Operation and safety of tramways in interaction with public space

COST Action TU1103
« STATE OF THE ART »

On behalf of the action: Matus Sucha
Introduction

- The COST Action TU1103 deals with the improvement of tram and Light Rail Transit (LRT) safety through a better management of their insertion into urban spaces, and therefore with the minimization of accidents and their impacts on both transport system and society.

- Safety, in the framework of the Action, deals with the risk and precautions taken to reduce level of risk related to accidents and injuries, such as the urban design insertion and measures which can be taken within the institutional framework.

- The Action focuses on the interaction between trams and other road users (pedestrians, car drivers, cyclists) in urban spaces.
Fact sheet

- Start of the action: 09/ 2011
- End of the action: 09/ 2015
- 34 entities (tramways operators, universities, research institutes, public bodies)
- 15 countries and UITP (International Association of Public Transport)
The first Working Phase (WP1) deals with the state of the art and context exploration. During this WP an inventory of the current situation has been made, for every participating country, in relation to the three main subjects:

- **Institutional and regulatory aspects**: concerning the legal basis and the technical requirements for LRT systems (WG1)
- **Data collection on accidents and other indicators**, at the national and local levels (WG2)
- **Infrastructure design**: practical aspects related to existing configurations (WG3)
The main objective of this state of the art context exploration in relation to institutional and regulatory aspects has been the overview on national key points for each country, the identification of the regulations concerning trams and the establishment of a common vocabulary.

Per country, the group has gathered information on networks, main regulation on tram safety and its philosophy, actors involved in tram construction and operation, and main urban insertion issues encountered in the country.
New tramway systems and lines are spreading all over Europe. After a period of gradual closure of this technology on their public transport urban networks, LRT systems are now growing with new vehicles and technology and the existing ones are extending in most medium and big cities of the EU countries.

Germany has the greatest number with 58 operators and more than 20 extensions in progress, and Ireland two tram lines in Dublin. France has known the highest progression of new lines during the last decade.
INSTITUTIONAL AND REGULATORY ASPECTS (WG1)
Data collection on accidents and other indicators (WG2)

- Safety management is mostly based on a reactive approach to reduce the frequency of undesired recurring events in black spots of the networks. Accident data are collected by the operator, but there is not an established practice to manage and analyse them in a national database according with common safety indicators, except in one country (France).

- There are a lot of types of accidents; the big variety is linked to the different locations where the tram is inserted, to the degree of track segregation (fully separated, partially separated or in mixed traffic), and to the operation speed.

- There is not a typical accident though the majority of them is obviously connected to intersections - most typical places of conflicts, turn-left movements with tram in the back. Cars are the most implicated on collisions with trams. Pedestrian crossings are also an issue.
Data collection on accidents and other indicators (WG2)

- Other parameters are given as *encountered problems*: lack of attention from other space users, speed, restricted sightline/visibility, traffic jams, etc.

- Accidents tend to happen because road vehicle drivers and other road users are *not aware of the presence of a tram* or do not treat it with sufficient respect recognising its longer stopping distance or different path.

- Whatever the regulation, whatever different solutions, all countries face these problems.
Data collection on accidents and other indicators (WG2)

- Regarding indicators, indicators were classified in 4 types: **global indicators, geographical indicators, typological indicators and economic indicators.**
- The **most common collected data** in the studied countries are as follows:
  - number of events (total);
  - **number of events (by types of events)** – e.g. emergency breakings;
  - number of fatalities;
  - number of seriously injured people;
  - number of lightly injured people;
  - number of victims;
The main work developed in relation to infrastructure design and urban insertion was the identification and gathering of information about common “Interaction points” (so called hotspots) in the LRT lines/networks from the different participating countries.

In relation to the Interaction Points identification, the first main conclusion made is the need to study separately the stations/stops and the rest of the infrastructure (called “between stations”). This distinction is made due to the important differences between those two kinds of zones, both in relation to the operation of the system and to the users/pedestrians behaviour.
In relation to users/pedestrian behaviour, most people around stations/stops are the users of the system, so they are aware of the approaching vehicles as they want to board them. In consequence, it would seem that these zones would be safer because of this awareness. Nevertheless, there are several circumstances that make the stops particularly troublesome points, which are the following:

- Users hurry to catch the vehicle coming, which can lead them to behave in a more risky way.
- The tendency to cross the tracks via inappropriate or non-organised paths, in order to get the more direct route to their final destination.
- The accumulation of users during rush hour in the limited space of the platform, with some of them trying to pass each other in the unsafe zone of the platform.
- The possible existence of stopped LRT vehicles, which restricts the visibility of other approaching LRT vehicles.
## Hotspots

<table>
<thead>
<tr>
<th>Interaction point ID</th>
<th>selection</th>
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<tbody>
<tr>
<td></td>
<td>pedestrians</td>
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<tr>
<td>Road junctions (cars and cyclists) with tramway</td>
<td>x</td>
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<td>Road junctions (cars and cyclists) with a left turn</td>
<td>x</td>
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<td>Roundabouts</td>
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<td>Tramway segregation along the street (lanes and sidewalks)</td>
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<td>Tramway perception on mixed streets (cars and cyclists)</td>
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<tr>
<td>Tramway perception on pedestrians areas</td>
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<td>Pedestrians level crossings</td>
<td>x</td>
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<td>Cyclists in segregated areas</td>
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<td>Stops and its accesses</td>
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<tr>
<td>Interchange areas</td>
<td>x</td>
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<tr>
<td>Traffic (road &amp; pedestrians) signals</td>
<td>x</td>
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<tr>
<td>Line signalling</td>
<td>x</td>
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</table>
Conclusions

The first conclusions of the state of the art exploration are:

- one of the main results achieved in relation to the institutional and regulatory frame is the knowledgeable improvement about similarities and dissimilarities among different European countries in this field: there is a wide range in the manner and level of regulation and standardization for light rail systems in each country.

- Comparison and harmonisation is very complicated due to the very different LRT networks.
Conclusions

- **Reactive approach** is more present than proactive in the matter of accident prevention.

- As for the danger indicators which may predict future conflicts or accidents, **analysis of emergency breakings** seems promising.

- Every country’s systems face **similar kinds of risky situations**, and there are specific **design solutions that may be generally considered as safe or dangerous**.
Thank you for listening!