

ŞANLIURFA BRT ROAD SAFETY AND ACCESSIBILITY PROJECT

Safe and Accessible Urban Transport

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Executive Summary

In April 2015, at the request of the Şanlıurfa Metropolitan Municipality, in Southeastern Turkey, EMBARQ Turkey conducted a road safety and accessibility inspection of the City's BRT (Bus Rapid Transit) corridor.

BRT, globally emerged as a result of efforts to improve the traditional bus system. It has been implemented in various cities worldwide and consists of a dedicated bus-only lane which allows for higher average speeds, system profitability, reliability, and passenger friendliness.

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According to Global BRT data, 191 cities operate BRT systems worldwide as of today. These systems have a total of 5,057 km in length and carry more than 31 million passengers per day (brtdata.org, 2015).

As a result of the increase in the population as well as growth in the downtown area, a higher capacity public transit system was needed to meet the demand for transportation in Şanlıurfa. In an attempt to improve local transportation, increase bus ridership, and relieve traffic congestion, the Şanlıurfa Metropolitan Municipality implemented a BRT system.

This present report was prepared to present recommendations for deficiencies and problems identified in the inspection of the Şanlıurfa BRT corridor. The recommendations provided in this report are the results of field work evaluations and office work regarding road safety and accessibility.

Road Safety Studies

2008 EC 96 coded European Union Directive road safety studies are collected under 5 headings:

- Road Safety Impact Assessment-RIA
- Road Safety Audit-RSA
- Network Safety Management-NSM
- Blackspot Management-BSM
- Road Safety Inspection-RSI

More detailed information on the studies above can be found on the following pages of the report.

Figure 1 Road Safety Studies under the 2008 EC 96 numbered EU Directive (EU, 2008)



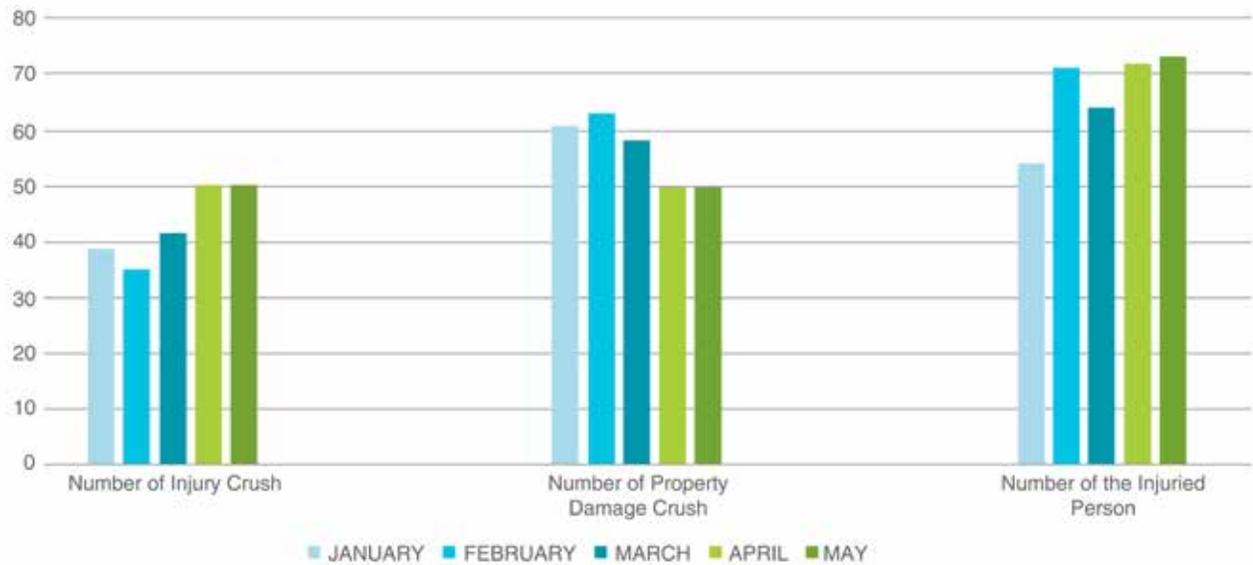
Data Analysis

The first section of this report includes data collection and evaluation. The goals of road safety studies are to assess deficiencies in the current system and suggest recommendations to address these issues and improve road safety. Despite the lack of sufficient data on traffic collisions for a more detailed analysis, EMBARQ Turkey conducted a general analysis and obtained the following results for year 2015:

- In January 2015, 40% of traffic collisions involved injuries and 60% resulted in material damage.

- In February, injury-related collisions decreased by 35% while collisions with property damage increased.
- Injury-related collisions increased in March, April, and May.
- In 2015, 69% of the traffic collisions occurred during the daytime.
- "AUTOMOBILE" motor vehicle collisions are ranked first with 218 incidents while "MOTORCYCLE" is second with 79 incidents in 2015.

Figure 2 Distribution of injuries and property damage in traffic crashes occurred in the first 5 months of 2015 (EMBARQ Turkey, 2015)



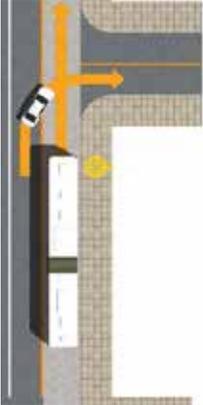
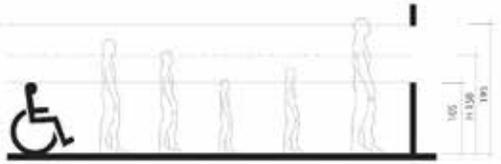
ROAD SAFETY AND ACCESSIBILITY INSPECTION

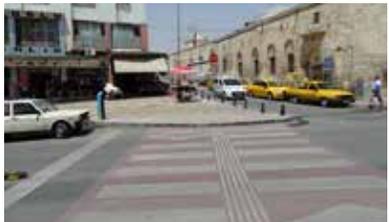
The second section of this report analyzes road safety and accessibility inspection. Results of these studies are categorized by general and specific problems of the system, and include recommendations to improve

or eliminate these issues. General problems are categorized as follows.

In addition to general problems, location-specific problems were also identified. These problems and the proposals can be found in the following pages of this report.

Problems and Deficiencies	Recommendations	Photos / Illustration
<p>Mid-block crossings used by motorcyclists for U-turns</p>	<ul style="list-style-type: none"> • Police enforcement • Infrastructural improvements • Staggered crossing should be placed 	<p>Figure 3 Staggered crossing (EMBARQ, 2012)</p>
<p>Illegal parking on sidewalks and on the BRT lane</p>	<ul style="list-style-type: none"> • Parking lots should be placed • Reducing the parking demand with higher prices • Clear markings should be placed (vertical, horizontal) 	<p>Figure 4 Illegal parking on the BRT lanes (EMBARQ Turkey, 2015)</p>

<p>Maintenance along the BRT corridor</p>	<ul style="list-style-type: none"> • Markings should be regularly maintained and made of a durable material 	<p>Figure 5 Delimitation between the BRT lane and mixed traffic lanes (EMBARQ Turkey, 2015)</p> 
<p>Trespassing of private vehicles on BRT lane</p>	<ul style="list-style-type: none"> • Enforcement • Pre-warning signs should be placed 	<p>Figure 6 Entrance of Abide intersection (EMBARQ Turkey, 2015)</p> 
<p>Right turns across bus lanes</p>	<ul style="list-style-type: none"> • Lower bus speed limits and should be placed raised pedestrian crossing • Barriers between bus and mixed vehicle lanes 	<p>Figure 7 Right turns across the bus lanes (EMBARQ, 2014)</p> 
<p>Misleading traffic signs from previous infrastructure</p>	<ul style="list-style-type: none"> • Old markings should be removed 	<p>Figure 8 Misleading traffic signs from previous infrastructure (EMBARQ Turkey, 2015)</p> 
<p>Lack of signs for the disabled</p>	<ul style="list-style-type: none"> • Hearable, touchable and readable signs and warnings for the disabled should be placed 	<p>Figure 9 Line of Sight (Dünya Engelliler Vakfı, 2011)</p> 

<p>Lack of parking lots for motorcycles and bicycles which leads to parking on the BRT and bus lanes</p>	<ul style="list-style-type: none"> • Assigning parking lot to motorcycles • High price policy to reduce the demand 	<p>Figure 10 Motorcycles parked on bus lanes (EMBARQ Turkey, 2015)</p> 
<p>Narrowed waiting areas and blocked access by street furniture</p>	<ul style="list-style-type: none"> • Street furniture should be replaced or removed 	<p>Figure 11 Street Furniture placed on bus stations (EMBARQ Turkey, 2015)</p> 
<p>Lack of bus driver training on road safety and other traffic issues</p>	<ul style="list-style-type: none"> • Road safety and safe drive trainings should be given to bus drivers 	<p>Figure 12 Access to BRT stations (EMBARQ Turkey, 2015)</p> 
<p>Pedestrians jumping over guardrails</p>	<ul style="list-style-type: none"> • The guardrails should be established with higher ones 	<p>Figure 13 The guardrails along the Atatürk Street (EMBARQ Turkey, 2015)</p> 
<p>Gaps along the guardrails</p>	<ul style="list-style-type: none"> • Guardrails should be established 	<p>Figure 14 Vulnerable road users - Balıklı Göl Street (EMBARQ Turkey, 2015)</p> 
<p>Need for more crosswalk in order to prevent illegal, hazardous crossings</p>	<ul style="list-style-type: none"> • Signal control should be placed • Raised pedestrian crossing should be placed 	<p>Figure 15 Pedestrian Crossings on BRT Lanes (EMBARQ Turkey, 2015)</p> 

ROAD SAFETY AND ACCESSIBILITY AUDIT

Road Safety Audit - RSA is the process of replanning and redesigning a project including the road safety components for all road users. RSA studies are carried out independently from yet in coordination with planning and designing teams and project executors.

This section includes suggestions for the Şanlıurfa BRT corridor to extend along Necmettin Cevheri Street. EMBARQ will conduct a comprehensive road safety audit as requested by the Şanlıurfa Metropolitan Municipality.

Safety Recommendations

Street Segments

In dense city centers of developing countries, pedestrians tend to cross and/or loiter in bus lanes. Moreover, pedestrians tend to consider bus lanes as safer than traffic lanes due to lower traffic volumes.

In urban environments, buses operate at relatively higher speeds and give pedestrians the least opportunity to cross over. The operating speed of buses and BRT systems is actually a performance indicator. However, increasing speed limits can cause greater risk for pedestrians.

While placing barriers and guardrails would decrease the risk, it would also limit accessibility for pedestrians and turn bus lanes into an urban

barrier. As a consequence, it is expected that pedestrians would simply jump over or damage the barriers and guardrails. In order to determine higher demand locations for crosswalks, EMBARQ Turkey suggests a comprehensive road safety inspection and accessibility study for the new corridor.

Intersection with Left Turn

In regard to road safety, each intersection infrastructure should be inspected and designed specifically. There are several planned intersection passing points along the BRT corridor to be constructed on Necmettin Cevheri Street.

Figure 17 Left turns across the bus lanes (EMBARQ, 2014)



Figure 16 Center BRT lanes with mid-block crossing on a urban arterial (EMBARQ, 2012)



Each left turn added to an intersection can cause a 30%-40% greater risk for incidents including pedestrian-vehicle conflict. Therefore, we suggest to only allowing left turns at locations that comply with the criteria below:

- High volume of left turn traffic is expected or traffic cannot be directed to adjacent streets.
- Areas with long blocks such as industrial areas or large campus areas.

Bus Stops

Bus stops carry the highest pedestrian volumes compared to any other point along the bus corridor due to oncoming traffic. Due to risky behavior, such as running a red light, and increased exposure, pedestrian conflict is greater at bus stops .

Design and layout of stops may influence such behaviors. Closed stations with high platforms can reduce red light infractions as opposed to open stations with low platforms.

Next Steps to be followed are:

- "Safe Driver Training" for BRT drivers, and "Traffic Safety raining" for law enforcement officers affiliated to the Şanlıurfa Provincial Security Directorate.
- RSA Study for the BRT and feeder bus service by independent road safety inspectors.
- Evaluate the Mexico City BRT Line 4 as a "Good Practice Example".

Figure 18 Center BRT lanes with mid-block crossing on a urban arterial (EMBARQ, 2012)



GOOD PRACTICE: MEXICO CITY BRT
LÍNEA 4, BUENAVISTA - SAN LÁZARO - AEROPUERTO



As a part of the report, “Mexico City BRT Line 4: Buenavista - San Lázaro – Aeropuerto” shared as a good practice from Mexico with the most similar use as the Şanlıurfa BRT. Latin American countries first operated BRT in Curitiba, Brasil. The Mexico City BRT Line 4 shows similarities where both used to connect new developed area to old city. In Mexico City’s downtown streets were rebuilt to provide safe transit to the new buses and helped to improve the urban environment especially air quality. The information about Mexico City BRT Line 4 shared in the table below.

Línea 4, Buenavista - San Lázaro - Aeropuerto	
Corridor length - km (running ways)	28
Stations	29
Daily demand (passengers per day)	55,000
Peak load (passengers per hour per direction)	1,000
Operated by	CCA (Conexión Centro Aeropuerto)
Year corridor commenced	2012
Operating speed (KM/H)	10

Source: Global BRT Data, 2015

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Otobüs Hatlarında Yol Güvenliği Kılavuzu (2012). EMBARQ Türkiye

Photo Credits

pg. 3 (bottom), 4, 5 (from top to bottom) Celal Tolga İmamoğlu, EMBARQ Türkiye; pg. 8 (top) CTSEmbarq Mexico.

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EMBARQ is the sustainable urban mobility initiative of WRI Ross Center for sustainable cities.

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