incorporating productive projects capable of fostering local economic development. This approach is based on the assumption that regional economic growth can serve as a foundation for financing public investments through increased tax revenues. The research adopted the cultural value chain of the cities served by CBTU João Pessoa, using the concept of territorial programs to delineate areas around stations intended for the installation of new cultural-sector enterprises. The objective was to generate fiscal multipliers to subsidize public contributions to the concession project. The expected results aim to provide inputs for the development of a new concession model that is financially balanced, attractive to the private sector, and economically sustainable in the long term.

RESUMO
O transporte ferroviário urbano de passageiros no Brasil enfrenta desafios estruturais recorrentes, como a ausência de planejamento integrado, políticas públicas ineficazes, infraestrutura precária e baixo volume de investimentos. Diante desse contexto, as concessões têm sido adotadas como principal estratégia para viabilizar investimentos no setor. No entanto, o modelo tradicional de concessão apresenta limitações significativas, como elevados custos iniciais, remuneração tardia e incerta, além da complexidade da gestão ao longo do contrato. Como Alternativa, a Engenharia Territorial propõe uma nova abordagem ao incorporar projetos produtivos capazes de impulsionar o desenvolvimento econômico local. Parte-se do pressuposto de que o crescimento econômico regional pode servir de base para o financiamento dos investimentos públicos por meio do aumento da arrecadação fiscal. A pesquisa adotou a cadeia de valor cultural das cidades atendidas pela CBTU João Pessoa, utilizando o conceito de programas territoriais para delimitar áreas no entorno das estações destinadas à instalação de novos empreendimentos do setor cultural. O objetivo foi gerar multiplicadores fiscais para subsidiar os aportes públicos no projeto de concessão. Os resultados esperados devem fornecer subsídios para o desenvolvimento de uma proposta para uma nova modelagem de concessão, financeiramente equilibrada, atrativa ao setor privado e com sustentabilidade econômica de longo prazo.

1. Introduction

Between 2008 and 2018, infrastructure investments in Brazil, undertaken by both public and private sectors, averaged 1.84% of GDP annually (Rocha, 2020). Raiser *et al.* (2017) argue that this investment level is insufficient to cover asset depreciation and maintenance costs, which are estimated at 2.41% of GDP. The required investment to maintain current standards of access and infrastructure quality is 4.25%

of GDP. Additionally, Brazil is experiencing fiscal exhaustion in relation to infrastructure investment (Orair, 2016; Tadini & Rocha, 2018).

To address these challenges, the Brazilian government has prioritized concessions as its main strategy for promoting infrastructure investment (Bracarense, 2017). Although the private sector expresses interest in public-private partnerships, firms generally accept only projects with guaranteed returns and often require the government to assume a larger share of investment in large-scale or high-risk ventures (Consulin, 2020). Furthermore, reliance on private investment through pure, sponsored, or administrative concession contracts has revealed significant limitations. These limitations stem from the inherently unfavorable characteristics of infrastructure projects, including high initial costs, delayed and uncertain returns, and the complexity of managing projects over extended contractual periods (Aragão & Yamashita, 2017).

Within this context, the article examines the economic viability of the urban railway concession managed by the Brazilian Urban Train Company (CBTU) in Paraíba, specifically at the João Pessoa Superintendence. This operation is marked by persistent financial deficits and a substantial reliance on public funding. The railway system comprises a single 30-kilometer line connecting 13 stations across the municipalities of Cabedelo, João Pessoa, Bayeux, and Santa Rita, all within the Metropolitan Region of the capital. In 2019, the system transported an average of 8,100 passengers per day, totaling approximately 2.1 million passengers annually (CBTU, 2022b). Financial analysis for the period from 2018 to 2022 resulted in the preparation of an Income Statement (DRE), which indicated losses in every year reviewed and an average annual deficit of BRL 33.3 million. These findings underscore the service's economic fragility.

The article also tests the hypothesis that the concession of the infrastructure can be linked to a proposal for economic development within its area of influence. This approach involves structuring a regional value chain that generates income and increases tax revenues, thereby enabling the coverage of counter payments, investments, and public expenditures associated with the railway concession.

The article is structured as follows: Section 2 presents the theoretical assumptions of Territorial Engineering and the specificities of the cultural sector; Section 3 details the methodology employed to test the coverage hypothesis; Section 4 describes the case study and applies the methodology; Section 5 discusses the results; and finally, Section 6 presents the conclusions.

2. Theoretical framework

Given the country's low level of infrastructure investment and fiscal constraints, it becomes indispensable to reconsider traditional financing models (Lissa *et al.*, 2021). It is thus necessary to complement current economic analysis techniques for transport projects, as systematized by Thá (2022) and Sehn (2009). Territorial Engineering offers an alternative by integrating infrastructure with productive initiatives that boost local economic growth and development. This dynamism may serve as the basis for financing, through the expansion of fiscal revenue capacity (Aragão & Yamashita, 2010; Aragão, Bracarense & Yamashita, 2019).

This would be promoted through territorial programs, defined as sets of initiatives and strategies aimed at fostering economic development in specific geographic areas. These programs would include plans and projects for territorial configuration, accessibility, mobility, and complementary infrastructure. They would also cover commercial enterprises linked to the implementation and operation of such infrastructure. Additionally, integrative policies capable of catalyzing economic and social growth in the region would be included (Aragão, 2008; Aragão & Yamashita, 2017; Aragão, Brasileiro & Consulin, 2021).

This approach aims to attract investment, generate employment, stimulate the local economy, and provide a fiscal revenue stream. This stream should sustain public initiatives without compromising the government's financial balance. Aragão, Bracarense & Yamashita (2019) propose a two-phase model for assessing fiscal sustainability. The first phase is financial analysis. It identifies costs for implementation, operation, and maintenance, as well as estimated revenues, allowing for the calculation of public contributions if direct revenues do not fully cover the costs. The second phase, fiscal analysis,

has specific stages: identifying productive sectors affected by the infrastructure; examining supply chain logistics to map direct, indirect, and induced fiscal effects; analyzing the tax structure for the responsible government entity, considering tax rates and bases on income, payroll, and production; and finally, calculating these variables using secondary data or estimates from historical series.

The authors define fiscal effects as direct, indirect, and induced. Direct effects come from the economic activity generated by the project and include taxes on revenues and operating expenses. Indirect effects result from supplier activities and supply chains, including taxes on inputs, revenues generated, and jobs created. Induced effects refer to the increased consumption resulting from workers' income, as estimated by spending profiles across income brackets. With this, it is possible to project fiscal revenues that can offset disbursements for the public sector's counter-performance.

In this context, and based on the concepts of Territorial Engineering, the article seeks to associate the concession of the analyzed railway enterprise with a proposal for economic development. This proposal envisions structuring a value chain within the regional economy capable of generating income and, consequently, expanding tax revenues—thereby enabling the coverage of counter-payments, investments, and public expenditures involved in the railway concession.

For this purpose, the chosen value chain was culture, given that the Northeast region—where the analyzed railway is located—possesses a rich cultural diversity. It is understood that this cultural diversity can serve as a strong catalyst for the economic development of the enterprise's area of influence.

Moreover, it has been observed that the cultural economy and creative industries have gained increasing prominence in both literature and among policymakers. This structural shift reveals the considerable potential of a sector that has long been underestimated by economists. An example of this is a UNESCO survey, which estimates that culture and creativity contribute approximately 3.1% of global GDP and employ around 6.2% of the world's workforce (Valiati *et al.*, 2023).

The cultural and creative sectors play a strategic role in modern economies. They should be seen as essential to any sustainable development plan. The creative economy supports productive diversification, revenue generation, trade, and innovation. It also has the potential to revitalize deteriorated urban areas and foster development in regions with rich cultural heritage (Valiati & Morrone, 2014; Oliveira & Turolla, 2013).

Nyko & Zendron (2018) cite a study by Ernst & Young, supported by UNESCO, which estimated the global market value of the creative and cultural industries at US$2.25 trillion in 2013. This accounted for approximately 3% of the world's GDP that year. Regarding employment, the study estimated that about 29.5 million people, about 1% of the global workforce, were employed in these industries during the same period.

According to the Itaú Cultural (2023), from 2012 to 2020, the Brazilian cultural economy's GDP and creative industries grew faster than the overall Brazilian economy. The cultural sector expanded by 78%, while Brazil's GDP increased by 55%. In 2020, the sector generated R$ 230.14 billion, accounting for approximately 3.1% of Brazil's GDP. With more than 130,000 companies and 7.4 million workers, the cultural economy made up 2.4% of net exports. For comparison, the automotive industry represented 2.1% of GDP in the same year.

In Paraíba, Itaú Cultural (2023) reported that the cultural economy and creative industries accounted for 0.41% of the state's GDP in 2020. This translates to revenues exceeding BRL 1.74 billion and approximately BRL 340 million in profits. The sector comprises 1,154 companies and employs approximately 88,416 individuals, accounting for about 6% of the state's workforce. The average remuneration is BRL 2,232, above the state average of BRL 1,961. According to IBGE's Cultural Information and Indicators System (2011–2022), the number of companies in Paraíba's cultural sector rose by 14% between 2011 and 2021. This growth outperformed the Northeast Region (4.2%) and Brazil as a whole (4.3%). Cultural sector employment grew even more—by 31%—while the Northeast Region rose 21% and Brazil only 2.5% in the same period.

In this context, an important topic is the fiscal return on investments in the cultural economy and creative industries. Valiati *et al.* (2023) analyzed taxes on employee remuneration, social contributions, gross mixed income, gross operating surplus, and taxes on production and imports from 2012 to 2020. In 2020, the arts, culture, sports, and recreation sector collected BRL 7.3 billion in taxes, net of subsidies.

Understanding the importance of cultural and creative activities for the Brazilian economy is, therefore, essential to granting visibility to this sector and fostering not only its development but also the overall growth of the country's economy (Valiati *et al.*, 2023).

3. Methodology

The methodology for the concession project comprised the following steps: a) collection of data and indicators, including financial and operational statements of the enterprise, followed by analysis to establish its fiscal and financial health profile; b) application of the conceptual model of territorial economic development programs proposed by Aragão & Yamashita (2010), grounded in Territorial Engineering and adapted to the context of deficit-ridden urban railways; and c) development, application, and validation of an economic modeling framework for designing a new concession model for the deficit railway.

The modeling was developed in conjunction with an economic development proposal targeting the enterprise's area of influence, focusing on the growth of a value chain within the regional economy. The methodology applied to the CBTU-João Pessoa case was organized into the following stages: a) collection of data and indicators, including CBTU's financial and operational statements in João Pessoa, and analysis of these figures to establish the company's fiscal and financial profile; b) compilation of project data regarding planned railway restructuring and modernization, specifying investments to facilitate calculation of construction, maintenance, and operational costs; c) compilation of tariff and extraordinary revenues throughout the concession contract, based on passenger demand, fare base, and operational expenses; d) assembly of regional economic indicators, based on the National Classification of Economic Activities (CNAE), concerning companies in the cultural value chain, including their number, size, employment, salary data, total wage bill, and job types by salary range; e) collection of data on areas adjacent to the railway for new companies in the cultural value chain, quantification of these companies, and calculation of fiscal revenue based on their activities; f) calculation of multiplier effects (direct, indirect, and induced) and fiscal revenues from the railway restructuring project and companies in the cultural value chain; and g) estimation of company cash flows using information from stage f) to achieve economic-fiscal balance for the project.

Based on the data collected, a fiscal and financial profile of the company was prepared. This enabled the simulation of two trend scenarios aligned with the traditional concession model, and two alternative scenarios grounded in the concepts of Territorial Engineering. In the latter, proposals were tested for integrating the railway into a broader program of local economic development.

4. The case of CBTU João Pessoa

The Brazilian Urban Train Company (CBTU) is a state-owned enterprise established in 1984 following the separation of urban railway transport services from the former Federal Railway Network (RFFSA). From 1984 to 1998, CBTU progressively integrated segments of existing systems in São Paulo, Rio de Janeiro, Belo Horizonte, Recife, Salvador, Fortaleza, João Pessoa, Natal, and Maceió. In 1993, CBTU became independent from RFFSA (Sousa & Prates, 1997).

Following this initial expansion, CBTU now manages only the urban train systems in the capitals of Recife, João Pessoa, Natal, and Maceió. In 2019, the Federal Government's Investment Partnership Program (PPI) Council recommended CBTU's inclusion in the PPI to facilitate its privatization through the National Privatization Program. In December 2020, CPPI Resolution No. 160 authorized corporate restructuring operations for CBTU. This restructuring has been completed, and the transfer of CBTU Belo Horizonte to the private sector occurred at the end of 2022. The transfer of the remaining superintendencies is under review by BNDES.

The CBTU urban train system in João Pessoa comprises 13 stations along a single 30 km railway line connecting the municipalities of Cabedelo, João Pessoa, Bayeux, and Santa Rita within the metropolitan region. Company data indicate that in 2019, the system transported an average of 8,100 passengers per day, 178,000 per month, and 2.1 million per year (CBTU, 2022b). Analysis of financial data from 2018 to 2022 enabled the preparation of an income statement (DRE) summarizing CBTU João Pessoa's financial operations. All fiscal years analyzed reported deficits, with an average annual loss of BRL 33.3 million.

4.1. Calculation steps for the application of the proposed modeling

The investment analysis quantified fiscal revenues and assessed concession feasibility in four stages: 1. identifying current fiscal revenues from the cultural value chain in railway-served cities; 2. identifying fiscal revenues from restructuring and remodeling works; 3. identifying fiscal revenues from railway operations; and 4. projecting fiscal revenues from future growth in the cultural sector due to new enterprises.

Because the calculations were complex, the authors developed explanatory flowcharts to clarify the methodology of each stage. Figure 1 shows the flowchart for the first stage, which identifies fiscal revenues from the chosen value chain.

In the current scenario, the survey of fiscal revenues related to the cultural value chain identified the economic activities of this sector according to the National Classification of Economic Activities (CNAE) in the cities of João Pessoa, Cabedelo, Santa Rita, and Bayeux. These activities were cross-referenced with the database of the Annual Social Information Report (RAIS) from the Ministry of Labor and Employment – MTE (Brasil-MTE, 2021), made available on its portal, to extract information on the economic indicators that affect the calculation of fiscal multipliers.

To ensure methodological consistency, the indicators used followed the methodology presented by Ferreira (2021), which emphasizes the importance of designing indicators in the development of sustainable projects. For the present research, four economic indicators directly related to the cultural value chain were selected: the number of companies by size, the number of jobs generated, the average salary, and the total wage bill.

The direct effects considered in the calculation refer to the collection of taxes levied on companies' revenues that comprise the analyzed value chain. For this purpose, the companies were classified according to their tax regime — Simples Nacional or Presumed Profit. Based on this classification, the corresponding rates were applied to the following taxes: ISS (Service Tax), under municipal jurisdiction; ICMS (Tax on the Circulation of Goods and Services) under state jurisdiction; and IRPJ (Corporate Income Tax), under federal jurisdiction. The rates applied to revenues were defined in accordance with the reference tables of the Municipal, State, and Federal Revenue authorities.

The indirect effects considered on taxes on job creation levied on the wage bill, with emphasis on IRPF (Personal Income Tax). Based on this survey, the IRPF rates were applied to the respective salary ranges, in accordance with the criteria established by the Federal Revenue Service.

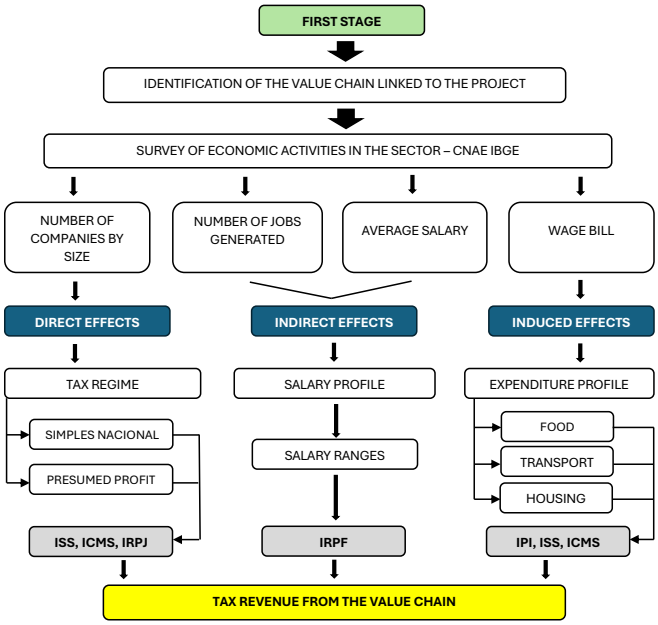

Figure 1 • Flowchart of the first calculation stage.

Following the assessment of direct and indirect effects, the analysis turned to induced effects, stemming from the relationship between income and expenditures within each income class, based on consumption patterns of Brazilian households. In other words, they correspond to the effects arising from the purchasing power of the contracted workforce, which increases consumption and, consequently, demand in the respective supply chains. For the analysis of taxes collected on the expenditure/income relationship of the wage bill, the most significant expenses with the greatest impact on household budgets were considered — namely, food, housing, and transportation — according to the calculation methodology of Bracarense (2017) and Ferreira (2021), with data extracted from the Household Budget Survey (POF) conducted by IBGE.

These successive analyses formed the basis for this first stage, whose objective was to analyze, based on the parameters of Territorial Engineering, the fiscal revenues of the economic sector in question, with the aim of estimating its growth potential over the period of the railway concession.

In 2014, CBTU signed a contract to modernize the urban train system of the João Pessoa Superintendency. Figure 2 presents the flowchart for the second calculation stage, which involves identifying the fiscal revenues levied on the planned investments.

To calculate the direct effects of the restructuring project, investments were divided into three categories: buildings (including stations and garages), permanent way (railway line infrastructure and superstructure, as well as railway sidings), and telecommunications (traffic control and radio communication). Fiscal revenues were calculated for each investment type.

The following taxes were considered when calculating taxation on the investments: ISS (Service Tax) and IRPJ (Corporate Income Tax). ICMS (Tax on the Circulation of Goods and Services) was excluded. This is because the investment involves civil construction works, and construction companies are exempt from this tax, as established by Precedent No. 432 of the Superior Court of Justice (STJ) (Brasil-STJ, 2010b).

For indirect effects, the calculation considered tax revenues levied on investment in rolling stock. Taxation applies to the suppliers of this equipment to the company contracted by CBTU. The calculation also included taxes on major budget items for the restructuring works, such as concrete, steel, and metal structures supplied by third parties to the CBTU contractor. ISS was applied only to the service-related provision of concrete and metal structures, ICMS to steel and metal structures, and IRPJ to all three items. Companies supplying concrete are considered service providers and are subject only to ISS, in accordance with Precedent No. 167 of the Superior Court of Justice (STJ) (Brasil-STJ, 2010a).

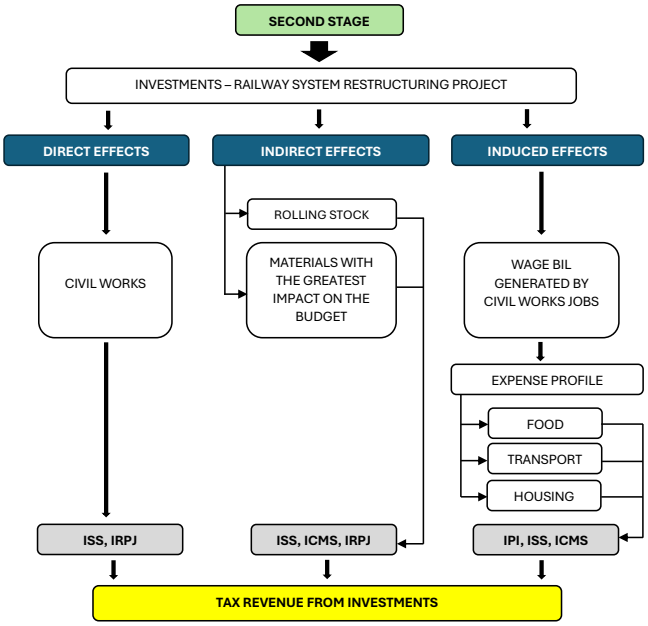

Figure 2 • Flowchart of the second calculation stage.

For induced effects, the study examined the payroll's impact on revenues for construction companies contracted for the works. Using the wage bill from these contracts, it was possible to estimate fiscal revenues on the consumption of this income, following the same parameters as in the first calculation stage.

The calculation used the total value of the contracted works as its revenue base. From this amount, the share corresponding to labor (payroll) was calculated. This was based on the premise that public works contracted by the Public Administration use SINAPI's reference tables from the National System of Construction Costs and Indexes. These tables, prepared by Caixa Economica Federal and IBGE, include both material and labor costs. The objective is to provide a standardized technical basis for public construction budgets.

In the third stage, fiscal revenues from railway operations (generated by the train operation and railway infrastructure) were calculated. Figure 3 presents the flowchart corresponding to this calculation stage.

In this stage, only the direct and induced effects were considered. For the direct effects, taxation on tariffs and extraordinary revenues were included. Fiscal revenues from these sources were calculated using the CBTU-MG concession study (BNDES, 2021). This study outlines the applicable taxes and contributions, along with their corresponding reference rates.

For the induced effects, fiscal revenues were calculated from the relationship between expenditure and income generated by the wage bill for jobs related to the concession operation. The most significant expenses impacting workers' income were considered, using the same parameters as in the cultural value chain's induced effects calculation. Payroll values for the concessionaire company came from the survey in Section 4.2, which covers cost and revenue specifications for the project.

In the fourth step, tax income was predicted based on the expected growth in the cultural sector. Figure 4 shows the flowchart for this step.

Unlike the first stage, which analyzed the cultural sector in its current state, this stage projected growth based on the establishment of new enterprises, allowing for the estimation of fiscal revenues. To establish a growth rate for the proposed project, the current landscape of the cultural sector in Brazil, particularly in the State of Paraíba, was taken into consideration.

Based on the survey conducted in the first stage on the economic activities of the cultural value chain in the cities served by CBTU-João Pessoa, it was possible to quantify, using financial data, the current reality of the cultural sector in João Pessoa, Cabedelo, Bayeux, and Santa Rita. This diagnosis identified activities with the greatest economic potential, highest revenues, and most job creation, revealing those with the highest potential for tax collection. Of the 41 economic activities mapped, the

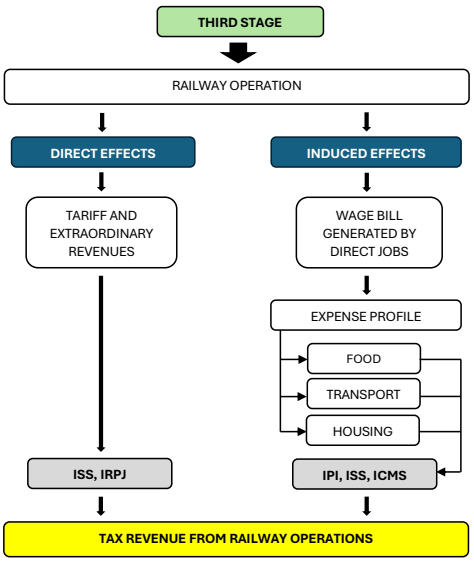

Figure 3 • Flowchart of the third calculation stage.

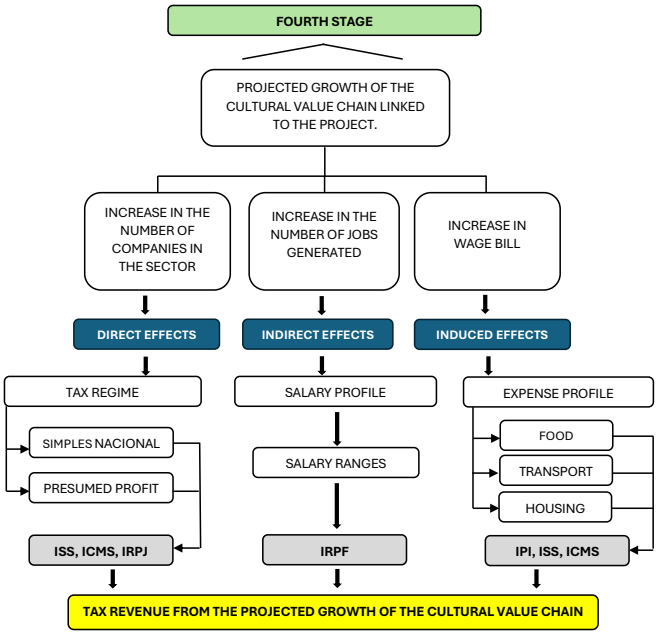

Figure 4 • Flowchart of the fourth calculation stage.

10 with the greatest financial and fiscal impact were selected as the basis for growth projection and revenue estimation in this stage.

After surveying fiscal revenues, cash flow statements were prepared to assess the financial feasibility of the railway concession project. Data analysis used four concession scenarios: two trend scenarios, which consider a conventional concession in which the concessionaire's remuneration comes from user fares and non-operational revenues, and two alternative scenarios, which adopt the concepts of Territorial Engineering.

In both scenarios, a cash flow spreadsheet was prepared based on the studies of Assaf Neto (2014) and Marion (2015). The spreadsheet contains revenue and expenditure values over 30 years. The indicators used include the Discount Rate, Net Present Value (NPV), accumulated NPV, Internal Rate of Return (IRR), Profitability Index (PI), and Payback Period (PB), which allowed for the evaluation of the project's feasibility.

4.2. Specification and calculation of project costs and revenues

The calculation spreadsheet incorporated costs from the company's Statement of Income (DRE) and projections from the Belo Horizonte railway transport system concession grant study by CBTU/MG (BNDES, 2021). Costs were categorized as operating expenses, salaries, social and labor charges, taxes, contributions, depreciation, amortization, and investments.

This research adopts a conservative approach by assuming the discount rate, or cost of capital, matches the basic interest rate. The Selic rate was 13.75% in December 2022.

Section 4.1 states that in 2014, CBTU signed a contract to modernize João Pessoa's urban train system. The project encompasses the rehabilitation and modernization of 30 km of railway tracks, along with related buildings and infrastructure. The budget, updated for 2022, was BRL 473.4 million, to be invested over an eight-year period. The Net Present Value (NPV) was estimated at BRL 276.8 million.

This study divided personnel costs into four categories: administration, implementation, operation, and maintenance. Employee counts and remuneration costs relied on CBTU's salary table from the Collective Labor Agreement of 2022/2023, available on CBTU's website (CBTU, 2022a). After this survey, personnel costs during the concession were estimated at BRL 662.4 million, with an NPV of BRL 105.9 million.

Regarding depreciation costs, this study adopted the interpretation of Diógenes & Slomski (2008), which classifies infrastructure assets as depreciable, as they are controlled by the State and form part of public property. The depreciation calculation was performed using the straight-line method, including investments in the system's restructuring, totaling BRL 473.4 million. The Net Present Value (NPV) of depreciation costs was estimated at BRL 112.3 million.

To estimate operating costs, the concession study of CBTU-MG, prepared by BNDES (2021), was used as a reference. According to this study, most efficient passenger railway systems present an operational cost indicator close to or even below BRL 12 per car-km. The operating cost of CBTU Minas Gerais, in 2019, was BRL 25 per car-km. For the CBTU-MG concession, an indicator of BRL 14.28 per car-km was obtained. Given the conservative nature of this research, it was decided to establish the average of the three values, resulting in an operating cost of BRL 17.09 per car-km for the João Pessoa CBTU train system. The costs over the concession period were estimated at BRL 1.2 billion, with an NPV estimated at BRL 176.9 million.

Regarding revenues, this study considered both fare collection and non-operational revenues, including those derived from advertising contracts and leases. Given the conservative nature of the research, the company's demand growth rate between 2014 and 2022 was calculated. Based on the data collected, the average demand growth rate was determined using the mean number of passengers transported per business day. It should be noted that this conservative projection did not account for the seasonality of cultural activities, which can lead to fluctuations in demand and affect fiscal revenue.

Regarding the financial volume of fare collection during the concession period, the study adopted, for analytical purposes, the fare of the urban public passenger bus transport system in João Pessoa, set at BRL 4.70 in 2023 (CMMU, 2023), applying a 90% multiplier. The initial fare used in the calculation was BRL 4.23, from which the average inflation rate of the last 20 years was applied to estimate the fare value over the 30-year concession period. Fare revenues throughout the concession period were estimated at BRL 3.7 billion, with an NPV estimated at BRL 350.2 million.

Considering extraordinary revenues, the concession grant study by CBTU/MG was once again referenced. This study analyzed the benchmark of several passenger railway transport companies in Brazil. Based on the analysis conducted, it was considered that, with the restructuring of the CBTU/JOP system and the expansion of fare revenues, this percentage would amount to 6.88% of annual fare revenues. Over the concession period, extraordinary revenues were estimated at BRL 259.6 million, with an NPV estimated at BRL 24.0 million.

Regarding the counter payments, which would be covered by the economic activities of the cultural value chain in the cities served by CBTU João Pessoa, the analysis began with an examination of the current situation of the cultural sector in João Pessoa, Cabedelo, Bayeux, and Santa Rita. From this analysis, the activities with the greatest economic potential, highest revenues, largest employment generation, and consequently, the greatest potential for tax collection were selected.

Taking the current scenario of cultural sector activities as a reference and projecting an average annual growth rate of 6.61% – a rate observed in the sector between 2012 and 2020 (Itaú Cultural, 2023; IBGE, 2023) – it is estimated that 300 companies would be created in this sector. Based on this projection, the fiscal revenues derived from the turnover of these companies and the wage bill generated over the concession period were calculated and redirected to the railway concession project. Fiscal revenues from the new companies over the concession period were estimated at BRL 3.4 billion, with an NPV estimated at BRL 470.8 million.

5. Analysis of results

5.1. Trend scenario

This scenario follows the traditional public concession model. The concessionaire is paid through user fares and non-operational revenues. Bracarense (2017) notes that feasibility assessment requires data on demand projections, costs, revenues, and financial analysis. Using this data, two trend scenarios were outlined. In Scenario A, there is no direct public sector investment. The deficit is covered by

counter payments. In Scenario B, the Public Authority directly manages construction and uses counter payments to cover the new deficit. In Scenario A, as shown in Table 1, the project's financial balance depends on a public counter payment of BRL 321.7 million to ensure feasibility.

In Trend Scenario B, investments would be funded by federal and state funds. This follows the study adopted by BNDES for the CBTU-MG concession. Applying the same practice to the CBTU João Pessoa project, the concession would still be unfeasible. It would have a negative Net Present Value (NPV) of BRL 44.8 million, as shown in Table 2, which models Trend Scenario B.

5.2. Alternative scenario

This alternative scenario applies the Territorial Engineering approach using a sponsored concession model. Here, public-sector counter payments sustain the contract's financial balance over a 30-year period. The concessionaire is remunerated via user fares, non-operational revenues (from leases and advertising), and public counter payments. The key distinction from the traditional scenario is the source of public funding for these contributions. Accordingly, this section outlines two scenarios that differ in how public counter payments are financed and in the sources that support them.

In Alternative Scenario A, the concessionaire covers both operational and non-operational costs, as well as investments in modernization. Public payments are derived solely from tax revenues generated by the project's fiscal effects and the concessionaire's activities.

In Alternative Scenario B, public payments are financed by tax revenues from the works and operations, as well as taxes generated by the cultural value chain. The concessionaire manages all costs and

Table 1 • Results of the financial analysis of trend scenario A (in BRL)

	PRESENT VALUE
REVENUES	**374, 380, 145.06**
Tariff Revenues	350, 294, 870.60
Extraordinary Revenues	24, 085, 274.46
INVESTMENTS	**−276, 868, 459.35**
Buildings	−105, 536, 856.37
Permanent Way	−63, 244, 960.11
Telecommunications	−24, 879, 471.73
Rolling stock	−83, 207, 171.14
OPERATING EXPENSES, WAGES AND PAYROLL CHARGES	**−282, 911, 298.66**
Energy, Fuel, Outsourced Services, Other Operating Expenses	−176, 934, 826.04
Wages and Social and Labor Charges	−105, 976, 472.63
TAXES, DEPRECIATION AND AMORTIZATION	**−136, 324, 598.62**
PIS	−397, 407.03
COFINS	−1, 830, 480.86
IRPJ	−8, 985, 123.48
CSLL	−4, 043, 305.57
ISS	−1, 204, 263.72
CPRB	−7, 487, 602.90
Depreciation and Amortization	−112, 376, 415.06
TOTAL PRESENT VALUE OF THE PROJECT	**−321, 724, 211.57**

DISCOUNT RATE	13.75%
PROJECT NET PRESENT VALUE (NPV)	−321, 724, 211.57
INTERNAL RATE OF RETURN (IRR)	Not profitable
PROFITABILITY RATE	Not profitable
PAYBACK PERIOD	> 30 Years (Economically unfeasible project)

Table 2 • Results of the financial analysis of Trend Scenario B (in BRL)

	PRESENT VALUE
REVENUES	**374, 380, 145.06**
Tariff Revenues	350, 294, 870.60
Extraordinary Revenues	24, 085, 274.46
PUBLIC COUNTERPAYMENT	**276, 868, 459.35**
Public capital contributions to cover investments	276, 868, 459.35
INVESTMENTS	**−276, 868, 459.35**
Buildings	−105, 536, 856.37
Permanent Way	−63, 244, 960.11
Telecommunications	−24, 879, 471.73
Rolling Stock	−83, 207, 171.14
OPERATING EXPENSES, WAGES AND PAYROLL CHARGES	**−282, 911, 298.66**
Energy, Fuel, Outsourced Services, Other Operating Expenses	−176, 934, 826.04
Wages and Social and Labor Charges	−105, 976, 472.63
TAXES, DEPRECIATION AND AMORTIZATION	**−136, 324, 598.62**
PIS	−397, 407.03
COFINS	−1, 830, 480.86
IRPJ	−8, 985, 123.48
CSLL	−4, 043, 305.57
ISS	−1, 204, 263.72
CPRB	−7, 487, 602.90
Depreciation and Amortization	−112, 376, 415.06
TOTAL PRESENT VALUE OF THE PROJECT	**−44, 855, 752.22**

DISCOUNT RATE	13.75%
PROJECT NET PRESENT VALUE (NPV)	−44, 855, 752.22
INTERNAL RATE OF RETURN (IRR)	Not profitable
PROFITABILITY RATE	Not profitable
PAYBACK PERIOD	> 30 Years (Economically unfeasible project)

investments in modernization. Unlike Scenario A, Scenario B supplements public funding with fiscal effects from cultural activities, broadening the project's funding base.

The fiscal revenues derived from the direct, indirect, and induced effects of the restructuring and modernization works, as well as from the concessionaire's operations during the concession period, were estimated at BRL 274.3 million, with a Net Present Value (NPV) of BRL 60.1 million. These resources would be allocated as public counter payments, as proposed in the cash flow for Alternative Scenario A. Nevertheless, the project remains unfeasible under this scenario, presenting a negative NPV, a payback period exceeding the concession term, and a negative rate of return. Table 3 consolidates the cash flow values.

Based on the hypothesis that the economic potential of the region's cultural value chain would be leveraged through its fiscal multipliers, the tax revenues from the new companies in the cultural sector over the concession period were estimated at BRL 3.4 billion, with a Net Present Value (NPV) of BRL 470.8 million. To this amount is added the tax revenue generated by the concessionaire's operations and by the restructuring and modernization works of the system, whose NPV was estimated at BRL 60.1 million. The consolidated total, therefore, reaches BRL 531.0 million, as shown in Table 4.

In this scenario, the payback period was 14.88 years, with a profitability index of 0.44 and an internal rate of return (IRR) of 21.85%. These results render the project attractive to the private sector and indicate a balanced cash flow—provided that the cultural sector is adequately mobilized and the corresponding

Table 3 • Results of the financial analysis of Alternative Scenario A (in BRL)

	PRESENT VALUE
REVENUE	**374, 380, 145.06**
Tariff Revenues	350, 294, 870.60
Extraordinary Revenues	24, 085, 274.46
PUBLIC COUNTERPAYMENT	**60, 175, 453, 68**
Direct effects on construction works and concessionaire operations	17, 353, 840.15
Indirect effects on construction works	19, 325, 769.57
Induced effects on construction works and on the concessionaire's operations	23, 495, 843.96
INVESTMENTS	**−276, 868, 459.35**
Buildings	−105, 536, 856.37
Permanent Way	−63, 244, 960.11
Telecommunications	−24, 879, 471.73
Rolling Stock	−83, 207, 171.14
OPERATING EXPENSES, WAGES AND PAYROLL CHARGES	**−282, 911, 298.66**
Energy, Fuel, Outsourced Services, Other Operating Expenses	−176, 934, 826.04
Wages and Social and Labor Charges	−105, 976, 472.63
TAXES, DEPRECIATION AND AMORTIZATION	**−136, 324, 598.62**
PIS	−397, 407.03
COFINS	−1, 830, 480.86
IRPJ	−8, 985, 123.48
CSLL	−4, 043, 305.57
ISS	−1, 204, 263.72
CPRB	−7, 487, 602.90
Depreciation and Amortization	−112, 376, 415.06
TOTAL PRESENT VALUE OF THE PROJECT	**−261, 548, 757.89**

DISCOUNT RATE	13.75%
PROJECT NET PRESENT VALUE (NPV)	−261, 548, 757.89
INTERNAL RATE OF RETURN (IRR)	Not profitable
PROFITABILITY RATE	Not profitable
PAYBACK PERIOD	> 30 Years (Economically unfeasible project)

tax revenues are considered a source for covering the project's costs.

6. Final considerations

The article aimed to show that, as fiscal space for infrastructure investments has been exhausted, relying on private investment through current concession contracts has shown its limitations. In this context, a new concession model is proposed. This model would prioritize territorial development around the granted assets as a pathway to building a business model that ensures fiscal sustainability for projects.

It should also be emphasized that the application of Territorial Engineering concepts in a future concession project for the CBTU João Pessoa railway assumes that the railway sector plays a strategic role in the development of the urban territory. The integration between transport and land use is considered one of the most promising approaches to promote urban sustainability and to foster economic and social development.

Using the proposed economic model, the study's initial hypothesis was verified. Financial analyses of trend and alternative scenarios demonstrated the concession's economic feasibility, provided a territorial development proposal is included—here, based on boosting the cultural sector—in the project's financial engineering. It is noteworthy that applying Territorial Engineering concepts to this model could make

Table 4 • Results of the financial analysis of Alternative Scenario B (in BRL)

	PRESENT VALUE
REVENUE	**374, 380, 145.06**
Tariff Revenues	350, 294, 870.60
Extraordinary Revenues	24, 085, 274.46
PUBLIC COUNTERPAYMENT	**531, 049, 676.96**
Direct effects on the cultural sector, on construction works, and on the concessionaire's operations	257, 609, 225.30
Indirect effects on the cultural sector and on construction works	59, 350, 518.86
Induced effects on the cultural sector, on construction works, and on the concessionaire's operations	214, 089, 932.81
INVESTMENTS	**−276, 868, 459.35**
Buildings	−105, 536, 856.37
Permanent Way	−63, 244, 960.11
Telecommunications	−24, 879, 471.73
Rolling Stock	−83, 207, 171.14
OPERATING EXPENSES, WAGES AND PAYROLL	**−282, 911, 298.66**
Energy, Fuel, Outsourced Services, Other Operating Expenses	−176, 934, 826.04
Wages and Social and Labor Charges	−105, 976, 472.63
TAXES, DEPRECIATION AND AMORTIZATION	**−136, 324, 598.62**
PIS	−397, 407.03
COFINS	−1, 830, 480.86
IRPJ	−8, 985, 123.48
CSLL	−4, 043, 305.57
ISS	−1, 204, 263.72
CPRB	−7, 487, 602.90
Depreciation and Amortization	−112, 376, 415.06
TOTAL PRESENT VALUE OF THE PROJECT	**209, 325, 465.40**

DISCOUNT RATE	13.75%
PROJECT NET PRESENT VALUE (NPV)	209, 325, 465.40
INTERNAL RATE OF RETURN (IRR)	21.85%
PROFITABILITY RATE	0.44
PAYBACK PERIOD	14.88

the concession viable through public counter payments resulting from fiscal multipliers. This approach would also benefit the local economy by generating employment and income where the railway operates.

The economic modeling proposal in this research offers an innovative contribution. It ties railway infrastructure to local economic development via the cultural economy. Still, as with any innovative and exploratory proposal, it presents certain limitations. These need to be considered to refine and assess the model's real-world feasibility. Instead of disqualifying the approach, such limitations highlight pathways for future research. These include integration with public policies, legal frameworks, and territorial strategies, as well as the development of new concession models that link infrastructure investment with local economic development, as proposed by Andrade *et al.* (2022). This model, under development via the Economic Corridors Project and financed by FNDCT, aims to create a new business type: the territorial enterprise. In this model, the public sector would grant not only infrastructure but also other public assets—such as land, real estate, and tax incentives—in exchange for economic dynamization outcomes.

Currently, it is important to highlight an unresolved issue at the institutional level. There is still no decision on whether the federal, state, or municipal government will lead the project. This uncertainty could threaten project implementation, especially where responsibilities overlap or clear leadership is absent. However, this challenge may become an opportunity if federative entities collaborate. Shared governance could unlock the potential of each level of government.

The research did not address public policies for cultural promotion in depth. Such policies are key to encouraging new enterprises in the territory. This omission results from the study's methodological limits but points to fertile ground for future research. Aligning economic modeling with public strategies for cultural promotion—using calls for proposals, financing lines, and fiscal policies—will be crucial to attract and sustain the planned activities economically.

Another important point is the effect of seasonality on cultural activities and projected demand. Visitor flows, event schedules, and income in the cultural sector may fluctuate throughout the year. These changes can affect fiscal revenues and the project's economic appeal. However, strategies for continuous and varied cultural programming can help. Well-planned event calendars across the year reduce seasonality effects and ensure steady attendance and investment. These measures reinforce the project's economic sustainability.

It is also important to note that some cultural activities have more economic growth potential than others. This may cause investment imbalances across the territory. Future analyses should refine the identification of the most promising cultural segments in each region. These efforts should take into account historical, demographic, and economic factors. Such steps will enable more precise modeling, match local details, and maximize the results. The study's limitations do not undermine the feasibility of the proposal. Instead, they outline strategic directions for future research and project improvement.

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CRediT authorship contribution statement

Rodolpho Rodrigues Soares: Data curation, Formal analysis, Writing – original draft, Writing – review & editing, Investigation, Methodology, Visualization; *Anísio Brasileiro*: Project administration, Formal analysis, Conceptualization, Writing – review & editing, Methodology, Investigation, Validation, Visualization; *Maurício Oliveira de Andrade*: Formal analysis, Writing – review & editing, Methodology, Investigation, Validation, Visualization; *Joaquim José Guilherme de Aragão*: Project administration, Formal analysis, Conceptualization, Writing – review & editing, Methodology, Investigation, Validation, Visualization.

Use of artificial intelligence-assisted technology

The tools used were ChatGPT and Grammarly to perform grammatical corrections to the text. The authors assume full responsibility for the use of this tool.

Competing interests statement

The authors declare that there are no conflicts of interest.

Data availability statement

The data, models, and code that support the findings of this study are available from the corresponding author upon request.

References

Andrade, M. O., J. J. G. Aragão, A. Brasileiro, Y. Yamashita, & R. Soares (2022). Potencial dos corredores econômicos para viabilização de investimento em infraestrutura viária: Estudo dos eixos nacionais de integração e desenvolvimento (ENID) e da iniciativa de integração da infraestrutura regional sul-americana (IIRSA). *Revista Brasileira de Gestão e Desenvolvimento Regional 18*, 398–412. DOI:10.54399/rbgdr.v18i3.6632.

Aragão, J. J. G. (2008). Fundamentos para uma Engenharia Territorial. CEFTRU, UnB, Brasília.

Aragão, J. J. G., L. S. F. P. Bracarense, & Y. Yamashita (2019). Princípios da Engenharia Territorial aplicados como instrumento para o crescimento e para o desenvolvimento econômico. *Revista Brasileira de Gestão e Desenvolvimento Regional 15*(1), 194–207. URL: https://www.rbgdr.net/revista/index.php/rbgdr/article/view/4329/751 [visited 02/sept/2025].

Aragão, J. J. G., A. Brasileiro, & R. F. Consulin (2021). Proposta de concessão para aeroportos regionais explorando potenciais econômicos locais. *Revista Econômica do Nordeste 52*(4), 146–166. DOI:10.61673/ren.2021.1318.

Aragão, J. J. G. & Y. Yamashita (2010). Engenharia Territorial: problemas e territórios programáticos. Technical report 08, CEFTRU, UnB, Brasília. URL: https://www.academia.edu/4787200/Engenharia_Territorial_Problemas_e_Territ%C3%B3rios_Program%C3%A1ticos [visited 02/sept/2025].

Aragão, J. J. G. & Y. Yamashita (2017). Promovendo projetos de grande vulto mediante novas soluções institucionais. In *Infraestrutura e parcerias para o desenvolvimento: as alianças público-privadas*. Brasília: Ministério do Planejamento, Desenvolvimento e Gestão. URL: https://www.gov.br/gestao/pt-br/central-de-conteudo/publicacoes/planejamento/assuntosinternacionais/SEAIN_Infraestrutura_PPP_web_8fev2017.pdf [visited 02/sept/2025].

Assaf Neto, A. (2014). *Finanças corporativas e valor* (7 ed.). São Paulo: Ed. Atlas.

BNDES (2021). Estudo de outorga de concessão do transporte ferroviário - Belo Horizonte/MG. URL: https://hubdeprojetos.bndes.gov.br/pt/projetos/CBTU-BH/7d48b409-e4a7-11eb-b2b1-0242ac11002b [visited 05/sept/2025].

Bracarense, L. S. F. P. (2017). *Elementos para um modelo inovador de Parcerias Público-Privadas em Infraestrutura de Transportes: Estudo aplicado à Hidrovia do Rio Tocantins*. PhD. dissertation, Universidade de Brasília, Brasília. URL: http://hdl.handle.net/11612/516 [visited 16/mar/2026].

Brasil-MTE (2021). Base de Dados do Cadastro Geral de Empregados e Desempregados (CAGED) e da Relação Anual de Informações Sociais (RAIS). Ministério do Trabalho e Emprego. URL: https://bi.mte.gov.br/bgcaged/inicial.php [visited 02/sept/2025].

Brasil-STJ (2010a). Súmula 167 - O fornecimento de concreto, por empreitada, para construção civil, preparado no trajeto até a obra em betoneiras acopladas a caminhões, é prestação de serviço, sujeitando-se apenas à incidência do ISS. Superior Tribunal de Justiça, Brasília, DF.

Brasil-STJ (2010b). Súmula 432 - As empresas de construção civil não estão obrigadas a pagar ICMS sobre mercadorias adquiridas como insumos em operações interestaduais. Superior Tribunal de Justiça, Brasília, DF.

CBTU (2022a). Acordo Coletivo de Trabalho 2022-2023. URL: https://www.gov.br/cbtu/pt-br/acesso-a-informacao/empregados-publicos-1/acordos-convencoes-e-dissidios-coletivos/acordo [visited 16/mar/2026].

CBTU (2022b). Relatórios Anuais. Companhia Brasileira de Trens Urbanos, Brasília, DF. URL: https://intranet.cbtu.gov.br/index.php/pt/desempenho/relatorios-anuais [visited 02/sept/2025].

CMMU (2023). Membros do Conselho Municipal de Mobilidade Urbana definem novo valor da tarifa de ônibus e melhorias para o transporte público. Prefeitura Municipal de João Pessoa. URL: https://www.joaopessoa.pb.gov.br/noticias/membros-do-conselho-municipal-de-mobilidade-urbana-definem-novo-valor-da-tarifa-de-onibus-e-melhorias-para-o-transporte-publico/ [visited 02/sept/2025].

Consulin, R. F. (2020). Uma nova estratégia para concessão de aeroportos regionais no Brasil. MSc. thesis, Universidade Federal de Pernambuco, Recife. URL: https://repositorio.ufpe.br/handle/123456789/37658 [visited 02/sept/2025].

Diógenes, E. S. & V. Slomski (2008). Depreciação em bens de infraestrutura: um estudo realizado na rodovia Nova Imigrantes. *ABCustos 3*(3), 91–110. URL: https://revista.abcustos.org.br/abcustos/article/view/60 [visited 02/sept/2025], DOI:10.47179/abcustos.v3i3.60.

Ferreira, L. C. S. (2021). Proposta metodológica para elaboração de projetos urbanos de aglomerações produtivas (clusters). MSc. thesis, Universidade de Brasília, Brasília. URL: http://repositorio.unb.br/handle/10482/41909 [visited 02/sept/2025].

IBGE (2023). Sistema de Informações e Indicadores Culturais 2011-2022. URL: https://biblioteca.ibge.gov.br/index.php/biblioteca-catalogo?view=detalhes&id=2102053 [visited 02/sept/2025].

Itaú Cultural (2023). Painel de Dados do Observatório Itaú Cultural. URL: https://www.itaucultural.org.br/secoes/pesquisas/painel-de-dados-do-observatorio-itau-cultural-tutorial [visited 02/sept/2025].

Lissa, M. T., L. R. Silva, Y. Yamashita, & J. J. G. Aragão (2021). O programa territorial como fator de viabilidade de infraestruturas aeroportuárias: Metodologia para identificação de oportunidades. *Revista de Geografia e Ordenamento do Território* (22), 28–51. URL: https://scielo.pt/pdf/got/n22/2182-1267-got-22-28.pdf.

Marion, J. C. (2015). *Contabilidade empresarial* (17 ed.). São Paulo: Ed. Atlas.

Nyko, D. & P. Zendron (2018). Economia criativa. URL: https://web.bndes.gov.br-/bib/jspui/bitstream/1408/16280/1/PRCapLiv214176_Economia%20criativa_compl_P.pdf [visited 02/sept/2025].

Oliveira, A. V. M. & F. A. Turolla (2013). Financiamento da infraestrutura de transportes. *Journal of Transport Literature 7*(1), 103–126.

Orair, R. O. (2016). Investimento público no Brasil: trajetória e relações com o regime fiscal. Texto para discussão 2215, IPEA. URL: https://repositorio.ipea.gov.br/handle/11058/6873 [visited 02/sept/2025].

Raiser, M., R. N. Clarke, P. Procee, C. M. Briceno-Garmendia, E. Kikoni, J. K. Mubiru, & L. Vinuela (2017). Back to planning: how to close Brazil's infrastructure gap in times of austerity. Report Nº. 117392-BR, World Bank. URL: https://documents.worldbank.org/curated/en/386151499876913758 [visited 02/sept/2025].

Rocha, K. (2020). Investimentos privados em infraestrutura nas economias emergentes: a importância do ambiente regulatório na atração de investimentos. Texto para discussão 2584, IPEA. URL: https://repositorio.ipea.gov.br/handle/11058/10217 [visited 02/sept/2025].

Sehn, D. (2009). Avaliação econômica de projetos de infraestrutura de transportes: uma metodologia aplicada à tomada de decisão governamental. Capstone project, Universidade Federal de Santa Catarina, Florianópolis. URL: https://repositorio.ufsc.br/xmlui/handle/123456789/123617 [visited 08/sept/2025].

Sousa, R. A. & H. F. Prates (1997). O processo de desestatização da RFFSA: principais aspectos e primeiros resultados. *Revista do BNDES 4*(8), 119–142. URL: https://web.bndes.gov.br/bib/jspui/bitstream/1408/13817/2/RB%2008%200%20processo%20de%20desestatiza%C3%A7%C3%A3o%20da%20RFFSA%20[...]_P_BD.pdf [visited 02/sept/2025].

Tadini, V. & I. Rocha (2018). As particularidades do investimento em infraestrutura. *Textos para Discussão 1*(1), 1–8. URL: https://www.abdib.org.br/wp-content/uploads/2024/06/Texto-para-reflexao.pdf [visited 02/sept/2025].

Thá, D. (2022). *Avaliação Socioeconômica de Projetos de Infra (Custo-Benefício-ACB)*. Brasília: ENAP. URL: https://repositorio.enap.gov.br/handle/1/7691 [visited 08/aug/2025].

Valiati, L., F. S. Lang, G. Möller, & E. Saron (2023). Produto interno bruto da economia da cultura e das indústrias criativas: uma abordagem pela ótica da renda. *Revista Observatório Itaú Cultural* (34), 74–105. URL: https://issuu.com/itaucultural/docs/obs34 [visited 02/sept/2025].

Valiati, L. & H. Morrone (2014). Conta satélite de cultura do Brasil: considerações técnicas e paradigmas internacionais. Technical report, Centro de Estudos Internacionais sobre Governo – CEGOV/UFRGS. URL: https://livrozilla.com/doc/1737916/conta-sat%252525C3%252525A9lite-de-cultura-do-brasil.-ufrgs.2014 [visited 02/sept/2025].