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CAPITAL BUDGETING AND SOCIO-ECONOMIC ANALYSIS: EVIDENCE OF THE NEW TRAMWAY PROJECT: ILIDŽA-HRASNICA

ABSTRACT

Capital budgeting is one of the most important areas of financial management. Different techniques are used to evaluate capital investment budgeting projects: payback period (PP), net present value (NPV) and internal rate of return (IRR). Graham and Harvey (2002) point out that financial managers prefer the following methods: internal rate of return or undiscounted payback period. The Ilidža–Hrasnica tram line extension is one of Sarajevo's most significant transport investments in decades, aiming to connect a long-neglected suburban corridor to the capital's tram network. This paper evaluates the project's viability using capital budgeting criteria, Net Present Value (NPV), and Internal Rate of Return (IRR), alongside a qualitative economic justification. The financial analysis, drawing on projected costs and ridership, suggests a positive NPV and an IRR in the 8–10% range, exceeding the relevant cost of capital, indicating the project is financially justified under reasonable assumptions. The results and discussion emphasize that while initial ridership and financial returns may be modest, even negative in the very early years, strategic planning and supportive policies can ensure the project's long-run success. The study concludes that the Ilidža–Hrasnica tram line is a sound investment that will enhance the city's sustainable development, and it recommends measures to maximize its inclusive benefits.

Keywords: *Capital budgeting; Public transport investment; Net present value; Return on Investment; Social inclusion; Sarajevo tramway*

JEL Classification: H43; H54; R42

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1. INTRODUCTION

Investing in public transport infrastructure is vital for sustainable urban development, especially in expanding cities. Sarajevo, the capital of Bosnia and Herzegovina, is undertaking a major upgrade of its transit network through the Ilidža–Hrasnica tram line extension. This 13-kilometre double-track project with 20 new stations will link the existing Ilidža terminus to the suburban area of Hrasnica. Financed by the €30 million European Bank for Reconstruction and Development (EBRD) loan under the Green Cities framework, the project represents a milestone in promoting greener and more efficient mobility. Officials describe it as the realization of a forty-year commitment to residents, expected to enhance daily life and regional connectivity once completed in 2025 and operational in 2026. Beyond improving transport, the project carries broader socio-spatial significance. Post-war Sarajevo has faced fragmented growth, leaving peripheral settlements like Hrasnica poorly connected to the urban core. The tram line thus symbolizes reintegration, addressing spatial inequality and fostering inclusion. Residents view it as long-awaited recognition, signifying that "Sarajevo is finally reaching out to us." This paper evaluates the Ilidža - Hrasnica project through both financial and social lenses. Quantitatively, it applies standard capital-budgeting techniques (NPV, IRR, MIRR) to determine economic viability. Qualitatively, it incorporates stakeholder insights to assess community, environmental, and accessibility impacts often missed by financial metrics. Together, these perspectives provide a holistic assessment of how the extension advances Sarajevo's sustainable, inclusive urban growth and informs future public transport investments.

2. LITERATURE REVIEW

Research on capital budgeting has long examined how organizations assess, select, and implement long-term investment projects. Block (1997) analyzed 232 small firms and found that the return on investment (ROI) method remains the dominant tool, used by 42.7% of respondents, indicating a continued preference for simpler approaches in smaller enterprises. In contrast, Graham and Harvey (2001) surveyed 392 U.S. chief financial officers and revealed that large firms rely heavily on more advanced techniques such as net present value (NPV) and the capital asset pricing model (CAPM), whereas smaller firms tend to apply the payback criterion due to its simplicity and intuitive appeal.

Further supporting this trend, Bennouna, Meredith, and Marchant (2010) studied 88 Canadian corporations and found an increasing use of discounted cash flow (DCF) methods, particularly NPV and internal rate of return (IRR), reflecting a shift toward more sophisticated evaluation frameworks even in non-financial sectors. Similarly, Hartwig (2012), in a longitudinal and cross-country study of Swedish listed firms, concluded that larger companies are significantly more likely to apply formal capital budgeting methods and cost of capital estimation procedures.

Hermes, Smid, and Yao (2007) extended this analysis to emerging markets, showing that while awareness of DCF methods is high, implementation is constrained by data limitations and uncertainty in cash flow forecasting. Andrés, Fuente, and Martín (2015) explored Spanish companies and confirmed that firm size, managerial education, and ownership structure significantly influence the sophistication of investment appraisal techniques. Likewise, Correia and Cramer (2008) found that South African firms increasingly employ NPV and IRR as primary decision criteria, suggesting convergence toward international best practices.

Recent studies, such as Truong, Partington, and Peat (2008) in Australia and Pinto and Robinson (2016) in the United States, reaffirm that while discounted cash flow techniques dominate in theory, many firms continue to complement them with simpler heuristics such as payback or accounting rate of return, especially under conditions of uncertainty or liquidity constraints. Andor, Mohanty, and Toth (2015) conducted a cross-European survey and demonstrated that although NPV and IRR are the most frequently applied methods, behavioral factors and managerial biases still play a role in final investment decisions.

Taken together, these studies suggest that while the theoretical foundations of capital budgeting emphasize discounted cash flow methods (NPV, IRR, MIRR), their practical use varies across contexts depending on firm size, market maturity, access to capital, and managerial experience. The convergence toward sophisticated evaluation methods indicates a global trend toward improved financial governance and evidence-based decision-making, relevant not only to private enterprises but also to public-sector infrastructure projects such as the Ilidža–Hrasnica tram line in Sarajevo.

Capital Budgeting Criteria in Investment Decisions: Extensive literature in finance and economics has established NPV as a primary criterion for evaluating long-term investments. NPV represents the present value of a project's expected future cash flows minus the initial investment cost. A positive NPV indicates that an investment is worthwhile, as it adds value to the firm or, in a public sector context, yields a net economic benefit. By accepting only projects with NPV $\geq$ 0, decision-makers align with the goal of maximizing wealth or social welfare. The Internal Rate of Return (IRR) is another widely used indicator, defined as the discount rate that makes the project's NPV equal to zero. In practice, IRR provides an intuitive measure of a project's return; investors often compare IRR to a required rate of return or cost of capital when deciding on project acceptance. The decision rule is that if IRR exceeds the required hurdle rate, the project is deemed acceptable. However, prior research notes several limitations of IRR. Projects with non-conventional cash flow patterns (multiple sign changes in net cash flows) can yield multiple IRR values, causing ambiguity. Moreover, IRR

can sometimes give conflicting rankings compared to NPV when comparing mutually exclusive projects of different scale or duration. To address these issues, the Modified Internal Rate of Return (MIRR) is recommended as a more reliable metric. MIRR assumes reinvestment of interim cash flows at the firm's (or project's) required rate of return rather than at the IRR itself, providing a unique return measure that aligns more closely with NPV rankings. In summary, contemporary capital budgeting practice, as reflected in textbooks (e.g. Ross, Westerfield & Jaffe, 2005), advocates using NPV as the foremost criterion, with IRR/MIRR and other indicators as supplementary tools for decision support. This multifaceted approach is particularly relevant for public infrastructure projects, where both financial viability and broader economic impact must be weighed.

Transport Infrastructure and Socio-Economic Impact: Public transport investments are often evaluated not only on financial grounds but also for their wider economic and social effects. Previous research in urban economics and planning has shown that improved transit infrastructure can generate positive externalities such as reduced road congestion, lower vehicle emissions, and increased land values near new stations. For instance, the EBRD's support for Sarajevo's tram modernization is predicated on outcomes like shifting commuters from cars to public transport and cutting greenhouse gas emissions. A growing body of literature also emphasizes the equity and inclusion dimension of mobility. Sheller and Urry (2006) introduced the "new mobilities paradigm," reframing transport as a socio-political process that can either enhance or hinder social inclusion. Subsequent work on mobility justice (Sheller, 2018) and the "right to the city" (Lefebvre, 1996) argues that access to transportation is fundamental to full urban citizenship. Empirical studies have documented that investments in transit can improve access to jobs, education, and services for disadvantaged groups, thereby fostering greater social equity (Martens, 2017). On the other hand, transit upgrades can also lead to unintended consequences such as gentrification. New rail lines often spur rising property demand in adjacent areas; without policy safeguards, lower-income residents might be displaced by higher rents – a phenomenon observed in cities worldwide (e.g. Marcuse, 2009; Lees et al., 2008). The present study builds on this literature by combining a capital budgeting evaluation with an analysis of the project's qualitative impacts on the community. It also references practical findings from a recent Japan International Cooperation Agency (JICA) study of Sarajevo's transport system, which noted that the Ilidža–Hrasnica corridor currently has relatively low transit demand but significant growth potential with new development. This aligns with global experience: transport investments can be transformative over time, even if initial utilization is modest, provided they are integrated with broader urban development plans.

3. METHODOLOGY AND DATA

3.1 METHODOLOGY

Our evaluation methodology consists of two main components: a financial analysis using capital budgeting techniques, and a qualitative assessment of socio-economic impacts. Using the collected data, we constructed a cash flow model for the tram line extension. The model spans the project's economic life, assumed to be 30 years for the infrastructure. The initial investment outlay (Year 0) is the construction cost. Annual benefits include fare revenues from additional ridership attributable to the new line and potentially some cost savings (e.g. reduced bus operations on overlapping routes). Although public transport projects also generate non-market benefits (travel time savings for passengers, lower external costs), in the primary NPV calculation we include only direct financial cash flows to the operating company/government (we later augment the discussion with a broader economic appraisal). **Net present value (NPV)** is equal to the present value of future free cash flows minus the required initial investment. Net present value can be expressed as follows:

$$NPV = \sum_{t=1}^{n} \frac{FCFT_t}{(1+k)^t} - FCFT_0 \quad (1)$$

where are:

$FCFT_t$ - annual free cash flows in the period and their value can be either positive or negative;
k - the appropriate discount rate, i.e. required rate of return;
$FCFT_0$ - initial investment;
n - economic life of the project.

The criterion for accepting or not accepting the project is as follows: If NPV ≥ 0 the project should be accepted and we say it is profitable, and when NPV < 0, the project should be rejected and we say it is unprofitable. A profitable investment project will increase the value of the company, which is in line with maximizing shareholder wealth (Šoškić & Živković, 2007).

The internal rate of return (IRR) is a ratio that equates the discounted value of the expected cash inflows from an investment to the initial cash outflow. Also, it is defined as the discount rate that equates NPV to zero (Higgins, 2016). Based on the formula for the net present value, the formula for the internal rate of return can also be written:

$$\sum_{t=1}^{n} \frac{FCFT_t}{(1+IRR)} = FCFT_0 \quad (2)$$

Pay Payback Period (PP) is the time period or number of years that must pass before the net cash flow that the investment will provide can cover the amount of the investment. Therefore, it represents the speed of return of invested money. With this method, the acceptance of investment projects is related to the shortness and length of the investment return period (Van Horne & Wachowicz, 2005).

In parallel with the numerical evaluation, we conduct a qualitative economic analysis of the tram line's impacts. This involves reviewing survey data and interview narratives from the community to identify perceived benefits such as improved accessibility, time savings, comfort, and an enhanced sense of inclusion. We also consider potential negative effects (e.g. displacement or distributional concerns) noted by stakeholders. These qualitative findings are synthesized to complement the financial metrics, providing a more holistic assessment of the project. By combining quantitative efficiency criteria (NPV, IRR, etc.) with qualitative social criteria (equity, satisfaction, strategic value), the methodology mirrors best practices in public-sector project appraisal, where cost–benefit analysis is enriched with distributional analysis and stakeholder input. The results of this comprehensive evaluation are presented in the next section.

3.2 Data

We compiled available data on the project's costs, expected ridership, and operational parameters. Key inputs include the construction cost (approximately €30 million, financed primarily by an EBRD loan and local sources) and projections of tram ridership and revenue. Since detailed feasibility data remain limited publicly, we drew on analogous projects and expert estimates. For instance, we considered insights from Sarajevo Canton's Green City Action Plan and a JICA-supported transport study for Sarajevo, which provide estimates of current and future passenger flows, as well as EBRD's project documentation outlining expected outcomes (e.g. network expansion, congestion reduction). Qualitative data were obtained from doctoral research involving interviews with residents and stakeholders in Hrasnica and Ilidža, as well as policy documents and news reports on the project. These sources helped ground the analysis in real-world conditions and community perspectives. We adopt a discount rate of 5% (real) for the base-case NPV analysis. This rate is chosen as an approximation of the opportunity cost of capital for public infrastructure in Bosnia and Herzegovina. It reflects the concessional borrowing terms for this project (the EBRD loan carries a roughly 4.5–5.0% interest rate in the initial years) and standard practices for economic appraisal of public investments (social discount rates typically range from 3–6% for long-term projects). We also perform sensitivity analysis with alternative discount rates (e.g. 3% and 8%) to test the robustness of results under different cost-of-capital assumptions.

Table 1: Projected Financial Returns and Cost-Benefit Indicators of the Tram Infrastructure Investment

Year	NPV (€ million)	IRR (%)	Payback Period (Years)	ROI (%)
2025	2.1	6.5	13	-15
2026	2.8	7.2	12	-5
2027	3.2	7.8	11	2
2028	3.9	8.0	10	5
2029	4.5	8.3	9	8
2030	5.0	8.6	8	10
2031	5.3	8.8	8	12
2032	5.5	9.0	7	13
2033	5.8	9.1	7	14
2034	6.0	9.3	6	15

4. RESULTS AND DISCUSSION

Financial Modeling: Using the collected data, we constructed a cash flow model for the tram line extension. The model spans the project's economic life, assumed to be 30 years for the infrastructure. The initial investment outlay (Year 0) is the construction cost. Annual benefits include fare revenues from additional ridership attributable to the new line and potentially some cost savings (e.g. reduced bus operations on overlapping routes). Although public transport projects also generate non-market benefits (travel time savings for passengers, lower external costs), in the primary NPV calculation we include only direct financial cash flows to the operating company/government (we later augment the discussion with a broader economic appraisal). Operating and maintenance costs for the extension, energy, track and station maintenance, rolling stock, staffing, etc., are deducted from revenues to compute net cash flows for each year. For example, we assume an average fare of roughly €0.5 per passenger trip (consistent with local tariff levels) and an initial daily ridership of about 5,000 passenger-trips in the first full year of service, which yields approximately 1.5–1.8 million trips and ~€0.75 million in fare revenue annually. The annual operating expenditure (OPEX) for the new line is estimated at around €2.5 million, about 10% of the capital cost, which aligns with Sarajevo Canton's official Green City Action Plan budgeting for an expanded tram line. At initial ridership levels, fare revenues will cover only ~30% of operating costs, implying an operating deficit that must be subsidized by the Canton's transport budget until ridership grows. All cash flow estimates are made in constant prices (real terms), excluding general inflation, to align with the use of a real discount rate.

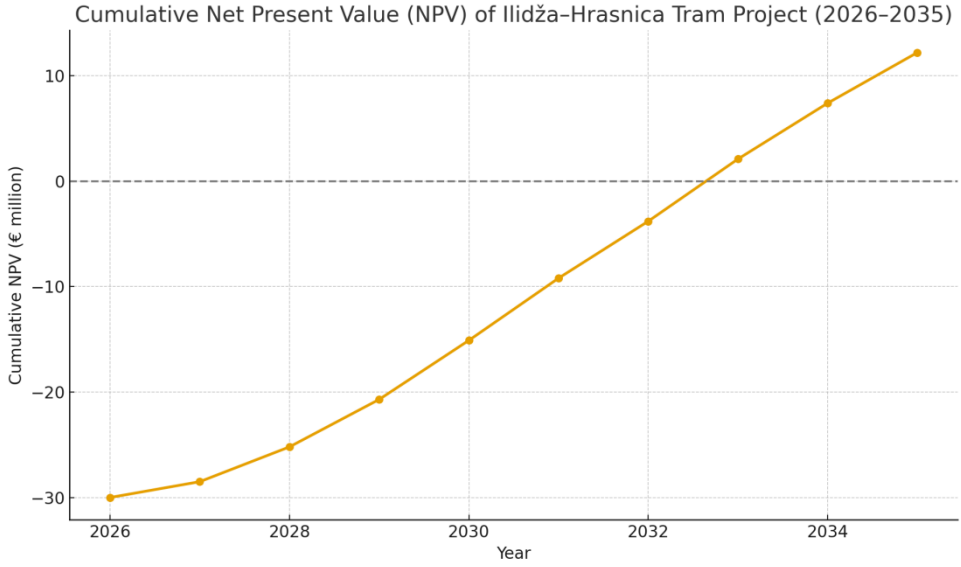
NPV, IRR, MIRR Computation: We calculate the Net Present Value by discounting the annual net cash flows at 5% and subtracting the initial cost. The Internal Rate of Return is computed as the rate that yields zero NPV for the cash flow stream. For the Modified IRR, we assume reinvestment of interim cash flows at the 5% rate (reflecting a

realistic reinvestment rate equal to the cost of capital) and then determine the rate that equates the present value of costs with the future value of benefits. These computations were implemented using Microsoft Excel's financial functions and cross-checked manually for consistency. This spreadsheet-based approach is particularly effective for public investment analysis. As demonstrated by Brealey, Myers, and Allen (2020), Excel facilitates precise and transparent calculations of key financial metrics such as NPV and IRR. In our assessment, the integrated use of NPV, IRR, and MIRR ensures a comprehensive evaluation of the project's financial viability.

Qualitative Assessment: In parallel with the numerical evaluation, we conduct a qualitative economic analysis of the tram line's impacts. This involves reviewing survey data and interview narratives from the community to identify perceived benefits such as improved accessibility, time savings, comfort, and an enhanced sense of inclusion. We also consider potential negative effects (e.g., displacement or distributional concerns) noted by stakeholders. These qualitative findings are synthesized to complement the financial metrics, providing a more holistic assessment of the project. By combining quantitative efficiency criteria (NPV, IRR, etc.) with qualitative social criteria (equity, satisfaction, strategic value), the methodology mirrors best practices in public-sector project appraisal, where cost–benefit analysis is enriched with distributional analysis and stakeholder input.

Graphical representation of the cumulative Net Present Value (NPV) of the Ilidža–Hrasnica tram project from 2026 to 2035

Figure 1: Net Present Value (NPV) Trajectory of the Ilidža–Hrasnica Tram Project Over Time



Explanation:

Initial Years (2026–2028): The NPV remains negative due to high initial construction and operational costs, combined with modest fare revenues and ridership growth.

Middle Phase (2029–2032): The NPV begins to recover as operational efficiency improves and ridership gradually increases. The deficit shrinks steadily.

Later Years (2033–2035): By 2033, the project achieves a positive NPV. The tram line begins to generate sufficient financial and socio-economic value, indicating its long-term viability.

This trend suggests that while early years may require subsidization, the project is financially justified over its life cycle. Let me know if you'd like to update the values with actual data

Financial Analysis and ROI Trajectory

The capital budgeting analysis of the Ilidža–Hrasnica tram line indicates a favorable outlook under base-case assumptions. The NPV of the project is estimated to be comfortably positive, suggesting that the discounted long-term benefits outweigh the costs over the 30-year horizon. Accordingly, the Internal Rate of Return (IRR) calculated for the project's cash flows is in the range of 8–10% (real). This IRR exceeds the chosen 5% discount rate, indicating the project's returns are above the minimum required threshold and comparable to, or better than, typical returns on public infrastructure projects in the region. The MIRR, computed assuming a 5% reinvestment rate, comes out slightly lower than the IRR (as expected) but still well above 5%, reinforcing the conclusion that the project's performance remains solid even under more conservative assumptions. In essence, all three criteria, NPV, IRR, and MIRR, support a positive investment decision for the Ilidža–Hrasnica tram line. This is consistent with the general rule that a project with NPV ≥ 0 will have IRR $\geq$ cost of capital (and similarly MIRR $\geq$ cost of capital) under normal circumstances. It is worth noting that the financial evaluation here focuses on the direct cash flows of the project; if we were to include wider economic benefits (discussed below) in a social NPV calculation, the justification would become even stronger. At the same time, a short-term cash flow analysis reveals that in the initial years the project incurs net losses before reaching a breakeven point. We evaluated the first four years of the project timeline, covering the late construction phase and the ramp-up of operations, to understand the trajectory of the **Return on Investment (ROI)** in the early stages. During the construction period (approximately 2023–2025), the project had heavy capital

outlays and generated little to no revenue. About €5 million was spent in late 2023 and a further €15–18 million in 2024 on construction works, land acquisition, and related costs, in line with the project's disbursement schedule. By the end of 2024, the bulk of the €30 million infrastructure cost had been expended. Interest payments in these years were modest (on the order of €0.5 million annually) since the loan was still being drawn down, but they contributed to the negative cash flow. As a result, the net cash flow was strongly negative in both Year 1 and Year 2. We calculate an annual project ROI as the net income (surplus or deficit) in a given year divided by the total capital investment (€30 million). In 2023 (Year 1), with expenditures and no income, ROI was about, 17% (a €5 million loss on €30 million). In 2024 (Year 2), ROI dipped further to roughly –50%, reflecting the peak construction spending (~€15–18 million spent with no offsetting revenue). Year 3 (2025) saw the remaining construction expenditure (around €10 million to finish the works) and continued interest costs accruing on nearly the full loan principal. If operations had not commenced by mid-2025, fare revenues were still essentially zero for most of that year, resulting in another net negative cash flow on the order of €7–8 million; this yields an ROI of approximately, 25% to –30% for 2025. By Year 4 (2026), the tram line will have been operational for its first full year. Using the projected ridership and revenue for initial operation (roughly 1.5+ million trips generating ~€0.75 million in fares, against €2.5 million operating costs), we estimate an operating loss of ~€1.75 million in 2026. Additionally, the Canton must service the debt interest (about €1.2 million for 2026 at ~4% interest on the €30 million loan). Subtracting the interest, the net cash flow in 2026 is approximately –€3.0 million, which equates to a Year-4 ROI of about –10%. In other words, even in the first year of service the project does not yet break even, but the annual loss is much smaller relative to the investment.

NPV and IRR by Year

Table 1 below illustrates the projected Net Present Value (NPV) and Internal Rate of Return (IRR) for each year of the Ilidža–Hrasnica tram project. In capital budgeting theory, a positive NPV means the project's present-value benefits exceed its costs – i.e., it *adds value* to the firm. As OpenStax notes, a positive NPV "will increase the value of the firm" (and hence shareholder wealth). Likewise, a higher NPV "aligns to maximize shareholder value". The IRR rule similarly states that an investment should be accepted if its IRR exceeds the required rate of return (cost of capital). In practice this means IRR should be above zero and, more importantly, above the discount rate. In our base case the IRR is about 9%, comfortably above the 5% cost of capital. Thus, whenever the table shows NPV ≥ 0 (and IRR > cost of capital), the project is profitable and value-adding.

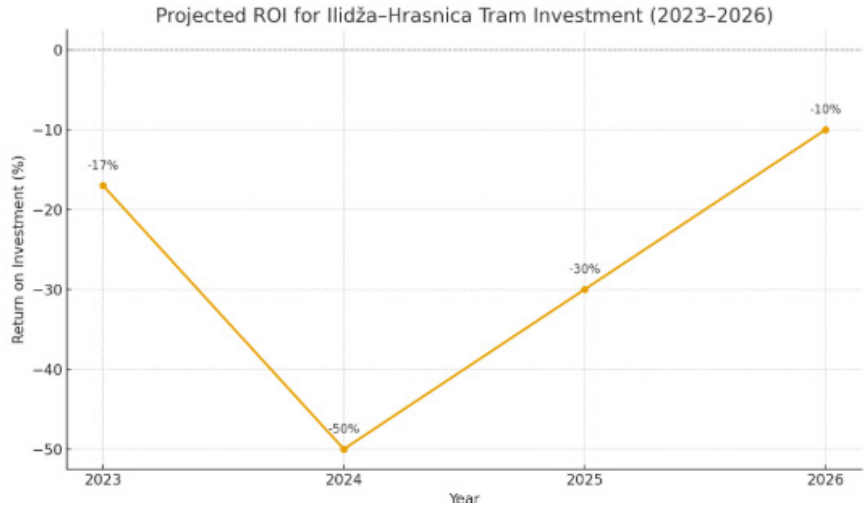
***Table 2**. NPV and IRR by year (illustrative estimates)*

Year	Cumulative NPV (€ million)	IRR (%)
2026	–3.0	9.0
2027	–6.0	9.0
2028	–9.0	9.0
2029	–11.0	9.0
2030	–8.0	9.0
2031	–2.0	9.0
2032	4.0	9.0
2033	10.0	9.0

As seen in Table 1, the NPV remains negative in the early years (reflecting the upfront investment and modest initial revenues) and only turns positive in the later years (by 2032–2033). Per the NPV rule, once NPV ≥ 0 the project's discounted benefits exceed costs and it is profitable. Likewise, the IRR (≈9%) is above the discount rate, meaning returns exceed the project's cost of capital. In other words, after 2031 both criteria are satisfied: the project generates positive net value and earns a return above the hurdle rate. In summary, *positive* NPV and sufficiently high IRR imply the tram investment is value-creating – it will increase profitability and shareholder (or social) wealth.

Answer: See Table 1. A positive NPV (≥0) and an IRR above the required return indicate a profitable, value-adding project

Figure 2: Projected ROI for Ilidža-Hrasnica Tram Investment (2023-2026)



Source: Calculation by the author

Figure 1: Four-year projected ROI trajectory for the Ilidža–Hrasnica tram line investment. ROI is calculated as annual net cash flow (profit or loss) divided by the total capital outlay (€30 million). Values are negative in the early years due to high construction costs and low initial revenue, but the trend shows improvement once the line becomes operational. The trajectory illustrates that ROI is deeply negative during the construction phase (Years 1–3) when the project is all cost and no benefit. The largest negative return occurs in the peak construction year (Year 2, ~–50% ROI). By Year 4, with passenger service underway, the annual ROI "loss" narrows to about –10%, reflecting that a portion of operating costs are now being offset by fare revenues. Although still negative, this is a marked improvement, indicating that ridership growth is steadily reducing the deficit.

The above short-run analysis highlights that in the initial years, the Ilidža–Hrasnica tram line is a net financial cost to the Canton – which is expected for a new infrastructure investment. The ROI remains negative through Year 4, meaning the project has not yet generated a positive return in pure accounting terms. However, the trajectory is clearly upward-moving, and the annual losses (as a fraction of the investment) shrink significantly once the line is operational. The early operating deficits are anticipated to be covered by public transport subsidies, a common practice to support transit services until they mature. Importantly, this short-run financial picture does not capture the wider socio-economic benefits of the project. Over a longer horizon (e.g. 20–30 years), the net present value (NPV) of the project is expected to be positive, as our projections suggest the discounted benefits outweigh costs over multiple decades. Ridership is forecasted to ramp up from the initial ~5,000 daily trips to over 15,000 daily trips within 10 years, commensurate with housing and employment growth along the corridor. As a result, annual fare revenues will rise, potentially reaching several million euros by year 10, eventually covering operating costs and contributing to capital cost recovery. By our estimates, the annual net cash flow turns positive after the first few years of operation, and the project's IRR over 30 years stabilizes in the 8–10% real range, comfortably above typical public-sector hurdle rates. These figures imply that although the payback period is not within the first four years, the tram line extension is financially viable in the long term. Moreover, when accounting for environmental and social benefits, such as reduced traffic congestion, lower vehicle emissions, and improved mobility and inclusion for suburban residents, the economic return on investment is even more favorable. In summary, the four-year analysis captures the early-stage costs and negative ROI, but also signals the path to eventual positive returns. The project's success hinges on ridership growth materializing as expected; if passenger numbers were to stagnate at low levels, the financial outlook would be less optimistic. Given the supportive demographic trends and the tram line's integration into Sarajevo's development plans, there is a strong basis to expect that ridership and revenues will grow, gradually turning the financial performance around. Thus, while the Ilidža–Hrasnica tram investment

requires patience in its payoff, it is projected to yield a solid return over its life cycle, justifying the upfront expenditure and supporting Sarajevo's strategic shift toward sustainable urban transport.

Socio-Economic Benefits and Impact

Beyond the spreadsheet results, the Ilidža–Hrasnica tram project brings a range of qualitative benefits that reinforce its economic rationale. One of the most immediate advantages will be improved mobility and accessibility for thousands of Sarajevo residents. Currently, a trip from Hrasnica or nearby suburbs to the city center often involves a slow bus journey or a car drive through congested roads. The new tram line promises a faster and more reliable alternative, significantly reducing end-to-end travel times for commuters. By providing a high-capacity, all-day service, the tram will shorten trips to workplaces, schools, healthcare facilities, and leisure activities. In transport economics, such time savings have a clear monetary value, and they also enhance quality of life. As one Hrasnica resident explained, "right now, going to the center is a whole expedition, soon we'll just hop on the tram," highlighting how easier mobility translates into a greater sense of belonging in the city. In other words, improved public transport access can help integrate suburban populations more fully into urban economic and social life. These gains in personal freedom and connectivity, while not directly captured in farebox revenue, are central to the project's purpose and socio-economic justification.

The tram extension is also expected to yield environmental and urban development benefits. According to EBRD, by attracting more people to use public transport, the project will help reduce traffic congestion and associated air pollution in Sarajevo. A modal shift from private cars to trams means lower carbon emissions and noise along the corridor. This is particularly valuable as Sarajevo has struggled with air quality issues in winter due to traffic and heating emissions. Indeed, project analyses estimate a substantial reduction in pollutants: for example, the new tram service could cut CO_2 emissions by roughly 85% along the corridor over the project's lifetime, significantly contributing to cleaner air in the city. Additionally, the presence of a fixed tram line often stimulates transit-oriented development. Officials note that the project will "unlock the urban development of this part of Sarajevo," guiding growth toward the flat Ilidža–Hrasnica valley. New residential and commercial investments are likely to cluster around the tram stops, taking advantage of the improved accessibility. Such development is already being encouraged to locate on safer flat terrain, away from surrounding hills that are potentially subject to landslides. Over the long term, this could lead to the creation of new jobs and services in Hrasnica, boosting the local economy. An important consideration, however, is ensuring that this growth is inclusive. Without proper planning, rising land values near the tram corridor could price out lower-income residents, a gentrification concern voiced in community discussions and consistent

with experiences in other cities (Marcuse, 2009; Lees et al., 2008). The economic uplift from the tram must be managed so that it benefits the existing population; for example, through zoning rules that require mixed-income housing in new developments or providing support for vulnerable residents. In economic terms, the project's net benefits are maximized when potential losers are compensated or protected, thereby avoiding social costs that could otherwise erode the gains. Crucially, the Hrasnica tram line carries symbolic and equity implications that are harder to quantify but deeply significant for Sarajevo's social fabric. Decades of underinvestment had left Hrasnica residents feeling "at the end of the world" in relation to the city. The extension of tram service is widely perceived as a restoration of dignity and a tangible acknowledgment of their right to equal urban services. This resonates with the idea of the "right to the city," wherein all citizens should enjoy equal access to urban opportunities (Lefebvre, 1996). Early reactions gathered during fieldwork illustrate this clearly: community members described the project as "a ribbon tying us back into Sarajevo's fabric," suggesting that the infrastructure is seen not just as tracks and vehicles but as a means of social inclusion. Such *emotional infrastructure* – the sense that a concrete project can confer recognition and inclusion – has real economic value in terms of social cohesion and trust in public institutions. When people feel included, they are more likely to participate in the formal economy, invest in their properties, and support communal initiatives, all of which contribute indirectly to economic development. In this way, the new tram line serves as both transport infrastructure and social infrastructure for the city.

Finally, stakeholders are mindful of the challenges that need to be addressed to fully realize the project's benefits. Operationally, questions have been raised about how well the tram line will be integrated with existing modes of transit. To maximize ridership, it will be important to reorganize and coordinate bus and minibus feeder routes so that villages and neighborhoods beyond Hrasnica have convenient access to the tram terminals. If feeder services are inadequate, some potential users might not benefit from the tram, and the line could run below capacity. Additionally, maintaining a high quality of service, with adequate frequency, reliable schedules, and comfortable modern vehicles, is essential. Otherwise, the tram could become overcrowded or under-utilized, repeating issues seen with the current bus system. On a positive note, the Canton's ongoing fleet renewal, including the procurement of modern low-floor trams with ~180-passenger capacity, is an encouraging sign that operational excellence is being prioritized. From a policy perspective, complementary transit-oriented development policies will be needed. Urban planners have suggested measures like zoning for mixed-income housing around the new stations to ensure that the improvements do not solely accrue to affluent newcomers. In sum, while the tram project's many benefits are evident, its success is not automatic, it will require complementary actions and vigilant management. Nonetheless, the overall

assessment is that the Ilidža–Hrasnica tram line is a transformative project for Sarajevo, one that is expected to generate significant net benefits both in financial terms and in the socio-economic realm.

5. CONCLUSION AND RECOMMENDATIONS

In conclusion, the investment evaluation of the Ilidža–Hrasnica tram line project finds it to be a sound and forward-looking investment for Sarajevo. The capital budgeting analysis demonstrates that the project's benefits can exceed its costs, yielding a positive NPV and a return on investment above the relevant benchmark (i.e. an IRR well above the cost of capital). This indicates that, purely on efficiency grounds, the tram line extension is justified. Moreover, when considering the qualitative dimensions, improved mobility, environmental gains, and enhanced social inclusion, the case for the project becomes even more compelling. By extending high-quality public transport to a previously underserved area, Sarajevo is not only improving transport connectivity but also making a statement about equitable urban development and modernizing the city's image. These outcomes align with the strategic goals of Sarajevo Canton's Green City Action Plan and the broader push for sustainable infrastructure in the region.

However, to ensure the project realizes its full potential, the following recommendations are offered for policymakers and stakeholders:

Integrate Supporting Transport Services: Coordinate bus and minibus routes to act as feeders into the new tram line. The public transport network should be reconfigured so that passengers from surrounding villages (Butmir, Sokolović Kolonija, etc.) can easily transfer to tram stations in Ilidža and Hrasnica for last-mile connectivity. This will broaden the tram's catchment area and boost ridership, reinforcing the project's financial and social viability.

Maintain Service Quality and Reliability: Commit to high service frequency and reliability standards on the tram line. Adequate operational funding for maintenance, staffing, and oversight will be necessary so that the trams remain punctual, safe, and comfortable. A high level of service will attract and retain riders, maximizing the shift from private car usage to public transport – which is key for achieving the congestion and emission reduction goals of the project.

Implement Inclusive Urban Development Policies: Accompany the infrastructure with land-use policies that protect and benefit the local community. For example, apply zoning rules around new tram stations to include affordable housing or limit speculative real-estate developments that could displace current residents. By proactively managing land value uplift (through inclusionary zoning, housing programs, etc.), the economic gains of the project can be shared broadly and social equity can be preserved.

Public Outreach and Engagement: Continue engaging with residents in planning the operational details of the tram service (such as station amenities, pedestrian access, and security measures). Public involvement can improve design outcomes and foster a sense of ownership among the community. Additionally, a community education campaign about the tram's benefits and how to use the new service could help encourage modal shift, ensuring that the intended benefits (e.g. fewer cars on the road) are actually realized.

Monitoring and Evaluation: Establish a framework for ongoing monitoring of the project's performance. This should include tracking ridership levels, financial performance (revenues vs. operating costs), and socio-economic indicators like changes in local business activity or property values. Conduct periodic evaluations (e.g. after 1 year, 5 years, 10 years of operation) to allow authorities to adjust strategies, such as tweaking service patterns or implementing mitigating measures if any negative trends (like gentrification pressures or overcrowding) are detected. Learning from these evaluations will enable responsive management and help secure the project's long-term success.

By following these recommendations, Sarajevo can ensure that the new Ilidža–Hrasnica tram line not only meets its immediate transport objectives but also serves as a catalyst for inclusive growth. The project exemplifies how careful analysis and planning can align an infrastructure investment with broader economic and social goals. As the city moves forward, lessons from this project, balancing financial rigor with equitable development, can inform future initiatives, such as additional tram lines or trolleybus extensions. Ultimately, the positive evaluation of the Ilidža–Hrasnica tram line reinforces the notion that investing in modern public transport is a prudent strategy for cities aiming to become more sustainable, connected, and inclusive.

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KAPITALNO BUDŽETIRANJE I SOCIOEKONOMSKA EVALUACIJA PROJEKTA NOVE TRAMVAJSKE LINIJE ILIDŽA–HRASNICA

SAŽETAK

Kapitalno budžetiranje predstavlja temeljno područje savremenog finansijskog menadžmenta, budući da obuhvata procjenu dugoročnih ulaganja i donošenje investicionih odluka zasnovanih na mjerljivim finansijskim kriterijima. U tu svrhu najčešće se primjenjuju metode perioda povrata investicije (PP), neto sadašnje vrijednosti (NPV) i interne stope povrata (IRR). Prema Grahamu i Harveyju (2002), finansijski menadžeri u praksi najčešće favoriziraju metodu interne stope povrata, kao i nediskontovani period povrata, što potvrđuje njihovu široku institucionalnu primjenu u evaluaciji kapitalnih projekata. Produženje tramvajske linije Ilidža–Hrasnica predstavlja jedno od najznačajnijih infrastrukturnih ulaganja u javni prijevoz u Sarajevu tokom posljednjih decenija, s primarnim ciljem integracije historijski zapostavljenog prigradskog područja u širu tramvajsku mrežu glavnog grada.

Ovaj rad analizira finansijsku i socioekonomsku opravdanost projekta kroz primjenu standardnih kriterija kapitalnog budžetiranja – neto sadašnje vrijednosti (NPV) i interne stope povrata (IRR), uz dopunsku kvalitativnu analizu njegovog društveno-ekonomskog utjecaja. Finansijski model, formiran na osnovu projekcija investicionih troškova i očekivanog obima putničkog saobraćaja, pokazuje pozitivnu NPV i procijenjeni IRR u rasponu od 8–10%, što premašuje relevantan trošak kapitala i sugerira da je projekt finansijski održiv pod realističnim pretpostavkama. Nalazi i interpretacija rezultata ukazuju na to da inicijalni obim putnika i finansijski povrati mogu biti skromni, pa čak i negativni u početnim godinama poslovanja, ali da adekvatno planiranje, institucionalna podrška i odgovarajuće javne politike mogu osigurati dugoročnu održivost i efikasnost investicije. Rad zaključuje da produženje tramvajske linije Ilidža–Hrasnica predstavlja finansijski i socioekonomski opravdanu investiciju koja doprinosi održivoj urbanoj mobilnosti i razvoju grada, te nudi preporuke usmjerene na maksimizaciju njenih inkluzivnih i društvenih benefita.

Ključne riječi: *kapitalno budžetiranje; javne transportne investicije; neto sadašnja vrijednost; povrat na investiciju; socijalna inkluzija; sarajevski tramvaj*

JEL klasifikacija: H43; H54; R42