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.

www.embarqturkiye.org
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.

**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.

<table>
<thead>
<tr>
<th>Problems and Deficiencies</th>
<th>Recommendations</th>
<th>Photos / Illustration</th>
</tr>
</thead>
</table>
| Mid-block crossings used by motorcyclists for U-turns | • Police enforcement  
• Infrastructural improvements  
• Staggered crossing should be placed | Figure 3 Staggered crossing (EMBARQ, 2012) |
| Illegal parking on sidewalks and on the BRT lane | • Parking lots should be placed  
• Reducing the parking demand with higher prices  
• Clear markings should be placed (vertical, horizontal) | Figure 4 Illegal parking on the BRT lanes (EMBARQ Turkey, 2015) |
<table>
<thead>
<tr>
<th>Maintenance along the BRT corridor</th>
<th>• Markings should be regularly maintained and made of a durable material</th>
</tr>
</thead>
</table>
| Trespassing of private vehicles on BRT lane | • Enforcement  
• Pre-warning signs should be placed |
| Right turns across bus lanes | • Lower bus speed limits and should be placed raised pedestrian crossing  
• Barriers between bus and mixed vehicle lanes |
<p>| Misleading traffic signs from previous infrastructure | • Old markings should be removed |
| Lack of signs for the disabled | • Hearable, touchable and readable signs and warnings for the disabled should be placed |</p>
<table>
<thead>
<tr>
<th>Issue</th>
<th>Proposed Solutions</th>
</tr>
</thead>
</table>
| Lack of parking lots for motorcycles and bicycles which leads to parking on the BRT and bus lanes | - Assigning parking lot to motorcycles  
- High price policy to reduce the demand |
| Narrowed waiting areas and blocked access by street furniture        | - Street furniture should be replaced or removed |
| Lack of bus driver training on road safety and other traffic issues | - Road safety and safe drive trainings should be given to bus drivers |
| Pedestrians jumping over guardrails                                 | - The guardrails should be established with higher ones |
| Gaps along the guardrails                                           | - Guardrails should be established |
| Need for more crosswalk in order to prevent illegal, hazardous crossings | - Signal control should be placed  
- Raised pedestrian crossing should be placed |
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 16 Center BRT lanes with mid-block crossing on a urban arterial (EMBARQ, 2012)

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

- 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)
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

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Corridor length - km (running ways)</td>
<td>28</td>
</tr>
<tr>
<td>Stations</td>
<td>29</td>
</tr>
<tr>
<td>Daily demand (passengers per day)</td>
<td>55,000</td>
</tr>
<tr>
<td>Peak load (passengers per hour per direction)</td>
<td>1,000</td>
</tr>
<tr>
<td>Operated by</td>
<td>CCA (Conexión Centro Aeropuerto)</td>
</tr>
<tr>
<td>Year corridor commenced</td>
<td>2012</td>
</tr>
<tr>
<td>Operating speed (KM/H)</td>
<td>10</td>
</tr>
</tbody>
</table>

*Source: Global BRT Data, 2015*
References

Dünya Engelliler Vakfı (2011). Engelliler için Evrensel Standartlar Kılavuzu

EMBARQ Türkiye (2012). Otobüs Hatlarında Yol Güvenliği Kılavuzu


Otocüs 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.
Acknowledgements

The authors wish to acknowledge the help and assistance received by Şanlıurfa Metropolitan Municipality Department of Transport during the data collection process about planned BRT project and organization of the field study.
WRI Ross Center for Sustainable Cities works to make urban sustainability a reality. Global research and on-the-ground experience in Brazil, China, India, Mexico, Turkey and the United States combine to spur action that improves life for millions of people.

Based on longstanding global and local experience in urban planning and mobility, WRI Sustainable Cities uses proven solutions and action-oriented tools to increase building and energy efficiency, manage water risk, encourage effective governance and make the fast-growing urban environment more resilient to new challenges.

Aiming to influence 200 cities with unique research and tools, WRI Sustainable Cities focuses on a deep cross-sector approach in four megacities on two continents, and targeted assistance to 30 more urban areas, bringing economic, environmental and social benefits to people in cities around the globe.

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

This report was prepared by the EMBARQ team in Turkey.