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AS-H02

HOW TO UNDERTAKE RAPID TRANSIT ALTERNATIVES ASSESSMENT

An overall framework for identifying, evaluating and selecting the appropriate rapid transit alternative including alignment, mode and operating environment.

Type: Step-by-Step Guide

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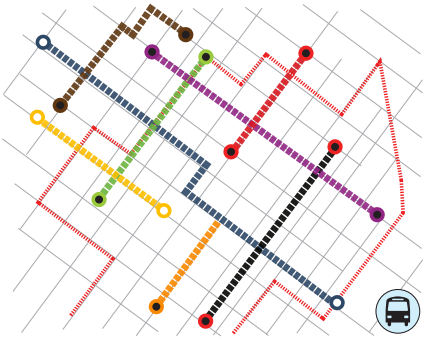
Disclaimer: *The Transit-Orientated Development Implementation Resources & Tools knowledge product is designed to provide a high-level framework for the implementation of TOD and offer direction to cities in addressing barriers at all stages. As the context in low and middle-income cities varies, the application of the knowledge product must be adapted to local needs and priorities, and customized on a case-by-case basis.*

01 DEVELOP INITIAL RANGE OF ROUTE & MODE OPTIONS

Use (A) **PRELIMINARY REFERENCE CRITERIA** to map initial corridors and collect feedback on it from political stakeholders, municipal & transit agencies and the public.

- People and Jobs Density
- Destinations and Land Uses
- Potential and Desired Connections
- Existing Recommendations
- Viable Modes



DATA SOURCES

- Satellite Imagery
- Statutory Policy and Plan Documents
- Existing Transport Studies
- Field Surveys
- Stakeholder Workshops

STAKEHOLDERS

Primary:

- Transit Planning/ Urban Planning Agency

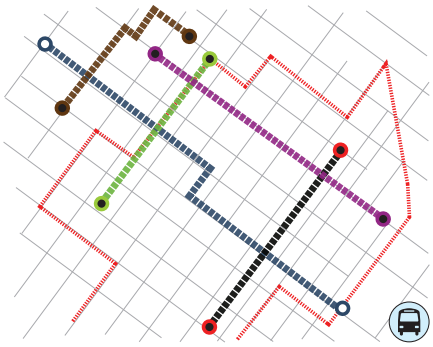
Secondary:

- Formal and Informal Transit Operators
- Land Use Planners, Environmental Planners
- Housing, Infrastructure, and Transportation Departments
- Neighborhood/ Community Organizations

02 UNDERTAKE INITIAL SCREENING

Use (B) **CORRIDOR SCREENING CRITERIA** to perform initial screening of the corridors identified in step 1

- City Vision and Goals
- Transportation Demand
- Ease of Implementation
- Community Building



DATA SOURCES

- Satellite Imagery
- Existing Census Data
- Population /Employment Projections
- Statutory Policy and Plan Documents
- Land uses and nodes along corridor

STAKEHOLDERS

Primary:

- Transit Planning Agency

Secondary:

- Formal and Informal Transit Operators
- Land Use Planners, Environmental Planners
- Housing, Infrastructure, and Transportation Departments
- Neighborhood/ Community Organizations

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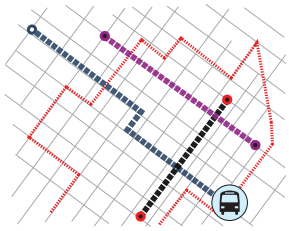
03-A UNDERTAKE DETAILED CORRIDOR SCREENING

Use B **CORRIDOR SCREENING CRITERIA** to undertake detailed screening of the corridors shortlisted in step 2.

- City Vision and Goals
- Transportation Demand
- Ease of Implementation
- Community Building



03-B UNDERTAKE TECHNOLOGY/ MODE REVIEW

Evaluate transit technology based on:

- Potential Ridership
- Mode Capacity
- Cost Comparison

Refer to AS-A04

DATA SOURCES

- Transit Ridership Projections
- Statutory Policy and Plan Documents
- Land uses and nodes along corridor
- Environmental Assessment Reports
- Capital and Operating Costs
- Stakeholder Workshops

STAKEHOLDERS

Primary:

- Transit Planning Agency

Secondary:

- Political Leadership / Appointed Executives
- State or Federal Departments
- Funding Agencies
- Formal and Informal Transit Operators
- Urban Planning Agencies
- Land Owners and Potential Real Estate Developers
- Academic Institutions, Advocacy Groups

04 UNDERTAKE BUSINESS CASE

Undertake C **DETAILED COSTING COMPARISON** and develop a detailed Cost-Benefit Analysis

I	Establish base and projected case	Based on current and future demand
II	List Benefits	Including productivity savings, healthcare cost savings, regional economic and environmental benefits
III	List Costs	Including transit capital and operating costs, costs of changing institutional procedures and negative externalities
IV	Monetize Benefits and Costs	Assign $ value to as many benefits and costs as possible. Where needed, use an equivalence factor to assign $ value
V	Calculate Net Present Value	Annual net costs and benefits in each year to be discounted to current day dollars value; derive Benefit-Cost Ratio

DATA SOURCES

- Capital and Operating Costs
- Ridership and Total Trip Data
- Emissions and Fuel Data
- Public Expenditure Data

STAKEHOLDERS

Primary:

- Transit Planning Agency

Secondary:

- Political Leadership / Appointed Executives
- State or Federal Departments
- Funding Agencies

A PRELIMINARY REFERENCE CRITERIA

Develop a long list of alternatives, building upon the work previously undertaken by the city and incorporate additional consultation with various stakeholder groups. The following Criteria must be considered in defining the long list of alternatives.

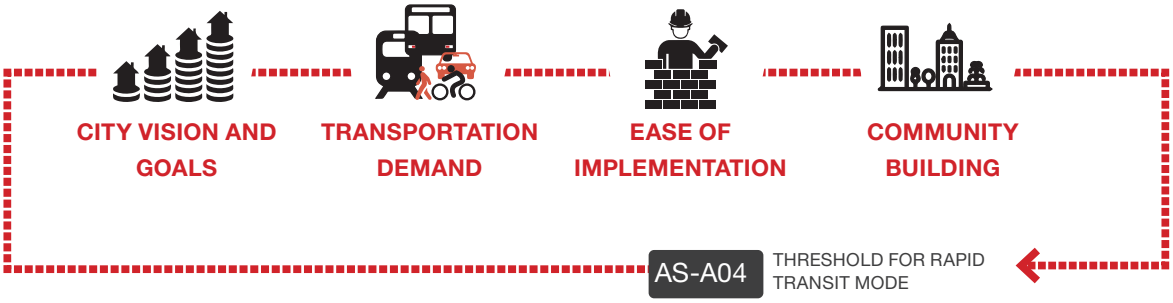
CRITERIA	MEASURE	IMPORTANCE
PEOPLE AND JOB DENSITY	**Density** of housing units and jobs identified through Census data and other surveys.	Areas with high population densities need Rapid Transit services to equitably fulfill mobility needs of all people.
DESTINATIONS AND LAND USE	**Major trip generators** within the city (weekdays & weekends) identified through destination mapping and land use maps.	Serving public destinations and high activity centers with Rapid Transit alleviates the potential for congestion and ensures optimum ridership.
POTENTIAL AND DESIRED CONNECTIONS	Identification of **existing and potential desired connections** measured from travel data and people's perception	Determine travel patterns using data from existing transit services or cab aggregators or congestion mapping.
EXISTING RECOMMENDATIONS	Review **recommendations from existing Plans and Policy Documents** and ensure they are still relevant & valid	Ensure that existing (and relevant) studies are reviewed and recommendations are considered in transit planning e.g. Transportation Master Plan, Master Plan, etc.
	Shortlist Viable Modes based on density thresholds AS-A04 THRESHOLD FOR RAPID TRANSIT MODE	Carry out a quick assessment of the most viable transit technologies and operating environment options for the city

DATA SOURCES

- Google Earth, Satellite Images, GIS Data, Worldwind, Marble, Virtual Ocean, Ossimplanet, GeoMappApp, OpenStreeetMap
- Statutory policy documents and relevant studies– Master Plan/ Development Plans/Transportation Master Plan
- Data from existing transit/busways/ private transit operators
- Field surveys
- Best practices
- Stakeholder workshops
- Public workshops

B CORRIDOR SCREENING CRITERIA

The intent of corridor-level screening is to evaluate the long list and short list of the corridor segment alternatives and advance those that demonstrate suitability for Rapid Transit. Corridor alignment alternatives need to be evaluated in parallel with mode and technology alternatives. The screening process described here is a two-step process, where initial screening criteria are suggested for evaluation of a long list of alternatives, followed by a detailed screening at a later stage of the shortlist of selected alternatives. Where required, cities may skip one level of screening depending on the availability of data and resources.



CITY VISION AND GOALS

CRITERIA	INITIAL SCREENING MEASURE	DETAILED SCREENING MEASURE
Growth Potential	Projected growth (10 year) within 500m in population density (person /ha) and employment density (jobs/ha). HIGHER IS BETTER	Supports growth management to focus high-intensity, mixed-use development in strategic locations; Supports transit-oriented development (Transit Villages), compatible with incentives for development along Rapid Transit corridors and at transit stations.
Economic Development	Connectivity to major growth centers, existing or proposed, within 500m of the corridor. HIGHER IS BETTER	Ability to attract and retain talent and influence long-term employment goals, improve business viability and attractiveness.
Mixed Use Development Potential	Areas that have a mix (2 or more) of land uses within a 500m buffer along the corridor. HIGHER IS BETTER	Land availability and market acceptance for new mixed-use development or redevelopment opportunities.
Land Value Capture Potential		Property value uplift along the corridor, increased attractiveness to live along the corridors, changes to parking and access.

DATA SOURCES

- Google Earth, Satellite Images, GIS Data, Worldwind, Marble, Virtual Ocean, Ossimplanet, GeoMappApp, OpenStreeetMap
- Census Data Existing
- Population /Employment Projections from Statutory Policy Documents & Relevant Studies
- Statutory Policy Documents & Relevant Studies – Master Plan / Development Plans / Transportation Master Plan
- Land Uses along corridor
- Key Nodes and Destinations
- Infrastructure Construction and Operating Costs
- Land Ownership Data

B CORRIDOR SCREENING CRITERIA

TRANSPORTATION DEMAND

CRITERIA	INITIAL SCREENING MEASURE	DETAILED SCREENING MEASURE
Transit ridership potential	Existing and projected population and job densities; existing transit ridership on existing services. HIGHER IS BETTER	Opening day and longer-term forecast of transit ridership projections compared to transit system capacity (persons/hour) of all modes on the mobility network.
Travel time improvement potential	Route length; average auto delay; maximum V/C Ratio; travel time (Auto vs Existing Transit). LOWER PERFORMING ROADWAY IS PREFERRED	Forecasted travel times to major trip generators, balancing transit and auto should show substantive improvements in travel time by transit compared to auto.
Existing transit network integration	Transfer points with existing transit network. HIGHER IS BETTER	Possibilities of integrating with local, rapid and regional transit systems, existing and planned, focusing on the highest potential for network reach and future expansion.
Transit service reliability		Right-of-way characteristics affecting reliability, frequency, quality, and flexibility of Rapid Transit service, including: o Availability of width for dedicated lanes/tracks o Intersections, restricted turning movements, and signalization
Support active transportation		Urban form characteristics that support active mobility choices such as walking, cycling and transit that are accessible and accommodate people of all abilities, including: o Block sizes and street connectivity o Availability of walking and cycling facilities
Safety of all corridor users		Road characteristics that allow for improvement to intersections, crossing locations and emergency vehicle access.

DATA SOURCES

- Statutory Policy Documents & Relevant Studies – Master Plan / Development Plans / Transportation Master Plan
- Existing Transit Ridership data - Boarding & Alighting Data
- Street Network in CAD, GIS, or any Transport Demand Modelling Software formats including ROW, Intersections, and Signalization Information
- Corridor Performance and/or Traffic Volume Data
- Data from Existing transit / busways / Private Transit Operators
- Accident Data

B CORRIDOR SCREENING CRITERIA

EASE OF IMPLEMENTATION AND OPERATIONAL VIABILITY

CRITERIA	INITIAL SCREENING MEASURE	DETAILED SCREENING MEASURE
Ability to Implement	Coordinated jurisdictional control under a single or few coordinated agencies. FEWER COORDINATION CHALLENGES ARE BETTER	Relative flexibility to implement the Rapid Transit network in stages.
Ease of Construction	Availability of Right-of-Way (ROW) and minimal immovable barriers. MORE SPACE IS BETTER	Number and complexity of construction challenges, including rail crossings, waterway crossings, sensitive or historical areas, sharp turns, right-of-way issues, utilities, or other construction challenges.
Financial Viability	Approximate annualized costs per person-km based on the type of operating environment and mode.	Rapid Cost-Benefit Analysis (CBA) comparing the cost of implementation and operations against revenue potential and quality of life benefits.
Property Impacts		Minimize the need for land acquisition or major land readjustment; undue negative impact on property ownership or property values.
Environmental Impact		Minimize impacts to designated environmentally significant areas, wetlands and provincially significant wetlands, fish habitat, woodlands and significant woodlands, significant valley lands, or environmentally sensitive areas, the habitat of endangered and threatened species and designated areas of natural and scientific interest

DATA SOURCES

- Statutory Policy Documents & Relevant Studies – Regional Plans, Environmental Studies
- Google Earth, Satellite Images, GIS Data, Worldwind, Marble, Virtual Ocean, Ossimplanet, GeoMappApp, OpenStreeetMap for Natural Features
- Infrastructure Alignment Data and Future Plans in CAD, GIS or other such format allowing for overlay analysis and identification of overlaps, interferences
- Land Ownership Data
- Property Valuation Data
- Capital and Operating Costs

B CORRIDOR SCREENING CRITERIA

COMMUNITY BUILDING AND REVITALIZATION

CRITERIA	INITIAL SCREENING MEASURE	DETAILED SCREENING MEASURE
Supports Inclusive Growth Objectives	Low/ middle-income neighborhoods who can benefit from affordable mobility choices to access key nodes and destinations HIGHER IS BETTER	Appropriate development potential with high affordability compared to planned growth, infill and intensification.
Connectivity to Neighborhoods and Business Areas	Higher neighborhood penetration and accessibility choices through a denser street network. HIGHER IS BETTER	Improved access to community amenities (schools, libraries, hospitals etc.), while maintaining vehicular access to residential and commercial properties and minimize vehicular infiltration of adjacent neighborhoods.
Intensification Potential	Corridors designated for growth and intensification are preferable, as they have the potential to intensify over time (TOD) and support ridership potential. HIGHER NO OF UNDERUTILIZED LOTS ARE PREFERRED	Availability of land for intensification within a 500m buffer of the corridor, including: o Parking lots, o Underutilized spaced o Dilapidated/end of life-cycle buildings o Transitional land uses, e.g. former industrial uses, etc.
Public Space and Amenities		Allow greater use of the public realm and improved aesthetics, enhance community connections, support safety and security through design and minimize impacts on existing public and private trees.
Cultural Heritage Impacts		Minimize impacts to built cultural heritage features and archaeological resources.
Climate Resilience		Resiliency to global warming trends (e.g. floods, droughts) following urban densification principles; impacts on air pollution and greenhouse gas (GHG) emissions.

DATA SOURCES

- Development Potential
- Property Valuation and Affordability Dats
- Population /Employment Projections from Statutory Policy Documents & Relevant Studies
- Statutory Policy Documents & Relevant Studies – Master Plan / Development Plans / Public Realm Plan
- Community nodes and destinations
- Heritage or Archaeological Data
- Air Quality Data
- Stakeholder Workshops

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C DETAILED COSTING COMPARISON

PROJECT CAPITAL COST

Capital costs are those required to install and launch each phase of the system and include equipment purchase, infrastructure cost and engineering and support costs.

HARD INFRASTRUCTURE COSTS	CURRENCY
Property Acquisition	
Civil Works	
Staging/Enabling Works	
Maintenance Facility/Yard	
Parking Facilities/Park & Ride Lots	
Structures	
Utility Relocation	
Streetscape Improvements/Placemaking	
Stations	
Electrical Power, Lines & Substation(s)	
Water Supply	
Signaling	
Operations & Control Centre	
SUB TOTAL A	
CONTINGENCY A1	~10%

SOFT INFRASTRUCTURE COSTS	CURRENCY
Engineering Design	
Construction Management	
Design Support (Construction Administration)	
Operating Agency Costs	
Program Management	
SUB TOTAL B	
CONTINGENCY B1	~5%

VEHICLE COSTS	CURRENCY
Capital Vehicle Costs	
SUB TOTAL C	
CONTINGENCY C1	~5%

TOTAL COST	CURRENCY
GRAND TOTAL (A+B+C)	
CONTINGENCY GRAND TOTAL (A1+B1+C1)	

FORECAST OPERATING COST & REVENUES

Operating costs are the cost to operate and maintain the system. These include hiring employees for operational tasks, as well as maintenance costs including purchasing tools and spare parts, upkeep of software, etc.

HARD INFRASTRUCTURE COSTS	OPENING YEAR	LIFECYCLE YEAR
Daily Ridership		
Annual Revenues		
Annual Operations & Maintenance		

Copacabana Beach, Rio de Janeiro, Brazil