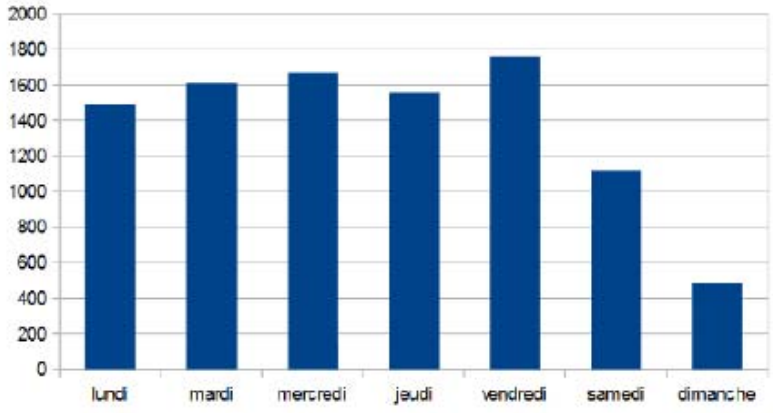
EUROPEAN COOPERATION IN SCIENCE AND TECHNOLOGY

COST ACTION TU1103:

OPERATION AND SAFETY OF TRAMWAYS IN INTERACTION WITH PUBLIC SPACE

Final conference – Frankfurt, Germany – 29 September 2015

Indicators



3.2 Summary of all accidents and incidents

	2005	2006	2007	2008	2009	2010	2011	2012	2013
SERVICE LEVEL									
Tram million kms	2.47	2.67	2.74	2.73	2.64	3	3.86	3.99	3.88
% change		+8%	+2.6%	-1.0%	-3.3%	+13.6%	+28.7%	+3.3%	-2.7%
INCIDENTS/ACCIDENTS									
Road traffic collisions (RTC) road vehicle/tram	36	24	28	32	23	30	30	24	38
Contact of person with tram	8	21	18	20	18	22	13	7	8
Collision between two trams	1	0	0	0	0	0	0	0	0
Derailment in depot	4	0	3	1	0	0	0	0	0
Derailment in service	1	1	0	0	1	2	0	0	0
SPADs	-	-	-	-	-	-	-	30	24
Emergency brake									

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Contents

- indicators : what are we talking about ?
- different types of indicators for tram safety
- uses and limits of indicators
- most useful indicators and their pro/cons

Indicators : what are we talking about ?

using some data to assess a situation…

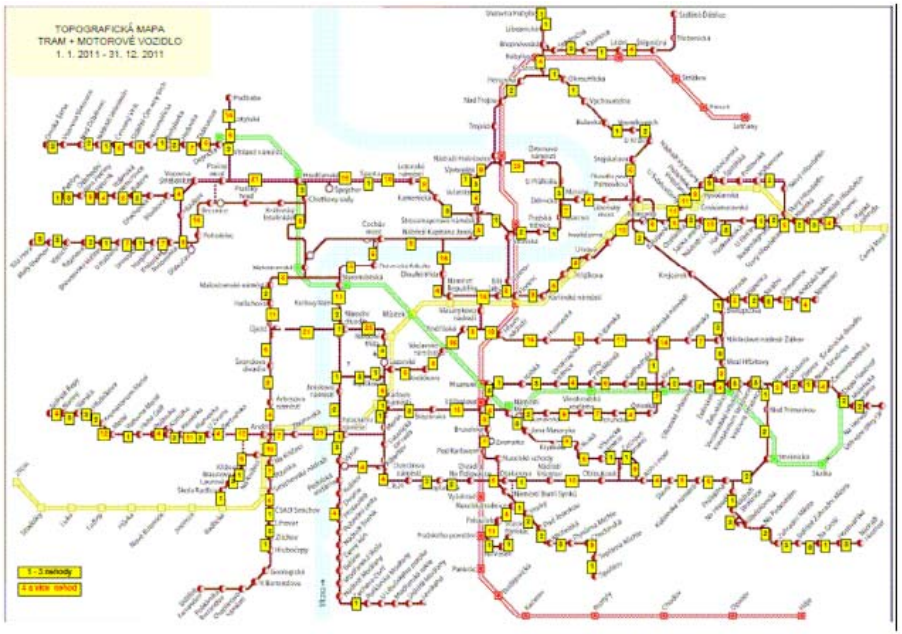
- in our case : measure a level of safety
- behind this general goal, the idea of *comparing situations*…

Indicators may be

- **raw data** (*i.e. number of events, of casualties*)
- **calculated figures** (*i.e. Percentage of collisions per third parties, ratio per kilometers run*)

Accidents							
	2005	2006	2007	2008	2009	2010	2011
Fatal	1	1	2	1	0	0	3
Serious	7	10	4	6	8	3	2
Slight	30	15	19	16	25	21	18
Total	38	26	25	23	33	24	23

Indicators : what are we talking about ?



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

Different kinds of indicators for tram safety

3 main categories, based on:

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

- global indicators
- geographical indicators
- typological indicators

some other indicators are linked to safety, when concerning:

degradation of level of service
social or economic costs
} due to impact of accidents

Global indicators for tram safety

When concerning ...

- the whole line or networks
- the whole period of operation
- all types of accidents and whatever the severity is

Then, no reference is made to...

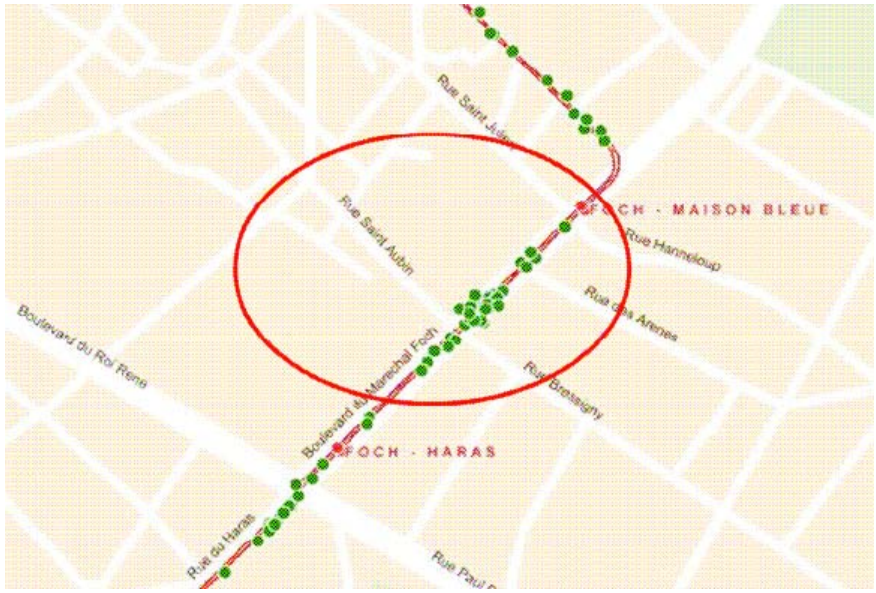
- the location of events
- the dates or time of occurence
- causes, types of involved users

*The **number of events** is a global indicator which leads us to say urban insertion is the main stakes of tram safety.*

Geographical indicators for tram safety

When these are calculated while looking at ...

- different part of networks
- various types of places (junctions, stops, ...)
- spatial location of accidents



Then, a reference is made to ...

- the location of events

*The **identification of hotspots** is a good example of use of geographical indicators !*

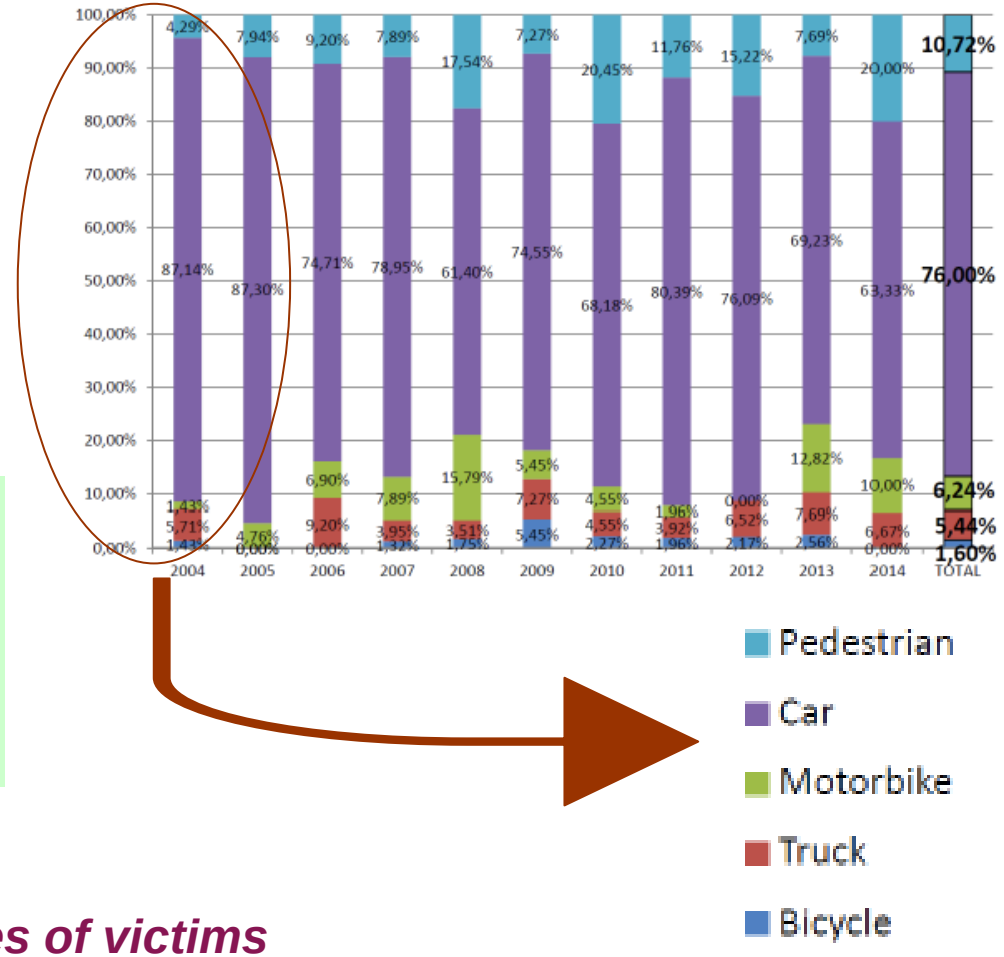
Typological indicators for tram safety

When these are calculated while looking at ...

- circumstances of accidents
- types of users involved
- context

Then, a reference is made to...

- categories of involved users
- date or time of occurence
- causes of accidents



*Example of Typological indicator : **types of victims***

Use and limits of indicators for tram safety

Indicators are most often used in a comparing process, in order to determine ...

- how things are evolving in time,
- how the safety level of a system is, compared to an external reference,
- what the main safety issues are on a network,
- how, when and where 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***

Use and limits of indicators for tram safety

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

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

They are complementary with detailed and qualitative assessments of accidents

Use and limits of indicators for tram safety

- Making comparisons between tram networks, tramlines or layouts is not often relevant

- One should rather try to follow things in time on each network

  - So, no requirement for authorities, operators nor regulation bodies to produce and use exactly the same indicators.
  - However, the same problems and limits are encountered, and coherent and homogeneous approaches are desired.

The main limitations of indicators for tram safety

- availability of data required to produce safety indicators

  ⇨ main accident data come from the drivers, but data collection is not their 1st task after an accident

- 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, ...

The main limits of indicators for tram safety

Be careful, comparing networks based on raw data is not relevant:

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

1 line

Tramway ents by city			injured		death
City	Period of reference	Number of accidents	slightly	seriously	
Bergamo	2009-2011	9	4	0	0
Florence	2009-2011	9	10	1	0
Mestre (Venice	2010-2012	6	3	1	0
Milan	1995-2012	161	436	36	21
Padua	2007-2011	6	0	1	0
Rome	1997-2011	107	314	38	10
Turin	00-2011	33	113	6	6

N lines

Most useful indicators and their pros and cons

Global indicators

1. Number of accidents
2. Number of fatalities, injured persons
3. Accidents per km per year

Geographical 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 (relative)
7. Number of accidents per number of type of location

Typological indicators

8. Distribution of accidents by third parties (relative)
9. Distribution of casualties by third parties (relative)
10. Number of lost km / number of planned km

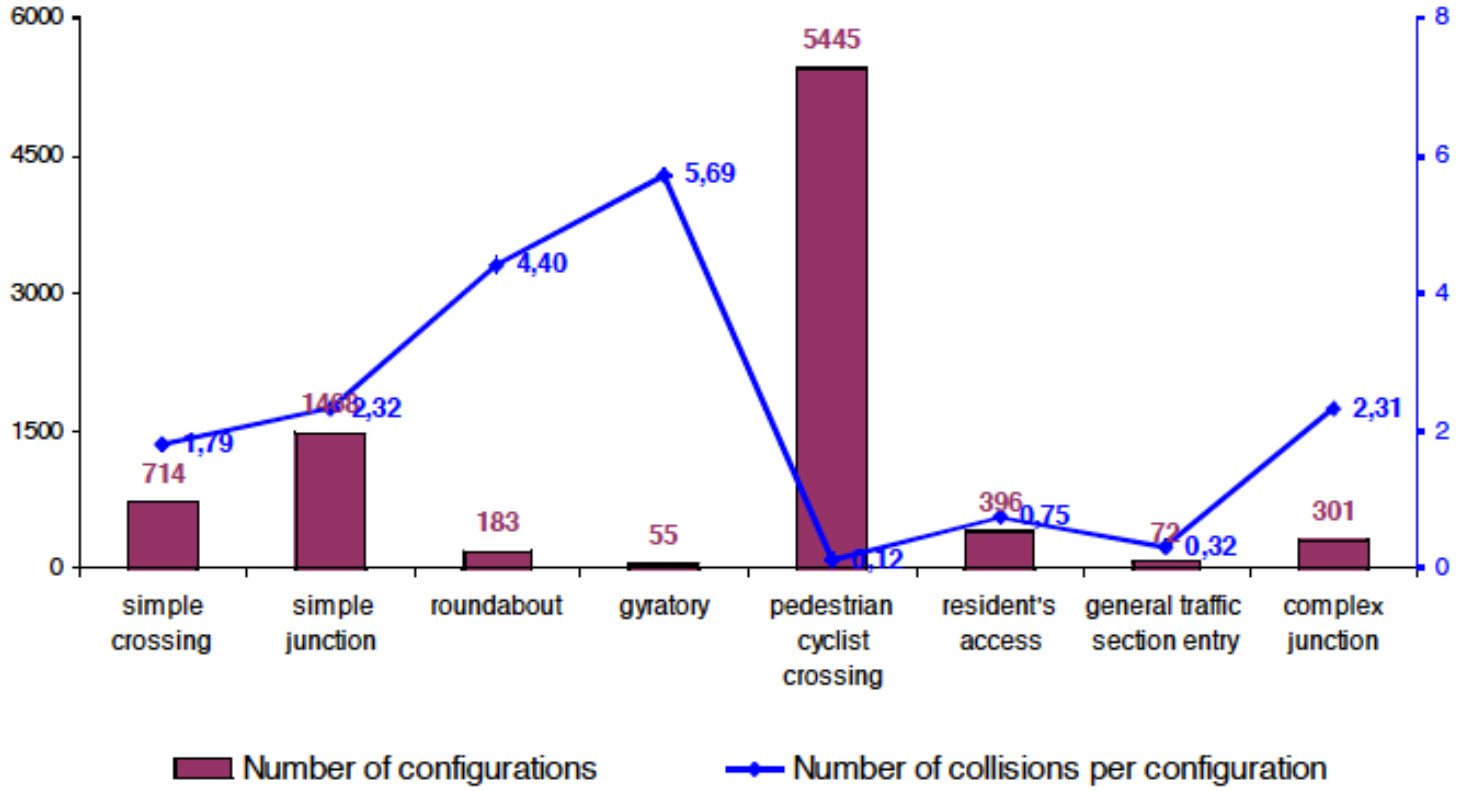
Most useful indicators and their pros and cons

An example of global indicator : the number of accidents

Definition and nature	Raw data: counted accidents[4] during the period
Category	Global indicator
Representation	Tables
Spatial field of application	Line(s), network(s)
Period	Relevant to distribute it more than one time per year (monthly, ...)
Relevant for	Measuring the stakes, getting a general overview of safety on a network or a line Reporting to the authorities
Not relevant for	Comparing with other domains (road safety, heavy rail, etc.), due to the different operation conditions Comparing networks Not reflecting the safety level of the tram network (shows no evolution, no gravity, no type of accidents). A pure figure.

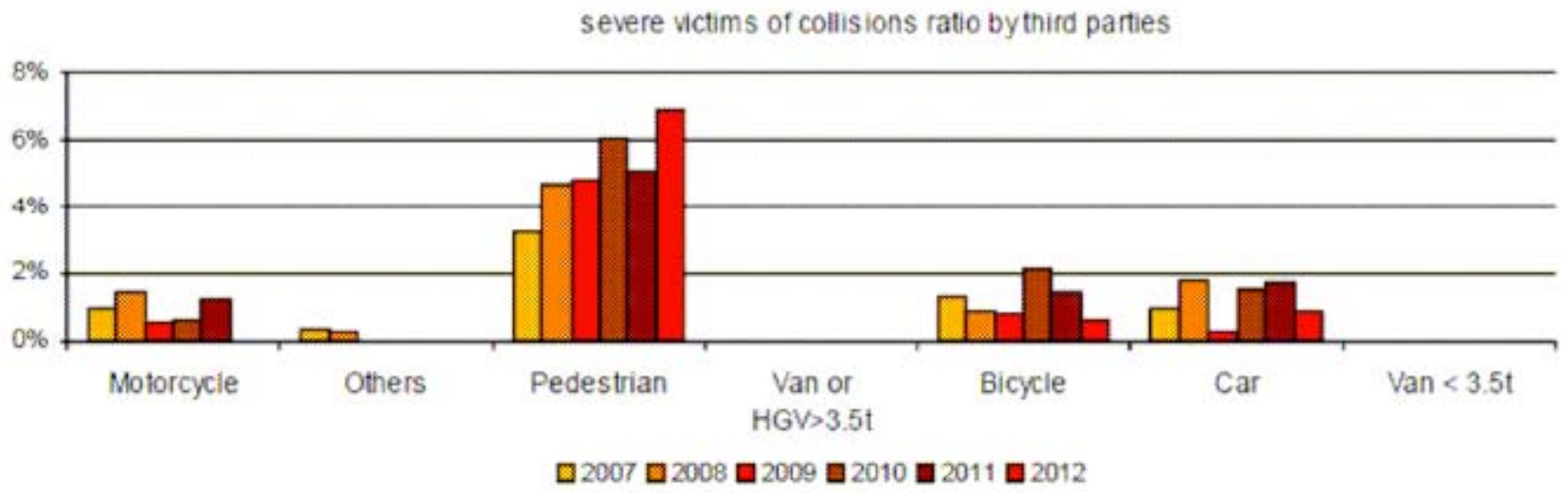
Most useful indicators and their pros and cons

An example of geographical indicator : number of accidents per number of types of location



Most useful indicators and their pros and cons

An example of typological indicator : distribution of injured and fatalities by third parties (relative)



Indicators

Any questions ?...

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Thank you for your attention !

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www.tram-urban-safety.eu