OPERATIONS EVALUATION

Evaluation of EIB support for urban public transport in the European Union (2007-2019)

Synthesis report

February 2021

European Investment Bank
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This is a publication of the EIB's Operations Evaluation Division, IG/EV.

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ABBREVIATIONS AND ACRONYMS

3PA	3-Pillar Assessment
CO_2	Carbon dioxide
EU	European Union
IG/EV	Evaluation Division of the Inspectorate General of the European Investment Bank
NO_2	Nitrogen dioxide
PPP	Public-private partnership
TEN-T	Trans-European Transport Network
UPT	Urban public transport

KEY TERMS

3-Pillar Assessment (3PA)	The three-pillar framework for assessing the projects to be financed by the EIB comprise: (i) contribution to EU policy, (ii) quality and soundness of the project, and (iii) EIB technical and financial contribution. Each pillar is composed of indicators and sub-indicators. The 3PA was introduced in 2014 replacing the former framework (i.e. **Value Added Framework**).
Accessibility	Ease with which the person can reach the desired goods, services and activities. The term refers to the movement itself of using different modes of transport.
Benefit-cost ratio	The net present value of project benefits divided by the net present value of project costs. If the benefit-cost ratio is greater than one, the project benefits exceed costs.
Clean/zero-emissions vehicles	As defined by the revised "Clean Vehicles Directive", a "clean vehicle" is: • A clean light-duty vehicle: any car or van meeting the following emission thresholds: (i) until 31 December 2025: no more than 50g/km CO_2 and up to 80% of applicable real driving emission (RDE) limits for nitrogen oxides (NOx) and for ultrafine particles (particle number; PN); and (ii) from 1 January 2026: only zero-emission vehicles. • Clean heavy-duty vehicle: any truck or bus using one of the following alternative fuels: hydrogen, battery electric (including plug-in hybrids), natural gas (both compressed natural gas and liquefied natural gas, including biomethane), liquid biofuels, synthetic and paraffinic fuels, liquefied petroleum gas.
Climate action	Climate action within the EIB refers to activities that contribute to either mitigating climate change (i.e. reducing and/or sequestering greenhouse gas emissions) or to activities that contribute to adapting to the impacts of climate change.
Cost-benefit analysis	Expresses a project's or measure's direct and indirect costs and benefits, allowing the benefits and economic viability to be assessed and expressed in monetary terms. It is undertaken by weighing the predicted monetised costs and benefits of the strategy, policy or measure for a set time scale. Cost-benefit analysis can include the consideration of both internal and external costs and benefits.
Discount rate	The rate at which future values are discounted to the present. The financial discount rate and social discount rate may differ.
Economic rate of return	The average annual return to society on the capital invested over the entire life of the project. It is, in other words, the interest rate at which the project's discounted benefits equal discounted costs, both valued from all of society's point of view. A project is accepted if the economic rate of return is equal to or exceeds a certain threshold (the **social discount rate**).
Economic net present value	The difference between all discounted benefits and costs at a given **discount rate**. The project is economically profitable if its economic net present value is positive.
Fare box revenue	The value of cash, tickets and pass receipts paid by passengers for public transport use.

Financial net present value:	The net balance of all discounted projects revenues and costs. The project is financially profitable if its financial net present value is >0.
Financial rate of return	An indicator to measure the financial return on investment of an income generation project, which is used to make the investment decision. Whilst the economic rate of return is calculated using economic values, the financial rate of return is calculated using financial values.
Framework loan	An EIB instrument for financing multi-component investments where, due to incomplete information being available at the appraisal stage, decisions concerning the financing of specific schemes have to be taken after approval of the overall operation by the Board.
Greenhouse gases	Gaseous constituents of the atmosphere (i.e. CO_2, NOX, CH_4), both natural and anthropogenic, that absorb and re-emit infrared radiation.
Micro-mobility	The light, electric and floating vehicles made available in urban areas through sharing schemes that let users locate, reserve, (un)lock and pay for them usually through their smartphones or credit cards. Micro-mobility typically includes bikes (including electric bikes), scooters and mopeds.
Urban mobility	The potential for movement and the ability to get from one place to another within an urban area, using one or more modes of transport to meet daily needs. As such, it differs from **accessibility,** which refers to the ability to access or reach a desired service or activity.
Modal share	The share of people using a particular mode of transport (including cycling and walking) within the overall transport usage of an urban area. Modal share can be calculated for passenger transport based on different units, such as number of trips or passenger-km.
Modal shift	The switch from a given transport mode to another, as a result of a modified choice—in the case of urban transport—by users. The modal choice is a very complex decision, determined by a wide range of factors. When a transport mode becomes more advantageous than another (e.g. in terms of cost, convenience, quality, comfort, frequency, speed or reliability), over the same route or in the same market, a modal shift is likely to take place.
Multimodality	The selection of alternative transport modes for different trips over a certain period of time. Multimodality (and also **inter-modality**) requires integration of infrastructure and transport services across modes in both passenger and freight transport.
Net present value	The sum that results when the discounted value of the expected costs of an investment are deducted from the discounted value of the expected revenues or benefits.
Patronage	In public transportation, patronage (or **ridership**) refers to the number of people using a transit service.
Sensitivity analysis	Systematic method for examining how the outcome of cost-benefit analysis changes with variations in inputs, assumptions, or the manner in which the analysis is set up. The analysis is carried out by modifying one variable at a time and determining the effect of that change on the **economic net present value**. Sensitivity analysis is known as a **"what-if analysis**".
Smart city	The European Commission's initiative promoting cities using technological solutions within different policy fields to improve the management and

	efficiency of the urban environment, as well as to reduce their environmental impact and offer citizens better lives.
Social discount rate	The parameter used in the economic analysis of investment projects to discount economic costs and benefits, and reflect the opportunity cost of capital from an inter-temporal perspective for society as a whole. In other words, it reflects the social view of how future benefits and costs are to be valued against present costs. In this sense, every discount rate entails a judgment concerning the future and it affects the weight attributed to future benefits or costs. The purpose of the social discount is to make costs and benefits that arise at different points in time comparable. According to the EIB Guide on Economic Appraisal of Projects, If the economic rate of return falls below the social discount rate, the project as defined is economically not justified and should therefore not be undertaken, as it would constitute a misallocation of economic resources. An economic rate of return at or above the social discount rate is a prerequisite for the project to be financed by the Bank. The **net present value** of a project can be calculated using the social discount rate.
Sustainable urban mobility plans (SUMPs)	A strategic plan designed by the local authorities to satisfy the mobility needs of people and businesses in cities and their surroundings for a better quality of life.
Transport Lending Policy	The EIB strategic documents setting out the guiding principles and selection criteria for the Bank to finance projects in this sector.

EXECUTIVE SUMMARY

This report is part of the evaluation of the EIB's support for urban public transport (UPT) in the European Union, 2007-2019, undertaken by the Operations Evaluations (IG/EV) Division of the EIB. This report presents and consolidates the findings from the individual evaluation of 12 UPT projects. The findings from this report have been integrated into the broader Thematic Evaluation report.

The purpose of conducting 12 individual evaluations was twofold: (i) to hold the EIB accountable by rating the performance of EIB-financed operations and investment projects supported; and (ii) to help better understand how EIB financing has contributed to the objectives of UPT projects laid down in the EIB Transport Lending Policy: "*Reducing congestion and environmental externalities through either the promotion of modal shift from private cars to more sustainable transport modes and/or improvements in transport efficiency".*

The sample of 12 urban public transport projects was selected from a portfolio of 216 UPT operations signed between 2007 and 2019. The sample was not meant to be statistically representative of the portfolio. The selection was made using a purposeful stratified sampling approach combining specific criteria, including various city sizes, operation sizes, provision of technical assistance, and inclusion of urban transport modes (metro, tramways, railways, buses), etc.

This evaluation undertook an ex-post cost-benefit analysis of eight of the 12 projects. This exercise aimed at illustrating factors which may explain the (under)performance of UPT projects after completion, and which could therefore be better taken into account by the Bank's ex-ante cost-benefit analysis. These eight projects (i) had an ex-ante cost-benefit analysis available and (ii) were completed and in operation for at least three years by the time this analysis was conducted.

The projects evaluated were aligned with EU and EIB policies and priorities and met the borrowers' needs

Overall, the 12 projects were aligned with EU policy, EIB priorities and urban mobility strategies in municipalities. The Bank's selection and appraisal procedures ensured alignment of the urban public transport projects with European Union, EIB and municipal policies. As required by the EIB Transport Lending Policy (2011), a condition for eligibility is the integration of UPT projects into an urban mobility plan.

The products, and terms and conditions offered by the EIB were adequate to address borrowers' needs. The EIB has supported urban transport projects mostly through long-term investment loans, which matched the asset life cycle, and were delivered through tailored financing arrangements meeting the borrowers' needs.

Whilst the projects evaluated were delivered as planned and provided better quality and more accessible transport, two-thirds did not achieve the expected ridership

The projects evaluated were delivered in line with expectations, with minor adjustments to technical specifications. They achieved better quality and more accessible transport. Despite measurement challenges (due to lack of data at appraisal and at completion), fragmented qualitative evidence suggests that all projects have brought about a significant improvement in the quality of services. For instance, metro and tram projects improved frequency and punctuality and new fleets provided better comfort and amenities.

After three years of operation, demand levels were still lower than forecast in about two-thirds of the project sample. This was due to a variety of factors, including (i) the unexpected impact of the economic crisis, (ii) the delayed implementation of project sub-components and/or complementary projects and (iii) the use of hypotheses that delivered overoptimistic demand forecasts by promoters.

The lack of data hampered the assessment of other key outcomes, including modal shift to more sustainable transport modes

Assessing the project-induced changes in modal share was challenging as data were not available at completion. Modal shift is a key objective justifying EIB financing for urban public transport projects and for driving the contribution to broader objectives, in particular environment and climate. However, in most of the cases, data on actual modal shift generated by the project was absent. Evidence gathered from the project evaluations showed that the availability of public

transport is not a sufficient condition to induce a significant change in car users' behaviour, unless it is combined with an appropriate mix of public policy measures discouraging the use of private cars.

The assessment of the attained greenhouse gas emission reduction was also faced with limited data availability and measurement challenges. At the time the 12 projects were appraised, the Bank was testing its methodology for calculating the carbon footprint, which may explain the lack of sufficient data to draw robust conclusions about projects' contribution to greenhouse gas emission reduction. A comparison between forecasted net carbon emissions and actual emissions could only be done for four out of 12 projects (of which three attained their objective). For the other projects, data on actual ridership levels and the attained reduction in bus and/or car services suggests that greenhouse gas emission reduction has been lower than anticipated.

The lack of data also complicated the assessment of the projects' contribution to environmental benefits. Reducing air pollution and (to a lesser extent) noise pollution was an important justification for the EIB's financing of UPT projects. However, there was insufficient data available at project appraisal (baseline scenario, targets) and at project completion to demonstrate that all evaluated projects contributed to air quality improvements.

Anecdotal evidence suggests that the projects have contributed to broader socioeconomic impacts

Qualitative data suggests that all 12 projects have contributed to improving accessibility, social inclusiveness, urban regeneration and territorial cohesion. These impacts were, however, difficult to ascertain. Several project evaluations showed that these impacts were likely to be greater when UPT projects were suitably integrated into urban development plans and delivered along with other urban regeneration investments in a coherent manner.

The projects were delivered efficiently

The 12 projects were implemented within the planned cost and those encountering delays were broadly in line with standards for the sector. In general, cost overruns and delays were relatively contained and in line with sector benchmarks. The technical contingencies added by the EIB were appropriate. Four projects experienced implementation delays exceeding one year, mainly due to their technical complexity and the risks associated to them, which were not fully anticipated or underestimated at appraisal by both the promoter and the Bank.

The economic efficiency of a limited number of projects deteriorated, mainly due to lower than expected ridership levels at completion and/or higher than expected project costs. In three out of the eight projects where an ex-post cost-benefit analysis was carried out, the projects' economic costs outweighed their economic benefits. The weak economic soundness identified in these three cases could not be fully anticipated by the traditional sensitivity analysis carried out by the Bank at appraisal. In two of these three cases, the ex-post economic rate of return was estimated by this evaluation to be significantly below the EIB's minimum acceptability threshold.

The sustainability of the projects evaluated was well established

The positive effects of the projects are expected to persist in the medium and long term thanks to municipal commitments towards continuous financial support of public mass transit transport. The evaluation found no major risks threatening the physical and/or operational sustainability of the evaluated projects. Policy coherence and commitment to continuous financing of the UPT sector were key to ensure the projects' sustainability under all dimensions.

Although the evaluation found that the projects' financial sustainability was not at risk, the operations and maintenance cost ratio varied substantially across projects and could in some cases reduce the promoters' capacity to continue financing urban transport investments in the future.

The EIB financial contribution to the projects was substantial and increased during the economic crisis, whereas its financial facilitation and technical contribution were more limited

The EIB terms and conditions were nearly always better than those offered by the market (commercial banks and municipal bond market) and international financial institutions/public sector alternatives. Furthermore, the EIB financial contribution was strengthened in the aftermath of the financial crisis.

Beyond the provision of competitive loan conditions, the EIB provided some financial facilitation mostly to UPT projects procured through a PPP and in the context of a long-term relationship with UPT promoters. Such effects were mainly catalysing support from co-financiers (thanks to the Bank's "stamp of approval") and positive signalling on project promoter creditworthiness. Financial facilitation by the EIB was more evident with promoters that had a long-term partnership with the EIB.

In the majority of the cases evaluated, the EIB's technical inputs were not requested as urban public transport operators already had strong in-house expertise and/or the EIB was involved late in the project design. The EIB technical contribution was significant only in a minority of operations, when advisory support was provided at a very early stage of project development from JASPERS (in three out of the 12 projects sampled).

The Bank has managed the projects evaluated suitably throughout the project cycle

In most of the 12 projects, the monitoring requirements set at the appraisal stage turned out to be appropriate. When issues emerged during project implementation, the Bank was informed and followed project progress more closely and/or tightened financial monitoring.

1. OBJECTIVES AND SCOPE OF THIS SYNTHESIS REPORT

1.1 Objectives

1. This report presents and consolidates the findings from 12 project evaluations that were carried out within the framework of IG/EV's evaluation of EIB support for urban public transport in the European Union in the period between 2007 and 2019. The purpose of conducting 19 individual evaluations was twofold:
   - To provide further insights into the thematic evaluation findings and to help better understand how EIB financing contributes to achieving the objectives of UPT projects;
   - To hold the EIB accountable by rating the performance of EIB-financed operations and investment projects supported.

2. This synthesis report assesses the extent to which the 12 projects have contributed to achieving the objectives of UPT projects as stated in the EIB Transport Lending Policy: "*Reducing congestion and environmental externalities through either the promotion of modal shift from private cars to more sustainable transport modes and/or improvements in transport efficiency, including improved intermodal connections*".

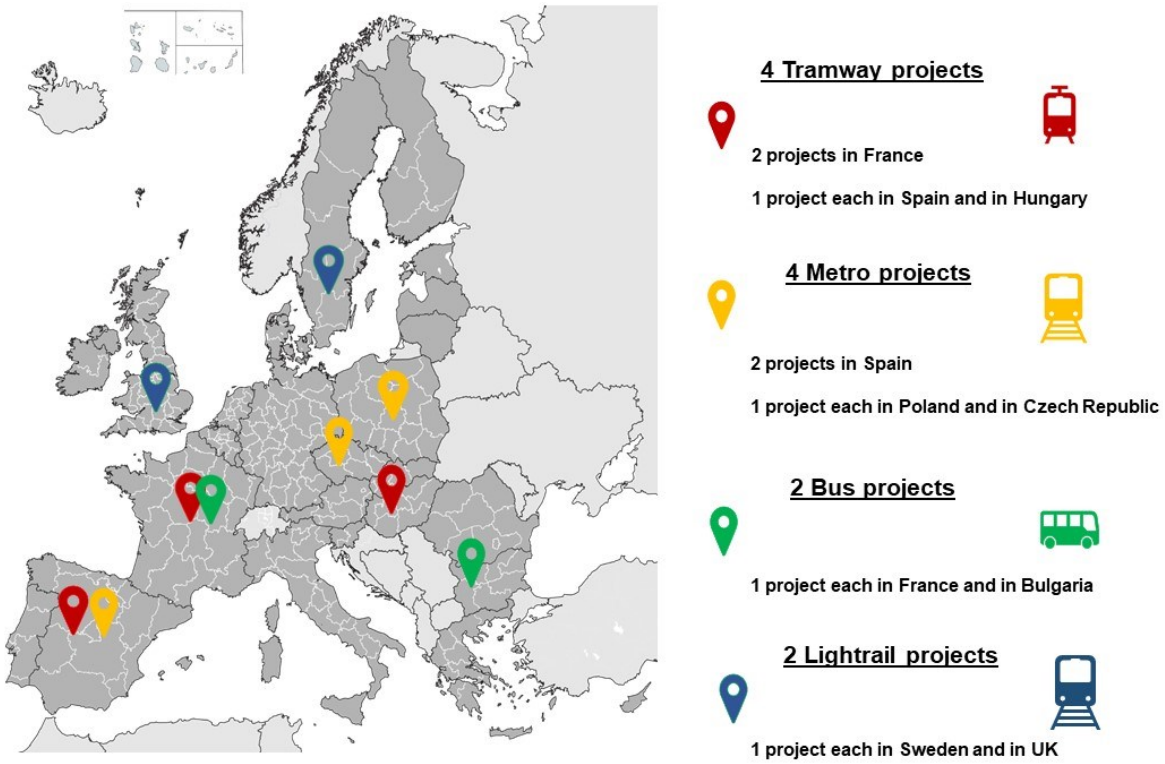
1.2 Scope

3. The 12 projects selected for in-depth evaluation were not intended to constitute a statistically representative sample, but to illustrate the findings of the thematic analysis with specific project examples. To this end, the project selection was carried out through a purposeful stratified sampling method based on a portfolio of 216 UPT operations signed between 2007 and the cut-off date of 31 December 2019. A project evaluability check identified a shortlist of operations eligible for in-depth project evaluations. Amongst these operations, the 12 operations were selected by combining the following criteria:
   - Inclusion of large operations (weighted by city population) to (a) cover a significant share of the total volume of the UPT portfolio and (b) to include projects with a potential large impact at city level.
   - Inclusion of operations with technical assistance, to assess how and with what results the EIB combined financing and advisory support to UPT projects.
   - Inclusion of operations belonging to each UPT sub-sector (urban railways, tramways, metro and bus) to ensure the inclusion of a minimum number of projects from each sub-sector despite (a) the over-representation of metro and tramways in the whole portfolio (around 33% and 31% each respectively) and (b) the uneven sub-sectoral distribution by country (e.g. large concentration of tramway projects in France and of metro projects in Spain).
   - The remaining operations were selected randomly.

4. A sub-sample of eight projects was selected to be assessed through an ex-post cost-benefit analysis. These projects had to fulfil two criteria: (i) be completed and in operation for at least three years by the time this analysis was undertaken, and (ii) have an ex-ante cost-benefit analysis available.

5. The figure below provides an overview of the location and sub-sectors of the 12 selected projects. The projects selected were located in diverse urban environments including:
   - Major metropolitan conurbations with a global reach and a population in the 8-11 million range.
   - Major cities in the EU-15 in the 2-6 million range of population.
   - Capitals in Central and Eastern European countries.
   - Medium-sized cities in the EU-15 in the 0.3-1 million population range.

Figure 1 Geographical and sub-sector distribution of the 12 sample projects



Source: IG/EV.

6. The following table provides the main features of the selected projects.

Table 1 Key project data

#	Country	Sub-sector	Type	Total project investment costs (●) & EIB loan amount in € (●)									
				<100m	<200m	<300m	<400m	<500m	<600m	<700m	…	900m-1bn	>1bn
PE1	UK	Light rail system	Infrastructure			●				●			
PE2	Spain	Tramway	Rolling stock and infrastructure		●		●						
PE3	Spain	Metro	Rolling stock and infrastructure			●		●					
PE4	France	Tramway	Rolling stock and infrastructure		●			●					
PE5	Spain	Metro	Infrastructure					●					●
PE6	Hungary	Tramway	Infrastructure		●			●					
PE7	France	Tramway	Rolling stock and infrastructure							●			●
PE8	France	Buses	Rolling stock and infrastructure	●		●							
PE9	Czech Republic	Metro	Infrastructure					●				●	
PE10	Poland	Metro	Infrastructure			●						●	
PE11	Sweden	Light rail system	Rolling stock and infrastructure				●				●		
PE12	Bulgaria	Buses and Trams	Rolling stock	●	●								

Note: Project investment costs correspond to the initial project costs as per signed contract. The EIB loan amount corresponds to data from the EIB portfolio.
Source: IG/EV based on EIB portfolio and project documentation.

1.3 Structure of this report

7. This report is structured as follows:
    - Chapter 2 briefly introduces the evaluation approach and methodology.
    - Chapter 3 presents the main findings of the 12 project evaluations. In particular:
        - The extent to which the 12 projects were aligned with the EU agenda and EIB strategic objectives relative to UPT, and responded to cities' needs (Chapter 3.1)
        - The results achieved for beneficiaries (Chapter 3.2)
        - The efficiency with which the projects were implemented (Chapter 3.3)
        - The extent of EIB contribution in the 12 operations (Chapter 3.4)
    - Chapter 4 presents the main conclusions stemming from the horizontal analysis of the 12 project evaluations.

8. Lastly, the annexes provide more details about the background of this evaluation and the methodology used for this evaluation.

2. METHODOLOGY

2.1 Approach and evaluation questions

9. **The project evaluations followed a theory-based approach, which consisted in describing the chain of inputs, activities and outputs leading to potential outcomes and impacts of the EIB-financed projects under evaluation.** A generic theory of change for EIB operations in UPT was reconstructed together with the relevant EIB services (Annex I) in the structuring phase of the evaluation and built upon a policy review covering both EU and EIB policy frameworks for urban transport. This generic theory of change identified three typologies of project results:

- The outputs delivered by the project and to which the EIB can have a direct influence as a co-financier (provision of quality infrastructure and service).
- The outcomes which justified UPT projects in the first place but over which the Bank has a more indirect influence (measured in terms of improved accessibility and use, modal shift, reduced congestion).
- Lastly, wider environmental, economic and social impacts to which the UPT project may contribute in conjunction with external factors and other interventions.

10. **Factors that can influence the materialisation of results are also described in the theory of change** (e.g. external context conditions, risks and assumptions). Whilst the outputs fall within the direct control of the project promoters, the project's outcomes are only under the direct influence of the promoter. The project's impacts, however, are influenced by many other factors, beyond the remit of the project itself. Likewise, the Bank's influence along the causal chain is strong at the level of inputs, but less so at the level of outcomes and beyond.

11. **Based on the theory of change, the following evaluation questions were formulated** (Table 2). Quantitative and qualitative information was collected against a detailed evaluation matrix to consistently bring together evidence from different project evaluations.

Table 2 Evaluation questions

Evaluation criterion	Evaluation questions
Relevance - *the extent to which the objectives and activities are consistent with underlying policies and cities' needs*	1. To what extent were the projects in support of UPT consistent with EU objectives and EIB priorities? 2. To what extent were the EIB operations appropriate to address the needs/policy priorities at urban level?
Effectiveness - *the extent to which EIB support for UPT projects in the European Union achieved its objectives*	3. To what extent did the EIB-supported UPT projects contribute to improving transport efficiency? 4. To what extent did the EIB support for UPT operations contribute to improving environmental sustainability and/or climate change mitigation? 5. To what extent did the EIB-supported UPT projects contribute to improving traffic safety and passengers' security? 6. Cross-cutting aspects: To what extent did the project contribute to territorial and social cohesion?
Efficiency - *the extent to which benefits are commensurate with costs*	7. To what extent were the results of the UPT projects supported by the EIB achieved (i) within the expected timeframe, and (ii) within the expected costs? 8. To what extent did the EIB-supported project achieve the expected net economic benefits?
Sustainability - *the extent to which the effects achieved by the projects persist in the long run*	9. To what extent will the outputs and outcomes of the EIB-supported projects be sustainable in the long run?
EIB contribution	10. To what extent could the EIB-supported projects have been implemented without EIB input (financial and non-financial) with the same scope, quality and/or timeframe?
EIB project cycle management	11. Were the EIB appraisal process and procedures applied appropriately in the case of the project sample?

Evaluation criterion	Evaluation questions
	12. Were the EIB process and procedures followed appropriately with respect to project implementation and monitoring?

Source: IG/EV.

12. **To respond to these evaluation questions, a combination of evaluation tools was used to triangulate evidence and achieve a solid, rigorous and nuanced judgment.** In all project evaluations, the evaluative evidence resulted from a documentary review (ex-ante appraisal documents and ex-post assessments), from project data provided by project promoters and municipalities, interviews with EIB services, project borrowers and/or promoters and relevant project stakeholders, including user associations, and from field visits to project sites.

13. **A project assessment rating on a scale from 1 to 4 was applied to all project evaluations to facilitate cross-project analysis**. Summary ratings were attributed for each evaluation criterion as follows: (i) Excellent, Satisfactory, Partly Unsatisfactory and Unsatisfactory for project performance and EIB project cycle management; and (ii) High, Significant, Moderate, Low for the evaluation of EIB contribution. To attribute such ratings, a number of sub-criteria were established to articulate and build the project summary ratings by evaluation criterion. Depending on the contribution of each sub-criterion to the project performance, which was based on the measurability and strengths of the causal links, equal or weighted values were attributed to each sub-criterion (see Annex 2). Several calibrations of the project ratings were necessary to ensure that this approach provided a consistent basis for the overall project assessment along the evaluation criteria.

14. **An ex-post cost-benefit analysis was conducted on a sub-sample of projects to assess changes in projects' economic efficiency and in project net welfare gains at the time of evaluation**. Unlike other analyses of project efficiency, cost-benefit analysis methodology assesses simultaneously both project benefits and costs by delivering a synthetic indicator of a project's economic value. Cost-benefit analysis is a standard methodology for project appraisal and selection, but it can also be used after project completion, during project lifetime, or at the end of the project life (Boardman et al., 2006). In particular, the cost-benefit analysis carried out at the end of the construction phase can be more immediately useful for decision-makers. The benefits of using ex-ante cost-benefit analysis also apply to ex-post cost-benefit analysis. A cost-benefit analysis provides a comprehensive analytical framework to systematically assess project performance and its evolution over time and requires thinking in terms of possible counterfactual scenarios (the '*what-if*' hypothesis).

15. **The ex-post cost-benefit analysis undertaken in these eight project evaluations adopted a hybrid approach, including features of both ex-post and ex-ante perspectives.** The ex-post cost-benefit analysis had an intermediate viewpoint with respect to the entire project life cycle, and the net welfare gains generated by the projects were assessed using the knowledge available at the time the evaluation was carried out. Some methodological adjustments were needed to fit the standard ex-ante cost-benefit analysis model (see Annex 3 for more details). The main implication of this choice is that the cost-benefit analysis ex-post result indicators (the economic rate of return, or the economic net present value) cannot be compared to the ex-ante values. Meaningful comparisons can only be made between forecasted and actual quantities used as inputs of the cost-benefit analysis model, such as annual volumes of passengers or investment costs (see Annex 3 for further details on the results of this comparison).

16. **The IG/EV disclosure policy applies to this publication**. Data at individual project level regarding the economic rate of return, financial rate of return and cost-benefit analysis are not presented in this synthesis report and its annexes.

2.2 Methodological challenges and implications for the project evaluation

17. **The project evaluations had to address several challenges, which were due to the specificities of UPT projects and data availability, both at appraisal and at project completion.** Specific challenges and limitations of the cost-benefit analysis are discussed in the cost-benefit analysis methodological annex (Annex 3).

Table 3 Summary of challenges and implications for the project evaluations

Challenges	Implications	Mitigation measures
Network effects, externalities and agglomeration economies distort the temporal and geographical boundaries, which need to be taken into account in the assessment of individual operations.	Attributing effects to a specific UPT project was not always feasible. Projects cannot be judged in isolation, but as a component of an investment strategy taking place within a long-term time horizon and a spatial framework extending beyond the project's boundaries.	The evaluation team assessed the project's contribution to a given outcome based on available data on modal shifts and/or demand levels. Network effects, context-specific factors and externalities were taken into account, where relevant, for the evaluation of each individual project.
In some cases, EIB UPT operations do not always correspond to a self-standing unit of analysis (e.g. when the EIB finances infrastructure, but not the purchase of rolling stock).	It is not possible to assess project outcomes and impacts without expanding the *evaluation scope*.	The scope of analysis was extended to include components that were not part of the EIB's support to create a self-standing unit of analysis.
Data availability: • Absence of updated data on the modal shift induced at project level • Lack of data on safety outcomes (no baseline data and no ex-post data) • Limited data on climate benefits • Lack of baseline scenarios	It was not possible to assess the contribution of projects to some of the outcomes or impacts identified in the theory of change.	The evaluation team relied on ex-ante estimates of key project performance indicators (e.g. time saving, passenger flows and modal shift) that were adjusted following discussions with project promoters and/or service providers. When no baseline and target were set ex-ante, achievements were discussed in absolute terms.
Changes in EIB reports' structure and assessment systems for project appraisal and for templates of project completion reports.	Comparison between ex-ante and ex-post key indicators (including EIB contribution) required the tools to be adjusted to ensure consistency of assessment across different rating systems and report structures.	A correspondence table was established to compare the available information.

Source: IG/EV.

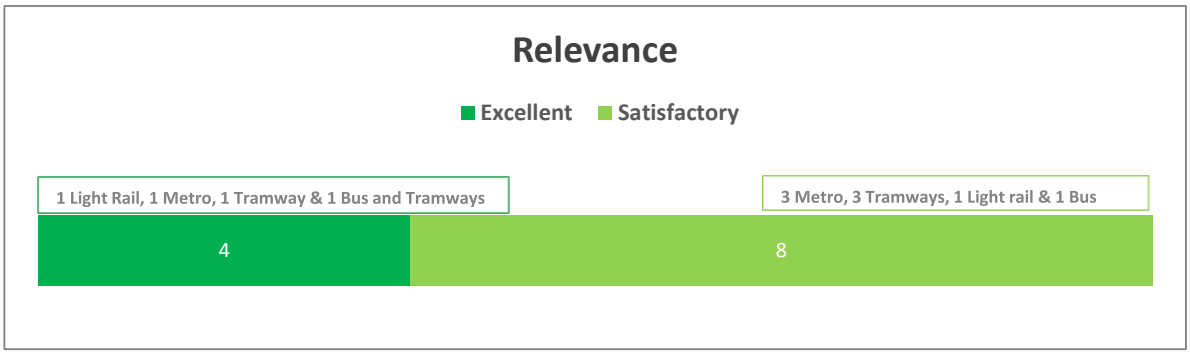
3. SYNTHESIS OF EVALUATION FINDINGS

3.1 Relevance

In the context of this assessment, relevance is defined as the extent to which the projects' objectives and activities are consistent with the underlying sector policies at the EU level, with the EIB's lending policies, and with local priorities and the cities' needs. This section retrospectively assesses how solid the project rationale was, in view of the alignment with EU objectives, EIB policies, and the promoter/client's urban development/transport strategies at the time of appraisal.

18. **The demand-driven nature of EIB operations generally ensures that each operation is in line with the cities' UPT objectives.** Relevance for all projects was excellent, except in one project where relevance was assessed as satisfactory. This positive assessment essentially reflects the fact that eligibility criteria for EIB financing of UPT projects require alignment with EU policy objectives and the EIB's corporate objectives, in addition to the integration of the project into the municipality's urban mobility plan. The reason for a lower score was where there was less sound evidence of latent demand.

Figure 2 Summary of relevance scores attributed by project evaluators



Note: Four-scale rating, ranging from "Excellent" to "Satisfactory", "Partly Unsatisfactory", and "Unsatisfactory".
Source: IG/EV.

3.1.1 Alignment with EU objectives

19. **The projects evaluated were aligned with EU policies**. According to the assessment performed at project appraisal by the EIB services, the 12 projects' contribution to EU priority objectives in relation to urban transport ranged from moderate to high. This evaluation confirmed that all 12 projects were broadly in line with the EU Transport White Paper (2006 and 2011), as well as with the 2007 Green Paper on Urban Mobility and the 2009 Action Plan on Urban Mobility**.** It should be noted, however, that priorities spelled out in EU transport policy documents are typically so broadly formulated that it is relatively simple to comply with them, as long as an UPT project addresses either congestion or environmental issues. At the project completion report stage, minor changes were observed in the Bank's self-assessment of project contribution to EU objectives. In only one case of project *P6*, such contribution was downgraded from "high" to "significant", although no explanation was provided, and the evaluation could not identify a reasonable explanation for this change in the project score.

3.1.2 Relevance in relation to EIB policies, strategies and priorities

20. **Alignment with EU policies ensured alignment with EIB corporate objectives as the two are interrelated.** All 12 projects were eligible under Article 267(c) of the Treaty Establishing the European Community (EC Treaty) or Article 309(c) of the Treaty of the Functioning of the European Union (TFEU), which in the transport sector refer to projects aimed at promoting sustainable transport modes. Additional eligibility criteria included contribution to cohesion regions (Article 309(a) of TFEU) and to the Trans-European Transport Network (TEN-T) as transport infrastructure of European interest (also under Article 309 (c)). As shown in the table below, all projects responded to at least the "sustainable transport criteria", and some of the projects responded to multiple eligibility criteria, which strengthened their alignment with EIB objectives.

21. **Retrospectively, the fulfilment of EIB eligibility criteria was confirmed, for all projects but one**. In the case of *P1*, the ex-ante eligibility related to the project's expected contribution to improving access to the Trans-European Transport Network (TEN-T) was not fulfilled, since the promoter abandoned the initial plan of establishing a connection with an international railway station. However, the project remained relevant from an EIB perspective because of its potential contribution to improving the capacity and attractiveness of UPT (sustainable urban transport eligibility).

22. **While not all the projects have a significant climate impact, currently they all fully count towards the EIB climate action key performance indicator.** The Transport Lending Policy considers that UPT investments are amongst the most promising in terms of reducing carbon emissions per transport unit. As such, all activities listed by the Transport Lending Policy as urban public transport projects currently contribute 100% of their signed amount towards the EIB climate action key performance indicator. This approach does not differentiate between UPT projects depending on their absolute greenhouse gas reduction and net carbon footprint[1]. However, not all UPT projects have a significant climate impact. In order to rate the merits of a UPT project ex-ante, the absolute greenhouse gas reduction and net carbon footprint are taken into account in EIB's ex-ante cost-benefit analysis, but not in estimating the project's contribution to the climate action key performance indicator. These dimensions are also quantified in the EIB's Pillar 4 (monitoring indicators), but Pillar 4 is not used for rating a project.

23. **At the time of writing this report, the Bank is revising this approach, against the backdrop of the work it is doing to become the EU climate bank and to enhance its additionality**. First, the list of activities eligible as urban public transport projects is being revised in the context of the EIB Climate Roadmap and the EU Taxonomy. Second, the Bank will roll out a new project assessment framework that will replace the 3PA as of 2021. This new framework is expected to make it possible to better value projects that have higher potential greenhouse gas emission gains by virtue of their contribution to addressing specific market failures. Potential market failures being addressed by UPT projects may include amongst others: the reduction of negative transport externalities due to a shift of traffic to more sustainable transport modes, or network economies associated with the development of the market for the deployment of alternative fuel vehicles and associated infrastructure. This revised approach is likely to enhance granularity in the way the EIB estimates the contribution of its UPT projects towards its climate action objective.

3.1.3 Relevance in relation to municipality strategies and beneficiaries' needs

24. **As required by the EIB Transport Lending Policy (2011), all 12 projects responded to cities' urban mobility priorities.** Project appraisal reports systematically presented the project within the context of broader urban transport investment plans and/or of other urban development programmes[2]. As a matter of fact, this is a condition for EIB eligibility of UPT projects set out in the Transport Lending Policy (2011)

[1] Since 2012, the Bank's project appraisal includes the estimation of the projects 'absolute greenhouse gas emission reduction' and the 'net carbon footprint'. Such approach was strengthened in 2015 when the Bank's climate action target for operations within the European Union were introduced, aimed at achieving annual climate action investment amounting to 25% of the EIB's total lending.

[2] The way transportation strategies are formed at urban level varies depending on administrative systems and cultures. In some countries there is a more developed tradition of comprehensive urban transport planning formalised in official documents (such as the *Plans de déplacements urbains* [urban mobility plans] in France), in other cases the process may be more pragmatic and ad hoc.

to ensure that projects financed by the EIB are part of integrated urban mobility plans.

25. **Projects responded to the needs of providing additional capacity to the public transport network and/or of improving its attractiveness, although evidence of latent demand was not always solid.** The table below summarises the main justifications that supported the EIB's decision to finance the project. Overall, by increasing and modernising capacity, all cities ultimately aimed at improving the modal share from car to public transport use. This evaluation found that these justifications were still valid and relevant at the time this evaluation took place, although, in some cases, the arguments and evidence provided by project promoters to demonstrate the need for the project were not solid enough.

Table 4 Project rationale with respect to existing urban mobility needs at the time of appraisal

Project #	Description of main needs
P1	Insufficient capacity, city growth
P2	Lack of attractiveness of public transport
P3	Insufficient capacity in suburbs
P4	Lack of attractiveness of public transport
P5	Insufficient capacity and territorial coverage of suburbs
P6	City growth, congestion, lack of attractiveness of public transport
P7	Lack of transport between suburbs, city growth, congestion
P8	Lack of attractiveness of public transport
P9	City growth, congestion, lack of attractiveness of public transport
P10	Insufficient capacity, city growth, congestion
P11	City growth, congestion in suburbs
P12	Lack of attractiveness of public transport, compliance with EU environmental standards

Source: IG/EV based on project evaluation reports.

26. **Evidence of latent demand is based on data submitted by project promoters that are used by the Bank services to assess the soundness of the project business case.** While the appraisal reports always include general indications of urban travel demand and of supply gaps motivating the need for an investment, the evidence of latent demand and capacity constraints is not always thoroughly documented. In four project evaluations (*P2, P3, P4, and P8),* the projects were approved in the context of declining or stable city population, which can be considered a risk factor for the achievement of demand targets. In a Western European city, traffic congestion was not a severe issue. In these cases, the projects were justified by the need to create better alternatives to the use of private cars.

Box 1 Aligning technology choices with city context, a good practice example

The P8 project was conceived as an alternative to the tramway, based on the premise that bus rapid transit (BRT) systems were better suited to the needs and financial capacity of a mid-sized urban area. The promoter had initially envisaged the construction of tramway lines. Demand forecasts, however, were not high enough to justify the heavy investment a tramway line would require. At the time of appraisal, a high-capacity hybrid bus was estimated to cost around €10-13 million per kilometre whereas the cost of a tramway line was above €15 million per kilometre. The promoter did not have the financial depth required to support the construction of a tramway line. The latter would also have posed some technical challenges given the configuration of the historical city centre. There were some discussions about adopting a tramway on tyre technology, but, given the cost and relatively new technology at the time, it was not considered as a viable alternative. In the end, the promoter opted for a BRT system to improve frequency, timeliness and overall capacity and put a lot of effort into the design of the buses, with the aim of providing a user experience as close as possible to that of a tramway line. The buses and the stations were purposely modelled on tramway lines.

Source: IG/EV P8 project evaluation report findings.

27. **In some cases, the analysis of the potential development of demand did not consider the effects of competing projects**. In the case of the *P5* project, a new railway shuttle to the airport run by a different operator could have been seen as a potential competitor to the metro line financed by the EIB. Conversely, the project promoter of *P1* carried out estimates that showed the neutral transport demand impact of a new metro line on the project financed by the EIB.

28. **The EIB had little leeway in discussing technology choices made by project promoters.** The assessment of the appropriateness of the selected solution to address the identified need(s) requires an in-depth analysis of alternatives. The EIB does verify the soundness of the option analysis when assessing projects, but it was in these cases brought in late in the projects, and therefore had limited capacity to provide an input related to the technological choices made by the promoters. By way of example, the choice to opt for a tram on tyre technology for tramway lines in *P7* was controversial. In this case, there was no room to revisit the decision made by the promoter since the tendering process was well advanced, though the Bank's services requested that the decision be reconsidered.

29. **The 12 projects encompass relatively conventional UPT projects that opted for consolidated technology choices rather than more innovative technological solutions.** When the 12 projects were appraised by the Bank, the EU Climate Agenda was not as important as it is nowadays. In the case of *P12*, the EIB supported the renewal of the city's bus fleet with compressed natural gas buses and more controversial EURO VI diesel-buses. At that time (2014), the conditions were not yet ripe to justify the purchase of more innovative solutions, such as hydrogen or electric buses. Since then, the Bank has helped the municipality and operators explore other options and technological solutions (e.g. hydrogen buses), for instance, through the ELENA technical assistance programme or the Cleaner Transport Facility.

30. **Stakeholders' view is that the EIB played a significant role in supporting UPT investments in the European Union by providing appropriate financial products**. EIB financing consisted in long-term investment loans, which matched the asset life cycle and were delivered through tailored financing arrangements to meet borrowers' financing needs. Discussions with EIB loan officers and project borrowers emphasised the EIB capacity to model the finance contract on the needs of clients to fit even the most complex project financing architecture (e.g. *P7*).

Box 2 Conclusions on relevance

- Overall, the 12 projects had a good formal alignment with EU policy, EIB strategies and priorities and the cities' urban mobility strategies.
- Projects responded to prevailing urban mobility needs at the time of their appraisal, although investment choices were not always well justified by data on latent demand.
- The products, terms and conditions offered by the EIB were appropriate to address borrowers' needs.

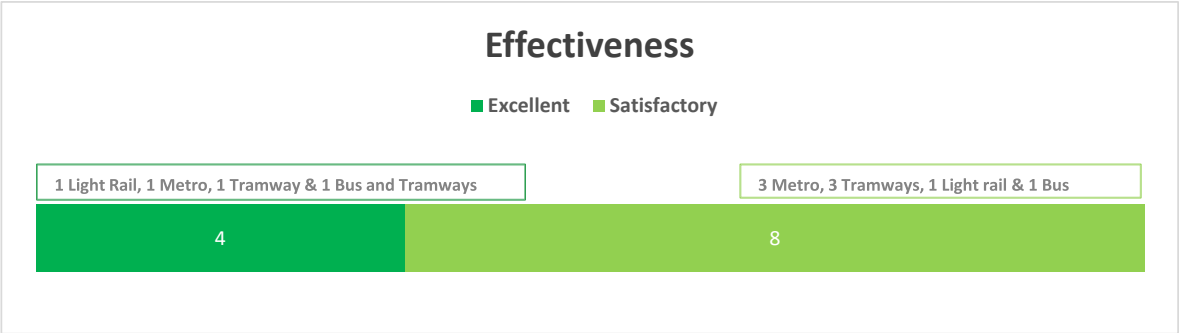
3.2 Effectiveness

In the context of this evaluation, effectiveness is defined as the extent to which EIB-supported projects achieved their intended objectives (i.e. by comparing expected and actual output and outcome indicators). The judgment on project effectiveness results from the level of performance on multiple dimensions linked to the delivery of outputs and the achievement of different categories of outcomes (measured in terms of improved accessibility and use, modal shift, reduced congestion).

In addition, the evaluation assessed whether the UPT projects may have contributed to wider impacts in conjunction with external factors and other interventions. These broader impacts included environmental and climate, territorial, social and economic cohesion, quality of life and social inclusiveness.

31. **While projects generally delivered the expected outputs, the achievement of the ridership targets was less satisfactory.** For the 12 projects, evaluators attributed an "excellent" or "satisfactory" score for the effectiveness criterion and the main difference between the two scores is due to a different level of performance in the achievement of outcomes. The assessment of project outcomes was severely limited by data availability, with the exception of data on passenger flows alone, which impacted the assigned ratings for effectiveness.

Figure 3 Summary of effectiveness scores attributed by project evaluators



Four-scale rating, ranging from "Excellent" to "Satisfactory", "Partly Unsatisfactory", and "Unsatisfactory". Source: IG/EV.

3.2.1 Delivery of expected outputs

The assessment of **output achievement** relied on observing whether the project was carried out as expected and if there were major modifications in the project scope.

32. **The delivery of outputs in the 12 projects was in line with expectations**. In all cases, there was no significant change in the scope of the projects:
    - Minor changes in original design occurred when it was necessary to comply with changes in the regulatory environment (e.g. *P8*) or to make improvements in terms of accessibility (e.g. in the *P3* project, whereby a new access to one metro station was added). However, these changes did not significantly impact key project features and operation.
    - In only one case (*P12*), the project scope was expanded. Thanks to savings occurred during the tendering process, the purchase of 22 additional buses was made possible.
    - In some cases, there were minor changes in the fleet and service features that were justified by the need to adjust the service to demand. Where they occurred, they did not affect transport service quality. Small changes in the capacity of the rolling stock (*P2*), in the commercial speed of vehicles (*P7, P8*) or in the frequency of the service (*P3*, *P10*) were observed.

33. **In two projects, the failure to deliver some project sub-components on time affected project capacity to deliver the expected services.** The *P5* and *P11* projects started operation before some sub-components were fully completed (see Box 3 below). This lowered the projects' attractiveness, which in turn resulted in underachievement of targeted demand and other related outcomes (see next section).

Box 3 Delayed delivery of sub-components can affect an entire project

The case of the *P5* project is complex. Although most stations of sections of the metro line covered by the project were completed and were in operation at the time of evaluation, according to the promoter's expectations and requirements, four were not yet open to users for reasons beyond the control of the concessionaire. These four stations constituted large intermodal hubs, where civil works interface with other complex schemes, which have not yet been completed. The fact that these key stations were still closed to the public weakens the effectiveness of the project.

The *P11* project experienced delays due to technical difficulties in integrating the old signalling system with the new one. This issue required passengers to change trains at a different station, which in turn negatively affected the frequency of trains and the total travel time on the line.

Source: IG/EV project evaluation report findings.

3.2.2 Achievement of anticipated outcomes

34. Anticipated outcomes include (i) the achievement of ridership targets, (ii) an improved modal share, and (iii) the materialisation of transport efficiency, safety and security benefits. The level of achievement of anticipated outcomes depends on the performance related to key determinants of UPT project outcomes, including:

- **Realised ridership:** The level of passengers' demand plays a critical role in determining other outcomes. Failure to deliver the expected increase in capacity or lower than expected traffic is likely to weaken the achievement of outcomes and impacts further down the theory of change causal chains.
- **Modal shift from private cars to more sustainable transport modes:** Another key parameter influencing the outcomes of UPT is changes in the modal share. The fact that data on the actual modal shift was not available or difficult to attribute to individual projects harmed the assessment of the achievement of other outcomes.

Ridership and modal shift

This section discusses the achievement of ridership's objectives in terms of achieved passenger levels and improvements in the modal share (reduced use of private cars in favour of sustainable transport modes).

35. **About two-thirds of the projects evaluated featured a lower than expected ridership** (Table 5). Forecast values for demand are those applied by the EIB at appraisal[3]. It was possible to gather relevant information on annual passenger flows at the ex-post evaluation stage for all projects evaluated. However, such information is sometimes not fully comparable across the appraisal, completion and ex-post evaluation stages, for instance when it is recorded at the network level rather than on a differential basis with respect to a project versus the counterfactual scenario. As shown in Table 5 below, of the 14 independent project components within scope (and for which ex-post data on ridership was available), nine or 64% had lower than expected demand levels at the time of evaluation.

Table 5 Achievements in terms of traffic levels

		Change	
Project #		**First year of full operation**	**2018**
P1		↓	↑
P2		↑	↑
P3		↑	↓
P4		↓	↓
P5		↓	↓
P6		↓	↓
P7	**Sub-project 1**	↑	↑
	Sub-project 2	↓	↓
	Sub-project 3	↓	↓
	Sub-project 4	↓	↑
P8		↓	→
P9		↑	↓
P10		↓	↓
P11		↓	↓
P12		/	/

Note: (*) Changes with respect to demand considered by the Bank at the appraisal stage: ↑ = actual demand higher than expected; → = actual demand in line with forecast; ↓ = actual demand lower than expected.

Source: IG/EV project evaluation report findings.

36. **Multiple factors contributed to lower than expected demand levels in the first years of full operation**, including:

- Longer ramp-up period (beyond 1.5 years). *P1*, *P7-Sub-project 4* and *P8* experienced a slower than expected uptake in passengers' demand, but the current demand at the time of evaluation showed excellent results and it was increasing every year.
- Optimistic forecasts (*P4*, *P6, P7-Sub-project 2*, *P7-Sub-project 3*, *P10*), which were the result of the hypothesis that underpinned the traffic models used by the promoters.

[3] EIB services adopt the demand estimates provided by the promoters when they deem them appropriate. In the case of P7, EIB services adjusted the promoter's forecasts upwards.

- Negative impact of the economic crisis in the post-construction and early operation years, resulting in a general decline in patronage across the entire public transport network (*P3*).
- Change in passenger counting methodology. This is the case for *P9* and *P10*, where a more accurate counting system was introduced in 2017 and 2018 respectively.
- Delays in the implementation of one project component. In the case of *P11*, the attractiveness of the project was hindered by interoperability issues (i.e. installation of a new signalling system).
- Delayed implementation of complementary projects and/or development of competing services. For *P5* low usage levels are explained by the fact that the core sections of the line, those that run through the central part of town, were missing.

37. **At project appraisal, most of the diversion in all 12 evaluated projects was expected to take place from the old to the new public transport mode, rather than from private car transport**. Overall, the modal shift from private transport modes was expected to be between 10% and, exceptionally 30%, which is in line with sector benchmarks and project technical specifications. For *P12*, which consisted in the acquisition of rolling stock, no modal shift was expected to be induced by the project. These results imply that the expected diversion of passengers from cars to public transport was limited, which is justified by the fact that these investments occurred in cities that already have a well-developed public transport network.

38. **Project contribution to the modal shift was sometimes overstated by project promoters and generated unrealistic expectations**. When a project accounts for only a small portion of the overall city network, the modal shift induced by the project itself is most likely small, particularly in cities with dense and mature UPT networks. For instance, *P11* represents less than 2% of total daily trips in the regional area covered by the light rail, which makes any consideration in terms of modal shift induced by the project at city level challenging to attribute.

39. **Project contribution to an improvement of the share of public transport modes could not be quantitatively assessed at project completion due to lack of data.** In the absence of updated data at the project completion report stages, based on ad hoc survey-based studies of passenger behaviour, it was difficult to assess the extent to which the expected modal shift was achieved at project completion. Except for two projects (*P2* and *P4*), no data were available at completion to quantify to what extent projects actually contributed to a change in the modal share. To undertake this assessment, the evaluation relied on the informed judgment of project promoters, data on actual ridership levels, on the use of private cars and on indirect evidence of the evolution of the modal shift in the city or in the project catchment areas.

40. **Modal shift is a complex process influenced by a multitude of factors (including ridership and travel time savings), many of which are beyond the projects' remit (e.g. urban development and mobility policies, socio-demographic factors, spatial patterns, journey features etc.).** All these factors influence greatly the passengers' decision to change transport mode in urban areas. Coherence between urban mobility policies and urban transport investment is key to ensure more substantial changes in passengers' travel patterns. In the case of some of the evaluated projects (for instance, *P4*), increasing the attractiveness of public transport was not sufficient to reverse users' preference for cars. In other cases (*P6*), parallel investments (e.g. road network) may have negatively affected the modal shift to public transport. Conversely, *P2* had positive results in terms of modal shift (40% reduction in car traffic in the project's catchment area) thanks to the service improvements offered by the tram (e.g. better safety conditions, comfort gains, higher frequency, time savings), as well as the regeneration of urban spaces along the tramline (e.g. reduced parking availability) and the development of new residential areas served by the tram.

Achievements in terms of transport efficiency

The analysis of transport efficiency outcomes includes the following dimensions:

- **Time savings**, which refer to reduced journey travel time for UPT users and possibly for non-users.
- **Reliability gains**, which refer to the reduced variation in journey times.
- **Operating cost savings**, which refer to reduced cost for transportation both for people diverted from private cars, which are more expensive than UPT, and for the public transport operator.

The achievement of transport efficiency outcomes is naturally related to actual usage levels and changes in the modal share. Where the expected demand levels for existing, diverted and generated users have been achieved, transport efficiency gains are more likely to occur.

41. **At project completion, the ex-ante estimates for time savings were confirmed through the information provided by project promoters, except for one project.** Time gains for direct users depend on journey time reductions (thanks to faster and/or more frequent service) enabled by the project compared to previous modes and are calculated by using complex traffic models. For the 12 projects, the average time saved by previous car users ranged between four and ten minutes per trip. Expected time savings were particularly low in medium-sized cities that had limited road congestion prior to project implementation (*P2*, *P4* and *P8)*. Given that data on actual time saved per trip was not available, the evaluation reassessed the ex-ante estimates through a qualitative assessment based on project promoters and/or transport operator judgments. Evaluators also deemed that, when projects' components and outputs were delivered as planned, it was reasonable to conclude that the anticipated time savings (in terms of minutes saved per trip) had materialised as expected at project appraisal. In one case only, it was found that the ex-ante estimates could not be met (*P11*). This occurred because of technical issues related to the implementation of the signalling system that increased the expected average travel time by five minutes.

42. **Increased reliability appears to be particularly significant for all projects given the involvement of automation and/or separated right-of-way systems.** These benefits were larger for tramways and metro projects that replaced existing bus systems (e.g. *P2, P3* and *P10*). Fully automated metro lines (*P5*) reduce both human errors and accidents that tend to be the main sources of delays and irregular journey times.

43. **Public transport operating cost savings were achieved as expected when these were planned**. Such savings were due to restructuring of the existing UPT network following project implementation. The need to provide evidence of bus network restructuring was included in the appraisal report among the contract undertakings. This is for instance the case of *P2* and *P9*, which brought about the restructuring of the existing bus network. In the case of *P9*, the tramway network, which was operated along the route, was also restructured. In *P10,* the municipality also had similar plans that will be implemented once the construction of the metro line is more advanced. The modernisation of physical assets, such as the purchase of a new fleet, may also result in lower operating and maintenance costs, although such benefits can be offset by service quality improvements (e.g. air conditioning in *P12*), which drove operating costs up.

Achievement in terms of service quality

Improvements in terms of **service quality** refer mainly to the availability of specific service features increasing passenger comfort (e.g. smoother movement of the vehicles, more comfortable seats, provision of electricity, free internet access, catering).

44. **Despite measurement challenges, the achievement of significant service improvements was confirmed for all projects by stakeholders.** Improvements related to service quality are frequently part of project objectives, but no specific targets were set at appraisal and reported at completion. The level of achievement on this criterion has been judged primarily based on consumer satisfaction surveys, which are regularly carried out by most transport operators. Metro and tramway projects improved frequency and punctuality when compared to the buses that they had replaced. The new fleets usually provide a high level of comfort and amenities (e.g. air conditioning, charging for mobile devices, more comfortable seating). Easy access and improved information systems were two additional service

quality dimensions of new UPT infrastructures.

Achievements in terms of safety and security

Safety benefits relate to a reduction in the number of fatalities, serious and slight injuries, and damage-only accidents. Safety benefits are mainly related to road traffic and arise by diverting passengers to other statistically safer transport means, such as light rail or metro.

Passenger security relates to a perception of feeling safe in the vehicles, at the stations, platforms and stops.

45. **Safety improvements were not primary objectives of the 12 projects, although they were often embedded in project components at the design stage.** Safety benefits were included in project ex-ante cost-benefit analysis, but this evaluation was not able to measure them through the collection of actual data. The ex-ante assessment of safety effects relied on the assumption that different accident rates are associated with different transport modes (typically higher rates are associated with the car mode). At project completion, however, promoters did not have the localised time-series data on traffic accidents that would have made possible a comparison between the ex-ante and the ex-post scenario. Some of the 12 projects (e.g. *P3*, *P5*, *P1)* integrated technologies that are, in principle, geared towards improving traffic safety, such as new signalling systems, which were corroborated during the site visits undertaken for this evaluation.

46. **Improvements of passenger security were never explicitly integrated into the ex-ante appraisal of the 12 projects**. Baseline and targets were not available, but considerations about passenger security were embedded in project design. New bus and tram fleets (e.g. *P12*) and new stations (e.g. *P9*, *P10*) were equipped with video surveillance systems.

3.2.3 Contribution to broader impacts

This section refers to the broader investment impacts depicted in the upper section of the theory of change (Annex 1). They relate to impacts in terms of environmental quality, climate, social inclusion, economic growth and competitiveness.

The assessment of UPT project impacts are typically associated with the cumulative effects of the implementation of large urban investment programmes. The magnitude of broader impacts depends on how cities combine their public transport, land-use and social policies. It also depends on the project size with respect to the city (e.g. the construction of the first tramway or metro line in a mid-size city is likely to generate large city-level effects compared to the extension of an existing metro network by a few kilometres or to the purchase of new rolling stock).

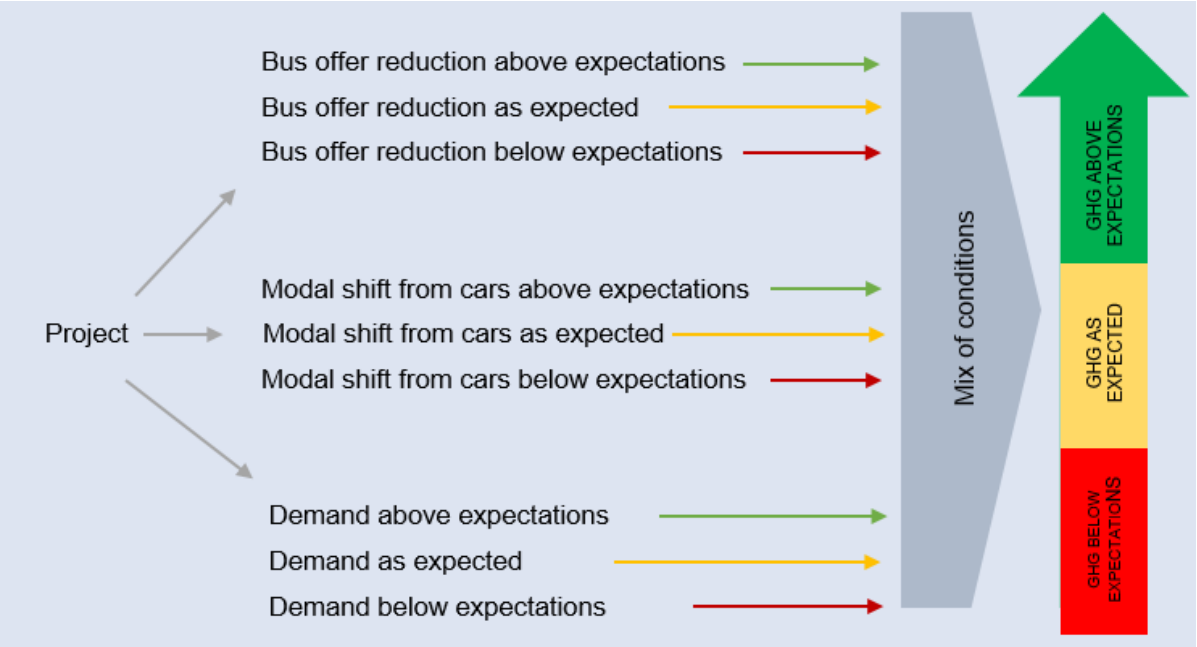
Given that causal attribution is difficult, if not impossible, this evaluation collected some qualitative and anecdotal evidence to illustrate how the 12 projects contributed to broader impacts.

Climate and environment

Contribution to climate objectives is measured by the absolute and net reduction in carbon emissions in the scenario with and without the project. Environmental achievements include improvements in air quality and a reduction of common air pollutants that are detrimental to human health.

47. **UPT projects are considered climate-friendly by the Bank as they are expected to lead to lower carbon emissions per unit of distance travelled.** However, estimates of carbon emission reductions are complex to calculate and rely on a number of key hypotheses. Figure 4 below provides a qualitative illustration of the logic underlying the assessment of the net greenhouse gas footprint. For a given traffic level, the higher the modal shift from the car and bus mode, the higher the reduction in car and bus mileage and in traffic congestion resulting in lower greenhouse gas emissions. Rail-based systems can be large consumers of electricity. Therefore, a city energy mix also influences the greenhouse gas reduction potential of public transport projects, since electricity may produce more or less greenhouse gas emissions according to the share of fossil fuels in electricity production.

Figure 4 Offer, shift and demand



Source: IG/EV.

48. **Where available, ex-ante estimates on relative carbon emissions were negative, implying that the project might have resulted in greenhouse gas emission savings relative to the "*without the project*" scenario**. Since 2010, the EIB project appraisal procedures give an estimation of the projects' absolute greenhouse gas reduction and the net carbon footprint. At the end of the pilot testing in 2012, these calculations were routinely incorporated into project appraisal documents and are thus not available for the entire project evaluation sample[4]. Where available, these estimates vary considerably depending, in addition to the above-mentioned factors, on the project size relative to the city urban transport network and cannot be directly compared.

49. **Nevertheless, it was not possible for the evaluation to make a judgment about the achieved reduction of greenhouse gas emissions because of a lack of data.** This evaluation could not validate the Bank's forecasts because project promoters did not have data on the achieved net carbon emission reduction. In order to perform such an assessment in quantitative terms, it would be necessary to reconstruct the causal chain with assumptions and metrics on traffic flows, the share of UPT traffic growth attributable to the project, diversion rates from more polluting modes such as cars and buses, average journey length, occupancy rates and unit emission rates in, for example, grams per vehicle-kilometre for CO_2. At project completion, only four projects (*P6, P9, P10, P11*) reported the achieved absolute greenhouse gas reduction in their project completion reports. For three projects the ex-ante estimates were confirmed at project completion (*P6, P9, P10*), while for the project in *P11* the ex-post absolute greenhouse gas reduction was lower than expected. For all other projects, no comparison was possible because of a lack of data.

50. **When demand is below forecasts, it is unlikely that the expected net greenhouse gas reduction was fully met.** The lack of project-based modal shift data and of a baseline scenario hampered a more robust assessment of the climate outcomes achieved by the 12 projects evaluated. However, when the anticipated ridership levels do not occur during the operation phase, the emission reduction expected by the project cannot not be achieved.

51. **Air quality improvements could not be proved, because baseline and targets were not defined at project appraisal and monitored at project completion**. The benefits of air quality improvements are localised and are difficult to attribute to UPT projects without location-specific information on pollutant

[4] The EIB carbon footprint methodology is still considered a "work in progress" that is subject to periodic review and revision in the light of experience gained and as knowledge of climate change issues evolves.

concentrations, population exposures, traffic emissions data and dispersion modelling. Reduction of pollutant emissions was generally expected from the 12 projects selected for in-depth evaluations, but no baseline data and/or target were identified at project appraisal. Unlike greenhouse gas emissions, for which some data were available in project completion reports, no data on changes in air pollution were collected by project promoters. In only one case (*P2*), an independent study assessed, among other benefits, the project's environmental outcomes. For future UPT projects, new technologies enabling large-scale environmental data collection might partly remedy the scarcity of reliable data and the costs of data collection, which have limited the evaluation's ability to reconstruct projects' impacts in terms of environment[5].

52. **Reduction of noise pollution was never mentioned as a specific objective in the 12 projects and was therefore considered a residual effect.** Project evaluations were thus not able to collect significant evidence with respect to this dimension.

Quality of life

53. **Improvements in terms of quality of life mainly came from improved accessibility and urban regeneration brought about by the projects.** These effects were likely to be larger in UPT projects that pursued multiple objectives, including urban regeneration and urban development. In various cases (*P1, P2, P3*, *P4*, *P7 and P8*), the development of the UPT project was conceived as an integral part of or undertaken in conjunction with urban renovation programmes. This applies particularly to projects in France where the development of tramway and bus rapid transit lines was fully integrated with broader programmes aimed at regenerating urban areas. In French cities, urban mobility plans are fully integrated with urban planning instruments[6] (all major urban projects must be organised according to existing or planned transport infrastructure). The case of one of the municipalities included in the *P7* project can be taken as an illustrative example (see box below).

Box 4 The construction of new tramway lines contributed to urban rejuvenation

The *P7* project consists of the construction of four tramway lines and the purchase of rolling stock. These lines are embedded in densely populated municipalities around a major city in the country. Thanks to the construction of one of the tramway lines, the city was significantly revamped. Neighbourhoods situated on the route of two other tramlines also benefited from substantial upgrades. The construction of the tramway lines was also seen as an opportunity to add green spaces in the cities and improve walkability in the area.

Source: IG/EV P7 project evaluation report findings.

Social inclusiveness

54. **According to qualitative evidence, the 12 projects contributed positively and significantly to social inclusion.** This objective was achieved in multiple ways:

- Most projects improved UPT accessibility for different user groups, reaching some of those previously suffering from poor access. In all cases, accessibility to users with reduced mobility was ensured by means of lifts, low-floor vehicles and dedicated spaces for wheelchairs. It is worth noting that accessibility standards for persons with disabilities and reduced mobility are increasingly required by both EU and national legislation.
- Most cities put forth efforts to ensure affordability of UPT services for all social groups through favourable fare policies for students, the unemployed or elderly people. For instance, in *P10* people with disabilities as well as children of school age, children and youths up to 21 years belonging to large families, elderly people, beneficiaries of municipal social welfare centres and the unemployed are entitled to use public transport services free of charge.
- Social inclusion was improved through better connections to and from less privileged neighbourhoods that were previously underserved by UPT (in *P1, P2*, *P3*, *P4*, *P5, P7, P8 and P10*). These new connections fostered access to diverse opportunities (e.g. work, leisure,

[5] For instance, extensive literature exists on the practical use of low-cost sensor platforms for air quality monitoring and exposure estimates. For an illustrative recent example on Oslo, see Schneider et al (2017).

[6] In France, since 2000, urban mobility plans (*Plans de Déplacements Urbains*) are required by law to be fully aligned with broader urban development plans, the *Schémas de Cohérence Territoriale*, which aim to ensure consistency across different policies affecting a broader geographical area (including housing, mobility, economic development, social policies, environmental, etc.).

education and health) for citizens living in areas that in many cases were subject to regeneration and new residential development.

Economic growth and competitiveness

55. **Project contribution to economic growth and competitiveness was difficult to assess and was likely to be larger where projects were followed by property developments.** This is the case for the *P1, P2* and *P10* projects, which went hand in hand with real estate market developments in the area served by the project. New buildings for mixed purposes were (and still are) being developed along the project area and the project promoters confirmed that these developments are linked to the area's improved public transport coverage.

Box 5 Conclusions on effectiveness

- Outputs: the 12 projects were delivered as planned with minor adjustments to technical specifications. All projects brought about a significant improvement in the quality of services.
- Public transport demand: After three years of operations, demand levels were still lower than forecast for two-thirds of the projects under evaluation. This was due to a variety of factors, including the unexpected impact of the economic crisis, the delayed implementation of project sub-components and the use of hypotheses that delivered overoptimistic demand forecasts by project promoters.
- Modal shift: Actual data on the project-induced changes in the modal share was not available for most of the 12 projects. Modal shift is a complex process determined by a combination of multiple factors, many of which fall beyond the projects' remit. A key success factor for achieving modal shift is the implementation of the project in combination with appropriate policy measures and incentives discouraging the use of private cars.
- Greenhouse gas emissions reduction: At the time the 12 projects were appraised, the Bank was testing its methodology for calculating the carbon footprint, which may explain the lack of sufficient data to draw robust conclusions about project contribution to greenhouse gas emissions.
- Environmental benefits: Reducing air pollutants was an important justification for financing these projects. However, no data were available at project appraisal (baseline scenario, targets) and at project completion.
- Broader socioeconomic impacts, including urban regeneration, territorial cohesion and social inclusiveness were considered relevant and significant to support the EIB decision to finance the project, but were difficult to ascertain and attribute ex-post. Anecdotal evidence showed that when UPT projects were integrated into urban development plans and delivered along with other urban regeneration investments, these effects were likely to be larger.

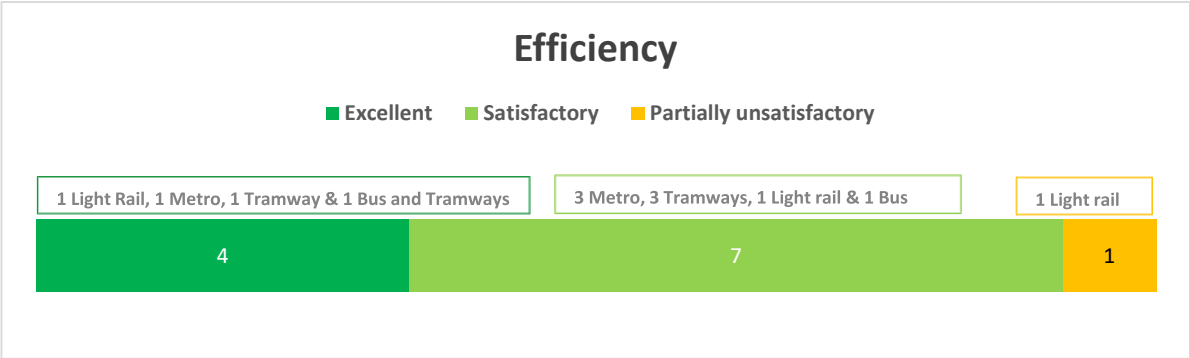
3.3 Efficiency

In the context of this evaluation, efficiency is assessed at two levels:

- The **quality of project implementation,** with specific reference to the extent to which the project's components were implemented within the expected timeframe and within the expected budget.
- **Project economic viability**, which is measured by a project's capacity to generate economic benefits that are higher than its economic costs.

56. **Overall, the evaluation found that project implementation was efficient,** with only one of the 13 cases classified as "partly unsatisfactory" and four projects achieving an "excellent" rating. Projects that did not achieve the expected usage levels and/or had higher than expected project costs saw a deterioration of their economic efficiency.

Figure 5 Summary of efficiency scores attributed by project evaluators



Note: Four-scale rating, ranging from "Excellent" to "Satisfactory", "Partly Unsatisfactory", and "Unsatisfactory".
Source: IG/EV.

3.3.1 Project implementation within the planned cost.

57. **EIB services have performed reasonably well in judging risks related to construction costs at appraisal**. The technical contingencies added by the EIB, which reflect more conservative cost estimates than those done by the promoters, were in most cases appropriate. Such contingencies integrate multiple factors including project complexity and the promoter's capacity. EIB services are generally in a good position to estimate costs since their involvement takes place late in the project cycle when the nature of the technical solution adopted is well understood. At that moment, certain preliminary, even detailed, studies – e.g. on soil conditions or environmental constraints – or executive designs have already been carried out. In many cases, the EIB loan has been approved when construction works have already been tendered and even started. This has likely reduced the cost uncertainty associated with the project.

Table 6 Comparing estimated and actual project costs

Project name		Deviation(*) between expected final cost(**) and total actual cost
P1		↓ (-5%)
P2		→
P3		→
P4		→
P5		→
P6		↓ (-5.6%)
P7	Sub-project 1	→
	Sub-project 2	↑(+7.5%)
	Sub-project 3	→
	Sub-project 4	↑ (+4%)
P8		↑ (+6%)
P9		↓ (-17%)
P10		↓ (-5%)
P11		↓ (-16%)
P12		↓ (-15%)

Note: (*) = Changes with respect to total expected cost: ↑= cost overrun; → = actual cost equal to planned (± 3%); ↓ = cost savings.
(**) = this includes base cost, technical contingencies, price escalation and interest during construction.
Source: IG/EV project evaluation reports.

58. **There was a diversity of factors determining negative or positive deviations between expected and actual investment costs:**

- New regulations made technical and architectural changes necessary (*P8,* see box below).
- There were issues with contractors and/or difficulties in the implementation of some civil works. For instance, in the case of the *P7 – Sub-project 2*, the tunnel construction turned out to be more expensive than expected and the steep slopes required the reapplication of concrete on some sections of the line.
- Outturn costs were lower than anticipated because of savings made in the tendering process (*P10 and P12*) or due to lower costs on certain components of the project (*P11*).
- The lower outturn total cost was due to the under-utilisation of the contingency allowances set by the EIB (*P1* and *P9*).

Box 6 Cost overrun: the example of a bus project

According to stakeholders, the cost overrun in *P8* is due to the great degree of architectural and technical changes required during project implementation.

As the project route runs through the city's historical city centre, strict compliance with requests made by the public body responsible for historical heritage was required. Such requests were difficult to predict at the appraisal stage, particularly as new national regulations entered into force as the project was already underway. As a result, a number of technical modifications were made during the construction phase, including the use of different materials for the pavements and the relocation of an external wall. In addition, it was discovered that the military land on which the maintenance centre was to be built needed decontaminating prior to construction. Moreover, the promoter decided to extend the line to the entrance of a hospital. Lastly, the access ramps on the buses needed changing, as they were not adapted to all types of wheelchairs (the installation of the new ramps cost €6 000 per bus).

Source: IG/EV P8 project evaluation report findings.

59. **In at least one case, EIB involvement resulted in considerable savings for the city.** The EIB's own project experience and sector benchmarks are nearly always part of the ex-ante appraisal carried out by its services and this informs the considerations on how the project unit cost compares to industry standards. In this context, in the particular case of *P10*, EIB advisory support provided via JASPERS, together with the Projects Directorate and the European Bank for Reconstruction and Development (EBRD), played a critical role in helping to substantially reduce the project cost to improve the value for money of the technical solution eventually adopted (see box below).

Box 7 EIB advice on a metro procurement process

The original calendar of the *P10* project required the project promoter to adopt a restricted tendering procedure under very tight time constraints. As a result, all the offers received for the design and building of the metro line were well above the available budget.

Following the EIB advice, the promoter set a more reasonable project implementation schedule and changed its procurement strategy. The main works contract was re-tendered in the form of an open tender procedure, which resulted in a lower project cost. The EIB advice translated into significant cost savings, amounting to approximately 25% of the total project cost. As a result, the EIB intervention not only enabled the project to be completed within the budget, but also its scope to be extended with additional components, which were not originally planned.

Source: IG/EV P10 project evaluation report findings.

3.3.2 Project implementation within the planned schedule

60. **Performance on timely project delivery was mixed, with four projects having encountered delays exceeding one year** (see Table 7 below). Similarly to costs, adherence to the project calendar is calculated on the estimates made by the EIB services at appraisal, which often include extra time contingencies compared to the calendar anticipated by the promoters. For *P10* and *P12*, the respective 12 and six months of contingencies expected by the EIB services at appraisal turned out to be appropriate. Conversely, the contingency plan anticipated for *P2*, *P4, P8*, and *P9* was unnecessary. In the case of the *P7* project, the delays were judged as acceptable given the scale of the project and the multiplicity of contractors and municipalities involved.
61. **In most cases, delays exceeding one year were due to technical complexity not fully anticipated at the appraisal stage**. Sometimes delays affected only one of the project's components, such as the

signalling systems (the case of *P1*, *P3* and *P11*). It is interesting to note that delays in project implementation have taken place even in cases of highly experienced promoters (e.g. *P1*, *P3* and *P11*).

Table 7 Schedule and timeliness

Project #	Maturity level at appraisal	Time contingency included by the Bank	Changes*	Comment
P1	Construction; 3-car works due to start	6 months	↑	Infrastructure delivered with **14 months' delay**
P2	Construction	3 months	↓	In line with promoter estimates
P3	Construction	6 months	↑	Final station operational with **2.5 years' delay**
P4	Construction	9 months	↓	In line with promoter estimates
P5	Construction[1]	6 months	→ (construction) ↑ (operation)	Construction finalised on time but **operation delayed**[5]
P6	Construction almost completed	/	↑	5 months
P7	Construction[2]	3 months for each line	↑	7 months, 9 months, and 5 months for sub-projects 1, 2 and 4; sub-project 3 opened on time
P8	Construction	3 months	↓	In line with promoter estimates
P9	Advanced construction[3]	2 months	↓	In line with promoter estimates
P10	Construction	12 months	→	In line with EIB estimates
P11	Construction[4]	/	↑	**5-year delay** for the automatic train protection component
P12	Compressed natural gas buses procured; Other components at tendering phase	6 months	→	In line with EIB estimates

*Note: * Changes with respect to the end of project implementation as anticipated by the Bank: ↑ = delay; → = actual time equal to planned; ↓ = completed in advance*
1. Works completed represented 20% of investment costs at first appraisal.
2. The progress of works varies between 10% and 50%.
3. 50% of metro stations and 15% of the tunnel were completed.
4. Approximately 50% of the project was already completed.
5. The construction of the respective sections' stations was carried out on time (in line with the timetable). However, the significant delays in construction of the rest of the line affected the opening of the sections covered by the project to the public (one section was opened with four years' delay and another one was partially opened with nine months' delay).
Source: IG/EV project evaluation reports.

3.3.3 Economic performance

62. **The financing decision was taken based on the consideration that the 12 projects could generate sufficient socioeconomic benefits.** For five of the evaluated projects the ex-ante economic rate of return was below the social discount rate (but above the minimum threshold required for EIB financing), implying that the decision to finance the investment was taken by looking at the long-term environmental and/or urban development impacts that could not be reflected in the cost-benefit analysis. In about half of these cases, the ex-ante economic rate of return only slightly exceeded the required threshold, which made the economic efficiency of these projects particularly vulnerable to minor changes in project performance key parameters, such as deviations from expected ridership level, investment costs and/or construction issues.

63. **Although in some cases the economic rate of return was expected to be worse than forecasted, the EIB self-assessment at the project completion report stage concluded that all projects**

delivered had an acceptable economic rate of return. The project completion report provides rough estimates of how the economic rate of return had likely changed taking into account the sensitivity analysis carried out at appraisal and the evolution of key project performance parameters (mainly passenger levels and investment costs).

64. **The ex-post cost-benefit analysis carried out for this evaluation found that project benefits exceeded their costs in five out of eight projects covered by this analysis.** The net welfare effect at project level was assessed based on three economic performance indicators: (i) economic net present value, (ii) benefit-cost ratio, and (iii) economic rate of return. A project was deemed satisfactory if the economic net present value was positive, the benefit-cost ratio was higher than one and the economic rate of return was equal or above the reference social discount rate. The ex-post cost-benefit analysis calculations estimate that three projects were not economically efficient at the time of evaluation.

65. **Weaker economic efficiency than expected was caused by deviations in passenger flows forecasts and project implementation issues.** The comparison of ex-ante/ex-post investment costs and demand shows that in four out of eight projects, for which an ex-post cost-benefit analysis was undertaken, there was an underestimation of the investment costs and an overestimation of demand. Deviations in project costs could not have been entirely predicted at project appraisal, while the lack of achievement of demand targets can be attributed to a combination of factors, including (i) the need for a ramp-up period longer than expected, (ii) an inadequate traffic model used by the promoter, (iii) the overoptimistic forecast in project promoters' traffic models, (iv) the impact of the economic crisis and (v) delays in interconnected urban public transport projects. The magnitude and the reasons of such deviations are explained in detail in Annex 5.

66. **Overall, projects were underpinned by sound business cases that were verified by the EIB, but in some cases short-term policy objectives, rather than economic efficiency considerations, might have driven the city's choice towards the investment.** A project with a negative economic return ex-ante is not necessarily a bad project, but it may use too much socially valuable resources to achieve benefits for all citizens that are too modest. These considerations relate especially to whether the choice of the transport mode was appropriate with respect to potential demand. This can be the case, for instance, of tramways, which could be compared to bus rapid transit projects. However, there are several limitations to the role that the Bank can play in such instances. First, the Bank is often brought in late in project financing, which leaves limited scope to provide inputs in the project's design. As a result, the Bank does not carry out a systematic technical or economic analysis of the options that the promoter has taken into consideration and has rejected, since such options analysis would be quite resource-intensive and could considerably delay the approval process. Secondly, if the technical and financial due diligence deliver an acceptable socioeconomic assessment (including an ex-ante economic rate of return above the EIB's minimum acceptable threshold) for the selected investment choice, the project is considered bankable.

67. **The combined risks of deviations in anticipated ridership and of project implementation issues were not fully integrated into the sensitivity analysis carried out at project appraisal.** The project documentation does not describe the results of tests conducted to examine the simultaneous changes in critical inputs and variables entering the ex-ante cost-benefit analysis. Appraisal documentation only contains information on basic sensitivity tests, which examine how the outcome of benefit-cost analysis changes by varying one by one the main variables and assumptions. Lack of information about how the results of an ex-ante cost-benefit analysis may vary under different scenarios limits the informative scope of sensitivity tests.

68. **As anticipated at appraisal, the distribution of project benefits ex-post was skewed towards transport efficiency gains, while environmental and climate benefits were more marginal.** This result is a consequence of the way the cost-benefit analysis is constructed, but also reflects the importance given to different project objectives. While improving mobility through higher transport efficiency can be considered the primary objective of EIB-financed projects, environmental and climate objectives can be seen as the likely and direct consequences of improved urban public transport systems.

Box 8 Conclusions on efficiency

- Overall, the implementation of the 12 projects evaluated was efficient, as all projects (except two) were implemented within costs. The performance in terms of timeliness was more mixed, as four projects out of the 12 encountered delays exceeding one year. In two cases, such underperformance compromised the delivery of outputs and outcomes.
- Construction and delivery delays were not infrequent and also concerned highly experienced promoters. The delays identified were broadly in line with the complexity of UPT projects.
- Overall, most projects generated sufficient socioeconomic benefits, in line with the expectations. However, the project economic costs outweighed their economic benefits in a limited number of cases (three out of eight projects subject to an ex-post cost-benefit analysis). When this occurred, it was due to a combination of factors, including higher than expected investment costs and ridership levels below forecasts. In these cases, the EIB's standard sensitivity analysis did not adequately account for the combination of risks on the economic soundness of the projects.

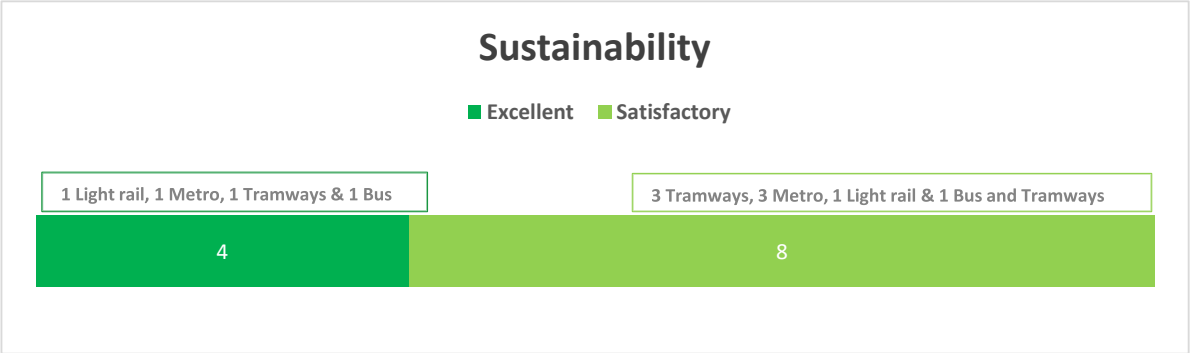
3.4 Sustainability

The sustainability concept is defined by the combination of the following three dimensions:

- **Long-term sustainability of effects,** related to the persistence in the medium and long run of the project outcomes, which can be facilitated, for instance, by the implementation of synergic urban mobility projects.
- **Financial sustainability,** related to the availability of financial resources needed to ensure in the long run adequate levels of operation and maintenance.
- **Physical and operational sustainability,** related to the expected evolution of the project operation and maintenance strategy in the medium to long run. Therefore, the dimension relates to the mechanisms through which the promoters/service providers are expected to ensure long-lasting delivery of the urban public transport services.

69. The evaluation found that **project sustainability was well established.** For all projects, this positive result was achieved thanks to a good alignment between a supportive UPT long-term strategic framework for the evaluated projects, a sound management structure and operations and maintenance policy and a robust financial support configuration.

Figure 6 Summary of sustainability scores attributed by project evaluators



Four-scale rating, ranging from "Excellent" to "Satisfactory", "Partly Unsatisfactory", and "Unsatisfactory". Source: IG/EV.

3.4.1 Long-term sustainability of effects

70. **The positive effects of the projects are expected to persist in the medium and long run**. In the case of the *P8*, *P10* and *P12* projects, there is evidence of measures reinforcing the project effects, such as congestion charges, parking limitations in city centres, construction of park-and-ride facilities nearby important transport nodes, awareness rising and promotional campaign activities. Some risks that could affect future demand were identified in a number of projects, including: (i) weaker political

support for further extension of the tramline (*P2)*, (ii) conflicting urban mobility policies such as free access to the city centre and low-cost parking spaces (*P4*), (iii) new competitive infrastructure (*P1, P6*), and (iv) uncertainty on timely completion of complementary projects (*P5*).

3.4.2 Physical and operational sustainability

71. **Based on qualitative assessments, this evaluation has found no evidence of possible risks related to inadequate physical and operational sustainability.** The latter is ensured by generally competent operators well-informed on best practice in the management of transportation systems and maintenance and replacement policy for rolling stock and other system components. In all cases, operational sustainability was supported via long-term contracts with public transport operators and/or concessionaires. Overall, the judgment expressed at the appraisal and completion stages was confirmed at the evaluation stage.

3.4.3 Financial sustainability

72. **Both at appraisal and at project completion, there was no expectation of positive financial return and projects' financial sustainability was ensured by subsidies provided by public administrations.** Given the cash flow features common to all UPT projects, financial performance metrics such as financial rate of return and financial net present value were negative for all the projects, both ex-ante and ex-post. UPT projects rarely, if ever, cover their investment and operating costs through user charges. Financial sustainability requires that resources additional to fare box revenues be identified and their availability secured in the longer term. Different mechanisms to finance public transportation exist (see Box 9 below). Mechanisms vary considerably and depend primarily on the administrative system and national context, as well as on market structures and contractual arrangements, for instance franchising and/or concessions. However, it is useful to bear in mind that the negative financial net present value represents a financial burden on the community[7] and that, especially in cases of cost overruns and/or lower than expected traffic flows, this burden can become more severe, all other things being equal. In many EU Member States, including those covered in the 12 projects, these resources will need to be mobilised under persisting budgetary pressure.

Box 9 Different systems for financing public transportation

It may be useful to give some illustrations of the diversity with which different EU countries currently mobilise resources to secure the support needed to achieve UPT financial viability.

- In France, one of the main funding sources is a local payroll tax earmarked to public transport (the *Versement Transport*), which is then paid to the transport operator to compensate the gap in the operating cost of the system.
- In Spain, a pre-defined amount of resources is transferred by the central government to municipalities with a statutory obligation to provide UPT services (cities with more than 50 000 inhabitants) These subsidies can be complemented by grants from other public institutions.
- In the UK, the arrangements are more ad hoc and rely on a variety of mechanisms, ranging from the use of formulas determining the level of central budgetary support needed by local councils to deliver transport services, to grants awarded to local authorities through a competitive bidding process, to specific initiatives to approve spending commitments for major UPT projects and multi-year agreements with transport authorities, of which the most important in terms of spending commitments are those with Transport for London.

Source: IG/EV project evaluations.

73. **At the time of evaluation, the project financial sustainability was not at risk, but the operations and maintenance cover ratio varied substantially across the 12 projects and could reduce the capacity to finance future investments.** The operations and maintenance cover ratio is a central component of financial sustainability of infrastructure projects. It consists of the ratio between fare box revenues and operations and maintenance costs. This ratio does not take into account the coverage of investment costs, which is usually met through sources other than fare box revenues. Only one out of the 12 projects evaluated achieved full coverage, meaning that no subsidies or other types of compensation are needed to secure financial sustainability during operation. However, cover ratios in

[7] Mostly on non-users, who do not benefit directly and do not contribute to fare box revenues.

the 30-60% range are more common in European UPT systems, and this is the case for the other 11 projects[8]. The lowest cover ratio in the sample was a project in a Western European city with 25%, while it ranges between 30-60% for the other projects for which this information is available. Although differences can be large, the choice of how to set the operations and maintenance cover ratio pertains to cities and it is not challenged by the EIB when it is not deemed to undermine the soundness of the investment.

Box 10 Conclusions on sustainability

- Policy coherence and commitment to continuous financing of the UPT sector ensured the projects' sustainability under all dimensions.
- The financial capacity and willingness of city administrations to subsidise the projects' operations were found not to be at risk. The operations and maintenance cover ratio varied substantially across the 12 projects and in some cases could reduce the capacity to finance future investments.

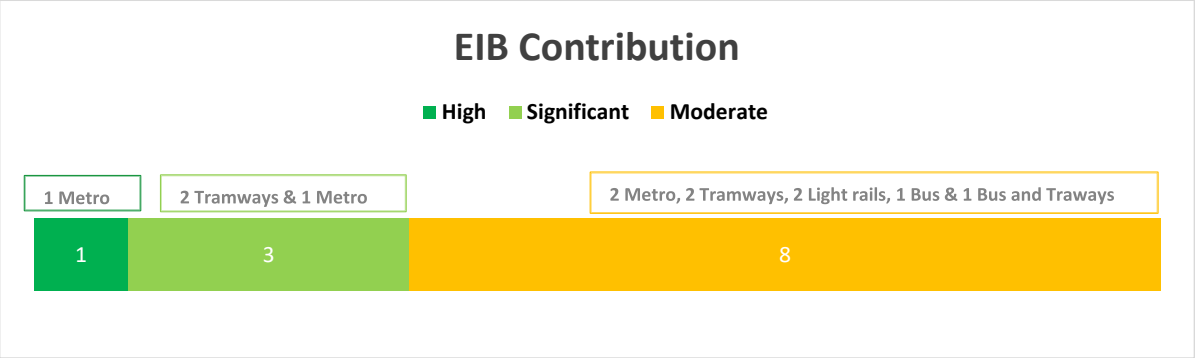
3.5 EIB contribution

Three dimensions of the EIB contribution to project performance were taken into account, in line with the EIB 3-Pillar Assessment methodology:

- The **financial contribution**, which identifies the value added provided by the EIB loan in relation to the alternative sources of financing available to the borrower, whether in terms of the loan's terms and conditions or cost of financing.
- The **financial facilitation**, which relates to the extent to which the EIB financial and non-financial inputs succeeded in catalysing other private/public financing and/or producing a signalling effect facilitating other comparable and valuable projects.
- The **technical contribution**, which relates to any non-financial contribution to the operation provided by the EIB and may take the form of improvements to the technical, economic or financial aspects of the EIB-supported investment, including management practices of the transport authority and/or project promoters.

74. **The assessment of the EIB contribution was mixed, because of a particularly good financial contribution and lower financial facilitation and technical contribution.** Financial contribution was based on the unrivalled conditions of EIB loans and was further strengthened by the financial crisis that enabled the EIB to play a significant countercyclical role for municipality finances for almost all 12 projects. Financial facilitation was difficult to ascertain, although it was generally positively rated by the EIB services. Besides JASPERS support to three projects in Eastern European cities, a technical contribution was not requested by promoters.

Figure 7 Summary of EIB contribution scores attributed by project evaluators



Note: Four-scale rating, ranging from "High" to "Significant", "Moderate", and "Low".
Source: IG/EV.

[8] Where available, the cover ratio reported in project documentation generally refers to the network and not to the individual project.

3.5.1 EIB financial contribution

75. **In all 12 evaluated projects, the EIB financial contribution was significant as the EIB loan terms and conditions were nearly always better than those offered by the market and by other international financial institutions and/or public sector alternatives.** Evidence collected during the field missions confirmed that either the borrower could have financed the project without EIB support but at a higher cost (*P1, P3, P4*, *P6 P9, P11* and *P12)*, or that it could not have financed the project without EIB support (*P2*, *P5*, *P8, P10*). In particular, EIB competitive loan conditions were based on:

- Loan maturity, which matched the entire asset life cycle.
- Low interest rates.
- Long grace periods, which were important to optimise city cash flow management.
- Loan size, which could not be matched by other individual financiers in a period when the financial markets were shaken.
- Long and flexible drawdown periods, which were relevant to spread over time city debts and limit debt exposure in the years when it was needed.

76. **The timing of EIB involvement in the aftermath of the financial crisis has strengthened the EIB financial contribution.** The countercyclical role played by the Bank was particularly critical for those cities benefiting less from the support of EU funds and where national and city budgets were tightened (e.g. in France and Spain).

Box 11 EIB support and the financial crisis

The *P8* project represented a major investment for the city (€215 million at appraisal for a population of about 200 000). The promoter faced challenges in securing the financial support needed for the project. The financial crisis and the collapse of part of the banking sector in the country had significantly tightened the credit market, particularly for smaller cities. The promoter's traditional financing partners were thus unable to finance an investment of the scale of the project and sponsored by a local authority.

The EIB loan was thus essential to the financial close of the *P8* project. The Bank's loan conditions were favourable, given the then prevailing market conditions. It also provided an opportunity for the project promoter to diversify its sources of financing outside its traditional partners.

Source: IG/EV P8 project evaluation report.

77. **Beyond the provision of competitive loan conditions, the EIB has also been able to provide sizeable financing volume and a flexible lending structure.** Some cities could have issued municipal bonds to finance the project (e.g. *P1, P3, P10*), but the process was considered far too complicated and cumbersome and the financing terms would have been more rigid, and for a shorter term, compared to the EIB loan. Flexibility was also perceived as the main advantage of the only framework loan included in the project evaluations (please see Box 12 below).

Box 12 EIB support through a framework loan

The *P6* project concerns the modernisation of two tramway lines and the extension of a third tramline in the city. The project is part of a wider urban investment strategy supported by the framework loan that was the sixth operation signed between the EIB and the municipality.

In early 2009, the EIB advised the city to adopt a framework loan in view of its high flexibility. Through the allocation of five different tranches, this solution made it possible to combine under one financial umbrella several large and small-scale infrastructure projects selected from an annual rolling plan aligned with the transport authority's strategic planning. Such flexibility was considered very important at that time when the investment conditions and the institutional context were changing fast. Moreover, framework loans allowed for a 30% upfront disbursement, which responded to the municipality's needs in terms of cash flow management.

Source: IG/EV P6 project evaluation report.

78. **The capacity of the EIB to fit into the most complex project financing structure was also appreciated**. In the case of the tramway project in *P7*, the complexity of the project's financing architecture could not have been met by commercial banks.

3.5.2 EIB financial facilitation

79. **Besides the projects procured through a PPP, the EIB did not provide significant signalling and catalytic effects to urban public transport projects.** In project appraisal documents, the Bank services indicated that EIB financial facilitation would have been moderate often mentioning that diversification of promoters' funding sources and signalling effects were relevant financial benefits of EIB funding. In most of the evaluated projects, the EIB loan complemented an EU, national or city grant, but there was no evidence that EIB involvement influenced the positive decision to finance the project through additional funding. As a matter of fact, by the time the Bank was contacted by the promoters, other sources of financing had been secured (e.g. *P3, P4, P8* and *P11)*. The EIB facilitation role was more evident in the case of PPP projects. According to the promoters both in *P2* and *P5*, EIB involvement provided a strong signal to the potential concessionaires and acted as a driver of trust with other partners involved in the project. Without the EIB, the procurement would have been less credible to the then volatile market. The EIB ability to intermediate part of the loan through commercial banks helped to crowd in the private financial sector and at the same time reduce EIB direct exposure.

80. **Financial facilitation was more prominent beyond the project boundaries, especially within well-established long-term partnerships.** Promoters in cities that had a long partnership with the EIB (e.g. *P1, P9* and *P10*) mentioned that the EIB funding had, in general, a good signalling effect for other investors for any future projects. These effects were also particularly evident for projects implemented in different stages (*P5* and *P10*), where the continuous involvement of the EIB facilitated the structuring of funding needs in the long term. Broader signalling effects of EIB loans were also captured by this evaluation in a highly sophisticated financial environment (Box 13 below).

Box 13 EIB financial facilitation

EIB support was provided to the promoter of the *P1* project in a period when it was engaged in obtaining a credit rating. The procedures to secure the approval of the EIB credit line produced a good signalling effect about the creditworthiness of the promoter and its ability to undertake sound investments using borrowed funds. It is worth noting that, in addition to this signalling effect, the competitive EIB loan terms proved extremely valuable to the project promoter when the financial crisis hit the country.

Source: IG/EV P1 project evaluation report.

3.5.3 EIB technical contribution

81. **In most projects, the EIB technical contribution was not requested by project promoters.** The technical capacity of the promoter and the maturity of the projects at appraisal was such that there was simply no perceived need for technical support. In all cases, the EIB involvement took place late in the project cycle, when most of the technical and financial due diligence had already been carried out. From the Bank services' viewpoint, experienced promoters are often unwilling to engage with EIB technical support initiatives, but in some cases (*P4* and *P11*) promoters were unaware that such services could have been offered by the EIB.

82. **Three projects received significant technical support from JASPERS[9] at the very early stage of project development** (*P8*, *P9* and *P10*). In these cases, JASPERS provided significant support to the project promoters in the definition and improvement of the project's technical and/or procurement specifications. In one case (*P10*) the Bank's relevant services, along with JASPERS and the EBRD, played a very important role during the re-tendering of the contract for the design and construction of the metro line, when they encouraged the city to change its procurement strategy. This resulted in substantial savings for the city. At the same time, JASPERS' involvement facilitated the work of the Bank's appraisal team since it made available rigorous modelling methods for demand analysis.

[9] JASPERS support was required because the projects received EU Cohesion Fund grants.

Box 14 Conclusions on EIB contribution

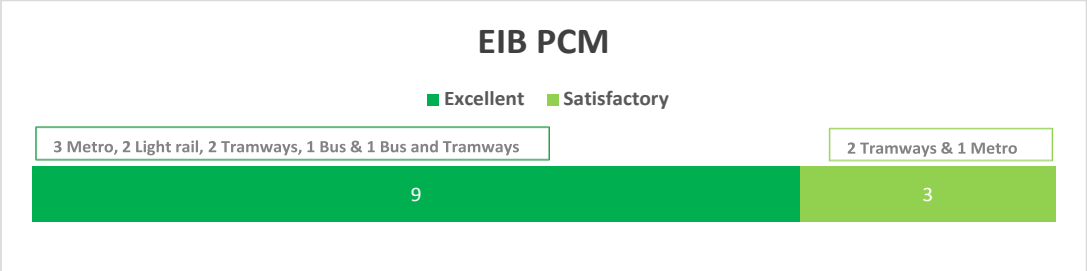
- In all cases, the EIB financial contribution was substantial. Indeed, EIB terms and conditions are nearly always better than those offered by the market (commercial banks and municipal bond market), and international financial institutions/public sector alternatives. Furthermore, the EIB financial contribution was reinforced during the economic and financial crisis.
- Beyond the provision of competitive loan conditions, the EIB financial facilitation was more visible in projects procured through PPPs and in those undertaken by promoters with whom the EIB had well-established long-term partnerships. In these cases, the Bank provided catalysing support from co-financiers (thanks to the Bank's "stamp of approval") and positive signalling on project/promoter creditworthiness.
- The EIB technical contribution was significant only in a minority of operations and, when advisory support was offered, it was highly appreciated by the client. In the other cases, the limited EIB technical contribution provided to urban public transport projects reflected a lack of demand due to (i) the strong in-house technical capacity of promoters and (ii) the maturity of EIB-supported projects when submitted to the EIB.

3.6 EIB project cycle management

The evaluation of the EIB project cycle management performance aimed to assess to what extent EIB services anticipated and successfully monitored the risks associated with the project cycle in UPT operations. Project cycle management capabilities are linked to the way the EIB services manage both the appraisal and the monitoring/implementation phases of EIB-financed UPT projects.

83. **The evaluation found that processes and procedures were adequate both at appraisal and during project implementation and monitoring.** The 12 projects in the sample are diverse, as they include both experienced and less experienced promoters, developed and less developed regions, conventional project structures and two PPPs. Against this backdrop, the Bank's project cycle management procedures showed enough flexibility to address successfully most challenges, as indicated by the fact that all projects were scored as "excellent" or "satisfactory". Difficult project situations were detected and closely monitored.

Figure 8 Summary of EIB project cycle management scores attributed by project evaluators



Four-scale rating, ranging from "Excellent" to "Satisfactory", "Partly Unsatisfactory", and "Unsatisfactory". Source: IG/EV.

84. **Moreover, the evidence in the 12 projects shows how a robust client relationship can work effectively in different contexts**. Contrary to large cities, where repeated operations are more frequent, in smaller cities the client relationship may be more difficult to establish and a strategic partnership more challenging to build. However, no issues occurred and the EIB collaborated effectively with new and well-known promoters. Repeat clients, as well as those who are used to dealing with national promotional banks or the EU Structural and Investment Funds, worked effectively with EIB procedures.

3.6.1 EIB project cycle management – appraisal

The evaluation of the EIB project cycle management at the appraisal stage focused on the Bank's ability to manage operations from the production of the appraisal documentation to approval and contract signature. Key elements determining the assessment under this sub-criterion include whether risks of various nature were properly anticipated, the promoter capacity was correctly assessed, the standard project assessment tools were competently employed, the contract signature proceeded smoothly and in line with client expectations, and the degree of project maturity was properly assessed.

85. Apart from minor issues and occasional glitches in EIB-client communications, **most of the 12 projects were managed adequately at the appraisal stage** and no major misjudgments compromising post-appraisal operations performance were made. As an illustration, risks linked to the limited experience of the promoter in traffic control centres were underestimated at the appraisal stage for the fleet renewal project in *P12*, but in the end they were addressed at the implementation stage. The cases of *P5* and *P11* are the two projects in the sample where it could be argued that more effective project cycle management at appraisal and later on at the implementation stage could have made a significant difference in project performance. In the *P11* project, the technical problems related to the implementation of the signalling system, which went undetected at appraisal.

3.6.2 EIB project cycle management – implementation and monitoring

Project cycle management at implementation and monitoring concerns the post-signature phase, after the project has gone through the process of appraisal and approval by the Bank's governing bodies. Normally in this phase the promoter carries out or possibly continues the construction of the project, in line with the stipulations contained in the signed loan contract.

More specifically, the elements determining the assessment of this sub-criterion reflect different items: the extent to which the promoter's capacity is adequate for the required level of monitoring; the level of communication and coordination between EIB services (primarily the Operations Directorate, the Projects Directorate, and the Transaction Management and Restructuring Directorate) and the promoter/borrower; the fulfilment of contract conditions and/or undertakings (contractual undertakings) and, where requested, the timely and accurate completion of the project completion report.

86. **In most of the cases, the monitoring requirements set at the appraisal stage were appropriate.** Some reporting issues emerged relating to the promoter's lack of responsiveness (e.g. one-year delayed project progress report) and sometimes to low quality of data provided by the promoter.

87. **EIB monitoring did not support projects that have critical technical performance issues, while financial monitoring is tightened when borrowers' capacity to repay a loan is considered at risk.** Monitoring aims primarily to keep the Bank informed about work progress through promoters' reporting and to verify that major deadlines are met. When unexpected technical issues occurred, promoters were asked to clarify the situation and to provide evidence that appropriate actions were taken to ensure smooth continuation of the works. This was the case, for instance, of two of the metro projects in the sample and of another metro project, where procurement issues were reported. If operations were threatened by adverse events, which could hamper the capacity of the promoter to repay the loan, closer monitoring of the finance plan started. For instance, the one PPP metro project required an intensive monitoring workload. The project faced several difficulties and delays concerning the construction of the line, mostly due to adjustments in the plans, budgetary constraints of the promoter amidst the financial crisis and the project's inherent technical complexity. This led to a rebalancing of the PPP concession terms between the promoter and the concessionaires in order to include a change in the funding mechanism of equipment renewals.

Box 15 Conclusions on the EIB's project cycle management:

- Most of the 12 projects were managed adequately at the appraisal stage and no major misjudgments compromising post-appraisal performance were made. In the case of two projects in the sample, it could be argued that a more effective project cycle management at appraisal (and later on at the implementation stage) could have made a significant difference in project performance.
- In most of the 12 projects, the monitoring requirements set at the appraisal stage turned out to be appropriate. When issues emerged during project implementation, the Bank was informed and followed project progress more closely and or/tightened financial monitoring.

4. CONCLUSIONS

88. **The Bank's appraisal ensured the soundness of the investment and the alignment of EIB-financed projects with EU policies, EIB policy objectives and cities' strategies.** The EIB decision to finance a UPT project is the result of complex due diligence carried out by the services, which includes an assessment of the project's quality to achieve its objectives and the promoter's capacity to implement and operate the project. There is little margin for the Bank to provide an input to promoters' investment decisions and technological choices when the Bank is brought in late in the project cycle and most key decisions have already been taken by municipalities.

89. **Overall, the 12 evaluated projects were delivered as planned with minor adjustments to the technical specifications and achieved significant service quality and transport efficiency improvements.** Despite data availability limitations, the evaluation found that the 12 projects evaluated have improved frequency and reliability and provided a higher level of comfort and amenities to users. Only in one case, the evaluation found that the anticipated time savings (in terms of minutes saved per trip) were not met.

90. **About two-thirds of the projects evaluated did not achieve the expected ridership levels.** Differences between the expected and the actual passenger flows point to issues in the traffic models developed by project promoters, in particular to the validity of some of the hypotheses underpinning the traffic models used by promoters and the assumptions to estimate future passenger flows. Some factors, including the economic crisis or the incomplete realisation of some project sections and/or complementary projects, contributed to delaying the achievement of the expected ridership. Some projects also had overoptimistic ridership forecasts that were only partly adjusted by the Bank's most conservative estimations at appraisal. The data analysed by the evaluation refers to the first years of project operations and ridership levels can increase in the future following further extensions of the public transport network or changes in urban mobility policies and incentives to promote urban public transport.

91. **Projects' contribution to a change in the modal share in the concerned cities could not be quantified due to lack of data.** Most of the modal shift expected from the 12 evaluated projects were from the old public transport modes to the new ones, rather than from private cars. The expected modal shift induced by the projects and estimated by the EIB was, however, found to be appropriate and to reflect projects' design and context, as EIB investments occurred in cities that already had a dense public transport network. Except for two projects, no data were available at completion to quantify to what extent projects actually contributed to a change in the modal share. Several factors, of which many beyond the projects' remit, play a key role in inducing a change in passengers' transport choices. Evidence gathered from the project evaluations showed that the availability of better public transport services alone is not a sufficient condition to induce a significant change in car user behaviour, unless it is combined with an adequate mix of public policy measures discouraging the use of private cars.

92. **The lack of data on outcomes achieved at project completion hampered the assessment of effectiveness.** The achievement of most project outcomes could not be captured in a satisfactory manner by this evaluation, though they were assessed and valued at project appraisal thanks to the use of model simulations. The Bank already collects key and well-structured information on project performance (project costs, ridership levels and time savings). However, there is too much uncertainty in relation to the 12 projects' contribution to other key project outcomes, including improving service quality, inducing modal shift to public transport from private cars and promoting accessibility. The environmental impacts of UPT projects could not be attributed in a systematic manner and with affordable methods. The combined use of sensors and Big Data can help promoters reducing the costs of data collection to quantify changes in modal share or in air quality in the projects' catchment areas. Although attribution will remain a challenge, it is expected that technology developments will enable accurate data to be collected and assessed with more certainty in the near future whether or not the projects' expected benefits have materialised.

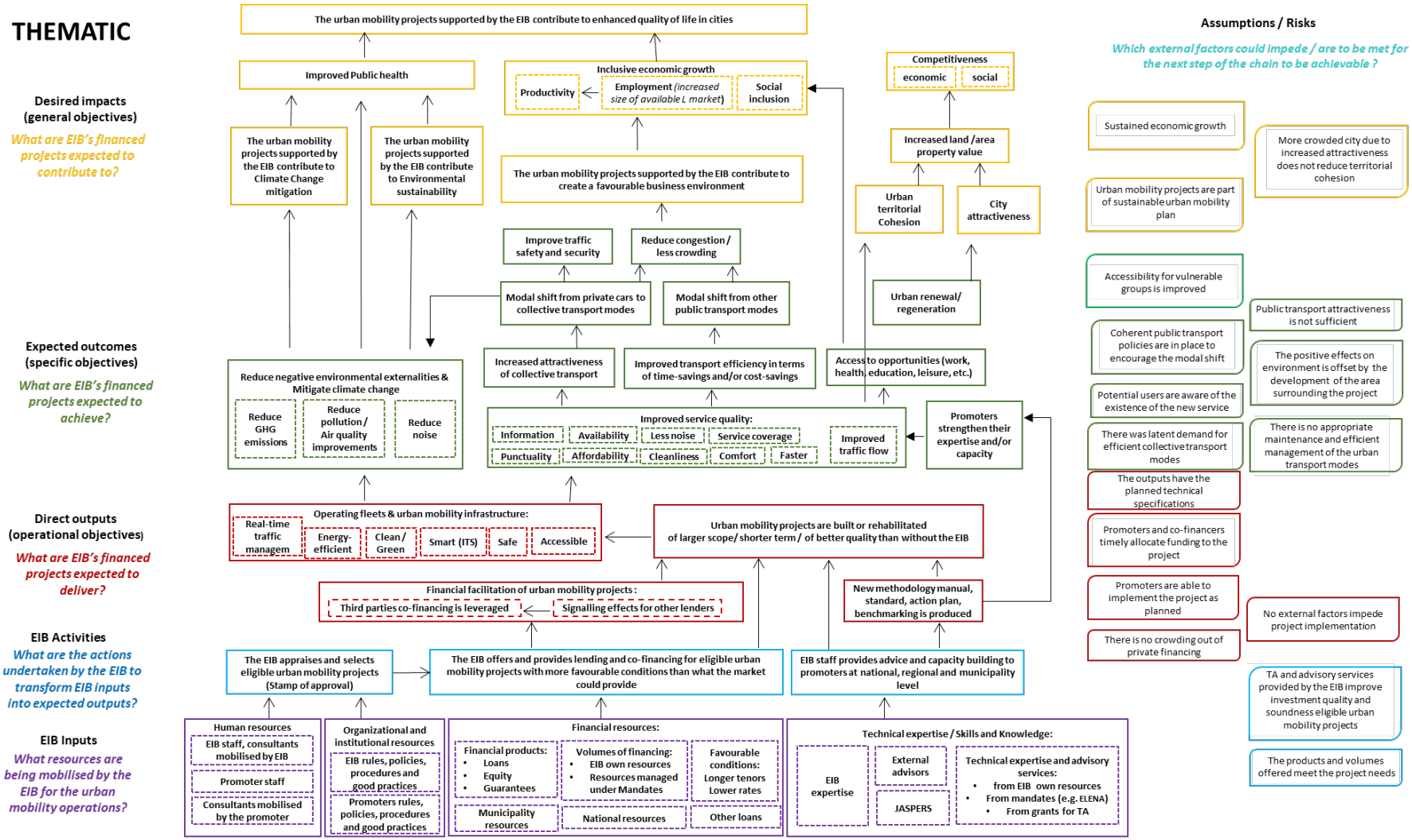
93. **Most of the 12 projects delivered net economic benefits, but in some cases the EIB's standard sensitivity analysis was not sufficient to identify the combined effect of risk factors on the economic efficiency of the project.** Data analysed at the time of the evaluation evidenced that when the projects' economic efficiency deteriorated, it was because of a combination of low usage level and/or higher investment costs and/or delays. Projects with a marginal ex-ante economic efficiency were more

vulnerable to minor deviations from achievement of key performance indicators. In three cases, the low project performance resulted in project benefits outweighing project costs, implying that there were no net benefits for society at the time of evaluation.

94. **Project sustainability is based on municipality commitments towards the continuous financial support of public mass transit, but the operations and maintenance cost ratio varies substantially across projects and can in some cases reduce the promoters' capacity to continue financing urban transport investments in the future.** Project financial sustainability was somehow taken for granted, even if project operations were heavily subsidised and capacity to invest in future UPT projects could be undermined. Within the context of the COVID-19 pandemic, however, it is not possible to anticipate to what extent these investment levels on urban public transport could be maintained in the future.

95. **EIB financial contribution was significant and reinforced in the aftermath of the 2008 economic and financial crisis.** In every city concerned, EIB loans had better conditions than other possible alternatives, when these where available. The financial structuring of these projects (long-term loans backed by a municipal guarantee), often combined with an EU or national grant, offered limited opportunities for other non-financial benefits. At the same time, demand for EIB technical and/or advisory support (provided in-house or through an EIB mandate) remained limited largely due to the project promoters' strong in-house expertise and the EIB's late involvement in urban public transport projects.

ANNEX 1 – THEORY OF CHANGE



ANNEX 2 – PROJECT ASSESSMENT FRAMEWORK

I. Relevance

Relevance is the extent to which the objectives and activities are consistent with underlying policies and beneficiary needs and the extent to which the project financing agreement was "fit for purpose".

Table 8 Relevance

Sub-criterion	Judgment criterion
1.1 Consistency with EU and EIB objectives	1.1.1 The project objectives were and remained in line with EU objectives
	1.1.2 The project objectives were and remained in line with Transport Lending Policy (2007) and (2011)
1.2 Relevance in relation to urban needs and policy priorities	1.2.1 There was a latent demand for the project
	1.2.2 The project was and over the years remained fully in line with the urban mobility needs and priorities established at urban level (as set out in Sustainable Urban Mobility Plans or/and in other relevant documents).
	1.2.3 The EIB offer is adequate to address the needs of the project promoters. Elements: - Capacity constraints of the promoter were adequately addressed. - The EIB has provided the Investment Loan and its financial terms given due consideration to the promoter's specific needs. - The Investment Loan and its financial terms are sufficiently adapted given due consideration to the promoter's evolving needs.

II. Effectiveness

Effectiveness relates to the extent to which the objectives of the projects supported by the EIB have been achieved, or are expected to be achieved. The assessment follows the causation chains outlined in the theory of change for project evaluations.

Table 9 Effectiveness

Sub-criterion	Judgment criterion
2.1 Delivery of expected outputs	2.1.1 The project is delivered as expected/fleets and urban mobility infrastructure are operating as expected.
	2.1.2 EIB support enabled promoters to build, rehabilitate and purchase operating fleets and urban mobility infrastructure that are energy-efficient, clean, green, safe and smart.
	2.1.3 The project has achieved the expected objectives in terms of improvement in the quality of service (punctuality, reliability, faster service, coverage, information availability, less noise, cleanliness, more comfort, affordable).
2.2 Achievement of outcomes in terms of transport efficiency	2.2.1 Potential users are aware of the new service and the expected targets of usage are reached.
	2.2.2 The project contributed to a modal shift from cars towards collective transport.
	2.2.3 Evidence suggests that the project has achieved the expected objectives in terms of time savings and cost savings for urban transport users.
2.3 Expected outcomes in terms of environmental sustainability and/or climate change mitigation	2.3.1 The project has generated improvements in air quality (referred to as local air pollution) as planned.
	2.3.2 The project has generated a net reduction in greenhouse emissions as planned.
	2.3.3 The project has reduced noise as planned.
2.4 Expected outcomes in terms of traffic safety and passenger security	2.4.1 The project has generated safety benefits in line with expectations.
	2.4.2 The project has generated security benefits in line with expectations.

Outcomes were considered relevant when they were part of the project's objectives or if they materialised after the project's implementation. Otherwise, they did not enter into the assessment of effectiveness.

III. Efficiency

Efficiency is the extent to which the project's results were achieved within the expected timeframe and within the expected costs, and the outputs delivered are commensurate with costs (i.e. efficient allocation of resources).

Table 10 Efficiency

Sub-criterion	Judgment criterion
3.1 Project's achievements with respect to time and cost variables	3.1.1 The project did not suffer delays in the implementation.
	3.1.2 The project did not suffer a cost overrun in the implementation.
3.2 Cost efficiency	3.2.1 Relationship between monetary inputs and delivered outputs.

IV. Sustainability

Sustainability assesses whether the physical outputs are likely to last (Physical and Operational sustainability) and whether the outcomes and impacts that have been achieved will continue to have their effects in the medium and long term – or whether threats exist to their sustainability (Sustainability of effects). Moreover, sustainability assesses the extent to which the urban mobility projects supported by the EIB are financially sustainable (Financial Sustainability).

Table 11 Sustainability

Sub-criterion	Judgment criterion
4.1 Project's achievements with respect to time and cost variables	4.1.1 The appropriate maintenance of the project will be ensured in the long run.
4.2 Sustainability of effects	4.2.1 The effects generated by the project in the short run will be sustainable in the long run.
4.3 Financial sustainability	4.3.1 The project is financially sustainable.

V. EIB contribution

The assessment of EIB contribution is based on three sub-criteria: financial contribution, financial facilitation, and technical contribution, in line with the 3-Pillar Assessment Methodology (3PA). The assessment reflects the extent to which the projects could not have been implemented by the market or at national level with the same quality, scope or timeframe.

Table 12 EIB contribution

Sub-criterion	Judgment criterion
5.1 EIB financial contribution	5.1.1 The support provided by the EIB was not available from the market.
5.2 EIB financial facilitation	5.2.1 The support provided by the EIB (financial and non-financial) provided value added by helping to attract private financing through positive signalling and/or by promoting synergies in co-financing with other public sources of funds.
5.3 Project's achievements with respect to time and cost variables	5.3.1 Without the EIB's technical assistance and advisory support the project would not have been implemented by national/local public resources with the same quality, cost, scope or time.

VI. EIB project cycle management

This criterion rates the Bank's handling of the operation, from identification and selection to post-completion reporting and repayment.

Table 13 EIB project cycle management

Sub-criterion	Judgment criterion
6.1 Adequacy of EIB appraisal process and procedures	6.1.1 Evidence shows that the appraisal processes and procedures in place at the EIB are adequate.
6.2 Adequacy of EIB process and procedures with respect to project implementation and monitoring	6.2.1 Evidence shows that the processes and procedures in place at the EIB are adequate to handle project implementation/monitoring.

ANNEX 3 – COST-BENEFIT ANALYSIS

This technical annex provides details about the methodology applied for carrying out the ex-post cost-benefit analyses performed for this evaluation.

I. Methodological approach

The aim of the ex-post cost-benefit analysis was the assessment of actual net welfare gain brought about by the projects. The cost-benefit analysis assessment has an intermediate viewpoint with respect to the whole project life cycle as the selected projects were in operation for at least three years at the evaluation date. Therefore, some methodological adjustments were needed to fit the standard ex-ante model into the *in medias res* (interim) and an ad hoc ex-post cost-benefit analysis model had to be developed.

The value of cost-benefit analysis in ex-post evaluation is well acknowledged (EVA-TREN, 2007; European Commission 2012 and 2018; Gómez-Lobo, 2012; Florio, 2014). Ex-post evaluations of transport projects are systematically undertaken in countries such as France[10], the United Kingdom and Norway[11], and by the World Bank[12]. For instance, the United Kingdom's Post-Opening Project Evaluation system requires that a cost-benefit analysis be undertaken the year after a project has started its operations and again five years later. These ex-post cost-benefit analyses are complemented by regular public consultations through resident surveys to assess broader impacts (e.g. quality of life). Benefits and costs are identified for a number of distinct objectives, including environment, safety, economy, accessibility and integration. The ex-post analysis of road projects in Norway is similar to the United Kingdom's approach. The European Commission relies on ex-post cost-benefit analysis for major infrastructure projects[13] on a sample basis.

The initial review of the various cost-benefit analysis models used by PJ over the years was the basis to develop a pre-set ex-post cost-benefit analysis template. The template was structured to reflect the knowledge of today and to allow an intermediate perspective. The team drew from Florio (2014), which contains useful insights for carrying out ex-post cost-benefit analysis, as well as from previous experiences in applying the ex-post cost-benefit analysis to a sample of major projects in the transport sector co-financed by the European Regional Development Fund and the Cohesion Fund.[14] The table below summarises the main features of such a model. The key features of the ex-post cost-benefit analysis model are summarised in the table below.

Table 14 Main features of the ex-post cost-benefit analysis model

Features	Definition
Time horizon	Ex-post the same time horizon used ex-ante can be adopted unless the construction phase was considerably longer. In this case, the time horizon can be extended to accommodate the longer horizon. The starting year – i.e. year 'zero' – is the first year in which the capital expenditures for the investment occurred. The 'backward' period includes the entire construction phase as well as the operation phase until the present time.

[10] See Chapulut J.N., Taroux J.P. and Mange E. (2005). In France, the Internal Transport Act 1982 (*Loi d'Orientation des Transports Intérieurs*) introduced the requirement for an ex-post evaluation of the economic and social performance of any major transport infrastructure project, five years after its opening. Later, in 2001, a Working Group recommended a dual approach: 1) an ex-post evaluation, using outturn cost and benefit performance, but using the same methods and unit values as used in the original ex-ante cost-benefit analysis; 2) an examination of how the evaluation changes when conducted to present standards using Boiteux (2001) values.

[11] See Welde and Voldens (2015).

[12] See World Bank (2005) and (2009).

[13] Large-scale investments with a value of more than €50 million, supported by the EU Cohesion Policy.

[14] European Commission (2012). Ex-post evaluation of investment projects co-financed by the European Regional Development Fund and the Cohesion Fund in the period 1994-1999, European Commission, DG Regio, Brussels. European Commission (2018). Ex-post evaluation of major projects supported by the European Regional Development Fund and the Cohesion Fund in the period 2000-2013, European Commission, DG Regio, Brussels.

Features	Definition
Prices	The base year for this evaluation is 2019. Consequently, both backward and forward cash flows (both benefits and costs) have been adjusted to 2019 prices. In line with EIB practice, market prices are used both in the financial and the economic analysis (i.e. shadow prices are not used in the economic analysis).
Project identification	The identification of project boundaries is based on two criteria: 1) self-standing unit of analysis; 2) pertinence. This approach led to the inclusion/exclusion of the following components: (i) investments made and completed before year 'zero' that are not functionally related to the existing infrastructure are treated as sunk costs and are not included in the cost-benefit analysis; (ii) preparatory works, site arrangements, environmental protection and land use-related costs are included in the cost-benefit analysis as they are necessary for the implementation of the project; (iii) costs for the purchase of rolling stock not part of the "EIB operation" were included in the cost-benefit analysis as long as they were necessary for the delivery of expected outcomes.
Reference scenario	The incremental principle of a cost-benefit analysis requires costs and benefits to be compared against a reference (counterfactual) scenario (also called the 'without the project scenario'). From an ex-post perspective, the counterfactual scenario is what would have happened in the absence of the project. The counterfactual scenario used in the ex-ante analysis was applied for all eight projects. However, the ex-post perspective allows for some unpredictable event that occurred after the start of the project to be taken into account. If relevant, this knowledge was used to estimate values for both scenarios.
Discount rates	The social discount rate (SDR) is the rate used to discount economic costs and benefits in the future as it reflects how society evaluates today's well-being versus future well-being. As in the context of this evaluation the cost-benefit analysis is carried out in the middle of the project's life cycle, it is necessary to discount future cash flows and capitalise past ones (see below). Ad hoc SDR country-specific values have been calculated and included in the cost-benefit analysis model.
Capitalisation rate	As in the context of this evaluation the cost-benefit analysis is carried out in the middle of the project's life cycle, it is necessary to discount future cash flows and capitalise past ones. Country-specific rates for capitalising past values have been calculated and included in the cost-benefit analysis model.
Monetisation of economic benefits	Unit values of typical economic benefits generated by transport projects are estimated by using the standard methodologies available in various guidelines (the EIB Handbooks and Guidelines, the European Commission's cost-benefit analysis guide, JASPERS publications) and the most updated values available in the literature. Specifically, the present evaluation takes into account the following benefits: • Time savings, which are calculated in terms of average person-hours saved thanks to the project implementation multiplied by the unitary value of time. Country-specific estimates of the value of time are available in Wardman et al. (2016). These values depend on local economic conditions (for example, GDP per capita) as well as differences in individual preferences. • Vehicle operating costs are calculated by multiplying the cost per km of operating a car by the total number of km avoided. The latter is estimated as passengers diverted from cars' * occupancy rate * average km avoided per single trip. Country or project-specific estimates are already expressed in monetary values from local models or feasibility studies. If not available, a simplified formula to calculate vehicle operating costs is used based on the approach suggested in the European Commission's Guide (2014). • Following the Handbook on the external costs of transport (2019), noise reduction is calculated on the basis of avoided vehicle-km, the estimation of traffic density at day and at night, and the related noise unit costs per 1 000 vehicle-km. Unitary monetary values of noise are available in the Handbook on the external costs of transport (European Commission, 2019). These values vary by mode of transport producing noise (car, bus, train), time of day (day, night), traffic type (dense, thin). • Greenhouse gas emission savings are calculated on the basis of cars' vehicle-km avoided by type of fuel used and the difference in public transport supply by mode of transport and type of fuel. The result (in tonnes) is multiplied by the corresponding unit costs of greenhouse gas emissions in the eurozone (€/tonne). Unitary monetary values of CO_2 emissions are available in EIB (2013) and an update of "annual adders" is provided by a recent publication of DG CLIMA"[15] where adders for the periods 2031-2040 and 2041-2050 are also indicated.

[15] "Climate Change and Major Projects – Outline of the climate change related requirements and guidance for major projects in the 2014-2020 programming period", available here.

Features	Definition
	• Following the Handbook on the external costs of transport (2019), air pollution gains are estimated by multiplying the average emission factor per km by the avoided vehicle-km, and by the unit costs of main pollutants from transport. Unitary monetary values of main local pollutants expressed as average damage cost (€ per tonne of emissions) are available in the Handbook on the external costs of transport (European Commission, 2019). • Safety was estimated by multiplying the number of accidents that occur in the country of the project per 1 000 000 vehicle-km by the number of avoided car-km in order to obtain the number of avoided accidents. Following the methodology provided in the Handbook on the external costs of transport (HEATCO, 2019), the number of avoided accidents was multiplied by the social accident unit parameters available in HEATCO (2019). Country-specific estimates of the social cost of accidents are available in the Handbook on the external costs of transport (European Commission, 2019). These values vary by type of injury (fatality, severe injury, slight injury).

Source: IG/EV.

The main implication of this methodological choice is that direct comparison of ex-post indicators (such as economic rate of return and economic net present value) with ex-ante ones would be misleading. Meaningful comparison can only be done between forecasted and actual quantities at the level of individual cost-benefit analysis inputs (e.g. annual volume of passengers, investment cost).

II. Overview of the Bank's cost-benefit analysis methodologies

The adoption of one model over another one is due to the appraisal year of the project. The eight UPT projects were selected because, amongst others, they had been subject to an ex-ante analysis by the Bank. Since 2008, when the first EIB model was developed, two other versions have been released in 2011 and 2015 respectively.

III. Limitations

The systematic collection of data at project level is paramount to correctly assess project achievements after implementation. Since the cost-benefit analysis requires identifying, quantifying and monetising most of the direct outcomes generated by projects, as well as of the related externalities, a rigorous and well-structured data collection strategy needs to be in place to facilitate comparison with ex-ante forecasts. Overall, it was possible to obtain outturn information on project costs and existing traffic levels but, in most cases, no project-level data were available on modal shift, avoided accidents and pollutant emissions. This led to a reasonable degree of uncertainty in the calculation of project benefits in the context of this evaluation. At the same time, the unavailability of these data prevented the evaluators from ascertaining the degree of achievements of key effects, such as decongestion and environmental benefits, which are often used ex-ante to justify the EIB's support.

In an ex-post cost-benefit analysis, the application of the network level approach may be problematic because actual data provided by the promoter may be at project level (e.g. demand at project level, average minutes saved per trip at project level, operating costs at project level). This calls for a change in the unit of analysis used in the ex-post cost-benefit analysis and a re-calibration of inputs for the estimation of benefits.[16] In this evaluation, it was necessary to move from a network-level to a project-level analysis in two cases.

The results of the cost-benefit analysis do not account for the wider socioeconomic impacts of the investment. These wider economic benefits can include the impact on mobility and accessibility,

[16] As an illustrative example, if the network level demand is considered, then the average time saved per trip is computed based on the entire network demand and not just on the project demand in terms of who is actually experiencing time savings. For instance, if project users representing 10% of the entire network's users experience five minutes of time savings, the remaining users do not experience any time savings, and the analysis is carried out at the network level, then the time savings would be 0.5 minutes.

socioeconomic development, urban image and spatial effects. Normally, these are impacts which cannot be included in the standard cost-benefit analysis in a consistent way, for a variety of reasons:

- The lack of an agreed methodology to identify their monetary value.
- The lack of data, which would make quantification impossible even if an agreed methodology were available.
- The difficulty to isolate a project's genuine impacts with a great deal of certainty, especially in the context of rapidly changing environments.

IV. Sources of data

The cost-benefit analysis relied on data collected at different points in time:

- At project appraisal.
- During project construction (progress reports).
- At project completion (data collected by evaluators from the promoter and/or the public transport service operator).

The following table discusses the sources of information used for the main items included in the ex-post cost-benefit analysis.

Table 15 Sources of data

Item	Sources of data
CAPEX	We usually obtained information about actual expenditure incurred for the construction of the project from the promoter. All capital costs necessary to deliver the expected benefits were considered.
OPEX	These cover annual operations and maintenance costs. As the projects we analysed were already operational, we generally obtained the information about actual operating expenditure from project promoters or operators and assumed that these costs would continue to be incurred for the remaining life of the project.
Demand volumes	Traffic and patronage drive the calculation of a project's impacts. As we undertook the ex-post evaluation a few years after project opening, we used two different approaches to calculate demand volumes for the entire life of a project. • From project opening to the time of evaluation: to cover this period we used observed data on traffic volumes. In some cases, we obtained this information directly from the project promoter or service provider. In other cases, we used publicly available sources such as annual reports available online and mobility observatories. • From the time of evaluation to the end of the cost-benefit analysis horizon: to estimate future demand volumes, we either used current demand levels as a starting point and extrapolated recent growth or used growth rates estimated ex-ante based on traffic models.
Modal shift	The modal shift is another crucial variable that drives the calculation of a project's effects. In most cases there were no data available on the actual modal shift generated by the project and so the ex-ante assumptions were used and discussed with/validated by the promoter. In one case, household travel surveys were carried out before and after the project opening which allowed, together with the information collected during the interviews, to re-estimate the modal shift. In other cases, the estimates are based on on-the-spot observation or related academic studies.
Supply	Supply may drive the calculation of the environmental benefits. For example, if a project concerns the construction of a new metro line and as a consequence of its opening a diesel bus line is cancelled, then the amount of local and global emissions produced by the public transport system could reduce. The approach used to estimate supply is the same as for demand. Specifically, • From project opening to the time of evaluation: to cover this period we used observed data on km supplied by mode of transport. Either we obtained this information directly from the project promoter/service provider or we used public available sources (e.g. annual reports available online and mobility observatories). • From the time of evaluation to the end of the cost-benefit analysis horizon: to estimate future supply, we either used current supply levels as a starting point and extrapolated recent growth, or used growth rates estimated ex-ante based on traffic models, or assumed a zero-growth rate.

Source: IG/EV.

V. Results of the ex-post cost-benefit analysis

The net welfare effect at project level was assessed based on three economic performance indicators: economic net present value, benefit-cost ratio, and economic rate of return. The main results of the economic analysis of the ex-post cost-benefit analysis were:

- **More than half of the projects yield a positive performance** according to the three indicators used.
- **The reasons for these results differ and usually a combination of factors is the explanation.** Beyond some methodological reasons, which play a role in downsizing time savings (application of the rule of half to demand diverted from cars), negative results are caused by deviations between forecasts and observed values of key indicators. These are further discussed in the next section.
- Overall, **the distribution of benefits was skewed towards transport efficiency gains**. **Time savings were the most relevant benefit** for all projects, regardless of the type of operation implemented.
- **Vehicle operating cost savings are the second most significant benefit**, which represents on average 15% of total benefits. **Environmental** (greenhouse gas[17] and local air emissions) **and safety externalities are more marginal effects**, which never cover more than 10% of total benefits, with few exceptions.

VI. Comparison of ex-ante and ex-post project key performance indicators

With respect to investment costs, **five out of eight projects have experienced cost overruns.** The following factors may contribute to explaining the differences:

- New regulations made necessary technical and architectural changes.
- Unforeseen circumstances during construction increased capital costs.
- Businesses affected by civil works were underestimated and so compensation was higher than expected.
- Land acquisition costs were higher than expected.

The comparison of ex-ante and ex-post demand shows that **project demand was below the expected levels in six projects.** The lack of achievement of demand targets was due to the following factors:

- The ramp-up period of the project was longer than expected.
- Delays in separate but interconnected urban transport projects.
- The global economic crisis had a negative impact in the post-construction phase of the project, resulting in a general decline in passengers across the entire public transport network.
- The latent demand was underestimated and consequently also the capacity.

The comparison of ex-ante/ex-post investment costs and demand shows that in **half of the eight projects considered, there was an underestimation of the investment costs and an overestimation of demand**.

[17] The net greenhouse gas footprint was quantitatively reassessed based on available information and estimates of net vehicle-km avoided by type of fuel (which in turn depends on traffic level, modal split, fuel consumption per mode, and greenhouse gas emissions per unit of fuel) and the unit costs of greenhouse gas emissions in the eurozone.

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