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SUMP TÜRKİYE



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HANDBOOK FOR BUS RAPID TRANSIT (BRT)

REPUBLIC OF TÜRKİYE
MINISTRY OF TRANSPORT
AND INFRASTRUCTURE

SECTORAL
OPERATIONAL
PROGRAMME FOR
TRANSPORT

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List of Acronyms

ADB	Asian Development Bank
AFD	Agence Française de Développement
AIIB	Asian Infrastructure Investment Bank
AYKOME	Infrastructure Coordination Centre
B+R	Bike and Ride
BRT	Bus Rapid Transit
CAPEX	Capital Expenditures
CCTV	Closed Circuit Television
EBRD	European Bank for Reconstruction and Development
EGO	Elektrik, Havagazı ve Otobüs İşletme Müessesesi (Public Transport Operator of Ankara Metropolitan Municipality)
EIA	Environmental Impact Assessment
EIB	European Investment Bank
EMW	European Mobility Week
EoI	Expression of Interest
ESHOT	Elektrik Su Havagazı Otobüs ve Troleybüs (Public Transport Operator of İzmir Metropolitan Municipality)
EU	European Union
GDP	Gross Domestic Product
HRT	Heavy Rail Transit
İETT	İstanbul Elektrik Tramvay ve Tünel Isletmeleri (Bus and BRT Operator of İstanbul Metropolitan Municipality)
ILBANK	Bank of Provinces
IMM	İstanbul Metropolitan Municipality
IsDB	Islamic Development Bank
ITDP	Institute for Transportation & Development Policy
KGM	General Directorate of Highways
LRT	Light Rail Transit
MoEUCC	Ministry of Environment Urbanisation and Climate Change
MoTF	Ministry of Treasury and Finance
MoTI	Ministry of Transport and Infrastructure
NGO	Non-governmental Organization

OPEX	Operational Expenditures
P+R	Park and Ride
PPHPD	Passengers per Hour per Direction
PPP	Public-Private Partnership
PSB	Presidency of Strategy and Budget
PTA	Public Transport Authority
PTO	Public Transport Operator
SUMI	Sustainable Urban Mobility Indicators
SUMP	Sustainable Urban Mobility Planning
TMP	Transport Master Plan
TOR	Terms of Reference
UITP	International Association of Public Transport
UKOME	Ulasim Koordinasyon Merkezi (Transportation Coordination Center)
UMT	Union of Municipalities of Türkiye
US	United States
WB	World Bank

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About this handbook

This handbook aims to **facilitate the preparation and implementation** of Bus Rapid Transit (BRT) systems within the Turkish context by providing detailed information and latest know-how on effective policies and strategies for BRT networks, presenting a structured and systematic approach that aligns with the Sustainable Urban Mobility Planning (SUMP) framework. **Targeted specifically at decision-makers** at local authorities, and national governments, the "BRT Handbook for Türkiye" offers a comprehensive resource, designed to equip actors with the essential knowledge, tools, and strategies needed to effectively develop, implement, and integrate BRT systems in their local contexts. By adhering to this handbook, municipalities and decision-makers can ensure that BRT systems are effectively deployed and aligned with the broader urban mobility and sustainability goals. The handbook contextualizes **BRT implementation within Türkiye**'s unique urban landscape by addressing the specific challenges and opportunities in Turkish cities.

This guideline is designed to serve as a starting point and key reference for Turkish municipalities and other decision-makers in the national government considering the implementation of BRT systems. It outlines the BRT fundamental ingredients starting from the idea, along through the **whole process** of planning, implementation, and operation. The handbook highlights the main and critical elements to consider and provides useful and concrete resources, approaches and suggestions to address these issues, particularly in the Turkish context. When further detailed information or specific technical guidance is required, the handbook directs users to additional resources where the required information can be found. In this sense, this handbook provides an overview on relevant technical terms and addresses the primary critical strategic BRT elements that a policymaker would require to make informed decisions.

The BRT Handbook for Türkiye does not intend to repeat any guidance that is publicly available for practitioners in the form of local, national or international standards or tools (proper reference to these is given when discussing related topics). Similarly, the Handbook does not intend to provide very specific documentation to every topic, subtopic, or specific technical issues, as these are covered in the above-mentioned standards. Instead, the BRT Handbook for Türkiye intends to **guide the reader through the whole, step-by-step process** of careful and comprehensive preparation, service design, implementation and operation of infrastructure and fleet of the BRT program and services, with high-level integration, following the logic of Sustainable Urban Mobility Planning. All issues relevant to the strategic planners are addressed in the following chapters, who, with the help of specific checklists after every major step, may receive guidance on what to do while navigating through the whole process. The

recommendations are presented in form of an **action plan** after each thematic chapter, and in a summarised format at the end of the document (see Annex 1).

This handbook has considered the latest publications on the topic of BRT. For instance, "**The BRT Standard**" published in March 2024, and online "**BRT Planning Guide**" both by the Institute for Transportation & Development Policy (ITDP) where technical details for each BRT topic are presented. The additional used documents throughout this handbook are also as follows: "**On the Road to a Concept for BRT**", **eBRT 2023**, **Horizon Europe project 2024.**

1. Introduction: What is BRT?

Bus Rapid Transit (BRT) is a high-quality, bus-based urban public transport system, first created in Curitiba, Brazil in the 1970s, and now used extensively worldwide, utilising high-capacity buses designed to achieve efficient operation and enhanced performance. It is praised for its ability to provide **high capacities** similar to rail-based systems like trams (see **Figure 1**), while requiring **lower capital and operational costs**.

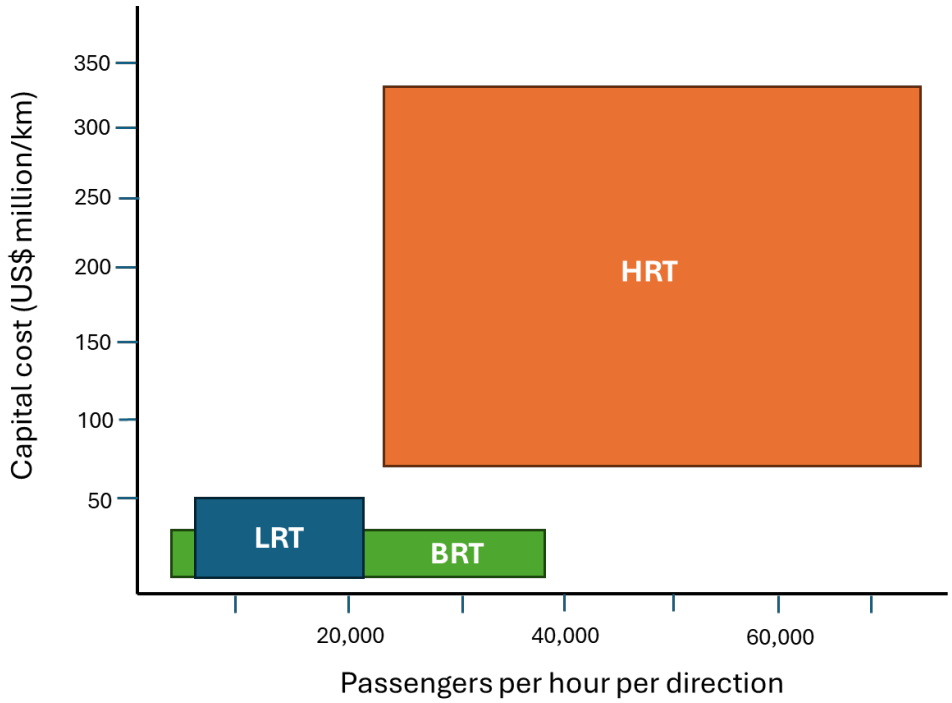


Figure 1: Capacity and capital cost of urban rapid transit systems[1]

[1] **ITDP BRT Planning Guide 2017 Edition**, available at: https://brtguide.itdp.org/branch/master/guide/pdf/the-brt-planning-guide.pdf

Compared to regular bus services, the main advantage of a BRT system is being "rapid", making both the speed of buses and the exchange of passengers **fast** by the following main features:

- **Centralised busway** alignment keeps buses away from busy urban kerbsides (with parked and turning cars, loading freight vehicles, and bicycle and pedestrian traffic),
- **Dedicated bus lanes** provide buses right-of-way, not being affected by mixed traffic-related urban congestion,
- **Off-board fare collection** eliminates delays caused by passengers paying on-board, also eases the operational duties of the bus drivers,
- **Priority at intersections** eliminates delays caused by crossing traffic of other modes of transport,
- Quick and easy **platform-level boarding and alighting** provide enhanced customer experience and accessibility to all passengers.

Once well-integrated into the existing public transport system of a city, BRT can provide **flexible services** using the same priority routes for buses and fast connections to other mass transit systems, with generating less greenhouse gas emissions (due to non-congested traffic flow and modern fleet). BRT corridors can also be the backbone of future urban development and revitalisation of urban areas, contributing to urban resilience and adaptability to climate shifts.

A successful BRT system is dependent on the following key elements:

- Careful **services and infrastructure** planning to provide high-standard operations,
- User-friendly frontend design – **stations and vehicles** satisfying customer needs,
- **Well-prepared communication** teaching inhabitants how the system works, incorporating local knowledge and feedback from future users to ensure public trust and approval,
- **Integrated system design** leads to general access to the system for all,
- **Proper maintenance** leading to reliable operations and enhanced customer experience,
- **Political will and proper institutional and regulatory arrangements** to support BRT throughout the whole process from preparation to operation.

Sustainable public transport systems like BRT can play a pivotal role in fostering sustainable urban mobility by offering efficient, accessible, and environmentally friendly transportation solutions by encouraging commuters to opt for public transit over private vehicles, thus reducing traffic congestion and carbon emissions. Careful preparation for the implementation and operation of a BRT system helps to overcome **challenges** including securing adequate funding, avoiding potential resistance from users of other transport modes and stakeholders, such as motorists, private public transport operators/owners or local businesses, integration with existing transportation networks, and continuously maintaining service reliability and quality. Overcoming these obstacles requires a clear vision, robust planning, continuous stakeholder engagement, and innovative solutions to create BRT systems that contribute to sustainable and inclusive cities.

The features, **characteristics**, and typologies of BRT can be different in various contexts, responding to parameters, such as the available space on the selected corridors, urban infrastructure limitations, available budget, realistic energy supply and other factors. There are different levels of BRT development, from fully segregated infrastructure to partially segregated and non-segregated infrastructure in the right of way. The number of stations and the distance in between have an impact on the average speed and system capacity. The number of passengers carried by the BRT system depends on the magnitude and extension of the BRT network.

2. Ecosystem: BRT for Türkiye

2.1 Why BRT is important for Türkiye?

Like many other countries around the world, Türkiye is facing challenges and negative effects of uncontrolled urban sprawl around major cities, car-dependency in everyday commuting, limited safety, accessibility, liveability and public space in urban environments, shortages of resources like expertise, funding, energy and materials, fast-changing customer habits and needs. As part of the SUMP Türkiye Project[2], national level policy making began in 2023, with a thorough situation analysis and policy level recommendations[3] to be ready by 2025. In parallel to identifying **high-level vision, sustainable strategy and effective measures** to address the challenges[4], a specific instrument has been selected as a best fit to help increase popularity and usage of mass transit services: Bus Rapid Transit.

In times of limited public budgets available, it is wise to build on existing assets while considering the introduction of a future service. While rail options are very limited nationwide in Türkiye, the country has a long-time history of road traffic solutions for public transport. The demand-driven "dolmuş" minibuses and regular **bus services are already part of the everyday mobility ecosystem**, with a massive supporting infrastructure including roads and highways, bridges and tunnels, terminals and stops among others. While introducing a high-capacity railway system (such as light rail, tram or metro) would need enormous amount of funding and a very long time for preparation and implementation, a well-prepared Bus Rapid Transit system could provide similar capacities and level of service at more rational costs and quicker implementation, therefore it can be the right answer on urban mobility challenges in Türkiye.

[2] **SUMP Türkiye with the full name "EU Support for Promoting Sustainable Urban Mobility in Turkish Cities"** aims to encourage the shift from individual transport modes to inclusive, sustainable, and accessible mobility modes at the national and metropolitan levels. The Republic of Türkiye and the European Union jointly fund the three-year SUMP Türkiye project. Starting in August 2022, the Union of Municipalities of Türkiye (UMT) was the project's ultimate beneficiary and the project aims to be completed in 2025, available at: https://www.skupturkiye.org.tr/en/

[3] **Green and White Policy Papers:** GREEN PAPERS present ideas that are still in the early stages of development for discussion and WHITE PAPERS are used to suggest new policy statements and ideas for new laws. To assist sustainable urban mobility in Türkiye, a situation analysis is developed with recommendations for institutional, legislative, and policy improvements which is provided in a Green Paper format. Whereas, the White Paper, which was created with input from important stakeholders, covers future and present problems as well as national and EU goals, sustainable urban mobility suggestions for Türkiye, and actions to accomplish those goals.

[4] **Sustainable Urban Mobility Planning (SUMP)** is a strategy plan designed to address the transportation requirements of residents as well as businesses in cities and the surrounding areas in order to improve the general well-being. Integrating known planning techniques, SUMP prioritizes evaluation, participation, and integration.

2.2 Who is the target group of this Handbook?

Bus Rapid Transit is an urban public transport system, therefore **all cities and municipalities in Türkiye** operating public transport are welcome to use this Handbook, regardless of what stage their BRT system is, information is available for preparation, implementation and operation. Experience in Sustainable Urban Mobility Planning or having a SUMP is an advantage, but not a premise for a city when observing the recommendations of this Handbook. Ideally, especially for such a complex project as BRT, practical guidance is supported by both national and municipal level thus clearly connected to higher level policy context (such as strategic national policies based on international recommendations and thematic strategies, and Sustainable Urban Mobility Plan measures).

On a personal level, the Handbook is best fit to **municipal decision-makers, strategic planners and experts** already leading or coordinating (or having the skills to be able to coordinate) the SUMP process. Planners, operators or social groups focusing on implementation may find other detailed practical guidance already available, in form of local, national or international standards and guides[5].

This Handbook can be used to **gain support and commitment** of key stakeholders at different levels of municipal governance, as follows:

- **Ministry of Transport and Infrastructure (MoTI)**: MoTI sets and implements policies and strategies for transport services, coordinating with relevant institutions to ensure safe, high-quality, and environmentally friendly infrastructure. It also establishes universal service policies, promotes competition, and ensures compliance with international regulations. However, the development of public and urban transport policies in Türkiye is fragmented among multiple ministries, and MoTI has limited duties and authorities in setting public and urban transport policy development.

- **Ministry of Environment, Urbanisation and Climate Change (MoEUCC):** MoEUCC prepares macro-level zoning plans and spatial strategy plans in urban planning processes to provide input to local zoning plans. Besides that, it also coordinates the preparation of local climate change action plans and prepares climate change legislation to minimize environmental impacts of urban transport. Similar to MoTI, MoEUCC has limited duties and responsibilities on the field of urban transport and public transport.

- **Presidency of Strategy and Budget (PSB):** PSB evaluates social and economic feasibility of public transport projects that require external finance, approves these projects before their inclusion in the public investment program, and allocates the necessary resources

[5] **ITDP THE BRT STANDARD 2024 Edition**, available at:
https://itdp.org/wp-content/uploads/2024/03/ITDP_BRTSTANDARD_APR2024_SINGLE-compressed.pdf
ITDP BRT Planning Guide 2017 Edition, available at:
https://brtguide.itdp.org/branch/master/guide/pdf/the-brt-planning-guide.pdf
EBRT2030: European Bus Rapid Transit of 2030 (Manel Rivera Bennassar & Flavio Grazian, 2023)
GOOD PRACTICE GUIDE Bus Rapid Transit (C40 Cities)

for their implementation. It also sets necessary standards and contributes to legislation to ensure efficiency and effectiveness in public expenditures. Additionally, PSB determines the country's sectoral and macroeconomic strategies and policies by coordinating with other institutions and organizations. This includes responsibility for strategies and policies in the transport sector, encompassing urban transport in coordination with MoTI, MoEUCC, and other stakeholders.

- **Ministry of Treasury and Finance (MoTF):** MoTF negotiates the financing conditions of the projects of the municipalities and provides a loan repayment guarantee in the transport projects requiring external finance. It manages effectiveness of financial resources by means of budget resources and external finance. Monitoring financial stability and developments in sectoral financial markets are also part of the Ministry's responsibilities.

- **Union of Municipalities of Türkiye (UMT):** UMT supports public transport including BRT projects in municipalities by providing guidance, consultancy, and training on public transport issues. This encourages cooperation among municipalities and supporting access to funds for transport projects. UMT conducts research and publications on municipal services, public transport including BRT, and follows global developments to help municipalities adopt innovative solutions. UMT also supports EU harmonization efforts and can implement international projects to facilitate cooperation on public transport including BRT initiatives.

- **The Transportation Coordination Centre (UKOME):** UKOME coordinates all transport services within metropolitan areas, making decisions on transport, traffic, and public transport together with integral facilities regarding public transport. It ensures traffic order and safety, sets public transport vehicle numbers, fares, and routes, and manages permits and licenses. For BRT systems, UKOME coordinates with other local governmental bodies by providing integration of public transport systems, collaborates with district municipalities, and addresses traffic issues.

- **Infrastructure Coordination Centre (AYKOME):** AYKOME coordinates infrastructure services within metropolitan areas by consolidating and finalizing draft programs into definitive plans, managing excavation permits, and ensuring compliance with infrastructure standards. In public transport projects, including BRT, for the areas under AYKOME's responsibility, AYKOME collaborates with UKOME to implement related infrastructure adjustments.

- **Political Leader**: Given the complexity and magnitude of a BRT project, and the number and diversity of resources to be secured, a committed political leader is key for the successful implementation. Typically, the elected mayor or an acknowledged senior official can take the role of building coalitions, advocating for the project in front of other key stakeholders, ensuring all in the form of political support (votes for project approval), technical capacities and funding and finance streams.

- **Local Authority**: By coordinating with related departments, local authorities can ensure that the BRT project aligns with local urban development plans, strategic plans and TMPs or SUMPs, addressing integration and regulatory compliance.

  Municipal departments and affiliated organisations' responsibilities are as follows:

  - **Department of Transport:** In metropolitan municipalities, it is responsible for the planning, coordination, and management of public transport systems. The department develops long-term transport policies and promotes environmentally friendly practices. This includes organizing the schedules and routes of public transport vehicles and coordinating their maintenance and repairs. They also oversee the efficiency of the transport systems and also BRT systems, provide information to the public, and manage traffic regulations. In terms of finance and budgeting, they determine costs and ticket prices, and manage subsidies.

  - **Division of Transport Services:** In provincial and district municipalities, public transport tasks are typically carried out by these sections/directorates. However, while metropolitan municipalities develop long-term and integrated transport policies, provincial and district municipalities have more limited resources in these areas, Therefore, they implement shorter-term solutions and smaller projects**.**

  - **Municipal Affiliated Organisations:** In some metropolitan municipalities, such as **İETT** in İstanbul, **EGO** in Ankara, and **ESHOT** in İzmir, are responsible for the operation, maintenance, integration, passenger information system, financial management, and sustainability of public transport including BRT systems. The duties and authorities of these institutions may vary across municipalities.

- **Industrial Partners**: Suppliers providing assets such as buses for the fleet, fare systems or station infrastructure, focus on delivering quality and durable assets tailored to the BRT's needs.

- **Financial Institutions**: Offering funding through loans, grants, and financial instruments, supporting both capital and operational costs based on project feasibility. One of the main financial institutions is **İLBANK**. İLBANK's responsibilities for public transport including BRT projects comprise providing financing, offering consultancy and technical assistance, contributing to project development processes, and engaging in international collaborations. İLBANK collaborates with international financial institutions like the Asian Development Bank (ADB), Asian Infrastructure Development Bank (AIDB), World Bank (WB), European Investment Bank (EIB), Agence Française de Développement (AFD), European Bank for Reconstruction and Development (EBRD), and Islamic Development Bank (IsDB) by leveraging their resources, expertise, and networks to finance and implement projects.

- **Horizontal Advisory and Support Groups**: Consultants, members of academia and civil society organizations offering expertise, research, and advocacy to ensure the BRT project is inclusive, innovative, and meets community needs.

Actors of BRT implementation in Türkiye are presented in detail in Annex 2.

2.3 How this Handbook relates to the policy context and other handbooks?

During the process of preparing the national level policy document (a.k.a. the White Policy Paper), SUMP Türkiye Project structured its recommendations introducing 5 mobility pillars (road space and access, public transport, shared mobility, active mobility, freight and logistics) and 6 cross-cutting topics (governance, funding and financing, energy efficiency and decarbonisation, data, digitalisation and resilience), in parallel, produced handbooks on selected topics to support the Sustainable Urban Mobility Planning process at municipalities. The BRT Handbook for Türkiye is a guidance created under the Public Transport pillar, aiming both to provide the necessary **guidance for preparation and implementation** of a successful BRT system, and to become a good example and **model for other topics** related to any of the 5 mobility pillars, should the decision be made on to create another Handbook for another topic. The project also created other handbooks related to 3 of the 6 cross-cutting (horizontal) topics (financing, data and resilience), that relate to projects from all 5 mobility pillars (**Figure 2**). **Integration** is a connecting logic for all handbooks, as no "silo projects" may be successful in times when complex challenges need complex solutions.

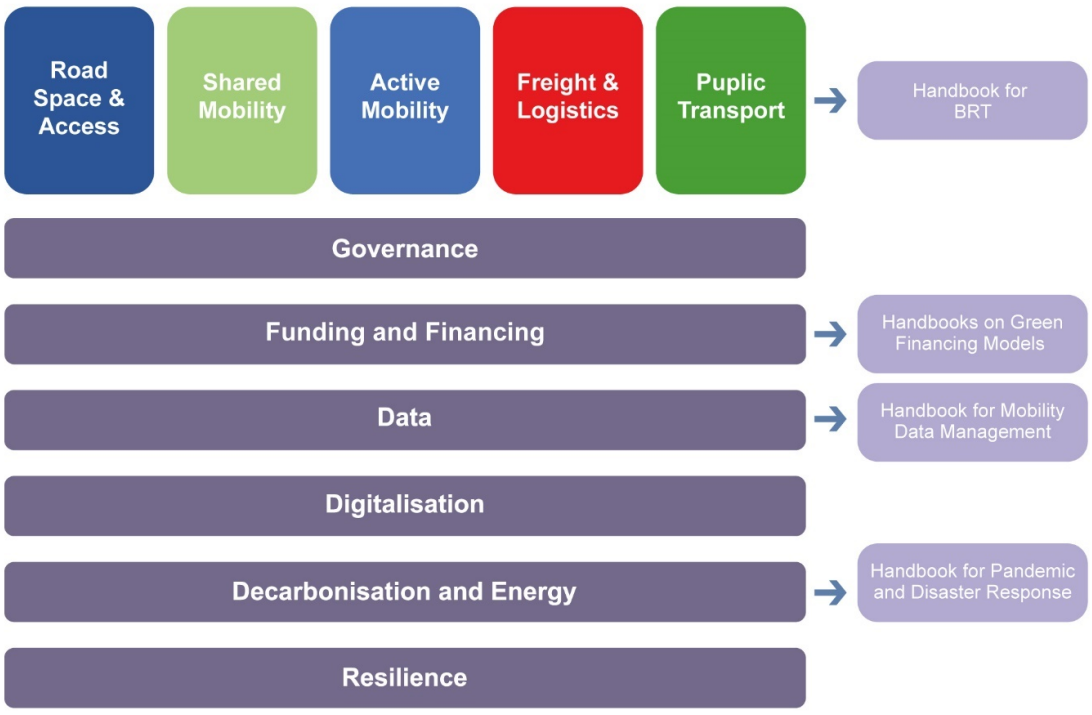


Figure 2: Relationship between handbooks and mobility pillars & cross-cutting topics in the SUMP Türkiye Project

3. Positioning: SUMP as BRT Enabler

3.1 Integrating the BRT preparation to the existing SUMP of your city

Any high-capacity public transport system can be the **backbone of the city's overall mobility scheme only**, if it is fully integrated with the infrastructure, service hours, fare and payment systems of other modes, providing not only fast and convenient commutes but easy and predictable access to large amounts of people to use these services daily. To prepare and implement a successful BRT system, an integrated approach is required, and the BRT project is very likely to need **complementary measures** to be completed.

In case your city has already developed a Sustainable Urban Mobility Plan, you are in possession of an integrated **strategic blueprint** that is crafted to meet the transportation requirements of both individuals and enterprises within urban areas and their environments, aiming to enhance overall well-being, leveraging existing planning methodologies and emphasizing the importance of integration, engagement, and assessment principles. Your SUMP will help you to address pressing environmental concerns by prioritizing sustainable transportation modes, reducing greenhouse gas emissions, alleviating traffic congestion, enhancing quality of life, and delivering economic benefits such as reduced infrastructure costs and increased productivity. Implementing your SUMP aligns with **broader policy objectives** related to sustainable development, urban planning, and public health, therefore contributes to more sustainable, efficient, and equitable transportation systems.

The BRT project – just like any other mobility project – can be easily integrated to the SUMP framework, regardless of what actual status your BRT project is - it is only a project idea, or some preliminary planning was already done, or it is waiting to be implemented after having all necessary plans and permits. A **clear goal** for the BRT system can be derived from the approved vision and strategic goals of the city. To validate usefulness of the BRT system for your city, **specific targets** can be set by assessing all measures listed in your SUMP, directly or indirectly related to BRT, with necessary **data needs and KPIs**. Besides the main BRT project, a **full package** of complementary projects can also be identified from the project list of your SUMP, which assure the implemented BRT system may operate effectively.

BRT preparation without a SUMP

While the concept of Sustainable Urban Mobility Planning is becoming widely known and used all over Türkiye[6], it may be the case your city does not (yet) have a SUMP (whether it is completely missing, being prepared or being reviewed). Using the **logic of the SUMP planning cycle** can ensure that the BRT service will meet the overall goals for the functional urban area:

- Assess the **situation** and already decided **goals and objectives** for the city, and its mobility system.
- If BRT was chosen to be implemented as an optimal solution over other alternatives, **define specific targets** the future BRT system should achieve.
- Assess existing **programs and projects** in the pipeline, and their status (envisioned, being prepared, permitted, being implemented), and align the future BRT project with them (also identifying all complementary projects that can support the BRT system).
- Gain momentum by **involving all stakeholders from decision makers to general public** for their support, presenting the assessed potential scenarios, transparent investment plan with estimated costs, timing and phasing, technical content and estimated results to get the necessary decisions, approvals and general acceptance.
- Define project preparation and execute the projects with **professional management** assuring continuous transparency.
- Monitor the process and **assess performance** of the system for future improvement of the services (repeating the strategic planning cycle again).

Once experiencing the usefulness of the SUMP logic described above, decide on to prepare a SUMP for your city[7].

[6] **Sustainable Urban Mobility Planning activities** are accelerated by SUMP Türkiye. SUMP Türkiye is committed to promoting environmentally friendly urban mobility throughout the country. **Trainings** on important mobility-related subjects are provided to professionals and local authorities with the skills and information necessary to develop successful Sustainable Urban Mobility Plans (SUMP). **Policy dialogue** is also one of the activities within the focus of SUMP Türkiye, encouraging eco-friendly transportation options and increasing community awareness. Furthermore, SUMP Türkiye participates in the formulation of national policies through the production of strategic publications like the **White Paper and Green Paper**, which serve as roadmaps for the country's future urban mobility, available at: https://www.skupturkiye.org.tr/en/about-project/

[7] **To get prepared for a SUMP**, the program is offering **webinars** (please see the link at the end) and **physical trainings** as well as **capacity building** activities. Within the focus of SUMP Türkiye, the Training Capacity Building Programme has been created to provide a comprehensive framework for capacity-building that will benefit the main target groups of SUMP Türkiye, including provincial and metropolitan municipalities and other government agencies. **Handbooks** in several topics (BRT, resiliency, data and finance) are other components that can help a city to be prepared for a SUMP, available at: https://www.skupturkiye.org.tr/en/webinars/ - egitim1

3.2 On your way to implement a BRT system

The BRT Standard[8] is providing a common definition about BRT (which this Handbook is also taking over), and by utilising a scorecard creates a recognition system for existing BRT corridors to become inspiration for other cities. This Handbook is structured to help cities and municipalities of Türkiye to prepare, design, implement and operate successful BRT systems, that may be recognised among the best ones worldwide, by meeting most requirements of the BRT Standard, and at the same time, avoiding possible negative effects that might mean deduction on the scorecard.

To be able to do a city-specific **sanity check** of the planned BRT system with the ITDP Scorecard,[9] there are 4 major tasks to be considered (**Figure 3**):

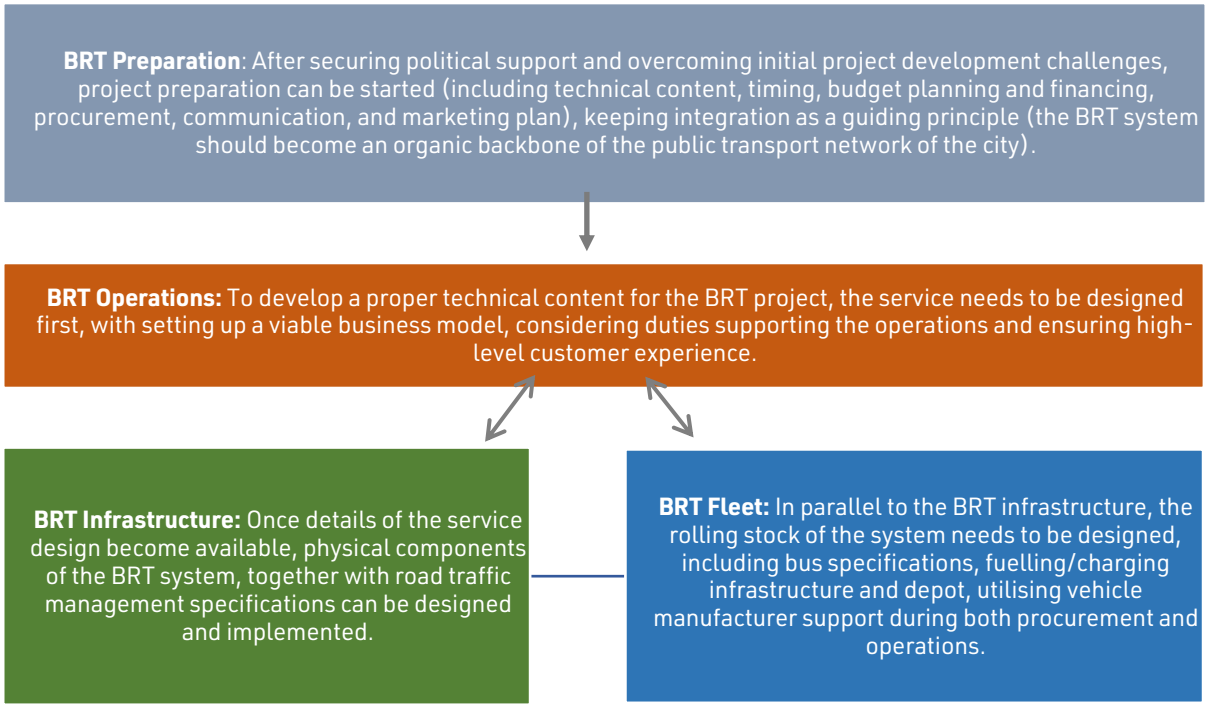


Figure 3: The implementation process of a BRT system

Detailed description of each of the above task, the related topics and steps of the process is presented in the following chapters of this Handbook.

[8] In March 2024 (dedicated as "Year of the Bus"), the Institute for Transportation & Development Policy (ITDP) published "**The BRT Standard**" as an international planning and evaluation tool for designers, planners, municipalities, advocates and banks to be able to compare existing systems on the same ground, identify gaps in design or problems in operations that need to be addressed, available at: https://itdp.org/wp-content/uploads/2024/03/ITDP_BRTSTANDARD_APR2024_SINGLE-compressed.pdf

[9] **ITDP Scorecard:** The ITDP BRT Planning Guide offers scorecards. Scorecards aim to support the creation of high-quality BRT lines, both design and operation-wise. To achieve that, five primary design categories comprising 32 metrics have been established under the BRT Standard, available at: https://itdp.org/library/standards-and-guides/the-bus-rapid-transit-standard/the-scorecard/

3.3 Is BRT the right choice for my city?

It is up to specific local circumstances to judge whether the BRT system is the right choice for a city, but the following key requirements and external criteria can be considered:

- **Inhabitants and density** of the city (external criteria): To be able to utilise advantages of the BRT system, with special regard to its **capacity potential**, the city should find the correlation between the number of its inhabitants, specific customer groups forming most of the commuting demand (workers, students) and the envisioned capacity level of the BRT system. In case the future demand is too low (not enough inhabitants), urban development potential should be assessed, whether BRT could be an enabler of future density of the city. On the other hand, when the demand is already higher than the maximum capacity potential of a BRT system, rail-based systems are to be preferred (BRT in such case might be considered as a "Phase 1" solution to be introduced before a "Phase 2" light rail or tram solution).

- Supportive **decision making and governance** (internal criteria): Once all technical requirements are met, **political willingness** towards change (restructuring existing systems) and governing regulations are needed for a successful BRT project implementation. This might require intensive lobbying, education and training, organisation of site visits, seminars and workshops to convince stakeholders about the advantages of a BRT system.

Given its complexity, it takes a lot of time and resources to prepare and implement a BRT project, therefore it also must be assessed to what extent local circumstances allow achieving basic **advantages of the BRT**[10].

- **Connectivity**: Will the proposed BRT system contribute to the improvement of urban accessibility of the city by providing frequent and fast service for daily commuters on the largest part of their mobility chain, becoming a preferred alternative to individual car use?

- **Convenience**: Will the proposed BRT system provide increased quality of service based on the daily demand of the customers, who therefore become regular users of the system?

- **Consistency**: Will the proposed BRT system offer more reliable, on-time services, with transparent travel information provided to its users?

[10] **Get on Board with BRT:** Unveiling the Updated BRT Standard, available at: https://itdp.org/publication/the-brt-standard

- **Comfort**: Will the proposed BRT system be the most comfortable, safe and secure mobility service in the mobility mix?

- **Cost-effectiveness**: Will the proposed BRT system utilise more affordable and fair fares compared to the existing mobility services, incentivising frequent usage?

- **Customer-friendliness**: Will the proposed BRT system provide improved customer experience from travel information, through journey planning, to the actual ride?

- **Cleanness**: Will the proposed BRT system utilise lower (or even zero) emission fleet compared to existing services?

A successful new development of the urban mobility system of the city (such as implementation of a BRT system) provides **serious changes to the existing status quo**, and improvements of the existing public transport services. This, on one hand, means introducing high quality new features (as positive incentives or "pull measures"), on the other, rationalising operation of other modes (including restrictions, negative incentives or "push measures). In case both **pull and push measures** can be clearly defined and drafted with a new business model for the mobility system of the city while preparing a BRT system, and there is enough support and willingness from stakeholders to implement the system, the BRT is the right choice for the city.

Actions for positioning

A1) Identify the long-term vision, goals, specific objectives and measures the SUMP or other high level transportation strategy suggests for your city, with special regards to **targets** for a potential future Bus Rapid Transit system.

A2) In case not experienced with Sustainable Urban Mobility Planning, get prepared to utilize the logic of the **SUMP** planning cycle for BRT preparation.

A3) Assess what **complementing measures and projects** are needed in your city for a successful BRT project implementation.

A4) Assess how your city meets **external criteria** for a BRT system (inhabitants and density of the city proportional to the capacity potential of the BRT system).

A5) Assess how your city meets **internal criteria** for a BRT system (supportive decision making, political willingness to reform governing regulations, enough knowledge and expertise, capacity to handle such a complex project, flexibility to allocate the necessary time for a long preparation process).

A6) Identify of all **components** of a BRT system to be implemented.

A7) Assess to what extent a future BRT system can **change** the existing status quo in the mobility mix, once pull and push measures are implemented to incentivise sustainable mobility.

A8) Based on detailed assessment, **validate** that BRT is the right system for your city. Get prepared to be able to **convince** others, especially decision-makers.

4. Screening: How to decide on a BRT system?

4.1 What is the current situation of public transport in my city?

Over 80% of Türkiye's population lives in the 30 largest metropolitan municipalities, and Turkish cities in general have a relatively **high mode share for public transport**. This modal share data as the main parameter that provides insight about a city's transport pattern is shared for eleven cities (Düzce, İstanbul, Kocaeli, İzmir, Mersin, Sakarya, Tekirdağ, Konya, Gaziantep, Eskişehir, Ankara) in the Green Policy Paper. As an opposite effect, cities in Türkiye face challenges (1) of increasing vehicle ownership and car-oriented investments in cities, causing (especially during peak hours) traffic congestion, leading to delays for public transport services, and extended travel times for commuters, safety issues, growing emissions and car-dominated public spaces for the citizens.

Table 1: Public transport challenges and possible policies & measures from policy documents in Türkiye

Challenges in Public Transport in Türkiye	Possible Policies and Measures to address the Identified Challenges
1. Lack of overarching umbrella legislation regulating both intra-city and inter-district public transport in metropolitan areas, and the absence of cohesive regulations connecting various aspects of urban transportation	▪ Carrying out **legislative work** to institutionalize public transport, establishing umbrella legislation to delineate the responsibilities and duties of central and local authority units regarding urban transportation.
2. Lack of a dedicated public transport authority in cities, impacting the management and coordination of public transport systems	▪ Establishing **dedicated public transport authority** in cities to provide a more effective and comprehensive organization for public transport and facilitate the strengthening and standardization of public transport systems across all cities.
3. Not well-integrated public transport services, access to public transport	▪ Increasing **service quality** in public transport alongside enhancing integration among different modes of public transport.
4. Challenge of retaining public transport use	▪ Encouraging sustainable, eco-friendly, efficient, and low-emission public transport systems and micromobility solutions over individual car use. ▪ Implementing **demand-oriented policies** in urban transport to reduce traffic congestion, accidents, and air pollution. ▪ Prioritizing **investments in urban public transport systems** such as buses, metrobus, and trolleybus in response to traffic density and travel demand, while considering rail alternatives where these options are inadequate. ▪ Promoting **public transport systems and enhance service quality by providing passenger information**, improving accessibility, reliability, punctuality, and ensuring safety, security, and comfort for passengers of all ages and genders. ▪ Implementing **regular inspection mechanisms** to effectively monitor these aspects.
5. Poor use of public transport data in service management and	▪ Developing common big data algorithms and implement intelligent transport systems for

planning, and not well-designed data collection process	urban transportation to diversify applications and utilize these platforms in city management and decision-making processes for integrated design. ▪ Facilitate data sharing among authorities within the scope of protocols, utilizing web services or cloud systems.
6. Low-Cost recovery (revenue/cost ratio)	▪ Developing measures to **increase the public transport use** such as improving service quality, enhancing the accessibility of stations and stops, increasing safety and security of public transport, affordable ticket prices, optimizing transfer times between different modes of public transport, utilizing digital platforms to track public transport vehicles etc. ▪ Using **public procurement** to support domestic production in rail systems more effectively and encourage design and R&D activities. ▪ Creating **sustainable urban transport planning**, including public transport, to meet the demand for low-emission, electric, autonomous vehicles, or integration of different transport modes.
7. Electrification of public transport fleet	▪ Promoting **electric vehicles** and **shared electric charging infrastructure** citywide and establish standardization of charging station elements considering interoperability.
8. Non-integrated service network (routes)	▪ Addressing spatial and transportation plans in an integrated manner; coordinate regional plans and urban transport master plans and make regulatory arrangements for urban rail system projects.
9. Non-integrated pricing and ticketing systems	▪ Swiftly introducing the nationwide implementation of the **Türkiye Card system** for use across the country.

There are differences between metropolitan and provincial municipalities in Türkiye regarding public transport services.

- Metropolitan municipalities are responsible for the provincial administrative border, which brings administrative and financial challenges due to the vastness of their responsibilities.

- In metropolitan municipalities, a more professional organizational structure is provided through transport departments and related subsidiaries. In contrast, such organizational structures are typically lacking in district municipalities.

- Metropolitan municipalities have higher levels of human resources, capacity, and awareness compared to other municipalities, which enhances the quality of public transport services as well as planning, design, implementation and operational processes of public transport.

- Institutions like UKOME and AYKOME in metropolitan municipalities facilitate collaboration between central government and local authorities, promoting a more participatory and robust governance framework. Such institutional structures are not present in provincial municipalities.

- Metropolitan municipalities are stronger in terms of financial resources. However, this strength is balanced by their broader scope of responsibilities.

- Metropolitan municipalities have better access to international financing sources, providing a significant advantage in project planning, design, implementation and operational processes.

To have a comprehensive overview of its current mobility situation, a city should **collect and update accurate data** (from regular traffic counting and surveys) about mainly the following, managed by a **responsible internal team** to prepare future decisions[11]:

- **Traffic Volume**: Vehicle count, Pedestrian count, Bicycle count, Public transport usage, Freight traffic
- **Traffic Flow:** Modal split, Travel time, Congestion levels, Trip length
- **Public Transport:** Length, Capacity, Operating hours
- **Parking:** Parking availability, Parking utilization rate, Parking cost
- **Non-motorized Transport:** Sidewalk and pathway conditions, Frequency of walking and cycling.
- **Safety**: Accident data, Safety survey
- **Environmental Impact:** Emissions, Noise levels, Air quality
- **Economic Factors:** Transport costs, Benefits

[11] **CIVITAS Overview of Evaluation,** (O. Roider and R.Klementschitz, 2010)

- **Technology:** ITS
- **Demographic Data:** Commuter demographics, Travel behaviour surveys

Ideally, a metropolitan city also has a **transport model** to be able to predict and assess future transport demand. Similarly, collecting **direct feedback** from users, NGOs, local businesses and the general public supports and helps accepting future development decisions. For smaller cities, the model of the metropolitan cities can also be used as the model for metropolitan cities usually covers its surroundings at the same time.

What mobility system does my city have?

Even though the use of rail systems (such as trams and metros) has been recently promoted in Türkiye, and the Ministry of Transport and Infrastructure is planning to prepare regulation for the examination, evaluation and takeover of urban rail system projects, budget constraints in Türkiye and the time-consuming nature of such complex and expensive light rail and metro solutions encourages municipalities to consider equal **alternatives of public transport development, such as BRT,** especially if the following questions can be answered by "No" or "Not to a satisfying level":

- Did my city already overcome most of the **negative effects** of growing car dependency (increasing car ownership and car use, limited parking spaces, delays in daily commute etc.)?

- Is the existing or currently developed public transport system in my city providing **high quality service** (accessibility, convenience, flexibility, reliability, comfort etc.) to its users?

- Does the existing or currently developed public transport system in my city have the potential to serve more users, especially from developing areas of the functional urban area or agglomeration of my city, or even become an **enabler of future urban development**?

- Does the existing or currently developed public transport system in my city have the **priority** throughout its entire network to minimise delays, uncertainties of the services?

- Is the existing or currently developed public transport **integrated** to other sustainable modes of transport (active and shared mobility) in terms of service network, pricing and ticketing?

To get a clear picture of the status of the mobility system of your city, a **qualitative assessment** of the available services is to be done as a first step.

What is the need for my city to reorganize its mobility system?

Once a thorough situation analysis and the qualitative assessment of the existing mobility system (including both in operation and being implemented) is done, the city can **identify existing gaps** that need to be filled. The general process for project generation should always follow the logic of Sustainable Urban Mobility Planning:

- Step 0: **Assessment of the current situation** based on historic data and monitoring of existing operation[12]

- Step 1: Clear vision, **goal setting** and identification of forward-looking measures for the city, about which direction to take, based on international, national and local requirements and guidance regarding sustainable urban mobility.

- Step 2: Programming: **Identification of projects** (both in urban mobility and urban development) that help to reach the set goals, with clear information of each project about who is responsible for the project, what is the actual technical content, in what phase the project currently is (project idea, under preparation, being designed, being implemented, completed and in operation), then selecting packages that contain the **most effective projects filling the gaps identified** to be implemented in short, mid- or long term, using the available or envisaged funding and resources.

- Step 3: **Project implementation**

- Step 4: Monitoring and **assessment of the new situation**, start another cycle

4.2 Choosing the appropriate rapid transit technology for my city

Selecting the appropriate rapid transit technology for a city is crucial to get the maximum influence on travel times, personal transportation costs and commuter comfort, by using available (often limited) resources in the most effective way. It requires balancing between citizens' preferences and managing the demand (by changing behaviour), also between available technical solutions and the reality of costs. The possible options can be selected from the following **scale**, based on what level of advancement the city is looking for, or able to deliver based on its available resources, level of suburbanisation, existence of high-capacity public transport systems, demographic trends and political will[13]:

- **Pre-BRT** solutions: In case the passenger demand does not meet the potential capacity of a BRT system, priority can be given to existing bus services (by introducing dedicated bus lanes, enhanced bus stops, low floor fleet, articulated buses, traffic management

[12] **To assess the current situation**, **Green Paper** is a working document within the project SUMP Türkiye to assist key decision-makers and stakeholders in Türkiye in comprehending, debating, evaluating, and addressing the primary mobility-related issues that Turkey is currently facing and plans to face in the future.
[13] **ITDP BRT Planning Guide 2017 Edition**, available at: https://brtguide.itdp.org/branch/master/guide/pdf/the-brt-planning-guide.pdf

priority to public transport at intersections, connecting systems such as P+R or B+R, etc). In case further development is envisaged, these improvements should be done to meet future requirements of a BRT system (design, facilities, potential enlargement of platforms etc.).

- **Bus Rapid Transit (BRT)**, maybe as a pre-rail solution: in case the passenger demand exceeds the maximum capacity of a regular bus system, the city should consider introducing BRT, as the backbone of its public transport network – in parallel reorganising existing operations to feed-in into the BRT system. In case further development is envisaged, the planned BRT system should also meet the future requirements of an LRT system (design, facilities, potential instalments of an electric overhead cable and grid system, tram depot etc.).
    - Operating and Capital Costs:
        - Capital costs include buses, stations, dedicated right-of-way (generally on the street), and bus depot on the BRT corridor proximity,
        - Operating costs include vehicle cost depreciation of buses which is 10 years, labour, fuel, cost of capital.
    - Planning and Development:
        - Design and implementation within a short period (from 8 months to 3 years) – within a single political term,
        - Greater flexibility in terms of phasing construction to accommodate the project budget size,
        - Changes can often be accommodated,
        - Ability to provide more direct door-to-door service.
    - Performance:
        - Theoretical capacity: 11,220 – 36,000 passengers per hour per direction (PPHPD),
        - Observed capacity: Bogotá shows the highest observed: 37,700 PPHPD. Las Vegas shows the lowest 7,400 PPHPD,
        - BRT, LRT, and HRT systems all have excellent records of reliability, BRTs are more reliable than conventional bus services,
        - The traditional image of the bus is relatively poor. However, BRT has shown a modern image and unique identity e.g., in Bogota and Curitiba.

- **Light-Rail Transit (LRT)**: in case the passenger demand exceeds the maximum capacity of a BRT system, and Heavy Rail Transit is not available physically or theoretically, once density requirements are met in a city, LRT (trams) system can serve the needs. Any LRT system must be designed to have the best possible connectivity to Metro and/or Heavy Rail Transit at major hubs.
    - Operating and Capital Costs:
        - Capital costs include rails, switches, electric catenary, rail vehicles, stations, and a special depot connected to the system by rail tracks,
        - Number of manufacturers for rail systems is limited,
        - High maintenance cost for rails, catenary, and labour,
        - Fuel depends on electricity and price is variable,

        - Significant operating cost generated by borrowing money from multilateral development banks, bilateral loans, and bonds to cover the cost of capital.
    - Planning and Development:
        - Planning a more complex rail project can consume 2 to 3 years of time. Construction can take an additional 2-3 years to complete,
        - Project financing can generate another significant delay due to the higher capital costs required,
        - LRT and HRT need high passenger numbers to financially sustain their high costs, thus, a large rail network will be economically more sensible than just operating a short segment,
        - Changes are much more complicated and expensive. Operation only where rail tracks are available, thus, increasing inconvenience and delays on transfers.
    - Performance:
        - Theoretical capacity: 8,058 – 21,488 PPHPD,
        - Observed capacity: Tunis-LRT shows the highest PPHPD: 13,400. Portland Streetcar shows the lowest 3,000 PPHPD,
        - Rail-based systems are associated with sophisticated and modern image, usually at a significant cost,
        - BRT, LRT, and HRT systems all have excellent records of reliability.

- **Metro or Heavy Rail Transit (HRT):** in case the passenger demand exceeds the maximum capacity of a LRT system, Metro and/or Heavy Rail Transit development is to be considered. HRT is not a competitor of LRT, having different functions in the city's mobility mix.
    - Operating and Capital Costs:
        - Capital costs include a grade-separated right-of-way, tunnelling or elevated infrastructure, rail vehicles, stations and extensive land acquisition for stations and depots,
        - Number of manufacturers for rail systems is limited,
        - High maintenance cost for rails, catenary, and labour,
        - Fuel depends on electricity and price is variable,
        - Significant operating cost generated by borrowing money from multilateral development banks, bilateral loans, and bonds to cover the cost of capital.
    - Planning and Development:
        - Planning a more complex rail project can consume 2 to 3 years of time. Construction can take an additional 2-3 years to complete,
        - Project financing can generate another significant delay due to the higher capital costs required,
        - LRT and HRT need high passenger numbers to financially sustain their high costs, thus, a large rail network will be economically more sensible than just operating a short segment,
        - Changes are much more complicated and expensive,

        - Operation only where rail tracks are available, thus, increasing inconvenience and delays on transfers.
    - Performance:
        - Theoretical capacity: 25,904 PPHPD – 71,808 PPHPD,
        - Observed capacity: Hong Kong-Subway shows the highest: 84,000 PPHPD. Atlanta shows the lowest 5,100 PPHPD,
        - Rail-based systems are associated with sophisticated and modern image, usually at a significant cost.
        - BRT, LRT, and HRT systems all have excellent records of reliability.

Many **criteria** should be considered for the decision, such as performance, cost, resources, implementation duration, local preferences, scalability (leaving the possibility for future development of a higher-level solution), and other key aspects. For most cities, capital and operating costs are crucial factors. It's essential to maximize social benefits from transit investments, balancing them against other economic and social priorities. Service quality, including capacity, speed, and comfort, are also vital. People are willing to pay more for faster, more comfortable service, and some areas with more potential riders need higher-capacity solutions.

The flexibility and **scalability** of transit systems are crucial. A city might need a high-speed service only in congested areas like downtown, with different transit modes requiring different minimum operable lengths for effective benefits. Costs vary by mode for stations, vehicles, and rights-of-way, influencing whether small or large segments are financially sensible. Expanding existing modes can offer seamless connections. Public investments need political and public support, making rapid implementation essential, particularly within a single political term. Economic development impacts also play a role in investment decisions, as rapid transit can stimulate growth in targeted areas.

Different public transport technologies can have varying **effects** on economic, environmental, social, and urban indicators:

- **Economic impacts** encompass the public transport system's potential to attract investment in the corridor and generate job opportunities and include land development and employment generation. The time savings created by the public transport options also create huge economic impacts depending on the capacities and mode shifts.

- To accurately assess the **environmental impacts** of a public transport project, various factors must be examined: the project's effect on modal shift (how many former motorists switch to the new transit system), the vehicle km travelled by the transit fleet before and after implementation, the emissions generated during construction, and the emissions specific to the transit vehicles themselves. LRT consumes more steel than BRT but otherwise, the construction involved is similar. Standard diesel-powered BRT systems have public health disadvantages. The use of Euro IV, V vehicles and cleaner vehicles can mitigate the emissions. For LRT and HRT, use of electricity is more environmentally friendly depending on how and where the power is generated.

- **Social impacts** may involve a new public transport system's capacity to enhance social equity within a city or its ability to reduce accidents and improve traffic safety, they can also pertain to changes in street safety and liveability.

Useful **international best practices** are collected in Annex 3 to present how BRT can help to overcome mobility related issues, once selected as the system best fit for the needs of a city. A special note to be made to use cases in Africa, where the starting situation was very similar to the current setup in Türkiye (with limited heavy or light rail available, bus and minibus are the most common solutions for public commuting, and multi-lane road infrastructure is available for passenger cars which remains in many cases the most common way of personal mobility).

Both existing bus services of the city (regular or lower standard BRT) and planned (higher standard) BRT systems can be assessed during the preparation phase by using the **online BRT Scorecard** of the ITDP BRT Standard[14] once the characteristics of the system (basic setup, planned service, stations and vehicles, communication, access and integration, operational details) are known, to get an instant feedback about how the existing or planned system meets the general requirements, also about how other systems in the world are ranked using the same scoring system.

[14] **ITDP THE BRT STANDARD 2024 Edition**, available at: https://itdp.org/wp-content/uploads/2024/03/ITDP_BRTSTANDARD_APR2024_SINGLE-compressed.pdf
ITDP BRT Planning Guide 2017 Edition, available at: https://brtguide.itdp.org/branch/master/guide/pdf/the-brt-planning-guide.pdf

Actions for screening

A9) Ensure your city has the necessary mobility related **data** needed to assess the current situation of the mobility pattern and public transport system.

A10) Ensure your city (or a related authority) has a responsible **team of experts**, skilled and prepared to manage a situation analysis to support decision making.

A11) Ensure your city (or a related authority) has a **unified transport model** to predict and assess future transport demand and compare project-ideas at strategic level.

A12) Ensure your city has a clear process for **involving** all types of stakeholders (users, NGOs, local businesses, private operator representatives, general public) in the development of future projects.

A13) Ensure that the results of a **qualitative assessment** of current public transport services are available for decision makers to get a clear picture of the status of the mobility system in your city.

A14) Identify existing **gaps to be filled** in the mobility system of your city.

A15) Create a comprehensive **list of development projects with an holistic approach** for improving the mobility system in your city.

A16) Prepare the most effective **project packages of interventions** based on technical content, available budget and envisioned timing for improving the mobility system of your city.

A17) Decide on the **appropriate rapid transit technology** to be implemented in your city.

A18) Be aware of how the existing or planned rapid transit system in your city meets the general requirements of the BRT standard, also about how other systems in the world are ranked using the same scoring system, by filling in the **BRT Scorecard** of ITDP.

5. Process of BRT project preparation

5.1 Project initiation

Even though over the past decade, BRT has internationally established itself as a viable mass transit option due to its scalability, cost-effectiveness and operational advantages, without good timing, advocacy and clear strategy, such a successful system may find it impossible to make a breakthrough in a relatively new environment, like Türkiye. For a **successful project initiation**, the following are to be considered:

- **Creating momentum for BRT:** Before implementing such a complex system, key stakeholders must understand and accept that improvements of the current mobility network of a city are necessary. **Inspiration** can come from private-sector operators, civil servants, political officials, civic organizations, or a group of concerned citizens. Without such a trigger, a city's public transport potential may remain unrealized. Motivation might arise from exposure to different ideas, or from dissatisfaction with current conditions, which can lead to public discourse and action. Since top officials often do not use public transport, the push for improvements usually comes from customers and citizen groups who experience the daily challenges. Municipalities are invited to listen to the voice of the above-mentioned groups, and instead of ignoring, silencing or fighting them, use these forces to create momentum for change.

  In the case of İstanbul, the momentum for the Metrobüs system was created through a combination of societal and institutional support, driven by the increasing traffic congestion and the urgent need for an effective and quick public transport solution. The implementation process aimed to address the chaotic minibus and paratransit (dolmuş) transport along the determined corridor, providing passengers with a more comfortable and reliable travel experience. Additionally, one of the key objectives was to alleviate traffic problems on the determined highway and reduce travel times. This societal and institutional push was instrumental in gathering the necessary support and creating a favourable environment for the successful implementation of the Metrobüs system.

- **Securing political support:** Implementation of a BRT system can be nearly guaranteed once elected officials put this development high on their **political agenda**, for the period of their administration, which brings the financial and human resources needed to kick BRT planning off the ground (the suitable phasing of such a complex system is crucial, as it may not be embraced by decision-makers in case the envisioned project is longer than a municipal or national election, or financing period of 4, 5 or 7 years). It is crucial to note that momentum and political support need **to be sustained at all stages of the BRT**

project lifecycle, not just at the beginning. Thus, planning a communication and participation strategy from the get-go is essential.

- **Flagship BRT in a strategic portfolio**: Including the future BRT system as part of the strategic portfolio of measures in the SUMP of the city provides a good starting point.

- **Raising awareness of decision-makers**: Site visits and study tours have a unique potential to inform and persuade political officials about the feasibility and benefits of public transport improvements. By showcasing real-world examples, particularly through **firsthand personal experiences**, officials gain insights into the feasibility and potential benefits across different economic contexts, and last, but not least, may start to fancy the idea.

Overcoming project development challenges

Once the project idea is born and the awareness of decision-makers is attracted, the following **challenges of project development** must be overcome to be able to set project preparation on track:

- **Real Political Commitment**: Making any decisions resulting in change of the status quo can be daunting for officials, but the political rewards can be substantial for those who – by **committing to groundbreaking initiatives** – dare not only to satisfy existing needs, but to manage future demands (leaders behind BRT systems in cities like Curitiba or Bogotá, car free zones of Brussels or Ljubljana, parking restrictions of Gent or Vienna) have left enduring legacies and gained significant popularity over time, even though initial opposition from motorists and existing transport operators. **Transparent and brave communication** focusing on benefits for all stakeholder groups can lead to success (a major increase in public transport usage can lead to fewer motorists on roads, which – even with restrictions and fairer cost sharing – may result in more predictable road journeys, with less delays and stress).

- **Public support by citizen involvement from the start**: It is crucial to **engage** civil society in the planning process at a very early stage, not only to enhance public opinion of the BRT, but also to reduce opposition to the implementation phase. Despite representing a minority of transport mode share in developing cities, car owners often hold considerable sociopolitical influence, potentially viewing BRT as a threat to their interests. Similarly, existing public transport operators may resist BRT due to perceived threats, though effective outreach can dispel unfounded fears. **Co-creation** of several elements of such a complex project (such as the environment of stations, colouring of infrastructure and vehicles, functionalities of major hubs etc.) may also increase ownership of the project by several stakeholder groups.

- **Official capacity building:** Municipal agencies may hinder progress due to a lack of familiarity with public transport or limited human-resource capacity, while financing and local conditions also pose challenges. **Project champions** can overcome these by

educating and training their staff (the SUMP Türkiye project is providing a set of training events for Municipalities of Türkiye).

- **Legal compliance with existing legislation:** The vision for the BRT system must align with existing legislation and policies to prevent legal delays or objections from detractors. Amendments or additions to current laws and policies may be necessary to fully endorse and implement the BRT concept. **Transport, land use, environmental and other** policies should be adjusted early in the project to avoid approval delays. Additionally, leveraging international or donor funding may require changes to local financial legislation to accommodate the funding within existing budget structures or establish alternative budget-management systems to safeguard the funds for BRT planning purposes. Beyond the initial mandate, additional approvals may be necessary, such as establishing a BRT unit, approving the budget or loans, and adapting legislation and policies. These formalities may require significant time and effort, emphasizing the importance of identifying them early in the planning phase. While leveraging existing legal frameworks is advisable, some projects may necessitate **establishing new frameworks** to facilitate implementation.

- In İstanbul Metrobüs case, there was resistance from interest groups, particularly from operators of private minibuses, paratransit (dolmuș) and public buses operated privately that were in competition with the new Metrobus system. These operators experienced issues as Metrobus routes competed with their services. To address the competition and operational issues, private minibuses, paratransit (dolmuș) and privately operated public buses on Metrobus routes were either redirected to alternative routes to feed the İstanbul Metrobüs system or new settlement areas. A significant number of İETT bus lines on Metrobus routes were cancelled. Moreover, there was no specific legislation directly addressing the Metrobus project; however, necessary zoning plan revisions were made in collaboration with district municipalities to facilitate the construction of Metrobus routes and stops. Additionally, adjustments were made to incorporate the D100 highway, which intersected with the Metrobus routes, into the İstanbul Metropolitan Municipality's (IMM) jurisdiction through a protocol with the General Directorate of Highways (KGM). Lastly, comprehensive information campaigns and active use of communication channels were conducted to inform the public about the project's benefits and details, helping to mitigate resistance and facilitate the implementation process.

- The existing policies and legislation in Türkiye support the modernization, sustainability, and safety of public transport, but the lack of a specific public transport policy framework including BRT presents a challenge to the direct implementation of BRT systems. National plans, including the 12th Development Plan (2024-2028), the National Smart Transport Systems Strategy, and the 2053 Transport and Logistics Master Plan, outline approaches for modernizing transport infrastructure and promoting public transport. Action plans like the Accessible Transportation Strategy (2021-2025) and the National Smart Cities Strategy (2024-2030) highlight the importance of smart, accessible transport solutions. The Green Deal Action Plan 2021 emphasizes the promotion and monitoring of the effective implementation of using electric vehicles in public transport fleets and service vehicles, as well as encouraging the use of public transport. The Energy Efficiency 2030 Strategy and 2nd National Energy Efficiency Action Plan (2024-2030)

focuses on developing infrastructure and mobility plans to promote public transport systems, enhancing service quality, and integrating various transport modes. Key laws like the People with Disabilities Law No. 5378 and the Energy Efficiency Law No. 5627 promote inclusivity and energy efficiency. Secondary regulations such as the By-Law on Increasing Energy Efficiency in Transport and the By-Law on Monitoring Accessibility further emphasize these goals.

In this context, aligning transport, land use, and environmental policies early in the project and accommodating international or donor funding within budget structures is necessary. Identifying these requirements early is crucial for timely implementation. Developing a BRT policy involves creating specific technical standards and guidelines tailored to BRT systems, integrated with existing transport policies.

To implement a BRT project, primarily, local authorities and citizens often find rail system investments like metros more appealing. Therefore, effective marketing strategies for BRT systems, clear communication to the public, and stakeholder involvement in the planning process are essential. Another issue is the high cost of these investments, coupled with the fact that existing public transport systems in Türkiye already operate at a significant loss, making large-scale investments challenging to implement. On the other hand, access to funds and financing is critical, and capacity-building support for local authorities in project development and planning is crucial. Furthermore, operating sophisticated systems like BRT is different from traditional bus operations, requiring the employment of competent personnel capable of managing such systems.

5.2 Institutional setup and project management

One of the main success factors of implementing a complex BRT system is the institutional structure, which refers to the team composition and integration with government functions. The institutional structure of a BRT system has a profound impact on its efficiency, the quality of service, and the cost of operations. A skilled and experienced **project management team** can successfully plan, develop, implement and operate a BRT system, accomplishing essential tasks, regardless of how responsibilities are divided among government agencies or contractors.

Aspects to be considered about setting up the BRT team:

- Two predominant philosophies exist regarding the **appointment** of the entity responsible for BRT development: **integrating** the BRT team within existing agencies or **creating** an entirely new organisational entity. Cities like São Paulo and Santiago have successfully integrated BRT project management into existing agencies, leveraging familiarity with the public transport landscape and already established relationships. Bogotá, Lima, and Dar es Salaam are notable examples where specialized project offices or agencies were created to oversee BRT development. These entities offer fresh perspectives and flexibility unencumbered by existing bureaucratic structures. For instance, Bogotá's TransMilenio system, managed by a dedicated project office reporting directly to the

mayor, exemplifies the success of this approach in delivering customer-oriented and innovative transport solutions.

- **Figure 4** shows a typical **BRT system** with the main components to be addressed during both implementation and operation phases. Initial teams are often relatively small, with a flat structure where each member assumes responsibility for specific functions. While engineers play a crucial role, it is essential to include individuals proficient in liaising with public officials, stakeholders, and transport industry players. The BRT **team composition and size** might be different according to the magnitude of the BRT project (e.g., the team required for building a whole BRT network might be bigger than for one BRT corridor). In the Turkish context, metropolitan municipalities are more complex than provincial municipalities, therefore, to set a new BRT team with the specific mandate, competences and decision **power** is crucial to ensure a more effective implementation.

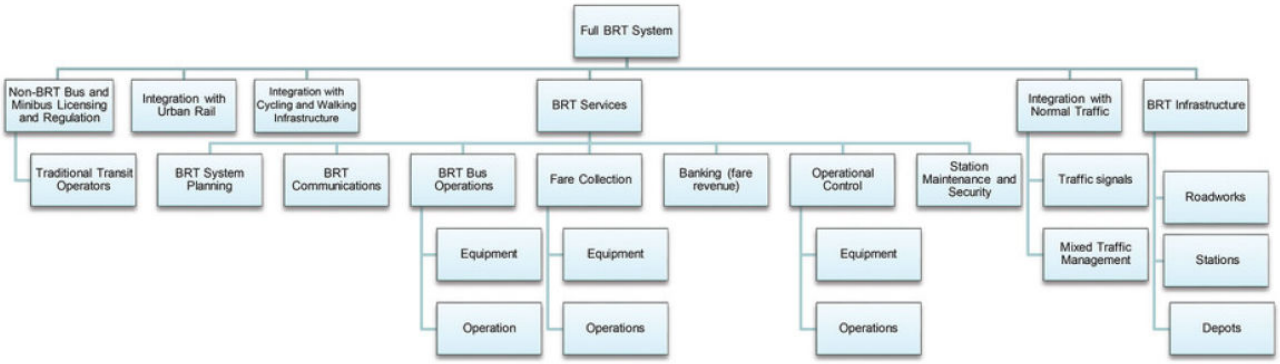


Figure 4: Basic functions of a full BRT system[15]

- **Consultants** with prior BRT experience can provide valuable expertise, helping to avoid reinventing the wheel and ensuring smoother project implementation. The selection of consultants should be transparent and competitive, with careful consideration given to technical abilities and alignment with project goals.

- A temporary **project office** is often set up, which may later evolve into an independent BRT authority, if the initial institutions lack the capacity to manage the project long-term. In some cases, BRT projects start and operate within existing institutions like a transit authority, which can be more effective if these institutions are already robust.

- It is crucial from the start that the **project head** has access to key decision-makers so that decisions can be made timely. Success often hinged on learning from the experiences of others and hiring knowledgeable and highly skilled staff. As cities develop new successful BRT systems, they produce a pool of skilled professionals, many of whom later become available as consultants.

[15] Walter Hook, **BRT Planning International**, LLC

In İstanbul's Metrobüs system, the operational team is structured under the Metrobüs Management unit, which is part of İETT. This management unit consists of six sub-units. These sub-units include the Anatolian Side Operations Sub-Unit, the European Side Operations Sub-Unit, the Fleet Management Sub-Unit, the Field Management Sub-Unit, the Planning and Data Analysis Sub-Unit, and the Financial and Administrative Affairs Sub-Unit. Additionally, the IMM's Road Construction and Infrastructure Coordination Department is responsible for maintaining the Metrobüs infrastructure and constructing overpasses. This collaborative structure ensures effective coordination and management across different operational areas, facilitating the smooth functioning of the BRT system. The involvement of specialized sub-units addresses specific challenges and streamlines processes, contributing to the overall success and sustainability of the Metrobüs system.

5.3 Budget planning

Budget planning of such a complex project as BRT is generally an **iterative process**, starting with the estimation of costs based on industry practice and preliminary plans, which at later stages can be finetuned as details of the project become known and interim decisions are made. Cost estimation involves **comparison** with other cities, **adjusting** for local factors, and **benchmarking** against local projects by public or private sectors. These estimates should be used as references, accommodating fluctuations from factors like material supply, labour costs, and economic conditions. Implementing a value-engineering process, including life-cycle analysis, ensures cost-effective material and technology choices without sacrificing quality. The final budget might be dependent on **available funding**, which might lead to revision of the scope of the project. Instead of opting for limiting content in the technical specifications (leading to lower quality of services), dividing the whole project into phases should be preferred. Main elements of the budget plan are the following:

- **Planning costs:** BRT planning costs may vary based on the scope and complexity of the project. Adequate planning budgets are essential to prevent extra expenses in the long term caused by rushed or under-resourced planning.

- **Preparatory, infrastructure and fleet costs (CAPEX):** One of the most critical and variable cost factors of preparing BRT systems is the **cost of land**, which can vary substantially within the same urban or peri-urban area, sometimes doubling or tripling as urban development expands (in extreme cases, land prices can escalate to levels that exceed the investment costs, potentially making the project financially unfeasible). Land acquisition often involves complex and time-consuming negotiations with landowners and settlers; therefore, it is essential that municipalities secure land reserves and establish legal land management mechanisms well in advance, even at the conceptual stage of a project. **BRT infrastructure costs** involve expenditures covering land acquisition, construction, upgrading, and equipping of elements like stations, busways, depots, and control centres. **BRT fleet costs** involve purchasing buses, adjusting and permitting prototypes to the Turkish circumstances, and including future options in the contract (which is recommended in case the city is planning more phases with extension of service areas or more routes).

Operation and maintenance costs (OPEX): To set up an adequate **business model** for the BRT system, all operation and maintenance costs should be estimated. The BRT Planning Guide of ITDP[16] calculates infrastructure maintenance costs per annum for a hypothetical BRT system roughly representing 1.4% of its total construction costs. This underscores the importance of considering and allocating resources for these costs from the outset. In this instance, maintenance would account for approximately 42% of the total investment over the typical 30-year lifespan of the infrastructure.

In İstanbul Metrobüs (BRT) system, the total construction cost (CAPEX) was approximately 259 million euros after commissioning of the final phase namely Avcılar-Beylikdüzü in 2012. All planning efforts involved personnel from İETT, with the project and planning processes managed by the IMM Transport Department. The construction work was executed by the IMM Road Maintenance and Infrastructure Coordination Department. Operational and maintenance expenses (OPEX) are covered by İETT. This comprehensive involvement of local institutions in the planning, execution, and maintenance phases ensures the project's sustainability and efficiency, highlighting the importance of collaborative effort and thorough financial planning in developing a successful BRT system.

5.4 Setting up communications, participation and marketing strategy

Effective communication is crucial in the implementation and acceptance of BRT systems, necessitating a strategic approach to stakeholder engagement, with the following steps:

- By setting precise objectives and conducting detailed stakeholder analysis, the municipality or a municipal agency can develop a **targeted communication plan** that address the needs and concerns of both internal and external audiences. Such plans should leverage a mix of traditional and digital platforms to disseminate information and facilitate feedback, ensuring stakeholders are well-informed and actively involved in the project's development. Regular monitoring and reporting on the progress of the BRT system help maintain transparency, build trust, and adjust strategies as needed, ultimately securing widespread support and ensuring the system's integration into the urban fabric aligns with community expectations and enhances public transport. **Engaging a broad spectrum of stakeholders**, including the general public, civic organizations, transport operators, local business and government entities, is essential for the successful development and implementation of BRT systems.

- The **employment of diverse participatory methods**, such as surveys, public forums, small group meetings, and digital engagement strategies, allows for the effective incorporation of community feedback into the planning process. Fostering an environment characterized by openness, transparency, and active stakeholder

[16] **ITDP BRT Planning Guide 2017 Edition, p.682**, available at: https://brtguide.itdp.org/branch/master/guide/pdf/the-brt-planning-guide.pdf

involvement is instrumental in overcoming challenges associated with public scepticism and resource constraints, ultimately contributing to the creation of more inclusive, efficient, and widely accepted BRT systems.

- **Marketing** and customer service are essential components for altering public perceptions and bolstering the public image of BRT services. Through strategic **branding** efforts, including the design of logos, uniforms, and comprehensive marketing strategies, BRT systems can present themselves as modern, efficient, and user-centric modes of transportation. The process requires meticulous planning, starting from the initial branding stages, such as the selection of names and logo designs, to the deployment of customer service protocols that underscore the brand's values. In the context of enhancing BRT systems' acceptance and public image, targeted marketing strategies are developed to cater to diverse market segments, including students, parents, professionals, existing public transport users, and individuals with disabilities. This ensures the system is perceived as inclusive, convenient, and modern. The strategic placement of customer information, both digitally and physically, within and surrounding BRT stations, is critical for accessibility and user-friendliness for all patrons, including those with disabilities. Through the implementation of clear signage, digital information, and staff training, BRT systems can provide an accessible and seamless user experience. The importance of continuous customer feedback is emphasized as a mechanism for ongoing improvement of BRT services.

5.5 Project timeline

To achieve the set goals with a new BRT system, a **detailed project work plan and timeline** is to be created, as follows, which helps both the BRT team, and the public understand the project's scope and necessary activities. Cities often underestimate the time required for a full BRT plan, which typically takes at least 12 to 18 months. **Experience and best practices** from other cities can reduce this timeframe. The work plan and timeline should include **public communication and education**, and sharing these with stakeholders can ensure realistic expectations. Adjustments may be needed due to unforeseen events, so periodic revisions are essential. Using software to detail and evaluate project components can help track progress and alert stakeholders to potential delays. While detailed plans are valuable, stakeholders may benefit more from summarized versions highlighting the most relevant items. In case the BRT system is constructed in phases, it's important to adopt a **comprehensive vision**, such as a route map of all planned corridors, to help residents and stakeholders understand the long-term benefits of the entire system. Without exceptional difficulties and with appropriate resources, moving from design concepts to detailed implementation plans can take between 6 to 24 months once conceptual design is initiated. It is essential to prepare a timeline that fully considers the time for procurement, permit procedures, regulatory approvals, and consultations.

5.6 Procurement plan

Project preparation should always include considerations of procurement. The initial step in a competitive tendering process is often issuing a call for **Expression of Interest** (EoI), inviting firms and individuals interested in the project to declare their interest. This helps officials create a shortlist of potential consultants for detailed proposals, allowing interested parties to express interest without submitting lengthy proposals initially. The EoI should be concise, focusing on key experts' qualifications rather than general company information, as specialized individuals are more beneficial than generalists. Local authorities should thoroughly research the proposed team's qualifications. There's no set rule on the number of teams to invite for formal tender; however, a shortlist of three to seven teams usually balances competition and manageability, avoiding undue strain on both authorities and applicants.

The next step is the development of **Terms of Reference (TOR)**, which outlines specific requirements for the detailed proposal, including required deliverables such as operational, infrastructure, architectural, engineering, financial, and marketing plans (this will be presented in the following sections of this chapter). A well-crafted TOR allows professionals to offer creative solutions for achieving these results. Although project cost is usually the main factor in awarding the contract, the team's relevant experience and qualifications are crucial and should not be overlooked. Legal constraints often require awarding contracts to the lowest bid, which can negatively impact the BRT project's quality. The bid adjudication process varies by local legislation; some authorities use a fixed price system, while others allow competitive price bidding to better understand differences between firms.

Actions for BRT project preparation

A19) Identify and **inspire a key political official** to realize the importance of BRT

A20) Identify and **involve stakeholders** as allies to motivate decision making about BRT.

A21) Propose BRT to become part of the **political agenda** of elected officials directly, or indirectly by flagship BRT in the strategic portfolio (SUMP or Transport Master Plan).

A22) **Raise awareness** of a wider group of decision-makers by arranging study tours and site visits to best international and local BRT examples.

A23) Create and update **communication and participation strategy** for your BRT project.

A24) Prepare **evidence and fact sheets** about and beyond BRT for officials to dare making decisions resulting in change of the status quo, supporting their communication.

A25) **Engage civil society** as soon as possible in the BRT planning process to gain acceptance, or even co-create several elements of the project (do not only listen to the loud minority but reach out to the silent majority).

A26) **Build capacity** for municipal agencies, educate and train employees.

A27) **Assess existing legislation**, identify gaps and propose amendments and additions, if necessary to ensure compliance with laws and regulations on transportation, land use, environment and other related disciplines.

A28) **Establish a BRT team** with a clear mandate, all necessary competences, knowledge and experience, consisting of engineers and staff proficient in liaising with public officials, stakeholders and transport industry players.

A29) Assess the need for **involving experienced consultants** to complement internal knowledge and resources, select contributing partners in a transparent and competitive manner.

A30) Decide on **arranging project management** within an existing organization or a new external entity, set up a dedicated project office accordingly, with the potential flexibility to grow with time and the maturity of the project.

A31) Ensure **decision power for the project head**, also access to key decision-makers in case a decision is necessary beyond this mandate.

A32) **Determine the estimated cost** of the whole project at a very early stage (by comparison with other cities, adjust to specific local factors, and benchmarking against other projects), identify available and accessible funding.

A33) Decide on the **project scope** to fit the available funding, without limiting the technical specifications (therefore the level of service) of the BRT system. Divide the project into lots or phases in case of budget constraints.

A34) Allocate **adequate budget, time and resources for planning** of the BRT system and all critical preparatory tasks (permitting, land acquisition, etc.)

A35) Estimate **capital expenditure (CAPEX)** of the BRT project, considering all relevant preparatory, infrastructure and fleet related costs.

A36) Estimate **operating costs (OPEX)** of the BRT project, including maintenance, and set up an adequate business model.

A37) Develop a **targeted communication plan** about the BRT project, addressing both internal and external audiences, engaging both spectrum of stakeholders.

A38) Employ **diverse participatory methods** to foster an open, transparent and active cooperation environment.

A39) Create a clear **marketing** strategy, following the stages of branding.

A40) Develop a detailed project **work plan and timeline**, based on experience and best practices, including public communication and education, and always referring to the big picture, especially in cases the project is divided into lots or phases.

A41) Create a **shortlist of potential contributors** by inviting interested firms and individuals to declare their Expression of Interest for the BRT project.

6. Process of BRT Operations Design

6.1 Service design

The first task of designing BRT system operations is the comprehensive design of the BRT services, with a special **focus on existing and future travel demand**, this will be the main input information for infrastructure design, fleet and traffic management considerations. This should be done by the following steps:

- **Basic data collection:** Utilising methods of route mapping, occupancy surveys, boarding and alighting surveys, vehicle and customer counts, the **current public transport supply** of the city (with a special focus on regular bus services) can be observed, the collected data can be used to create origin-destination matrices, territorial and transport supply models.

- **Estimation of future travel demand**: A **strategic transport model** is intended to reliably predict expected travel demands and the effects of measures aimed at improving the current situation, and to contribute the reasoning of development projects by providing input data for cost-benefit assessment and value-in-use analyses. It is suitable for long-term transport strategic assessment, examining effects of major traffic management and regulatory interventions or complex infrastructure projects covering multiple zones of the city, such as the BRT system, utilising an appropriate modelling software like EMME, CUBE, or VISUM. In Türkiye, the most widely used PTV Vissim and Visum software, among others, are used in an integrated manner for these purposes. The transport model enables testing various BRT scenarios to generate demand estimates, aiding planners in assessing capacity requirements, station congestion, profitability, and potential modal shifts from private vehicles, thereby optimizing the proposed route network to enhance capacity factors and minimize line transfers. In addition to focusing on predictive-assign modelling, it is crucial to emphasize the importance of implementing push and pull measures along with effective demand management strategies to create a more balanced and sustainable approach.

- **Appointing BRT routes and corridors:** A BRT corridor is defined by an encompassing series of infrastructure, technological and operational enhancements, which extends continuously for at least 3 kilometres and significantly improves the performance and service quality of the service compared to former bus route. The implementation of a BRT corridor is considered not only a technical, but a political decision, therefore – besides experts and officials – the proposal must be consulted with the general public and decision-makers. It remains crucial, however, that the chosen corridor is technically

viable, offering a high return in investment and enhancing the overall quality of the transportation system for the greater good[17].

- **Integration with other modes:** The BRT system can become the backbone of the public transport system of the city, only if integrated perfectly to the existing mobility network. This means the BRT system should be planned, implemented and operated in a fully **harmonised** way with linked public transport services (feeding in lines, first and last mile solutions, shared services, active mobility options), and in the same time, the existing services should be reviewed and **reorganised** to better fit the future network (avoiding parallel lines, inconvenient connections, long waiting times and walking distances, too many mode changes etc.). Operation hours, capacity and frequency of the BRT system and the reorganised services should be planned in an integrated way.

- **Business model:** An implemented BRT system may either be operated as an organic **part of the existing public transport system** (adopting its standard procedures), or be operated as a separate, **stand-alone business**. If the BRT operation is integrated into an existing transit system, it will need to adhere to the system's established rules and procedures, include necessary capital investments in the system's capital budget, and account for the new BRT system's operating expenses in projected operating budgets. The BRT business plan outlines which aspects of the BRT system will be outsourced to private companies and which will remain under the control of a local authority. This decision is partly based on the anticipated revenue from the system, primarily fare revenue, and how much of the operating costs this revenue can cover. The business plan also identifies which parts of the system can be financially isolated and contracted out to private operators. Experience has shown that the operation of elements of the BRT system (such as the fleet of vehicles and the fare collection system) is often more efficient if handled by a private company, assuming the contracts are done well and there is appropriate supervision. In Europe, BRT vehicle operations are generally contracted to private operators, and therefore, fare collection systems are also operated by the private sector. In most cases, these two functions are handled by the same company. Once the business model is elaborated, the **contractual framework** for BRT implementation and operation can be finalised, and the **detailed procurement plan** can be developed.

- Preparatory work of service design should be concluded with conceptual and preliminary designs of the BRT system, and ultimately a **feasibility study**, to prove its technical, operational, economic and financial viability for decision-makers and the general public. The **conceptual design** offers a comprehensive overview for assessing the proposed system's cost, functionality, and aesthetics, requiring a full audit of each segment to identify nuances and issues, with special attention to **intersections, access points, and station sizing and placement**. Developing initial renderings and traffic simulation at this stage is very useful, which provides a realistic view, to enhance communication with decision-makers and stakeholders to secure support. Once a conceptual design is finalized and initial cost estimates are within an acceptable range, the **preliminary design**

[17] **ITDP BRT Planning Guide 2017 Edition, p.143**, available at: https://brtguide.itdp.org/branch/master/guide/pdf/the-brt-planning-guide.pdf

process can commence. Public feedback is often sought and valuable during the preliminary design phase when the conceptual design is evaluated for feasibility, and input from the local community and municipal officials is necessary to refine the layout and design.

6.2 Customer experience

Providing enhanced customer experience by high level of service is a core requirement of a BRT system, therefore the following aspects should be carefully designed as part of BRT operations:

- **Accessibility:** All elements of the BRT system (such as the stations and stops, platforms, vehicles, services etc.) must be accessible for **masses of customers** to ensure constant usage. Special attention is to be made to **vulnerable user groups**, women, children and families, and all customers with special needs – these needs should be the standard requirements during design (what is good for someone in a baby carriage or a wheelchair, will be good for all users)

- **Safety and security:** Safe movement of customers and personal security must be provided throughout the whole mobility chain, in which the BRT system is the backbone, but connecting services, first and last mile mobility options play also a crucial role. Safe and secure public transport contributes to establishing a massive group of **frequent users and**, therefore can directly contribute to the **financial stability** of the system by guaranteed fare incomes.

- **Greening and resilience:** Connecting infrastructure (roadways, bridges) and certain parts of the BRT system where users spend more time **waiting or changing modes** must comply with resilience requirements (features protecting customers from the elements – rain roofs and sunshades, wind protection, earthquake-resistant buildings, air conditioning, drainage of stormy rainwaters etc.) and be equipped with possible green surfaces (grass, trees, etc.)

- **Brand and communication:** The BRT system can have a strong, standalone brand, whether or not being an integral part of the existing public transport landscape. Static and dynamic communication should always follow the standards and requirements of the BRT brand, taking **user groups with special needs** (e.g. visually impaired, blind, deaf customers) into account.

- **Passenger information:** People should have access to **all relevant, static and real time information** that is essential to plan their journeys, to travel through the whole travel chain smoothly and to be aware of potential alternatives (especially during disruptions). Core information should be available in **English** for foreigners.

- **Data collection**: Data representing the usage of the BRT system should be collected in an automated way as much as possible, without unnecessary disturbance to passengers, and in compliance with personal data protection principles.

6.3 Supporting duties

The level of service of the BRT system operation should be kept at the same level as on day 1. This requires the following:

- **Maintenance**: The proper maintenance of all elements of the BRT system (infrastructure, fleet, system tools etc.) should be designed in advance and conducted in compliance with the "good owner" principle. **Competition** for external entities, also **procuring** related services in parts might help keep the standard high.

- **Enforcement**: Both from a **personal and financial safety** and security point of view, rules of the BRT system usage should be enforced with extra care, keeping a certain level of flexibility to handle unintended non-compliance with **equity**, but at the same time **discourage** violating rules and regulations.

Actions for BRT operations design

A42) Collect **basic data** about the existing public transport services of the city, which will be the input for origin-destination matrices for transport modeling.

A43) Utilize a **strategic transport model** to predict expected travel demands, assess possible scenarios and optimize proposed BRT network.

A44) **Consult** the proposal with experts, officials, general public and decision-makers on BRT routes and corridors.

A45) **Ensure integration** of the BRT system with other transport modes of the city, review and reorganize existing transport services to achieve a fully harmonized urban transport system with BRT as the backbone.

A46) Build up a **business model** for BRT operation, identify the most fitting contractual framework and develop a detailed procurement plan.

A47) Develop necessary conceptual and preliminary designs of the BRT system, conclude it in a **feasibility study**.

A48) Ensure **accessibility** to all elements of the BRT system for masses of customers, setting the needs of vulnerable user groups and customers with special needs standard requirements for planning.

A49) Ensure **safety and security** for the whole mobility chain (the BRT system itself, connecting services, first mile and last mile options).

A50) Develop a **green and resilient environment** for users of the BRT system, especially at locations with longer waiting times or changing modes of transport.

A51) Create a **brand and communication** requirements for the entire BRT system, taking user groups with special needs into account.

A52) Ensure **access to all relevant, static and real time information** for general people (customers and non-customers), make core information available in English for foreigners.

A53) Ensure **automated data collection** about the usage of the BRT system, in compliance with personal data protection principles.

A54) Ensure proper **maintenance** of all parts of the entire BRT system, keeping standards high by competitive and separated procurement.

A55) Ensure proper **enforcement** of rules and regulations related to the usage of the BRT system.

7. Process of BRT Implementation

7.1 Physical infrastructure

Once the preparation phase of a BRT system is fully completed, implementing the project may commence. Based on formerly completed and approved conceptual and preliminary design plans, additional plans will provide precise dimensional and structural details, which will later be converted into **detailed engineering plans**. The detailed design process culminates in the final construction plans, project specifications, tender documents (including contract conditions), and a complete bill of quantities with a full capital cost estimate. The designer company, if separate from the construction company, should oversee the construction process to ensure adherence to the designs and to address any contingencies or issues that arise during construction. In the design of Bus Rapid Transit (BRT) systems, the **roadwork and related civil engineering** aspects are typically overseen by a civil engineering company with specialized BRT design knowledge. This phase involves **collaboration** from a diverse team including geotechnical, pavement, geometric, utility, structural, and traffic engineers, alongside urban designers and landscape architects. Additional specialist designers, such as universal access, non-motorized transit specialists, and surveyors, are also incorporated on an ad-hoc basis to ensure comprehensive integration and accessibility in the design process. Infrastructure planning is deeply intertwined with other areas, especially operational design. They influence and refine each other throughout an **iterative process**. Getting BRT infrastructure design right is crucial for two reasons. Firstly, infrastructure represents the **largest expense** in the total cost of the BRT project and offers the least flexibility once established – unlike operational design, which allows adjustments such as changing vehicle numbers and frequencies over time, modifications to build infrastructure are highly restrictive and costly in terms of both money and time. Secondly, infrastructure, along with the vehicle fleet, serves as **the "face" of the BRT system** to passengers. Efficient, accessible, and aesthetically pleasing infrastructure organically embedded in the city texture significantly influences user experience, directly impacting their daily decision to use the system.

Core physical components to be constructed and adjusted for the operation of a BRT system are the following:

- **BRT roadways**: A project as large and complex as a BRT system necessitates significant changes to the existing built urban environment, particularly spatial transformations at the street level, which involves reconfiguring every linear kilometre and cross-section where the system is to be implemented. To ensure the BRT system has a positive and impactful effect on the overall sustainable mobility of the city, **road space reallocation** should follow the "**inverted mobility pyramid**" principle, prioritizing high-quality spaces

for active mobility (walking and cycling) first, then public transport, freight services, and finally private motorised vehicles. As for roadway design: the more exclusive the busway can get – with minimal interaction with other modes along the corridor and at intersections – the more it positively impacts BRT operation's smoothness, reliability and speed. Similarly, the greater the number of bus lanes allocated to the system, the higher the capacity for more or bigger buses to operate more frequently along the corridor. As operational and spatial conditions vary along the corridor, a one-size-fits-all approach to busway design is not suitable (the conditions in a consolidated, historic business district significantly differ from those in developing suburban areas), leading to **multiple busway configurations** along the corridor. Typical busway typologies are summarised in the BRT Planning Guide[18]. An effective BRT infrastructure integration in urban areas can be achieved by **optimizing existing road space** including geometric changes not to increase the current level of transport related land use. **Existing assets** such as bridges, overpasses, underpasses, and elevated intersections should be taken into account. Preferred strategies are **converting car lanes to bus lanes or narrowing car lanes** to accommodate BRT infrastructure (road widening involving land acquisition for the BRT corridor should be a last resort exception). Major routes in Türkiye consist of multiple car lanes, elevated intersections, several pedestrian overpasses and underpasses, therefore providing a good starting point for road space reallocation. Priority for active mobility (walking and cycling) also means the BRT corridor does not divide the city, horizontal and vertical alignment of the roadway must be adjusted to allow **safe crossings for people** without major detours. Cars, on the other hand, can be diverted to support smooth BRT operation, and indirectly making car use less competitive compared to BRT. Roadway **pavement** requires a specific design to comply with the requirements of the intense BRT operation, resilience and urban planning, from both functional and aesthetic points of view. **Utility lines** affected by the BRT corridor are advised to be relocated or protected in a way that later maintenance will not need demolition of the road pavement (building utility tunnels). Delimiting and enforcing the **right-of-way** for BRT lanes is to be done by colorization and physical segregation of the busway.

- **BRT stations**: Stations, where all elements converge, are the most critical and sensitive part of the BRT system, largely determining its overall capacity. The ease or difficulty passengers experience in performing their travel related actions significantly affects their overall experience and satisfaction with the system. **Access and arrival, entrance areas and sub-stops** should accommodate masses of passengers, with enough capacity for peak hours, times of major events and programmed maintenance, able to handle necessary functions (waiting, changing modes, purchasing and validating tickets, etc.). The number and **design of docking bays** should be compliant with operational needs, with **passing lanes** included to enable the smooth, simultaneous movement and circulation of multiple vehicles. Platforms should be designed taking the **minimum dimension requirements** into account. Details of station design are outlined in subchapter "25.6. Station Dimensions" of ITDP's planning guide[19].

[18] **ITDP BRT Planning Guide 2017 Edition, p.699**, available at: https://brtguide.itdp.org/branch/master/guide/pdf/the-brt-planning-guide.pdf
[19] **ITDP BRT Planning Guide 2017 Edition, p.837**, available at: https://brtguide.itdp.org/branch/master/guide/pdf/the-brt-planning-guide.pdf

- **BRT depot:** Bus depots are essential yet less visible components of BRT systems, functioning as **operational hubs**, where vehicles are fuelled, cleaned, repaired, stored and safeguarded, but also more than just vehicle **maintenance areas**: depots include office spaces, cafeterias, nurseries, locker rooms, and other facilities necessary for staff to effectively perform their daily duties. They also serve as operational headquarters, accommodating drivers, mechanics, and administrative staff. Design of the depots should consider core **functionality** (storage and maintenance of buses), additional functions (accommodating staff needs), **energy** (fuelling, recharging and energy production infrastructure – such as rooftop solar panels), **urban design** (architecture design, green areas) aspects.

7.2 Traffic management

Traffic management components that supplement the physical components of the infrastructure of the BRT system are the following:

- **Intersections:** By definition, conflicts at intersections arise when there isn't enough road space to accommodate incoming flows accurately, leading to congestion, delays, and potential accidents. While the incoming roadways and public spaces must be designed and constructed by keeping estimated capacities and other conditions mentioned in the previous section, traffic management should support the suitable operation of intersections. For a successful BRT system, **priority should be given to public transport** flows (the BRT itself, but also other connecting public transport services) and at the same time **active modes** (walking and cycling), with special regard to crossing traffic. Motorised car traffic should not under any circumstance get priority, especially at intersections with demand responsive traffic management systems (such as traffic lights). Overall priority at all times to emergency services however needs to be considered. Driving culture issues in Türkiye must be considered when developing public transport projects including BRT systems. Despite laws requiring drivers to stop for pedestrians at crosswalks, many fail to do so, putting pedestrians at significant risk, particularly in urban areas where proper crosswalks and signals are often lacking or inadequately maintained. Lane discipline is another major issue, with drivers not adhering to lane markings and often weaving in and out of lanes without signalling, leading to confusion and increasing the likelihood of accidents. Speed limits are frequently ignored, especially on highways, and aggressive driving behaviours like tailgating and abrupt lane changes are common, contributing to unsafe driving environments. Additionally, a general disregard for traffic rules, including running red lights and illegal parking, further exacerbates the problem, making it crucial to address these issues for the successful implementation and operation of public transport including BRT systems.[20] Intersection redesign can be supported by an ex-ante traffic audit, that can reveal intersection and non-intersection related causes of conflicts and delays. Once problems at the intersections are identified, multiple solutions can be

[20] **WHO Global Status Report on Road Safety**, 2018, available at: https://www.who.int/publications/i/item/9789241565684

considered (information available in the ITDP planning guide, chapter "24. Intersections and Signal Control[21]").

- **BRT control centre:** Integration of the traffic control and dispatch centre of the BRT system and other public transport modes allows higher level options of monitoring and intervention, compared to separate systems. A **centralized** and devoted control centre allows the constant monitoring system over operations, schedules and even fare flows, for not only public transport operator (PTO) and public transport authority (PTA) personnel, but to some extent passengers (information and timely responses to expected or unexpected changes in demand, technology performance, and human or weather-related incidents etc.). Existing technologies used to monitor regular bus services (e.g. global positioning systems, communication systems, CCTV and direct alert connection to enforcement and emergency services) can be further developed to help operational decision making, while recent advancements in technology, such as Digital Twins, have enabled the use of collected data to simulate and optimize performance in both mid-term planning and real-time scenarios.

7.3 BRT fleet

The selection of vehicles is a pivotal decision in BRT system development, significantly impacting system performance. The following aspects are to be considered:

- **Specifications to select the rolling stock:** While technical specifications are typically set by system designers to ensure **infrastructure compatibility**, vehicle procurement often involves collaboration between public agencies and private operators. Public agencies set standards, while operators choose manufacturers, ensuring adherence to detailed specifications. Factors such as emissions compliance, capacity fulfilment, operational consistency, maintenance requirements, spare parts availability, and financial viability must be carefully weighed by operators when selecting **propulsion technology**. Despite the allure of advanced technology, considerations of maintenance, spare parts availability, and **operational costs** should remain central to decision-making processes. Sustainability goals including the emission of greenhouse gases can only be successfully targeted if other propulsion technologies can be considered other than diesel. **Electric BRT technology** is becoming available worldwide and, therefore will be a valid consideration for all cities wishing to opt for implementation of BRT systems[22]. **Automation** technologies (such as docking, driving navigation, positioning at charging stations, automated passenger counting etc.) are widely available and, therefore should be carefully selected for vehicle specifications.

- **Economy of scale aspects:** The number of vehicles to be procured should be considered from the economy of scale point of view, especially in case the BRT system is planned to be implemented in phases. Contracts including **future options items**, or **cooperation**

[21] **ITDP BRT Planning Guide 2017 Edition, p.743**, available at: https://brtguide.itdp.org/branch/master/guide/pdf/the-brt-planning-guide.pdf
[22] **EBRT2030: European Bus Rapid Transit of 2030,** (Manel Rivera Bennassar & Flavio Grazian, 2023)

between cities willing to purchase smaller number of vehicles might keep prices reasonable.

Designing, implementing and operating major public transport systems, especially including special vehicles (such as double-articulated buses of a BRT system) cannot be realistically managed without proper **manufacturer support**. Both on **PTA and PTO** level it is advised to establish lively **cooperation with bus manufacturers**, obviously without violating general procurement rules.

7.4 Targets for cities in Türkiye - possible achievements for BRT

Urban transport in Türkiye is plagued by significant challenges, with traffic congestion and road safety standing out as critical issues. The country's car-centric infrastructure has led to substantial economic and social costs, including considerable loss of time and productivity. Traffic congestion alone results in thousands of lost hours annually and a notable decrease in GDP. Additionally, road accidents cause a tragic toll on public health, with numerous deaths and injuries each year. These pressing problems underscore the urgent need for comprehensive solutions to improve Türkiye's urban transport systems and ensure safer, more efficient mobility for its citizens to **establish national aims and objectives:**

- Türkiye has set national goals in the **12th Development Plan** (2024 – 2028) and the Annual Program of Presidency of the Republic of Türkiye for 2024. These include reducing car dependency by promoting public transport and walking, integrating sustainable urban transport with low-emission and autonomous vehicles, and enhancing public transport systems to alleviate congestion and improve efficiency. **The Energy Efficiency 2030 Strategy and the 2nd National Energy Efficiency Action Plan (2024-2030)** focus on optimising bus routes based on fuel consumption and travel demands, improving public transport efficiency, and accelerating energy transition through new technologies and electrification. Financial resources will support these initiatives, with programs encouraging business-local authority collaboration to boost public transport usage. Lastly, **the Accessible Transportation Strategy and Action Plan (2021-2025)** aims to create an inclusive transport network by improving mobility for individuals with reduced mobility and enhancing their social participation. This includes raising awareness, strengthening governance and regulations, developing institutional capacity, improving infrastructure and vehicle accessibility, and enhancing intermodal integration.

- In addition, the **2021-2030 Road Traffic Safety Strategy** aims for a 50% reduction in traffic fatalities and serious injuries by **2030**, with a long-term goal of zero fatalities and serious injuries by **2050**. To achieve this, Türkiye plans to implement a Safe System Approach, improve infrastructure, support advanced vehicle technologies, promote safe behaviours, and enhance post-accident interventions. The current state of traffic and public transport in Türkiye reveals severe issues with congestion and road safety, necessitating comprehensive solutions to enhance urban mobility as elaborated in high-level policy and strategy documents of Türkiye. In 2023, Türkiye witnessed 6,548 traffic fatalities and 350,855 injuries. When comparing 2023 traffic accident statistics to that of

2022, despite an 8.5% increase in motor vehicles, fatal and injury-related accidents rose by 19.2%, deaths by 25.2%, and injuries by 21.5%.[23] The direct and indirect costs of traffic accidents were significant, amounting to 49.6 billion TL in 2016, 55.8 billion TL in 2017, and 66.4 billion TL in 2018 with current prices, underscoring the economic burden.[24] In Türkiye, Gaziantep, İstanbul, Ankara, and İzmir metropolitan cities rank 32nd, 34th, 69th, and 75th respectively among 225 European cities, for average travel times per 10 km, indicating significant congestion, particularly in Gaziantep and İstanbul.[25]

- In 2022, **public transport commute times** in İstanbul with 77 minutes, Ankara with 65 minutes, and İzmir-Aydın with 63 minutes were among the longest compared to cities in Italy, Spain, France, Germany, the UK, and the US. Additionally, when examining the percentage of people with short commutes of up to 30 minutes (one-way) within the same ranking, Turkish cities are at the bottom. Furthermore, in a list comparing public transport incentives across 60 cities from similar countries in 2022, Antalya ranks 39th among Turkish cities, followed by Ankara, İzmir-Aydın, Adana-Mersin, İstanbul, and Bursa, which rank 44th. These incentives include accurate arrival times, cleanliness, higher frequency of vehicles, fewer transfers, lower fares, enhanced personal safety, shorter trip durations, and less crowded vehicles.[26]

The national framework for traffic-related problems in Türkiye and the improvement of public transport is outlined above. This framework provides a basis for municipalities to develop a BRT system. In addition to this national strategic framework, the development of urban public transport systems is mandated by the **Municipality Law No. 5393 and the Metropolitan Municipality Law No. 5216.** When municipalities need to implement the BRT system, with the guidance of the determined national framework and the responsibilities determined in the legal framework, firstly, municipalities should establish a comprehensive plan by referencing existing frameworks like the TMPs or SUMPs to enable integrated public transport system, transit-oriented development, and multi-modal accessibility considering other modes of transport. These plans should address technical, economic, and social aspects, including the need for skilled personnel and local authority commitment. Implementing BRT may face initial resistance from car owners, necessitating political support to overcome these challenges and integrate the system into the city's transportation agenda. Securing financial resources is crucial, involving negotiations for both local and national funding. Lastly, ensuring the availability of human resources for the operation and maintenance of the BRT system is essential. These steps align with Türkiye's broader national goals for urban transport improvement and sustainability.

[23] **Traffic Accident Statistics**, (TURKSTAT, 2023), available at https://data.tuik.gov.tr/Bulten/Index?p=Karayolu-Trafik-Kaza-Istatistikleri-2023-53479

[24] **Road Traffic Safety Strategy Document 2021-2030 and Road Safety Action Plan 2021-2023**, available at: https://www.trafik.gov.tr/karayolutrafikyonet13

[25] **Tom Tom**, available at: https://www.tomtom.com/traffic-index/ranking/

[26] **Moovit**, available at: https://moovitapp.com/insights/en/Moovit_Insights_Public_Transit_Index-countries

7.5 Measuring strategic targets

In Türkiye, monitoring the success of public transport systems is conducted through **SUMPs and TMPs**, which are typically updated every 5 to 10 years, these plans provide values for key indicators that are essential for assessing the performance of public transport. The analysis methods generally involve tools such as desktop research and surveys to measure various factors, including average time spent in traffic, the length of public transport routes, average speeds, and modal split and so on. User satisfaction surveys are mainly utilized to assess public sentiment and identify areas for improvement within existing systems. This approach allows cities to effectively monitor and enhance strategic targets such as accessibility, air quality, and traffic safety, thereby improving the overall sustainability and efficiency of urban mobility systems. While cities like Ankara, İstanbul, İzmir, Konya and Eskişehir have successfully implemented these methods, there is a need for further development to achieve a more comprehensive understanding of public transport performance.

SUMPs not only provide a transparent process on how to define an overall vision and strategic goals for the city, how to select measures and projects to accomplish these goals, but also how to monitor the progress on a strategic level by utilising **Sustainable Urban Mobility Indicators[27] (SUMI).** A well-designed, implemented and operated BRT system in general has the potential to have a positive effect – directly or indirectly – on all these indicators:

- Affordability of public transport for the poorest group
- Accessibility of public transport for mobility-impaired groups
- Air pollutant emissions
- Noise hindrance
- Road deaths
- Access to mobility services
- Greenhouse gas emissions
- Congestion and delays
- Energy efficiency
- Opportunity for active mobility
- Multimodal integration
- Satisfaction with public transport
- Traffic safety of active modes
- Quality of public spaces
- Urban functional diversity
- Commuting travel time
- Mobility space usage
- Security
- Modal split

The municipality should assess what type of mobility related data it can collect or have access to, develop a **data map**, processes and a database, then set Key Performance Indicators (KPI) to quantify the set goals. Instead of trying to collect all possible data, the main focus should be collecting data related to the core SUMI indicators, and at the same time, using limited human and financial resources efficiently.

[27] **Sustainable Urban Mobility Indicators (SUMI)**, available at: https://civitas.eu/tool-inventory/sumi-sustainable-urban-mobility-indicators

7.6 Funding and financing

In Türkiye, to implement BRT projects, municipalities will follow almost the same **budgeting procedures** as for other public transport projects except for rail systems. Municipalities may either utilize their own finances or apply for external funding to budget for BRT projects. In the projects requiring external finance, municipalities first prepare feasibility reports for public transport projects like BRT within the framework of TMP or SUMP, including economic and financial analyses. Municipalities submit them to the PSB and MoTF. PSB assesses the projects' alignment with the country's economic and social policies and also the feasibility, includes them in the investment program, and allocates resources. Meanwhile, MoTF evaluates the loan terms and contracts for the projects and approves the loan agreements and disbursements. Additionally, the budget monitoring and evaluation of the project are carried out by PSB. On the other hand, İLBANK serves as a financial intermediary for foreign grants and credits allocated to municipally externally financed urban transport projects.

For **municipalities' self-financed public transport projects**, including BRT systems, the transport department, which is a division within provincial municipalities, of the municipalities conducts a needs analysis and prepares public transport planning based on the TMPs and SUMPs. The department carries out feasibility studies that include economic and financial evaluations of the project. Once the municipal council approves the project, implementation begins. Additionally, İLBANK's role in such a project is the distribution of shares allocated from the General Budget to local authorities[28]. On the other hand, operational processes of public transport projects require financial management. The costs of rubber-tired public transport in Türkiye are influenced by exchange rates and include bus investments, fuel, maintenance, and personnel expenses. The main source of income is passenger ticket sales. In major cities such as İstanbul, Ankara and İzmir the operations are handled by the municipal affiliated organisations; respectively İETT, EGO, and ESHOT, which do not receive shares from the central government but cover their expenses through their own revenues or support from metropolitan municipalities in the form of loans and grants. On the other hand, in cities other than these three, bus operations are managed by municipalities' related departments[29].

İstanbul Metrobüs system (further information about the İstanbul case can be found in Annex 4) is publicly owned with no private sector involvement in its construction or operation processes. The planning processes of the project were operated by IMM Transport Department coordinating with İETT's related units. The local authority financed most of the system's initial investment, including the purchase of buses, which covered nearly 40% of the costs; however,

[28] **Municipality Law No. 5393**, available at: https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=393&MevzuatTur=1&MevzuatTertip=5
Metropolitan Municipality Law No. 5216, 2004, available at: https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=5216&MevzuatTur=1&MevzuatTertip=5
Law 5779 on the Allocation of Shares to Special Provincial Administrations and Municipalities from General Budget Tax Revenues, 2008, available at: https://www.mevzuat.gov.tr/mevzuat?MevzuatNo=5779&MevzuatTur=1&MevzuatTertip=5

[29] Further strategies for funding and financing can be found in the SUMP Türkiye "**Handbook on Green Financing Models for Municipal Infrastructure and Vehicle Fleets**" and "**Handbook for origination and commercialisation of sustainable urban mobility project portfolio for green financing**", providing a comprehensive guide for municipalities to navigate the complex funding landscape

external financing was preferred for the vehicle costs which are required for the increase of capacity. The operation and maintenance processes' financing are conducted by İETT.

Since İstanbul Metrobüs is designed as a BRT with a dedicated median lane on the D-100 highway, there was no need for expropriation, but a total area of 32,560 m^2 has been covered, where the average length of the stations is 183 m, and the width is approximately 4 m. There are a total of 6 depot areas in İstanbul Metrobüs system, and the total area of the depots of İstanbul Metrobüs is 135,454 m^2. Approximately 90% of the depot areas are under the status of İETT and treasury land, 5% are conditional donations, and 5% are purchased through expropriation. In this context, approximately 6,250 m^2 of the total depot areas, which is around 5%, was acquired through expropriation[30]. The land acquisition process was implemented by the Department of Building Facilities of İETT. Besides that, Property and Expropriation Unit and Metrobus Stationary Facilities Unit organised under this department specialized in land acquisition process. In Türkiye, expropriation by municipalities involves acquiring private property for public use under the Expropriation Law No. 2942. The process begins with a public interest decision by the municipal council. The area is then checked for compliance with zoning plans and necessary approvals are obtained by relevant departments of İETT and IMM. Property value is assessed based on expert reports and market conditions. İETT attempts to purchase the property through negotiation. If an agreement isn't reached, an expropriation decision is made, and the value is determined by the court. Upon payment, the property is transferred to the İETT and registered in the land registry. Property owners can appeal the process in administrative courts to ensure legality. However, administrative court process is long-lasting, leading to significant delays.

There are various options for international financing and two international examples are listed below:

- **Vienna**[31]: Every company in Vienna that employs one person or more is required to pay the **"metro tax"** (Dienstgeberabgabe). The levy provides a financial cushion to support the upkeep and growth of the metro system in the city. It is two euros a week per employee, with some groups (older people, people with disabilities, part-timers) being exempt.

- **Ahmedabad**[32]**:** The largest municipality in the state of Gujarat, Ahmedabad, issued **municipal bonds** in January 2019 to generate 200 crore Indian rupees (INR) ($26,2 million as of April 23, 2020) for "green projects." The ability of municipal bonds to contribute to the financing of climate-resilient urban development is demonstrated by Ahmedabad's success in raising capital through these instruments.

[30] **İstanbul Metrobüs**: first intercontinental bus rapid transit. Journal of Transport Geography (Alpkokin, P., & Ergun, M., 2012), available at: https://www.sciencedirect.com/science/article/abs/pii/S0966692312001548

[31] Wuppertal Institute

[32] **Case Study, Ahmedabad** issues municipal bonds to implement green projects, available at https://southasia.iclei.org/wp-content/uploads/2021/09/Ahmedabad-Green-Municipal-Bond-Case-Study-2.pdf

Like any major transport projects, BRT projects need to secure financial security by following two main directions (see also **Figure 5**):

- **Increase budget**: Increasing the public budget through diverse revenue streams is one of the strategies. **Local revenues** can be enhanced by leveraging project-related income, such as farebox revenue, advertising, and commercial activities at stations. Implementing **Land Value Capture (LVC)** mechanisms can also significantly boost local funding. By capitalizing on the increased property values around BRT corridors, municipalities can channel a portion of this uplift into the project. **National funding**, often through governmental grants or subsidies, provides another critical layer of support, ensuring alignment with broader national transport policies. Additionally, **European Union funding** and other external sources, such as international financial institutions, can offer substantial grants or concessional loans, reducing the financial burden on local governments. Municipalities can also explore debt mechanisms to finance BRT projects. Municipal bonds, including green bonds, represent a viable option for raising capital.

- **Reduce costs:** To reduce the direct costs of BRT projects and services, private sector involvement plays a crucial role. **Public-Private Partnerships** (PPPs) can be structured to share both the risks and rewards of the project, allowing municipalities to benefit from private sector efficiency and innovation while minimizing upfront public expenditure.

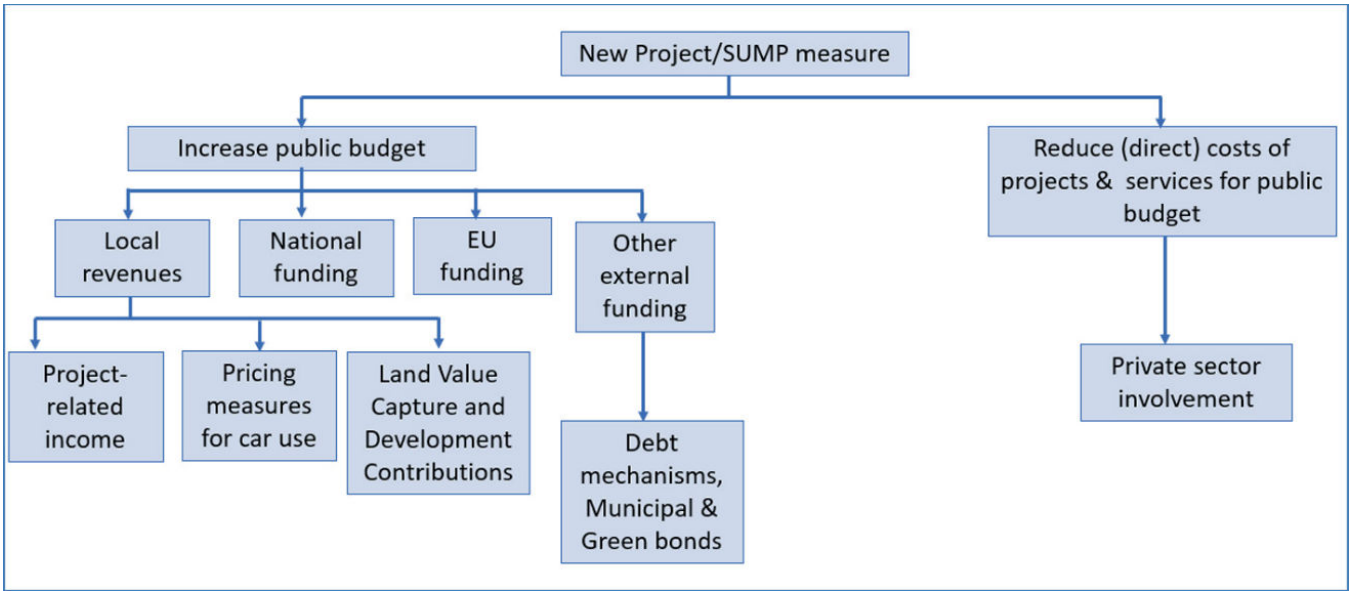


Figure 5: Role of financing in achieving sustainable urban mobility[33]

[33] Towards User-Centric Transport in Europe

Actions for BRT implementation

A56) For the **physical components of the BRT** system (roadways, stations, depot), plan for road space reallocation prioritizing high-quality spaces for active mobility (walking and cycling) and public transport, take existing assets into account, ensure safe and suitable crossings for people, and comply with standard for detailed design.

A57) Ensure **priority to public transport** (BRT and connecting services) by traffic management tools - never give priority to personal motorized traffic.

A58) Opt for an **integrated traffic control and dispatch center** for the whole public transport network, including BRT.

A59) Assess specifications for the rolling stock in cooperation with manufacturers, PTOs and PTAs, consider **opting for available sustainable technologies**.

A60) Consider **economy of scale aspects** while deciding on purchase volumes, in cooperation with other cities or by including future option items in the contract.

A61) Identify **sustainability targets** for your city, derived from higher level goals, assessing best practices, utilize SUMI indicators to measure effectiveness of the BRT system.

A62) Prepare a **full package of projects**, with complementary measures supporting the BRT implementation.

A63) Before launching the package of projects, **reassess available funding and financing mechanisms**, rearrange the package to fit budget constraints (do not degrade technical content of the BRT project).

8. Annexes

Annex 1: BRT Complete Action Plan

The action plans for BRT are already presented separately at the end of Chapters 3,4,5,6 and 7. They are also given together below:

ACTIONS FOR POSITIONING:

A1) Identify the long-term vision, goals, specific objectives and measures the SUMP or other high level transportation strategy suggests for your city, with special regard to **targets** for a potential future Bus Rapid Transit system.

A2) Assess what **complementing measures and projects** are needed in your city for a successful BRT project implementation.

A3) In case not experienced with Sustainable Urban Mobility Planning, get prepared to utilize the logic of the **SUMP** planning cycle for BRT preparation.

A4) Identify of all **components** of a BRT system to be implemented.

A5) Assess how your city meets **external criteria** for a BRT system (inhabitants and density of the city proportional to the capacity potential of the BRT system).

A6) Assess how your city meets **internal criteria** for a BRT system (supportive decision making, political willingness to reform governing regulations, enough knowledge and expertise, capacity to handle such a complex project, flexibility to allocate the necessary time for a long preparation process).

A7) Assess to what extent a future BRT system can **change** the existing status quo in the mobility mix, once pull and push measures are implemented to incentivise sustainable mobility.

A8) Based on detailed assessment, **validate** that BRT is the right system for your city. Get prepared to be able to **convince** others, especially decision-makers.

ACTIONS FOR SCREENING:

A9) Ensure your city has the necessary mobility related **data** needed to assess the current situation of the public transport system.

A10) Ensure your city (or a related authority) has a responsible **team of experts**, skilled and prepared to manage a situation analysis to support decision making.

A11) Ensure your city (or a related authority) has a **unified transport model** to predict and assess future transport demand and compare project-ideas at a strategic level.

A12) Ensure your city has a clear process for **involving** all types of stakeholders (users, NGOs, local businesses, general public) in the development of future projects.

A13) Ensure that the results of a **qualitative assessment** of current public transport services are available for decision makers to get a clear picture of the status of the mobility system in your city.

A14) Identify existing **gaps to be filled** in the mobility system of your city.

A15) Create a comprehensive **list of development projects** for improving the mobility system in your city.

A16) Prepare the most effective **project packages of interventions** based on technical content, available budget and envisioned timing for improving the mobility system of your city.

A17) Decide on the **appropriate rapid transit technology** to be implemented in your city.

A18) Be aware of how the existing or planned rapid transit system in your city meets the general requirements of the BRT standard, also about how other systems in the world are ranked using the same scoring system, by filling in the **BRT Scorecard** of ITDP.

ACTIONS FOR BRT PROJECT PREPARATION:

A19) Identify and **inspire a key political official** to realize the importance of BRT.

A20) Identify and **involve stakeholders** as allies to motivate decision making about BRT.

A21) Propose BRT to become part of the **political agenda** of elected officials directly, or indirectly by flagship BRT in the strategic portfolio (SUMP or Transport Master Plan).

A22) **Raise awareness** of a wider group of decision-makers by arranging study tours and site visits to best international and local BRT examples.

A23) Create and update **communication and participation strategy** for your BRT project.

A24) Prepare **evidence and fact sheets** about and beyond BRT for officials to dare making decisions resulting in change of the status quo, supporting their communication.

A25) **Engage civil society** as soon as possible in the BRT planning process to gain acceptance or even co-create several elements of the project (do not only listen to the loud minority but reach out to the silent majority).

A26) **Build capacity** for municipal agencies, educate and train employees.

A27) **Assess existing legislation**, identify gaps and propose amendments and additions, if necessary to ensure compliance with laws and regulations on transportation, land use, environment and other related disciplines.

A28) **Establish a BRT team** with a clear mandate, all necessary competencies, knowledge and experience, consisting of engineers and staff proficient in liaising with public officials, stakeholders and transport industry players.

A29) Assess the need for **involving experienced consultants** to complement internal knowledge and resources, select contributing partners in a transparent and competitive manner.

A30) Decide on **arranging project management** within an existing organization or a new external entity, set up a dedicated project office accordingly, with the potential flexibility to grow with time and the maturity of the project.

A31) Ensure **decision power for the project head**, also access to key decision-makers in case a decision is necessary beyond this mandate.

A32) **Determine the estimated cost** of the whole project at a very early stage (by comparison with other cities, adjust to specific local factors, and benchmarking against other projects), identify available and accessible funding.

A33) Decide on the **project scope** to fit the available funding, without limiting the technical specifications (therefore the level of service) of the BRT system. Divide the project into lots or phases in case of budget constraints.

A34) Allocate **adequate budget, time and resources for planning** of the BRT system and all critical preparatory tasks (permitting, land acquisition, etc.)

A35) Estimate **capital expenditure (CAPEX)** of the BRT project, considering all relevant preparatory, infrastructure and fleet related costs.

A36) Estimate **operating costs (OPEX)** of the BRT project, including maintenance, and set up an adequate business model.

A37) Develop a **targeted communication plan** about the BRT project, addressing both internal and external audiences, engaging both spectrum of stakeholders.

A38) Employ **diverse participatory methods** to foster an open, transparent and active cooperation environment.

A39) Create a clear **marketing** strategy, following the stages of branding.

A40) Develop a detailed project **work plan and timeline**, based on experience and best practices, including public communication and education, and always referring to the big picture, especially in cases the project is divided into lots or phases.

A41) Create a **shortlist of potential contributors** by inviting interested firms and individuals to declare their Expression of Interest for the BRT project.

ACTIONS FOR BRT OPERATIONS DESIGN:

A42) Collect **basic data** about the existing public transport services of the city, which will be the input for origin-destination matrices for transport modelling.

A43) Utilize a **strategic transport model** to predict expected travel demands, assess possible scenarios and optimize proposed BRT network.

A44) **Consult** the proposal with experts, officials, general public and decision-makers and BRT routes and corridors.

A45) **Ensure integration** of the BRT system with other transport modes of the city, review and reorganize existing transport services to achieve a fully harmonized urban transport system with BRT as the backbone.

A46) Build up a **business model** for BRT operation, identify the most fitting contractual framework and develop a detailed procurement plan.

A47) Develop necessary conceptual and preliminary designs of the BRT system, conclude it in a **feasibility study**.

A48) Ensure **accessibility** to all elements of the BRT system for masses of customers, setting the needs of vulnerable user groups and customers with special needs standard requirements for planning.

A49) Ensure **safety and security** for the whole mobility chain (the BRT system itself, connecting services, first mile and last mile options).

A50) Develop a **green and resilient environment** for users of the BRT system, especially at locations with longer waiting times or changing modes of transport.

A51) Create a **brand and communication** requirements for the entire BRT system, taking user groups with special needs into account.

A52) Ensure **access to all relevant, static and real time information** for general people (customers and non-customers), make core information available in English for foreigners.

A53) Ensure **automated data collection** about the usage of the BRT system, in compliance with personal data protection principles.

A54) Ensure proper **maintenance** of all parts of the entire BRT system, keeping standards high by competitive and separated procurement.

A55) Ensure proper **enforcement** of rules and regulations related to the usage of the BRT system.

ACTIONS FOR BRT IMPLEMENTATION:

A56) For the **physical components of the BRT** system (roadways, stations, depot), plan for road space reallocation prioritizing high-quality spaces for active mobility (walking and cycling) and public transport, take existing assets into account, ensure safe and suitable crossings for people, and comply with standard for detailed design.

A57) Ensure **priority to public transport** (BRT and connecting services) by traffic management tools - never give priority to personal motorized traffic.

A58) Opt for an **integrated traffic control and dispatch center** for the whole public transport network, including BRT.

A59) Assess specifications for the rolling stock in cooperation with manufacturers, PTOs and PTAs, consider **opting for available sustainable technologies**.

A60) Consider **economy of scale aspects** while deciding on purchase volumes, in cooperation with other cities or by including future option items in the contract.

A61) Identify **sustainability targets** for your city, derived from higher level goals, assessing best practices, utilize SUMI indicators to measure effectiveness of the BRT system.

A62) Prepare a **full package of projects**, with complementary measures supporting the BRT implementation.

A63) Before launching the package of projects, **reassess available funding and financing mechanisms**, rearrange the package to fit budget constraints (do not degrade technical content of the BRT project).

Annex 2: Actors of BRT Implementation

The actors and stakeholders of BRT implementation are explained further after giving them briefly under Chapter 2.2:

Who needs to act in Türkiye?

When considering the introduction of such a complex public transport system as BRT in a city, an accurate **stakeholder map** is to be drawn to clearly represent all responsible stakeholders in the whole process, especially for the following major steps:

- **Strategic planning** and preparation of decision making (ensuring compliance with high level vision and sustainable goals)
- **Technical project preparation** (harmonised with other development ideas, ensuring compliance with technical standards)
- **Financial project preparation** (search for available funding, building a viable financing model for planning, implementation and operation phases)
- **Project implementation**
- **BRT operation** and maintenance (including enforcement)

Strategic planning and preparation of decision making

- In Türkiye, local authorities are responsible for urban transportation and urban planning: according to Law No. 5393 on Municipalities and Law No. 5216 on Metropolitan Municipalities, these institutions are obligated to plan, regulate, and finance the city's transportation infrastructure and public transport services. Municipalities regulate urban transportation services, including land-use plans and public transport, and can delegate these responsibilities regarding the service provision to third parties, when necessary, as well as borrow for financing. As stated in Article 6 of the By-Law on the Principles and Procedures for Increasing Energy Efficiency in Transportation[34], municipalities with a population higher than 100,000 prepare transport master plans, as well. Metropolitan municipalities have obligations also to establish UKOME. Limited outstanding legislation related to promoting **public transport** is as follows: According to the Spatial Plans Preparation By-Law, transportation master plans **prioritize public transport** and provide solutions for integrating various transportation modes, aiming to reduce vehicular traffic and prioritize public transport systems in urban planning. Main and sub-centres are

[34] By-Law on the Principles and Procedures for Increasing Energy Efficiency in Transportation, (2004), available at: https://www.resmigazete.gov.tr/eskiler/2019/05/20190502-5.htm

planned considering accessibility via public transport, bicycle lanes, and pedestrian pathways.

- By-Law on Procedures and Principles Regarding Increasing Energy Efficiency in Transport outlines measures for local authorities to **encourage public transport usage**, increase investments in rail systems, build bicycle lanes and parking areas, thereby enhancing energy efficiency and promoting healthy urban transportation.

There is no direct law or by-law specifically focusing on public transport systems in Türkiye (the By-Law on Procedures and Principles Regarding Increasing Energy Efficiency in Transport primarily targets urban transportation and public transport services, yet it does not provide a clear roadmap or comprehensive framework for what needs to be done to achieve sustainable urban transportation), therefore, there is a need for more **specific and detailed legal framework to improve public transport**.

In cases of very complex public transport projects – such as BRT –, involving expertise and stakeholders – besides public transport – other modes of transport, land use planning, city development, energy grids, intelligent technologies, data science, digitalisation, environment, etc., for a successful outcome it is essential to enable the involvement of all stakeholders from the very beginning of strategic planning. The SUMP framework was created to enable this **integration and cooperation** of stakeholders, therefore providing common ground to compare competing development ideas. SUMPs in Türkiye – on the other hand – are only considered as plans (similar to Transportation Master Plans) required by Municipalities to be prepared, the Sustainable Urban Mobility Planning process has yet no supporting legislation, therefore the above-mentioned **integrated approach can be a challenge**. Thanks to recent efforts of the SUMP Türkiye project, the European Mobility Week campaign, and other activities, there is a growing interest and understanding of the SUMP logic, therefore, there is a need for a **SUMP-related policy development to be introduced on the national level (the SUMP Türkiye project is preparing a White Policy Paper for that purpose by 2025).**

Technical project preparation

In Türkiye, **Municipalities** follow **steps of classic project management**, when implementing urban transportation projects, including public transport, using their own financial resources:

- The process of public transport investment begins with a **needs analysis** and planning phase, during which municipalities thoroughly examine transportation needs and plans, and identify projects focusing on public transport.

- Subsequently, **project development and feasibility studies** are conducted. Projects are evaluated from technical, economic and social perspectives, and feasibility studies are carried out.

- In the stage of **identifying financing sources**, budget planning is conducted, borrowing options are evaluated, and applications for grants/funds are made.

- During the **approval** process, projects are approved by the **municipal council**, and in some cases, approval from the central government may also be required. Approval from the **Ministry of Transport and Infrastructure** is particularly necessary for rail system projects aimed at public transport.

- During the project implementation and **procurement** phase, implementation plans are prepared, and the tender process is initiated.

- **Construction and implementation** begin, and inspections are carried out during this phase. Upon completion and commissioning of the project, projects are finalized and put into service.

- Finally, in the **maintenance and operation** phase, project maintenance is performed, and operation is ensured. In cities other than İstanbul, Ankara, and İzmir, bus operations are managed by municipalities. In these three major cities, the operations are handled by the **General Directorates of İETT, EGO, and ESHOT** respectively, which do not receive shares from the central government but cover their expenses through their own revenues or support from the metropolitan municipalities in the form of loans and grants.

Metropolitan municipalities have directorates responsible for the processes of providing urban mobility projects. Moreover, the Transportation Coordination Unit, under UKOME, operates within metropolitan municipalities. It conducts initial studies for the metropolitan transportation plan, aligning with land use and transportation planning within the master plan boundaries and neighbouring areas. The findings are then presented to the board. On the other hand, provincial municipalities have mostly sections for providing urban mobility services. Despite some progress in major cities, **sufficient units for public transport have not been established** across municipalities of Türkiye. This lack is especially acute in provincial municipalities, leaving them very inadequate to handle growing urban populations and effectively manage public transport systems.

The classic bottom-up project management approach bears a risk of producing "silo-projects" as outcomes – these may suggest solutions for specific transportation-related needs, but very likely will not be compliant to overall sustainable requirements. In the case of BRT, transportation needs are core questions, however, without taking other disciplines (such as urban development, energy, environmental issues etc.) the success of such project remains questionable. Municipalities responsible for technical preparation of complex transportation projects (such as BRT) are invited to follow the SUMP-process, **involve all relevant stakeholders from the beginning of the planning**. Allocating the necessary extra time and energy for this exercise will pay off during the operational phase.

Financial project preparation

The responsibility for municipal mobility projects related to public transport services requiring **external finance** involves several key actors (see the Figure of Process of providing urban mobility projects in Türkiye):

- **Metropolitan municipalities** are tasked to prepare Transportation Master Plans (TMPs) or Sustainable Urban Mobility Plans (SUMPs), obtain approval from authorized bodies for urban mobility projects, and submit feasibility reports, including social, economic and financial analyses, to the Ministry of Transport and Infrastructure (for rail projects that are subject to technical approval), Presidency of Strategy and Budget and Ministry of Treasury and Finance.

- **Ministry of Transport and Infrastructure**, in turn, reviews and approves projects (only rail projects) and specifications.

- **The Presidency of Strategy and Budget** evaluates the social, economic and financial feasibility of projects, ensuring their alignment with national economic and social policies, prioritizing them, and allocating resources accordingly.

- **İLBANK** serves as a financial intermediary for externally financed urban transport projects, providing technical assistance in project implementation.

- **Ministry of Treasury and Finance** evaluates loan terms and conditions, approves loan agreements, and oversees loan disbursement for these projects. Through collaboration among these entities, municipalities can effectively plan and execute externally financed mobility projects in Türkiye.

Project implementation

In Türkiye, municipalities follow specific steps when implementing public transport projects, including BRT systems. The design phase of the public transport projects, including BRT systems, begin with preliminary design, which involves creating initial layouts of the public transport corridors, stations, and their integration with existing transportation networks. This is followed by detailed design, where comprehensive engineering designs are developed, including the layout of bus lanes, station designs, signalling systems, and the integration with other transport modes. An Environmental Impact Assessment (EIA) process (if required) is then conducted to identify and mitigate any potential negative impacts on the environment. The implementation phase encompasses several key steps, starting with procurement, which involves processes for acquiring construction contracts, bus fleets, and technology systems, often including tendering to select contractors and suppliers. During the construction phase, the dedicated bus lanes, stations, and necessary infrastructure are built, and technology for fare collection and traffic management is implemented. Finally, before the system becomes operational, extensive testing and commissioning are carried out to ensure that it meets safety and performance standards. These processes are managed by the Transport Departments/Divisions of the municipalities, and in the municipalities with municipal affiliated organisations like EGO, İETT and ESHOT, in cooperation with these organisations.

İstanbul Metrobüs system is a corridor-based BRT project, which was conducted by IMM Road Maintenance and Infrastructure Coordination Department. The project implementation consists of three main areas: constructing dedicated BRT lanes, reorganizing public and secondary transport lines, and improving highways. The project preserved three mixed traffic lanes per

direction by utilizing central reservations, service roads, and emergency lanes, despite some safety concerns. The system included lanes, junctions, pedestrian overpasses, and stations. During this process, due to the D100 highway being under the authority and responsibility of the General Directorate of Highways, the need arose to include the section of the D100 highway that intersects with the İstanbul Metrobüs route within the authority and responsibility of IMM. The issue was resolved through a protocol with the KGM, transferring the authority and responsibility of the İstanbul Metrobüs route section to the IMM, except for the bridge crossing. On the other hand, design process of İstanbul Metrobüs project was also conducted by IMM Road Maintenance and Infrastructure Coordination Department. The design process included planning elements such as stops and their locations, and separated roads. A significant focus was placed on constructing overpasses and stairs to ensure safe pedestrian passage at heavily trafficked points.[35]

The processes of providing urban mobility projects in metropolitan and provincial municipalities are summarised in the below figure:

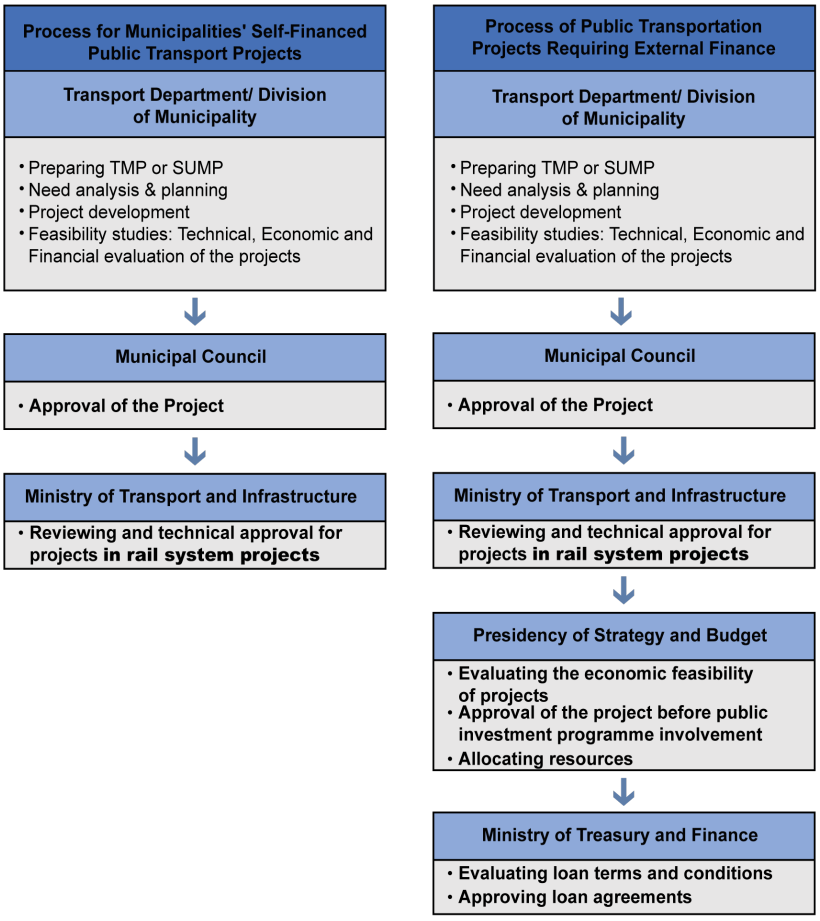


Figure 6: Process of providing urban mobility projects in Türkiye

[35] Alpkokin, P., & Ergun, M. (2012). **İstanbul Metrobüs: first intercontinental bus rapid transit. Journal of Transport Geography**, available at https://www.sciencedirect.com/science/article/abs/pii/S0966692312001548

BRT operation and maintenance

The operational process of public transport projects in Türkiye, including BRT systems, involves a multifaceted approach encompassing operational planning, financial management and organizational oversight. The operational processes of public transport projects are managed by the relevant departments of municipalities or special subsidiaries such as İETT, EGO, and ESHOT, using their own resources and personnel. These institutions own buses and other public transport vehicles, and the vehicles are typically maintained and repaired in the administration's own garages. Vehicle maintenance and repairs are carried out by the administration's own staff or staff of private maintenance companies, ensuring continuous and effective upkeep. Additionally, these institutions employ drivers and technical personnel within their own organizations, and this staff operates according to operational plans set by the administration. The planning and operation of public transport services are also managed by the administration, providing higher control and the ability to offer customized services. [36]

[36] Güldüler, E. S. (2022). **Kent içi toplu ulaşımın operasyon ve bakım uygulamalarında yeni model arayışları**. İDEALKENT, available at, https://dergipark.org.tr/en/download/article-file/2217941

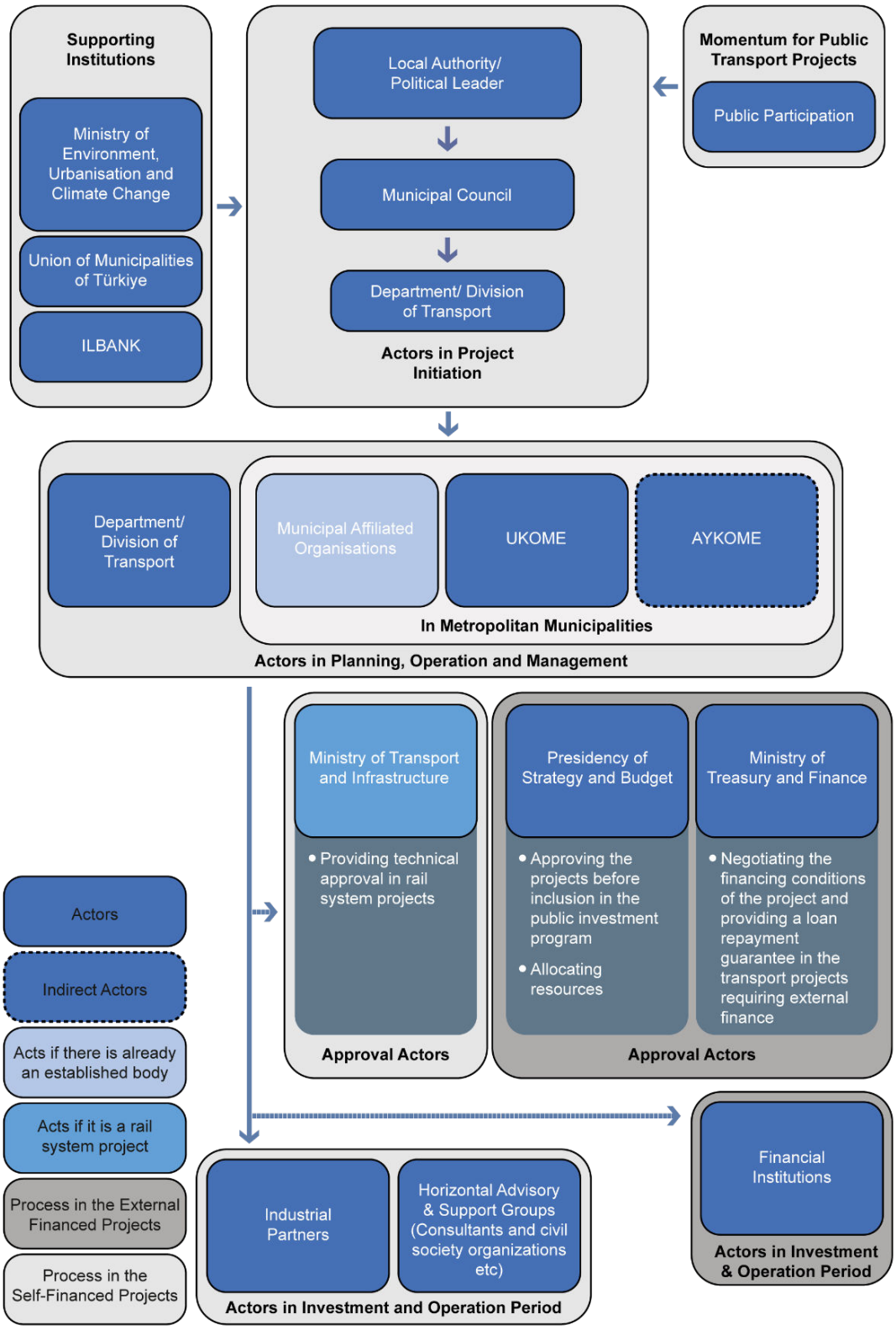


Figure 7: Stakeholder Map for Public Transport Projects in Türkiye

Annex 3: BRT systems worldwide

The following examples provide an overview of BRT systems in various world contexts and show concretely their specific characteristics. BRT can be implemented considering different challenges, needs, demands, priorities and local and context conditions as was also explained in Chapter 4.2.

Box 1 BRT İstanbul, Turkey

Since its establishment in 2007, **İstanbul's Metrobüs** has been a key player in the city's transportation landscape as well as becoming the first and only BRT system in Türkiye. Covering 52 kilometers with **fully segregated lanes (excluding the bosphorus connection)**, it offers rapid and convenient travel along its single corridor. With an average of 900,000 passengers per day, İstanbul's Metrobüs system operates at a speed of 35 kilometers per hour, efficiently serving the diverse needs of the city's population (BRT Data, 2024). According to EMBARQ's cost benefit analysis of İstanbul BRT, the biggest benefit of the system is travel shortening of their duration. This was followed by reduction in bus operating costs and improvements in road safety followed (EMBARQ, 2013).



Box 2 BRT Lagos, Nigeria

Lagos encounters several transportation hurdles such as traffic jams, rundown vehicles, overcrowding, unclear and unreliable stops, as well as fluctuating and unregulated fares. The BRT Lite system aimed to address these issues by introducing consistency, reliability, safety, and efficiency to the public transport network (infrahub, 2023). Accordingly, **Lagos** introduced its Metrobús system in 2008, providing a vital transportation link across the bustling metropolis. Spanning 22 kilometers with **partially segregated lanes**, the system serves a daily average of 200,000 passengers. Operating at a speed of 30 kilometers per hour, Lagos' Metrobús offers a convenient and accessible mode of travel, albeit facing challenges typical of a rapidly growing urban environment (BRT Data, 2024).



Box 3 "Transmilenio", BRT in Bogotá, Colombia

Bogotá's BRT "Transmilenio", established in 2000, is the most famous BRT system in the world and boasts an extensive network spanning 114 kilometers with 11 lines or corridors. With **fully segregated lanes**, it ensures efficient and reliable transportation for its average daily ridership of 1.84 million passengers. Operating at an impressive speed of 27.2 kilometers per hour, Bogotá's Metrobús is a vital component of the city's public transit system, providing connectivity and accessibility to residents and visitors alike (BRT Data, 2024). Bogotá boasts pedestrian pathways, with 8 out of 13 terminals conveniently accessible by bicycle. (Duarte & Rojas, 2012).



Box 4 Electric BRT in Nantes, France

Established in 2006, the **Nantes Metrobús** system has swiftly become a cornerstone of the city's public transport network. With a line length extending 12.9 kilometers across two corridors, it caters to an average of 47,400 passengers each day. Operating at a comfortable speed of 21 kilometers per hour, the Metrobús navigates along segregated busways or bus-only roadways, ensuring smooth and efficient travel for commuters. Moreover, in one of the unique feature that Nantes has is that they are using electric buses and the e-bus system introduced by Nantes Métropole has been honored with the UITP Award in the "Operational and Technological Excellence" category. Nantes' commitment to sustainable mobility is exemplified by its **modern and reliable** Metrobús system, which plays a pivotal role in facilitating urban connectivity and accessibility (BRT Data, 2024).



Annex 4: Lessons learned from İstanbul Metrobüs (BRT) System

To be able to design a BRT system in Turkish context, it is important to examine the first BRT system in Türkiye: İstanbul Metrobüs. In Chapter 7.6, the finance and funding related aspect of İstanbul Metrobüs were given and in the annex, İstanbul Metrobüs case is explained with general features as well as how to avoid mistakes in the future.

Best practice in a nutshell

İstanbul Metrobus system, the only BRT project case in Türkiye, was inaugurated with the opening of the 18.3 km line, which began construction at the beginning of 2007 and was completed in just eight months, in 2007. This line reduced the travel time between Topkapı and Avcılar from 67 minutes to 22 minutes. The second phase, the Zincirlikuyu segment, was opened in September 2008, increasing the number of stops to 25. The third phase, the Söğütlüçeşme line, was opened in March 2009, connecting the two sides of İstanbul in the shortest route and reducing the travel time between Avcılar and Söğütlüçeşme to 63 minutes. The fourth phase, the Avcılar-Beylikdüzü line, was opened on July 19, 2012, making the total line 52 km long with 44 stations, and the average travel time on the Beylikdüzü – Söğütlüçeşme line became 83 minutes. In 2023, there was an average of 900,000 daily trips on this line. To increase capacity and service comfort, a total of 252 Euro VI vehicles were procured and put into service in 2022 and 2023.[37]

İstanbul Metrobüs system was introduced as a response to severe urban congestion exacerbated by a rapidly growing population and increasing private car ownership. The primary target was to alleviate traffic congestion and improve public transport efficiency. The BRT system now spans 52 km, carrying approximately 900,000 passengers daily. It features dedicated lanes taken from private car use, providing a high capacity with a peak hour frequency of 15-20 seconds, double-articulated buses. In 2012, upon the completion of all stages of the İstanbul Metrobüs system, passengers experienced significant time savings, averaging 132 minutes per day and 34 days annually per passenger, additionally, the system achieved a daily reduction of 623 tons in CO_2 emissions.[38] This project was a successful "quick fix" solution that improved public transport capacity and reduced congestion while other long-term rail projects were delayed.[39]

[37] **İETT 2023 Annual Report**, available at: https://İETT.İstanbul/BBImages/Slider/Image/2023-i%CC%87ett-faali%CC%87yet-raporu.pdf
[38] **İETT 2012 Annual Report**, 2013.
[39] **Transforming Cities With Bus Rapid Transit (BRT) Systems**: How To Integrate BRT?, 2019, available at: https://www.uitp.org/publications/transforming-cities-with-bus-rapid-transit-brt-systems/

How to avoid major mistakes?

With the İstanbul Metrobüs project, the primary goals were to reduce travel times and increase passenger comfort. Additionally, one of İETT's main objectives is to use the Metrobüs line more effectively and efficiently while improving operating conditions. Successfully, travel times have been reduced, and passenger comfort has increased. The number of journeys, which was 176 million in 2010, rose to 287 million in 2023. On the other hand, the experience of İstanbul Metrobüs system has yielded numerous valuable lessons, the main one being the necessity to find fast and flexible solutions to the problems encountered during the project. Other lessons learned are as follows:

- Conducting detailed cost and needs analyses at the project's inception is essential for realistic and sound budget planning, contributing to long-term financial sustainability.
- Recognizing the necessity for a transparent approach to external financing processes and developing open financial strategies is vital.
- It is important to make realistic and detailed demand forecasts. The unexpectedly rapid adoption of the İstanbul Metrobüs system resulted in a rapid and significant increase in the number of passengers, necessitating the acquisition of vehicles with higher capacity and speed than planned.
- Ensuring accessibility to Metrobüs lines through the construction of overpasses and staircases at high pedestrian traffic points is essential.
- Developing accident prevention and mitigation systems is important to ensure a safe travel experience for passengers.
- The selection of durable and long-lasting materials is critical.
- Implementing continuous improvement processes based on passenger feedback ensures the BRT system remains user-focused and fosters public acceptance of the new system.[40]

[40] Obtained from interviews with IMM

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