

# Safety management in European LRT systems :

some tools for collecting and using accident data

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# Key Presentation Take Aways

- The TU1103 “COST” Action
- Accidents databases and other sources
- Ideal Accident Report
- Indicators, an output of data
- Identification of hotposts

# The *TU1103* “COST” Action

*“Operation & safety of tramways in interaction with public space”*

A networking action funded by **European Union**

15 countries, 35 entities, about 50 people :

- Regulation offices,
- Public Transport Authorities,
- Operators,
- Research & study bodies

The aim...

=> to share experiences and information,

=> to identify key recommendations for safety improvement

on a topic reduced to **interaction between tramway & public space**



# The TU1103 “COST” Action

## Chair :

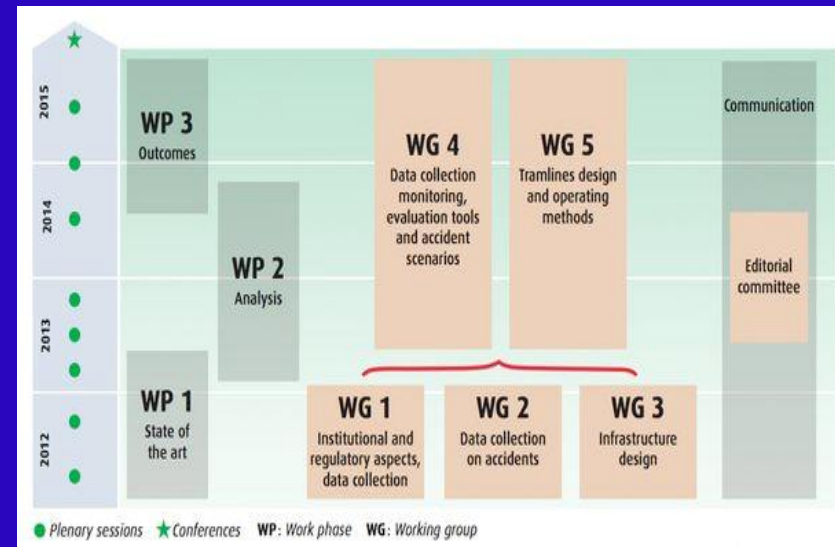
Laetitia FONTAINE (STRMTG, France)

## Organisation :

3 steps + communication tasks  
for 4 years (Sept 2011 -2015)

## Deliverables :

1 brochure,  
1 full report,  
appendicies



<http://www.tram-urban-safety.eu>



After the *final conference* in **Frankfurt**, the Action is over !  
Then, we have in mind to try going on through a *light networking process* : *to set up a “Urban Tram Forum” !?...*

# Accidents databases and other sources

## Advantages of a database at a wide scale (nationwide)

a better understanding of things through

- a broader analysis on a larger scope
- valuable statistics (based on a wider sample)
- a standardization of data
- an easier access to data and results

## Challenges to implement a nationwide database

- to agree on the way to build, maintain and use it
- to set up a shared nomenclature and unique definitions
- to use a common codification of accidents (and location)
- to collect all required data, in the agreed way and deadline

*Till now, no other sophisticated and exhaustive tool than the French “tramway accidents database” managed by STRMTG*

# Accidents databases and other sources

Anyway, some key points :

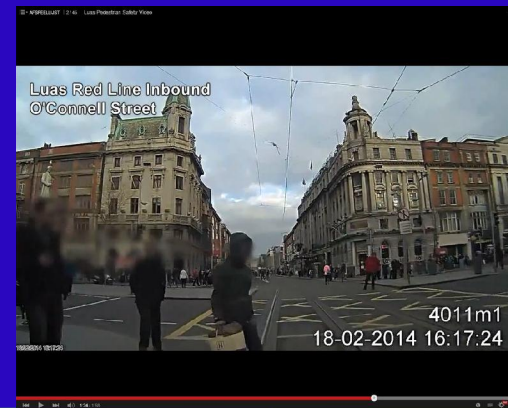
- a tool made for operators, with (by) operators
- a centralized management, with sufficient means
- an anonymous recording process
- a training process for feeders & users
- failures' detection fostered by an intensive use

Besides accidents, other crucial information sources:

- traffic handling information
- CCTV devices on tracks & in front of streetcars
- automated events recorders (“black boxes”)



Helpful to understand accidents and near-misses scenarios and emergency brake analysis



# What could be an Ideal Accident Report ?!

The aim (*beyond feeding a database*):  
to set up the collection of information to

- allow later analysis and better understanding of accident scenarios
- use lessons from it for accident prevention
  - layout modifications
  - operation ways changes
  - drivers training
  - safety campaigns





# What could be an Ideal Accident Report ?!

## Contents :

- Location of event (place, time, layout types)
- Actors (involved people & vehicles, witnesses)
- Description (how?...)
- Context & circumstances
- Consequences (personal, material, operational)
- (Immediate) measures



## Some key points :

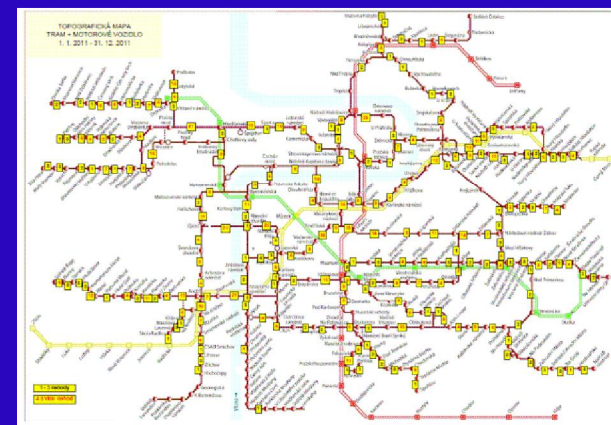
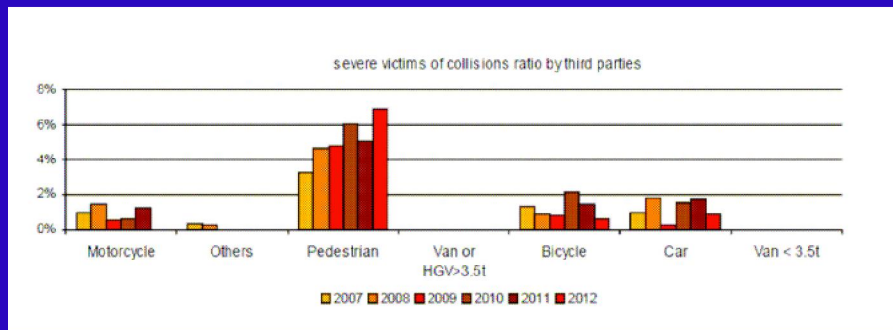
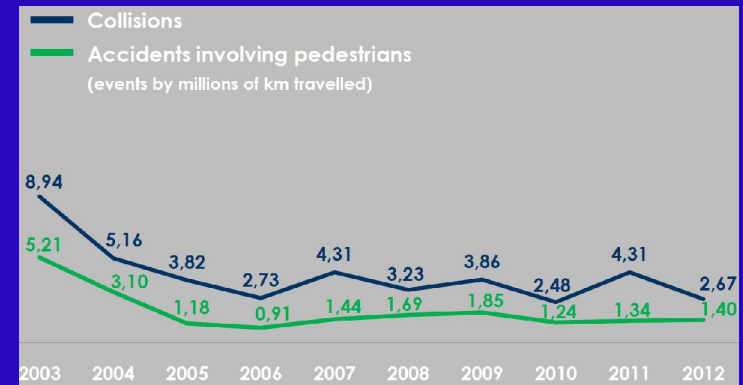
- missing information would be hard to get later
- the driver is the core actor (needs help & training)
- usable information = detailed but clear !



# Indicators, an output of data

a useful tool for tramway safety...

- to give **general information**
- to show **trends** in terms of safety
- to identify and **rank the issues**
- to **assess the strategy** and implemented **actions**
- to **improve the knowledge** for planning and upgrading of systems



# Indicators, an output of data

**raw data or calculated figures to measure a level of safety**

↙ (i.e. number of events, of casualties)

↘ (i.e. Percentage of collisions per third parties, ratio per kilometers run)...

Behind this, the general idea of comparing things...

- how are things evolving in time ?
- what is the safety level of one system, compared to an external reference ?
- what are the main safety issues on a network ?
- how, when and where do most frequent accidents occur.

*However, to be (properly) compared, things need to be comparable !*

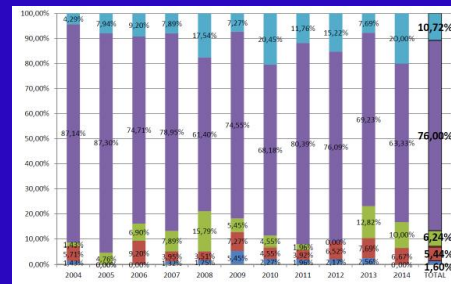
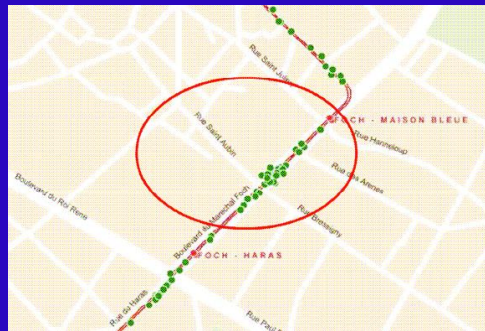
- *homogeneous data and way of calculation*
- *similar contexts and equal other parameters*

# Indicators, an output of data

Different kinds of indicators for tram safety, based on:

- the field they apply to
- the nature of information used ...

- global indicators
- geographical indicators
- typological indicators



some other indicators linked to safety, when concerning

degradation of **level of service**

social or economic **costs**



due to **impact of accidents**



# Use and limits of indicators

- Making comparisons between tram networks, tramlines or layouts is not often relevant...
- One should rather try to follow things in time on each network !

In such a comparing process, indicators should **not be used** in order to ...

- rank the networks or the tramlines,
- understand why accidents occur,
- choose signalling tools or layout design

*as many (external) factors are interacting...*

*Indicators are a useful tools in a quantitative approach to get general conclusions and help to identify main core issues*

*They are complementary with detailed and qualitative assessments of accidents*

# Use and limits of indicators

## Main limitations for indicators regarding tramway safety

- availability of data required to produce safety indicators
  - ⇒ main source is drivers, but data collection is not their 1st worry after an accident
- sufficient numbers of figures to make valuable statistics
  - ⇒ fortunately not so many tramway accidents, and very diverse situations
- existing differences about definitions in safety data
  - ⇒ e.g. “injured” people, “passenger”
- differences of contexts of accidents and conditions of operation
  - ⇒ frequencies, traffic level, layouts, road regulation and signalling, behaviours
- unavailability of additional but essential data to objectivize comparisons
  - ⇒ data regarding car traffic in junctions, speed, ...

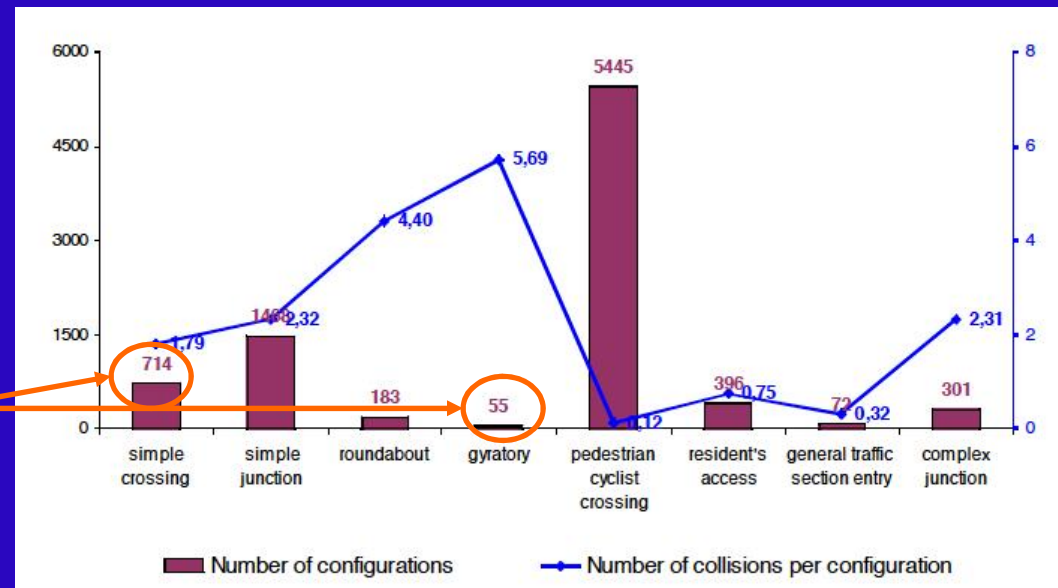
# Use and limits of indicators

Pay attention while considering raw data :

- no information on
  - size of networks,
  - km run
  - number of junctions
- various periods (years) of operation

	Operation period	Number of accidents
Network A	2010-2012	6
Network B	1995-2012	161
Network C	1995-2010	107

Have in mind the size of sample on witch the indicator is based !





# Most relevant indicators

1. Number of accidents
  2. Number of fatalities, injured persons
  3. Accidents per km per year
- global indicators*

4. Number of accidents by location
  5. Distribution of accidents by type of location (relative)
  6. Distribution of casualties (fatalities, injured) by type of location (rel.)
  7. Number of accidents per number of type of location
- geographic indicators*

8. Distribution of accidents by third parties (relative)
  9. Distribution of casualties by third parties (relative)
- typological indicators*

10. Number of lost km / number of planned km
- socio-economic ind.*



# Identification of hotspots

## What is a *hotspot*?

### – Operators' definitions:

- greatest **number of events** (accidents) in past year (Warsaw)
- **accident locations** in past *X* years (Lisbon, Dublin, Barcelona, Manchester) - *X* : 3 to 10 according countries
- three **similar injury accidents** in last 3 years or 5 damage only accidents in past 5 years (Vienna)
- **emergency brake application frequency** (Dublin)

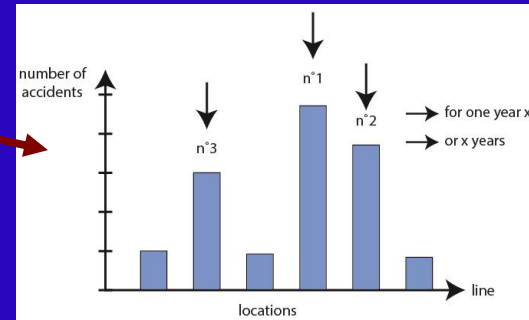
### – Other definitions:

- numbers of **near missed** accidents (Dublin)
- **passenger** accidents due to emergency braking (Le Mans)
- minor collisions with vehicles (various) / pedestrians

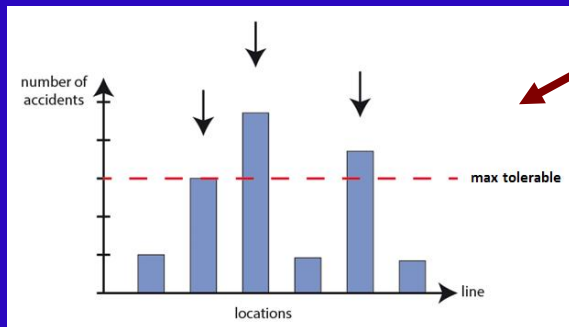
# Identification of hotspots

With the number of accidents along a line (or on a network)

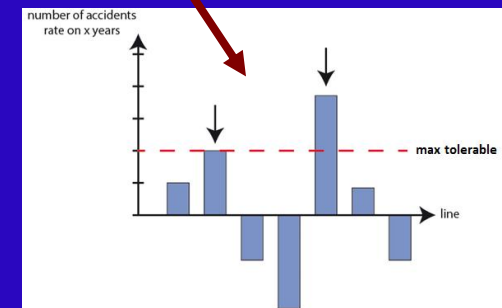
- rank locations and keep “first” ones



- keep locations exceeding a fixed limit



- look at trends of accidents occurrence and choose highest increase



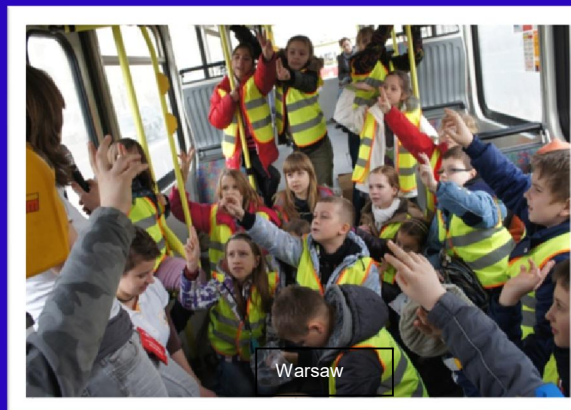
Beyond accidents data, important resources are

- tram drivers
- line managers
- instructors

# Identification of hotspots

the first step for in-depth post-analysis,  
leading to proposals for improvements to reduce risks, e.g:

- new traffic signals / modifications to existing traffic signals
- carriageway markings
- improved sightlines
- prohibit turning movements
- tram driver **training**
- safety **campaigns**



# Post-analysis and hotspots

## Example of before / after situation

Manchester : Poor sightlines at junction of cars with tramway



=> better signs erected





# Any question ?...



<http://www.tram-urban-safety.eu>

## Thank you for listening

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