Turkey: Bursa Tramway

Ex post evaluation

OECD sector	21030/Rail transport	
BMZ project ID	1997 65 363 (investment) Training 1997 167 (personnel support/training)	
Project executing agency	City of Bursa	
Consultant	Yapi-ICF Kayser, Istanbul (investment) Rail Consult, Cologne (training)	
Year of ex-post evaluation report	**2010 (sample 2010)**	
	Project appraisal (planned)	**Ex-post evaluation (actual)**
Start of implementation	Q 2/ 1997	Q 4/ 1998
Period of implementation	2 1/2 years	4 years
Investment costs	EUR 310.5 million	EUR 300.9 million
Counterpart contribution	EUR 184.0 million	EUR 174.4 million
Financing, of which Financial Cooperation (FC) funds	FC: EUR 74.32 million Commercial loan: EUR 52.15 million	FC: EUR 74.32 million Commercial loan: EUR 52.15 million
Other institutions/donors involved	---	---
Performance rating	2	
• Relevance	2	
• Effectiveness	2	
• Efficiency	2	
• Overarching developmental impacts	1	
• Sustainability	2	

Brief description, overall objective and project objectives with indicators

The project's objective was the sustainable operation of a local public rail transport system in Bursa. Throug this, the burden of bus and private traffic on the inner city was to be reduced – as a contribution to improved living conditions for the population, particularly road users, pedestrians and local residents.

The project comprised 21.3 km of a new 52 km tramway in the city of Bursa, Northwestern Turkey. Besides the track construction with overhead cables, the project also included maintenance infrastructure (workshop with EDP-assisted maintenance supervisory system), the supply of 48 articulated tramcars, an electronic ticket system, consultancy services for implementation supervision as well as accompanying training for management and workshop personnel in leadership, administration, maintenance and operation.

The final costs of section A amounted to EUR 299.2 million. KfW combined finance (FC/commercial loan funds) accounted for EUR 126.5 million, the remainder consisting of a counterpart contribution of EUR 28.3 million and other loans taken out by the Bursa municipality.

As a complement, training measures were supported in the startup phase and the first two operating years at a total cost of EUR 1.69 million.

Project design/major deviations from original planning and main causes

The original design provided for a tramway system of 20.6 km with its own double track and altogether 25 stations; in 2000, the newly elected mayor decided to move a 1.3 km section underground. This avoided considerable demolition measures in the historic city centre. To adjust investment measures to the available budget, the initial subnetwork was shortened to 17.4 km with 17 stations, which, however, also affected passenger volume (see below). All other investment measures were carried out as planned.

Since commissioning in October 2002, the tramway has run smoothly for the most part. Apart from a couple of days of downtime, there have only been a few third-party accidents (e.g. due to the collapse of high-voltage cable). Due to the high efficiency of the subway route without crossroads, 370,000 passengers can be transported during the 18-hour operating time – in theory. In practice, passengers still needed to change lines due to the network's relatively small size, and cars can be overcrowded during peak hours. To address those constraints, the city authorities subsequently re-authorised some parallel bus and commercial transport lines. Thanks to the separate routing, average speed is relatively high at 32 km/h. There is a connection to the city bus service at the stops along the tramway and to the main suburban bus lines at some larger bus stations.

At ex-post evaluation, vehicles, stations, railtracks, workshops and other buildings financed through the project were in very good condition. Vehicles and railtracks are maintained professionally and competently. The tramway operator earns a surplus of about EUR 6-7 million a year, which covers running costs but also makes a significant contributi on to debt repayment.

Key results of impact analysis and performance rating

The tramway operator, Burulas, enjoys a high degree of managerial autonomy and operates according to commercial principles. It has been able to recover running costs so far and pays surpluses to the city. If present price levels are retained and the highly efficient performance continues, commercially viable long-term operation would appear assured. For passengers, the tramway offers a fast, safe and comfortable transport service. The statistics indicate an average travel distance of about 4 km, i.e. the tramway provides access for residents in remote districts. With the current, relatively low car motorisation level, public services or motorcycles constitute the major transport means over longer distances, especially for poorer residents.

A differentiated, macroeconomic assessment was conducted: based on simplified assumptions, the costs for investments, maintenance and operation of infrastructure and rolling stock were compared with the benefits of lower operating costs for the discontinued bus service, of time saved for tram users and of reduced CO_2 and NO_x

emissions as well as of lower accident costs. This comparison results in a macroeconomic return for the project of 23 per cent, with a benefit-cost ratio of 1.75.[1]

During the local mission, new businesses and also settlements were already in evidence along the previous and future tramline. Owing to this concentration of residential and business locations near the tramline, the tramway offers a fast and comfortable alternative to road transport for travelling to work, to shops, to school and university or to hospitals and doctors. It reduces the threat of urban sprawl disfiguring the landscape. Bus and car journeys discontinued due to alternative transport provided by the tramway result in CO_2 emission savings of approximately 19,000 tonnes per year. Against this is, however, almost 10,000 tonnes of CO_2 are emitted yearly from power stations to generate electricity for the tramway, resulting in a CO_2 savings balance of roughly 9,000 tonnes a year. Continued improvements in car and bus engine technology will, over time, lead to reduced fuel consumption; accordingly, savings are expected to diminish further to a range between 7,000 and 8,000 tonnes of CO_2 over the total investment period up to 2032. As the tramway was built along and/or in the middle of existing streets or underground, respectively, relatively few negative environmental effects were caused.

Key sustainability risks identified at project appraisal were the professional operation of the tramway and financial viability. Neither risk has materialised and no significant new risks are foreseen.

Relevance: The programme concept aimed at replacing at least a part of dense minibus and private traffic (with its considerable problems like traffic jams, exhaust fumes and accidents) by an efficient local public transport system. The causal relation - contributing to a higher quality of life, particularly along major road axes and in the historical city centre – is plausible and evident. As such, the approach chosen is considered sound. The restricted road space available required at least a partial transfer to rail transport. The project thus conformed with the BMZ country strategy with its focus on environment-friendly municipal development. The concept and the project were coordinated with the EU and EIB, which also co financed the extension of other sections of the planned tramway. It is not possible to determine to what extent concessional FC financing terms and conditions substantially influenced the investment decision or date (Subrating: 2).

Effectiveness: In the original design, project success was to be measured by various indicators, such as the volume of tramway traffic, income, the availability of tram vehicles and average speed. During ex-post evaluation, it was found that almost all indicators were met, with the exception of traffic volume: whereas actual figures amount to 150,000, an unrealistic 300,000 passengers per day were forecast , assuming operation full capacity over the entire day (i.e. disregarding rush and low hour fluctuations). With hindsight, this target should have been set lower, as parallel bus lines are still available and the available tramway fleet does operate at peak capacity during rush hours. When applying other standard international performance benchmarks, such as passenger km per line km or number of passengers per track length, Bursa rates above average in comparison with other local public rail transport systems in Europe and worldwide. The project objective was therefore adequately achieved (Subrating 2).

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[1] In the benefit-cost ratio, net, discounted benefits are divided by net, discounted costs over the defined term.

Efficiency: The costs of Phase I of the tramway system amount to about EUR 17.6 million per km. This is higher than the average costs of an overground tramline (about EUR 10 million per km), but still considerably less than a subway tramline costing about EUR 30 million. Accounting for the long tunnel stretches and underpasses at cross-roads, the costs are moderate. Compared with other urban rail systems in this respect, the Bursa tramway counts among the best. The good macroeconomic return of 23% p.a. is proof to a high allocation efficiency (Subrating 2).

Overarching developmental impacts: With the introduction of the tramway – and in combination with the reorganised bus system, approx. 600 minibuses were taken out of service and partly replaced by new and larger buses running on designated lines and stations according to published timetables. This has reduced unregulated minibus stops, the resulting traffic congestion and air pollution due to traffic jams in the historical city centre. It has also shortened travelling times and reduced the number of accidents. The improved local public transport system has also enhanced the mobility of residents without motorised transport, making access to work, shops, hospitals, etc. easier for them. Moreover, with its scheduled extensions, the tramway system will help to concentrate the very rapid urban development in Bursa along central local public transport corridors. New residential estates and businesses are already emerging along the existing and planned tramline route. The tramway system therefore also contributes to energy-efficient and environment-friendly urban planning and development in the city of Bursa, easing the burden of the rapid growth in road traffic (Subrating 1).

Sustainability: In *functional* terms, tramway operation and maintenance can be considered ensured. In *financial* terms, earned income covers operation and maintenance expenses, with Burulas as operator not requiring subsidies; rather, surplus income is paid to the city for pro-rata debt service. Anticipated passenger growth due to further expansions of the tramway system is expected to raise revenue, but this will not be enough to cover debt service in full. Investments in new infrastructure and vehicles will continue to necessitate financial support from the city, the government or donors. Full finance for the operation, maintenance and financial costs of new infrastructure and vehicles is, however, the exception in local public rail transport systems throughout the world. In most European urban centres, similar systems can rarely earn enough to pay their operational costs out of their own revenue, thus permanently requiring subsidies. Therefore, the situation in Bursa merits a good rating (Subrating: 2).

Project performance overall is therefore rated as good (Rating: 2).

General conclusions

The integration of a public transportatio project into overall development and spatial planning sets a good practice example. On the one hand, the tramway serves as the backbone of a reorganised, efficient local public transport system and on the other, adequate account is taken of its role as a major planning parameter in urban development, whereby deliberate planning concentrates the location of business and residential estates along the tramway. Such densely built-up areas can be effectively accessed by the tramway. Thus, the tramway has a structuring effect that further contributes to dense, energy-efficient and environment-friendly urban development.

The operational organisation of the tramline as an independent private enterprise with far-reaching staffing and financial autonomy is highly conducive to sustainability and sets an institutional example for similar interventions.

Notes on the methods used to evaluate project success (project rating)

Projects are evaluated on a six-point scale, the criteria being relevance, effectiveness (outcome), "overarching developmental impact" and efficiency. The ratings are also used to arrive at a final assessment of a project's overall developmental efficacy. The scale is as follows:

1	Very good rating that clearly exceeds expectations
2	Good rating fully in line with expectations and without any significant shortcomings
3	Satisfactory rating – project falls short of expectations but the positive results dominate
4	Unsatisfactory rating – significantly below expectations, with negative results dominating despite discernible positive results
5	Clearly inadequate rating – despite some positive partial results the negative results clearly dominate
6	The project has no positive results or the situation has actually deteriorated

A rating of 1 to 3 is a positive assessment and indicates a successful project while a rating of 4 to 6 is a negative assessment and indicates a project which has no sufficiently positive results.

Sustainability is evaluated according to the following four-point scale:

Sustainability level 1 (very good sustainability)

The developmental efficacy of the project (positive to date) is very likely to continue undiminished or even increase.

Sustainability level 2 (good sustainability)

The developmental efficacy of the project (positive to date) is very likely to decline only minimally but remain positive overall. (This is what can normally be expected.)

Sustainability level 3 (satisfactory sustainability)

The developmental efficacy of the project (positive to date) is very likely to decline significantly but remain positive overall. This rating is also assigned if the sustainability of a project is considered inadequate up to the time of the ex post evaluation but is very likely to evolve positively so that the project will ultimately achieve positive developmental efficacy.

Sustainability level 4 (inadequate sustainability)

The developmental efficacy of the project is inadequate up to the time of the ex post evaluation and is very unlikely to improve. This rating is also assigned if the sustainability that has been positively evaluated to date is very likely to deteriorate severely and no longer meet the level 3 criteria.

The overall rating on the six-point scale is compiled from a weighting of all five individual criteria as appropriate to the project in question. A rating of 1 to 3 indicates a "successful" project while a rating of 4 to 6 indicates an "unsuccessful" project. In using (with a project-specific weighting) the five key factors to form an overall rating, it should be noted that a project can generally only be considered developmentally "successful" if the achievement of the project objective ("effectiveness"), the impact on the overall objective ("overarching developmental impact") and the sustainability are considered at least "satisfactory" (rating 3).