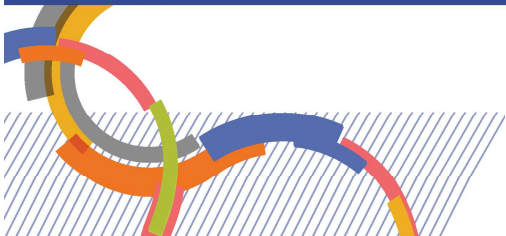# Pedestrians vs tramways accidents : current issues and expected solutions

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Cerema

Lyon, France

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
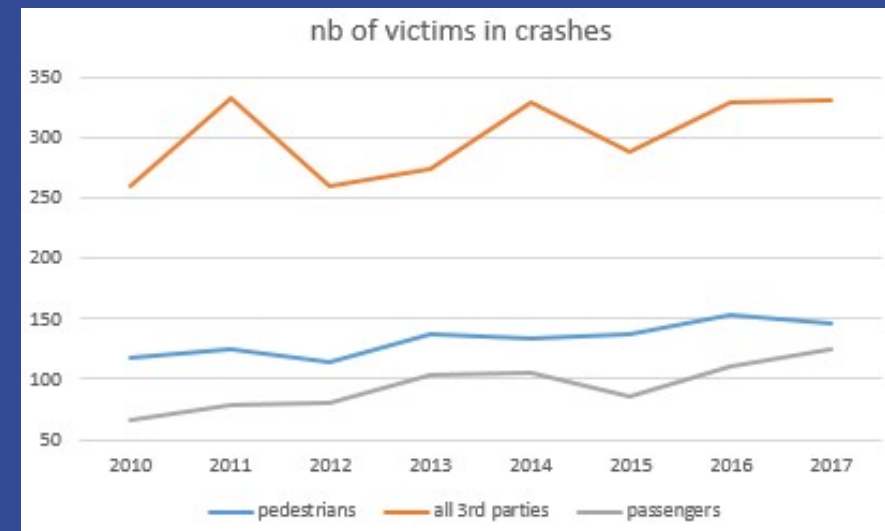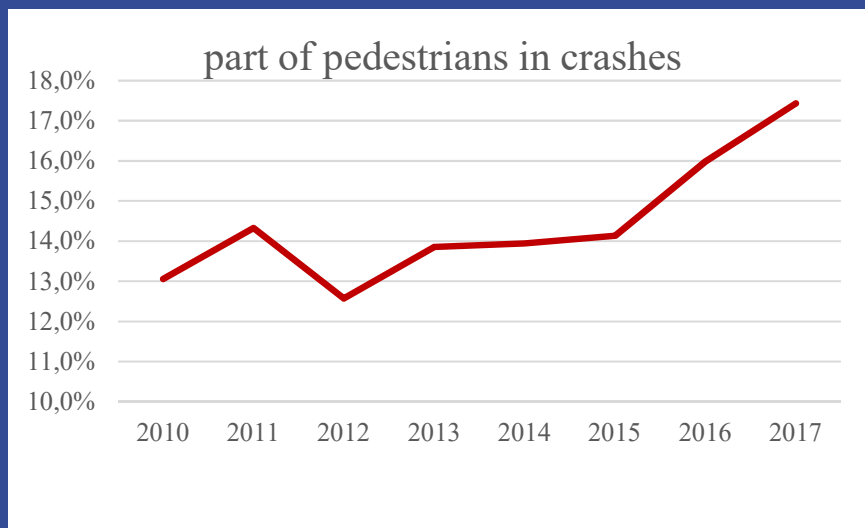
- Safety campaigns (communication)

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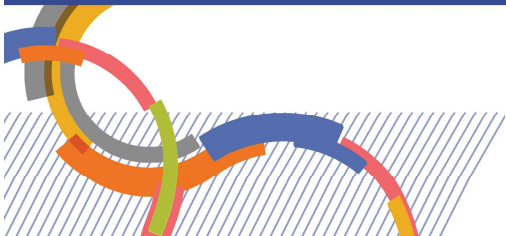
Pedestrians, a main concern for tram actors
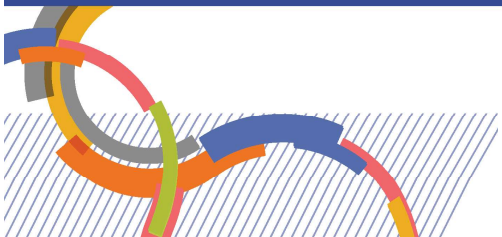
A real issue (accidents data results)

- 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**) …

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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*)


crashes per 10 000km run
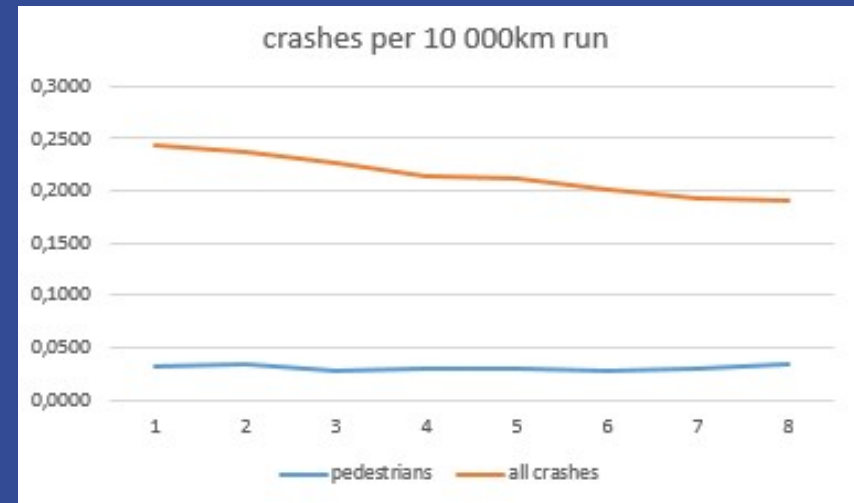
- Presence of distractors* in 20% of accidents in 2017
    - but no information on real impact of these ones in accidents' scenario
    - more than in road accidents ?
    (*distractors only appears in 3% of pedestrians fatal accidents in 2015*)

* headphones, smartphones, mobile devices…

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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 !*
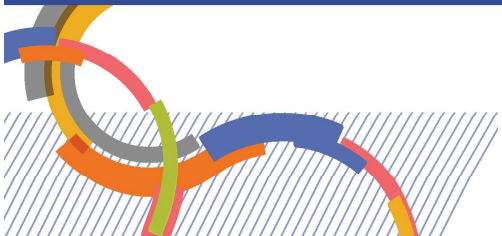
A sensitive issue, beyond figures

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

impact on productivity :

- **regularity**

- **availability**

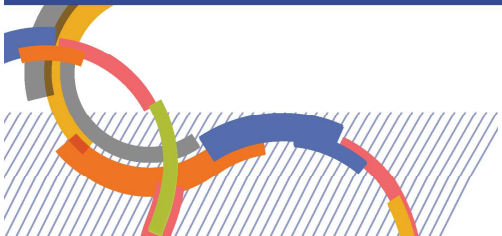- **commercial speed**

- **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

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 !
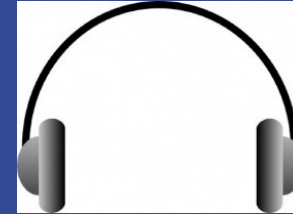
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The aims of new solutions

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, …)

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An overview of new imagined solutions

Flashing lights on ground (LED on gauge limit)

- linked with tram approach

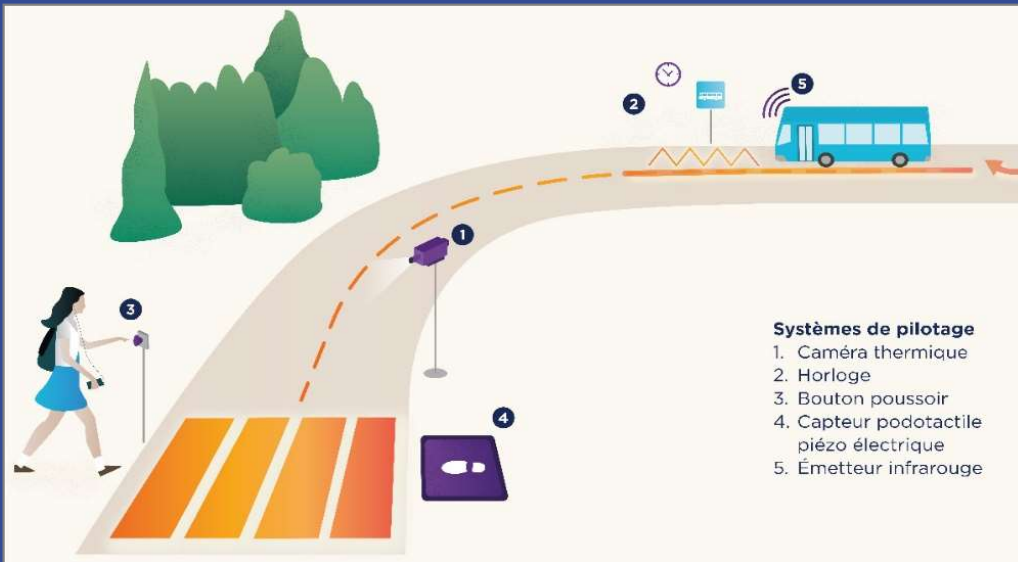- possible use in addition of existing signalisation

experimental process

Dedicated device for pedestrians paths

May also be implemented on road junctions

Need to change/precize signage regulations for public space

An overview of new imagined solutions

Systèmes de pilotage
1. Caméra thermique
2. Horloge
3. Bouton poussoir
4. Capteur podotactile piézo électrique
5. Émetteur infrarouge

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

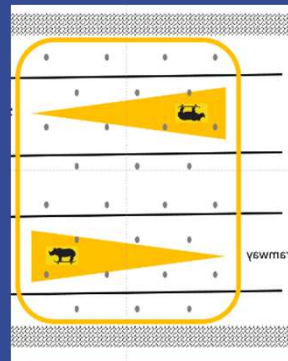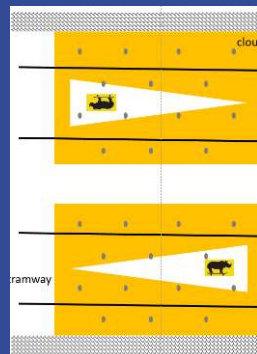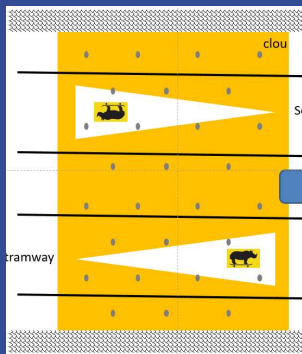Economics aspects to be precized (installation, consumption)

Needs to change regulation of road signage

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

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
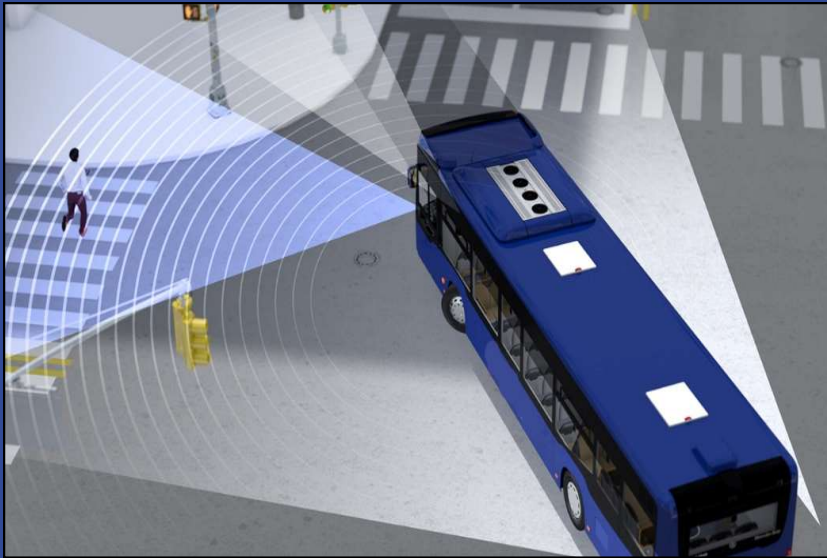

Flashing lights on streetcars

- 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

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)
$\Rightarrow$ reduce cognitive overload of tram drivers

- ODAS system (Bombardier)
$\Rightarrow$ detection of potential users in the tramway swept path

- ...
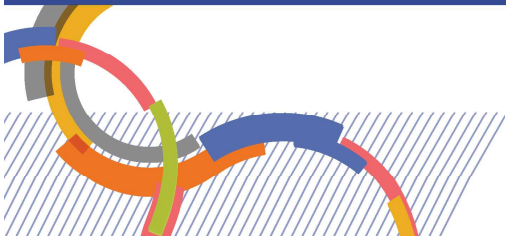
Pending questions and assessments needs

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 ?

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