

# **Pedestrians vs tramways accidents : current issues and expected solutions**

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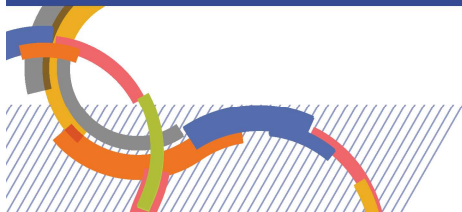
## Key Presentation Take-Aways

- Pedestrians, a main concern for tram actors
- A real issue (accidents data results)
- Pedestrian behavior and consequences on tram operation
- The limits of existing solutions (design, signals)
- An overview of new imagined solutions



## **Pedestrians, a main concern for tram actors**

- Many alerts from operators and from involved authorities (annual reports, technical meetings,...)
- Several local initiatives to improve pedestrians safety
  - Infrastructure design or signals
  - On-board systems on rolling stock (tram driver alerts or pedestrians alerts)
  - Personal devices for pedestrians
  - Safety campaigns (communication)



# Pedestrians, a main concern for tram actors



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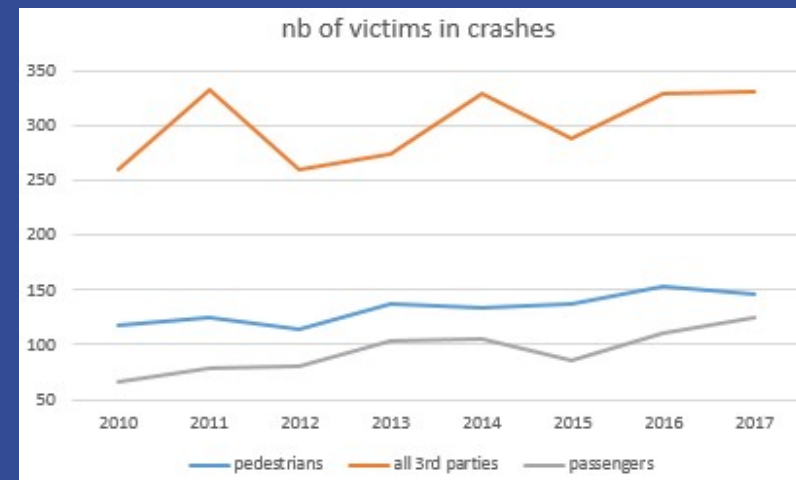
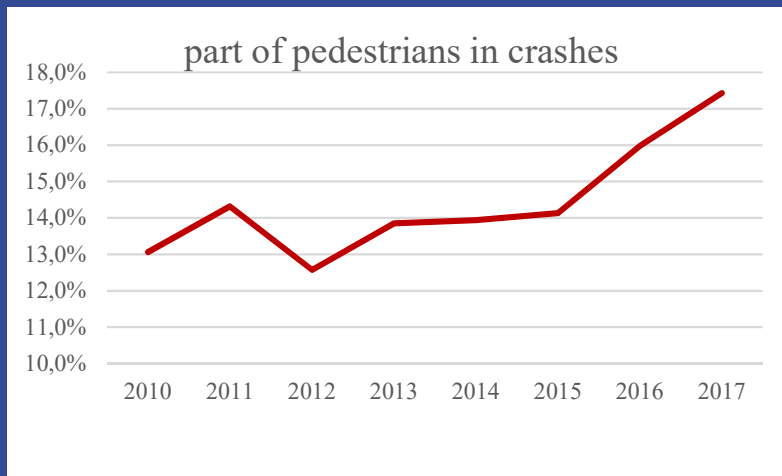
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# A real issue (accidents data results)

- A relative small part of crashes\* (15%), but an increase on last years

*\*70% of these events are personal accidents (physical injury or death)*

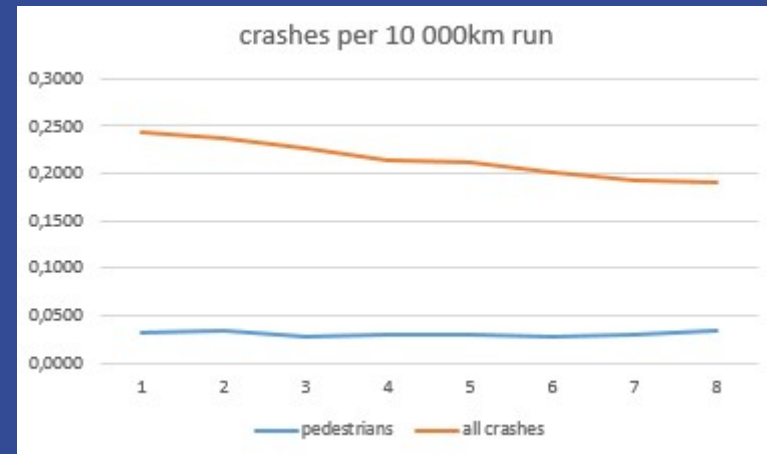


- But, pedestrians represent **45% of victims** of all crashes
- Pedestrians also involved in a significant and increasing share of « passengers events » (falling inside rolling stock due to **emergency braking**) ...



# A real issue (accidents data results)

- 3 crashes with pedestrians for 1 M km run  
(while all crashes decrease under 0,2 for 10 000 km run)



- Presence of distractors\* in 20% of accidents in 2017
  - but no information on real impact of these ones in accidents' scenario
  - more than in road accidents ?  
(distractors only appears in 3% of pedestrians fatal accidents in 2015)

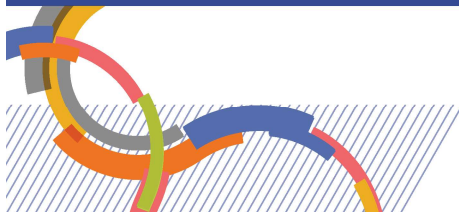
\* headphones, smartphones, mobile devices...



# A sensitive issue, beyond figures

## A direct stake ...

- Pedestrians are vulnerable
  - ⇒ often serious accidents (seriously injured or died)
  - ⇒ crashes with pedestrians affect more than car crashes
- Media-friendly accidents
- Users of public transport are pedestrians...
- *and tramways necessary run close to pedestrians !*





# A sensitive issue, beyond figures

As all accidents, also an **indirect** one, because of

impact on productivity :

➤ **regularity**

➤ **availability**

➤ **commercial speed**

➤ **corporate image**

➤ **operation costs**

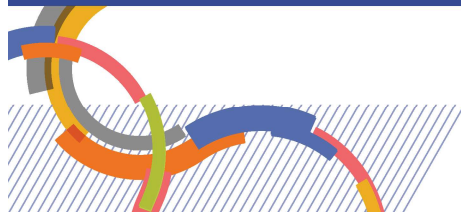
**disruptions due to accidents**

immobilized vehicles  
services breaks

**prevention methods**

restrictives orders  
distrusting driving

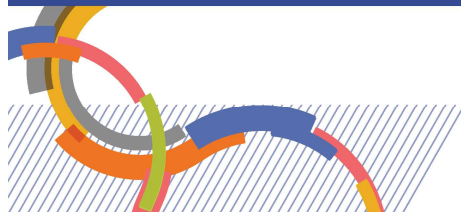
**=> drivers stress**





# A sensitive issue, beyond figures

- In the meantime : a more balanced use of public space
- promotion of active modes (walking and cycling)
  - reduction of car's prominence



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# The limits of existing solutions

To manage conflicts between pedestrians and tramways,



Readability of the path, making the tram perceptible, channelling pedestrians flow, signalization... => NOT SO EFFICIENT !



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# The aims of new solutions

In order to influence the pedestrians behavior

- enhance the tracks presence
- alert on Tramway upcoming\*

\* *Especially to reduce distractors impact*

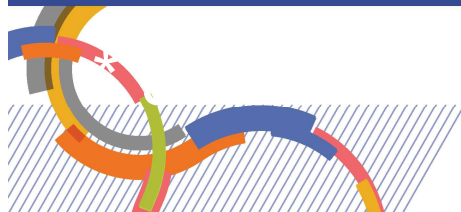


In order to help the tram drivers

- detect the dangerous situations
- decrease their cognitive overload

In the meantime, some tools may

- improve answers to disabled users need
- be efficient for other users  
(cyclists, car drivers, ...)





# An overview of new imagined solutions



Flashing lights on ground (LED on gauge limit)

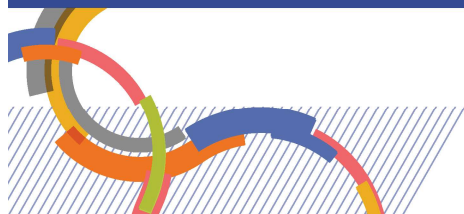
- linked with tram approach
- possible use in addition of existing signalisation

\* *experimental process*

Dedicated device for pedestrians paths

May also be implemented on road junctions

Need to change/precize signage regulations for public space

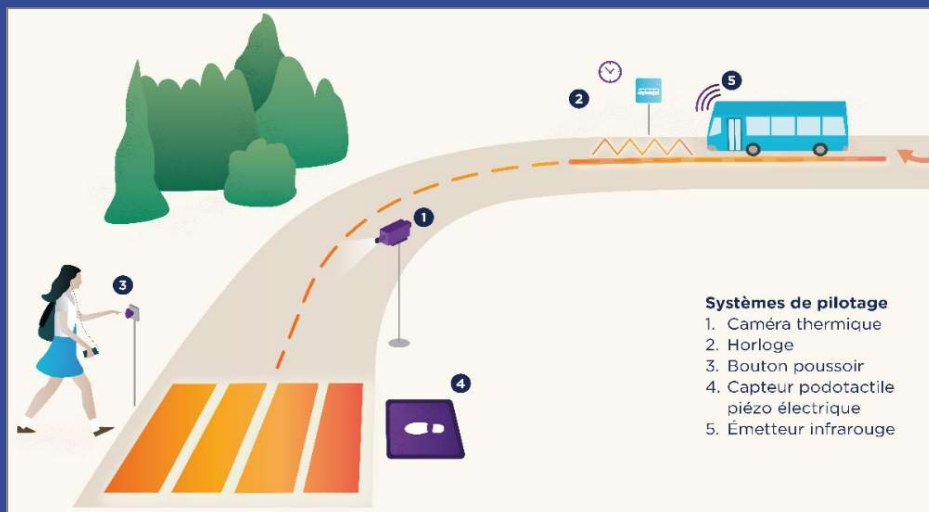


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# An overview of new imagined solutions



Light horizontal signage (Flowell - Colas)

- modular or/and dynamic devices
- enhance the existing signalisation
- may be linked to vehicles approach

\* *experimental process*

Relevant for both pedestrians and vehicles users

Economics aspects to be precized (installation, consumption)

Needs to change regulation of road signage



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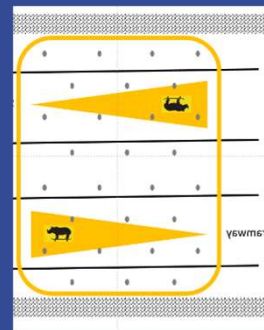
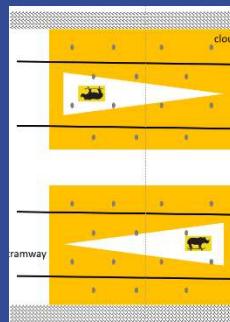
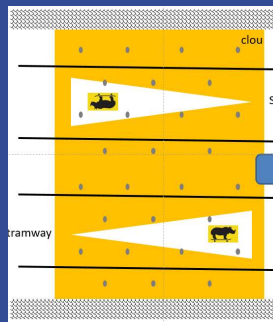
# An overview of new imagined solutions



Painting on floor

- New marks on pedestrians crossing
- Street art actions
- Linked with communication (safety campaign)

\* *experimental process*



Needs to change/precize signage regulations for public space



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# An overview of new imagined solutions



## Smartphone alerts (SAM\*)

- Duplication of the tram gong (bell) on smartphones

\* *experimental process on Bus lines (RATP)*

Some remaining technical and operational issues

- Doppler effect, mask effect of clothes, bags
- Targetting only concerned users (those crossing)
- Way of dissemination of the app and effective use





# An overview of new imagined solutions



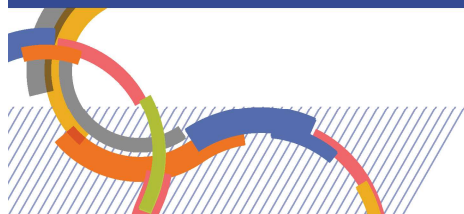
## Flashing lights on streetcars

- Additional devices
- Linked with gong or emergency braking

*\* experimental devices*

## Pending questions

- Efficiency (too late if linked to emergency braking) ?
- Credibility if linked to gong (too often used ?)
- Dazzling of drivers and other users

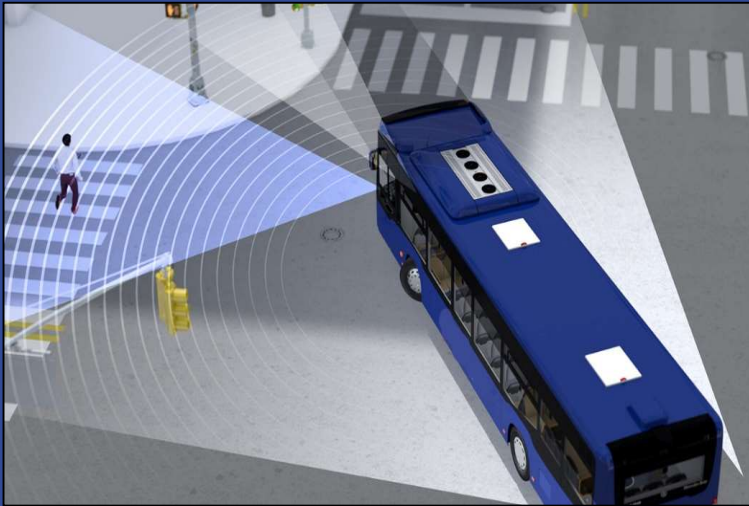


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# An overview of new imagined solutions



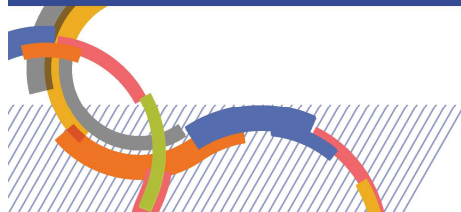
## Pedestrian (and cyclist) blind spot detection (**MobilEye Shield Plus**)

- Sound and visual – on-board system (tram driver alert)
- Mapping of alerts (localization of hotspots in a preventive way)

*Already implemented on busses and dumpsters*

## Elements to be consolidated

- Credibility of systems (false detections)
- Information of drivers or direct influence on rolling stock running ?



# An overview of new imagined solutions

Some others on-board systems :

- Smart vigilance (ALSTOM)  
⇒ reduce cognitive overload of tram drivers
- ODAS system (Bombardier)  
⇒ detection of potential users in the tramway swept path
- ...



# Pending questions and assessments needs

For all light devices on infrastructure

- Contribution to visual pollution ?
- Maintenance and availability issues ?
- Impact on non equipped crossings ?

For all systems

- Efficiency on pedestrians behavior ?
- Unexpected impacts ?
- Impact on drivers behavior ?

