Source:	CITS EG-ComAD WG2 Chair and Vice-Chair
Title:	CITS EG-ComAD WG2 - Vehicular communications for advanced emergency braking, including to protect VRUs
Contact:	Stéphane Buffat (Chair); Email: stephane.buffat@lab-france.com Zengwen Li (Vice-Chair); Email: lizw@changan.com.cn

Place, date:	Virtual, 4 November 2024
DOC #	DOC 021

Future Networked Car Symposium FNC 2025 session 4

Expert Group on Communications Technology for Automated Driving

Presentation plan

1. WG2 Genesis and scope
2. Workplan and boundaries
3. Road safety/safe system (high level to showcase how safe vehicle and safe infrastructure are important)
4. International road safety (global worldview to show case VRU importance
5. Accidentology : different viewpoints & Stake holders: Automotive view/ Motorbike industry/Cyclists/Communication
6. Scenarios/use cases
7. Future deliverables

➢ WG2 Genesis & Scope

The U.S. NHTSA has announced extended regulation for advanced emergency braking, including to protect VRUs. It will implement the new Federal Motor Vehicle Safety Standard that will make extended requirements for automatic emergency braking (AEB), including pedestrian AEB, standard on all passenger cars and light trucks by September 2029. This safety standard is expected to significantly reduce rear-end and pedestrian crashes.

The new standard, FMVSS No 127, requires that “all cars be able to stop and avoid contact with a vehicle in front of them up to 62 mph and that the systems must detect pedestrians in both daylight and darkness. In addition, the standard requires that the system apply the brakes automatically up to 90 mph when a collision with a lead vehicle is imminent, and up to 45 mph when a pedestrian is detected”.

The initial implementation of “Vehicular communications for advanced emergency braking, including to protect VRUs” is expected to be for all U.S. light vehicles (gross vehicle weight rating of 10,000 pounds or less).

As this is the first regulation with such requirements, it likely to set a bar for the AEB worldwide. WG2 will study if vehicular communications will assist in meeting this AEB requirement.

➢ Workplan and boundaries of WG2:

- Collect and organize relevant accident situations from the field in which vehicular communications will allow for efficient, up to long-range and high-speed advanced emergency braking, including to protect VRUs;
- Define the most relevant accident scenarios in which vehicular communications;
- Define which requirements for vehicles to benefit from vehicle communications included with AEB, safely, and with the required reliability up to high-speed situations;
- Build a consolidated functional safety perspective for vehicular communications for advanced emergency braking, including to protect VRUs across major vehicle manufacturers;
- Collect large, complex examples of the high-speed AEB environment in all major jurisdictions as well as appropriate other jurisdictions;
- Identify the level of failure that authorities in different jurisdictions might be able to accept.

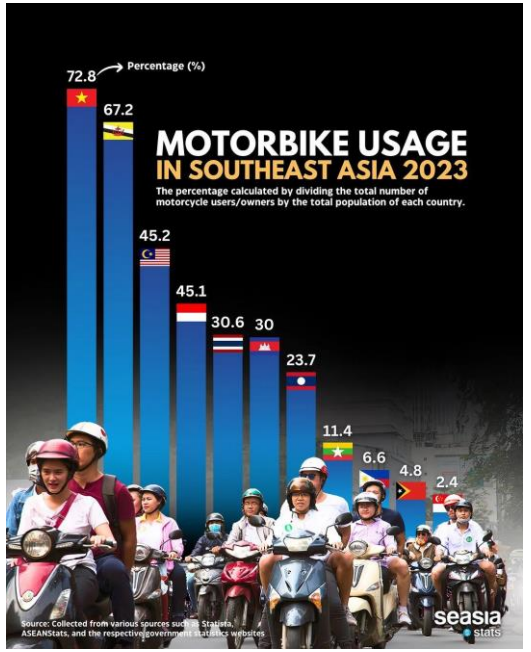
Work on requirements for vehicular communications for advanced emergency braking, including to protect VRUs identified by other groups will be included.

➢ Workplan and boundaries of WG2:
➢ Some key principles

- When working on use cases across the world, consider the specificity of the countries/the traffic complexity and segregation, aka the **local road grammar**

- Keep in mind the **Human Factor**

- Consider **all actors** involved and their needs, dynamic and inertia (e.g. Pedestrian, low speed, low inertia/pedal bikes medium speed, higher inertia, minimum viable speed, etc.)



- WG2, established under the CITS EG-ComAD, had its inaugural meeting on 20 September 2024.
  - Chair: Stéphane Buffat (Renault Group)
  - Vice-Chair: Zengwen Li (Changhan University)

Achievements of WG2(until now):

- Defining Application Requirements and Needs:
  - Discussing the importance of focussing on relevant scenarios according to accidentology data
  - A drafting group dedicated to this task is being created

- List of Possible VRUs Scenarios:
  - Reviewing accidentology data and driving rules, considering various jurisdictions to refine lane merging use cases

- Focus on Functional Safety perspective(FuSa):
  - Examining trustworthiness, interworking of V2X messages, vehicle sensors, etc.

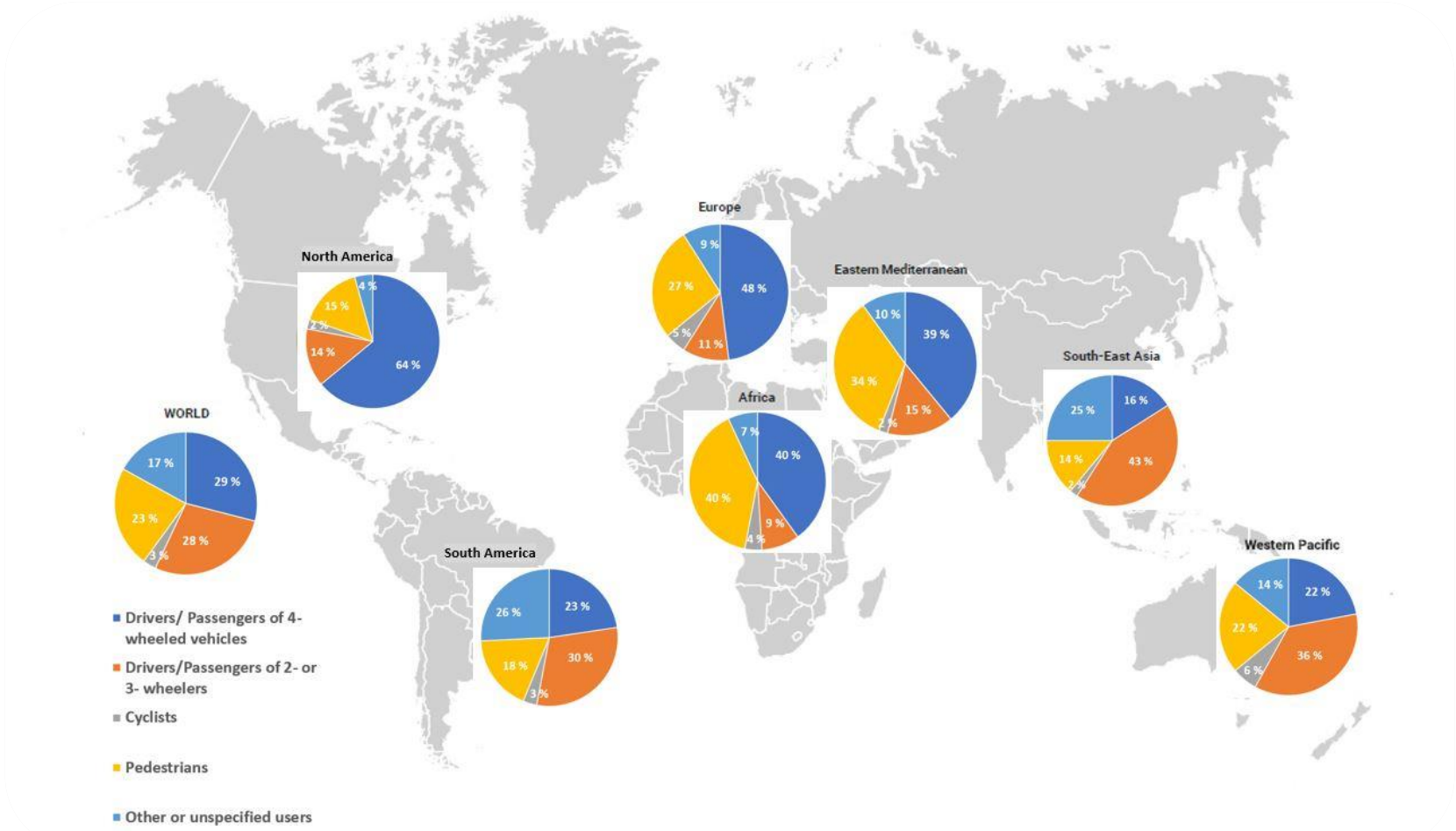
- Leveraging existing work and incorporating them as inputs:
  - Presentations made or scheduled from experts on various countries, including two-wheeler perspective, aiming to enhance the collaborative expertise, and maintaining a list of relevant previous compliant publications

- Upcoming activities:
  - Alignment on underlying principles of safety concepts
  - Creation of a draft technical report

Safe System

➢ International road safety (global worldview to show case VRU importance

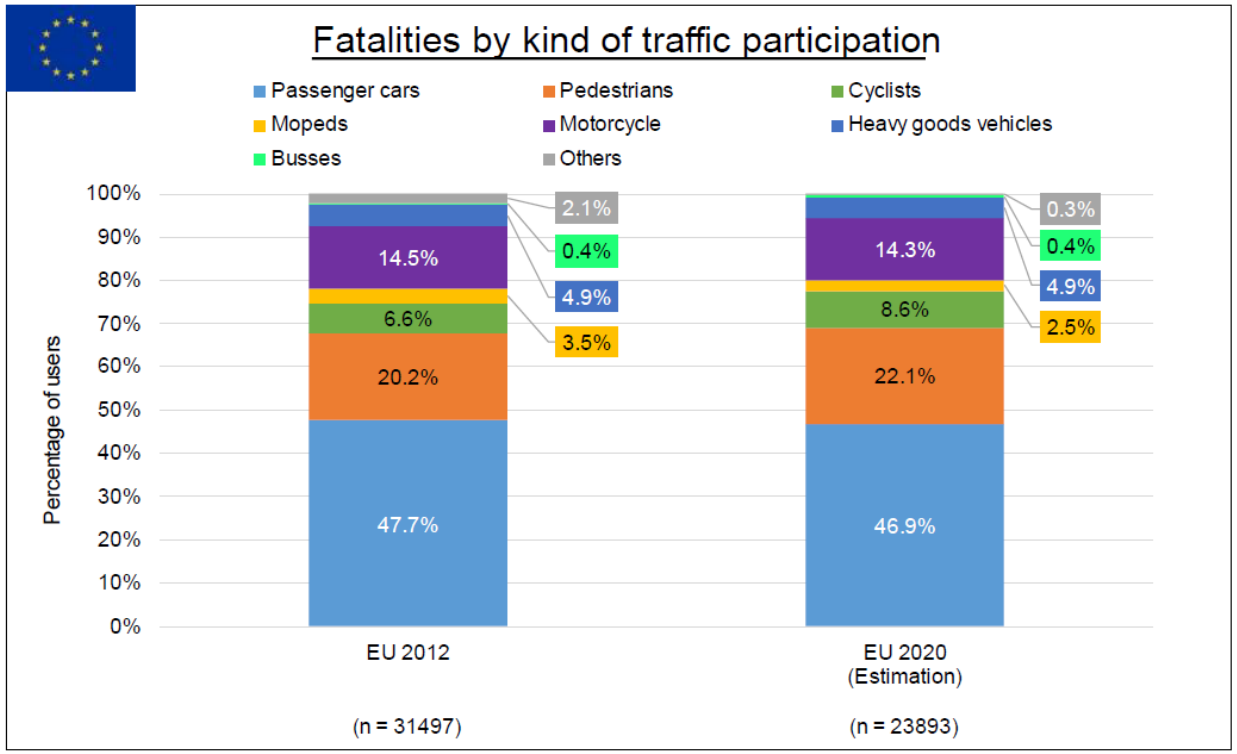
Killed by category of road user

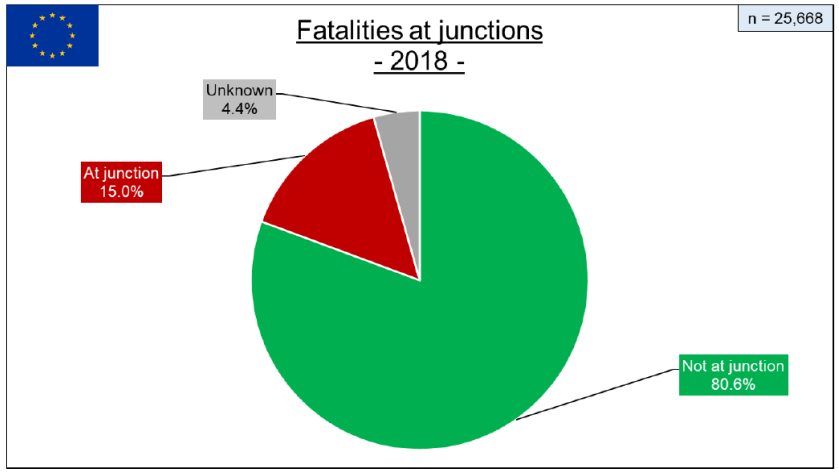


Source: WHO

Source: internet

Accidentology





Source: SECUR Project

Table 103: Top 9 categories combined with kind of road usage – List of scenarios

				Total	Passenger Car	Powered Two-Wheeler	Bicycle	Pedestrian	Other kind of participation
Ranking KSI	Category			KSI	KSI	KSI	KSI	KSI	KSI
1	Category 13	SCP-RD	Straight Crossing Path - Right Direction	735	233	40	248	214	0
2	Category 14	SCP-LD	Straight Crossing Path - Left Direction	575	179	29	167	194	6
3	Category 9	Oncoming	Oncoming	377	332	24	14	4	3
4	Category 1	LTAP-OD	Left Turn Across Path - Opposite Direction	301	123	87	56	34	1
5	Category 15	RE-PV	Rear End - Previous Vehicle	201	154	39	6	0	2
6	Category 21	LOC-CU	Loss Of Control in Curve	190	190	0	0	0	0
7	Category 4	LTAP-LD	Left Turn Across Path - Left Direction	188	86	82	20	0	0
8	Category 11	RE-FV	Rear End - Following Vehicle	184	164	12	7	0	1
9	Category 20	LOC-SL	Loss Of Control in Straight Line	174	174	0	0	0	0

➢ International road safety (global worldview to show case VRU importance

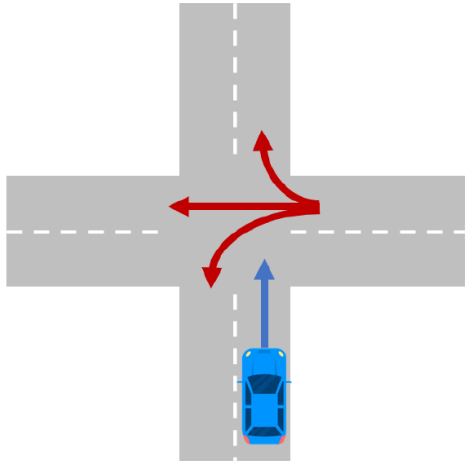


Figure 82: Pictogram – SCP-RD

Straight Crossing Path – Right Direction

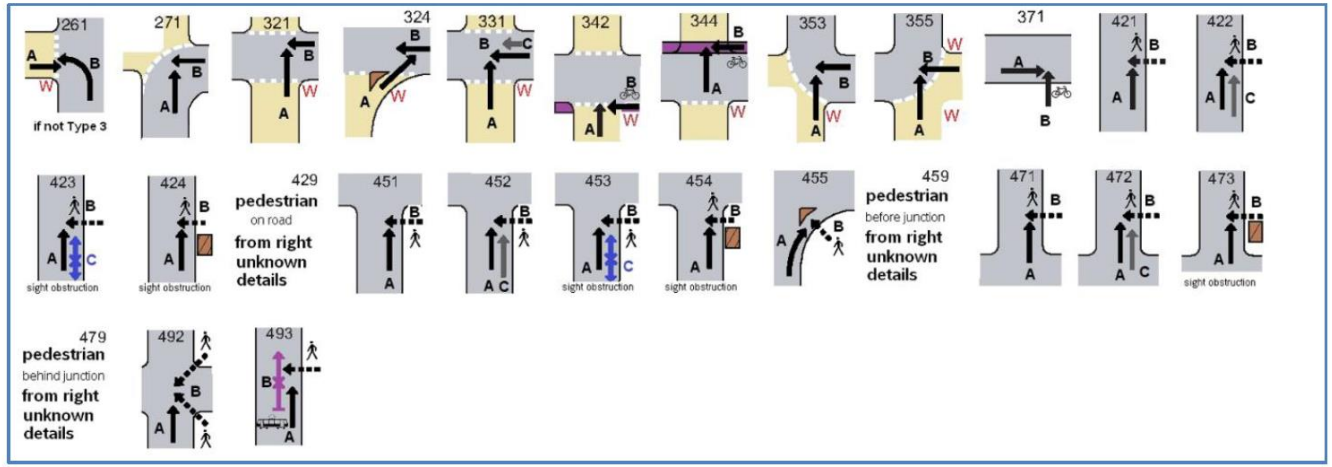


Figure 83: Accident types - participant A – SCP-RD

Source: SECUR Project

➢ Scenarios

Source: CMC
presentation by Mr Hennes Fischer
YAMAHA MOTOR EUROPE
N.V.Senior Adviser

CMC 1.0

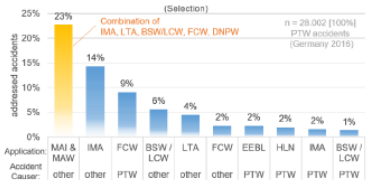
- 1. Accident analysis with representative accident data from Germany 2016

- Which scenario groups address how many accidents?
- What is the proportion of the main accident causer?

CMC 1.0

- 2. Assessment of C-ITS application potential

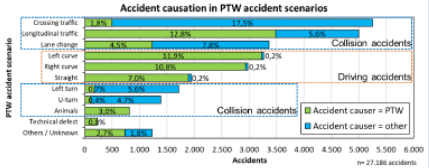
C-ITS Definitions of 2017/2018



- What is the calculated potential of different C-ITS applications for PTW depending on the accident scenarios?
- Evaluation of the potential of 19 C-ITS applications

CMC 2.0

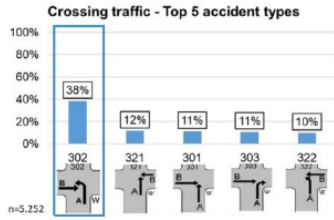
- 3. Updating the representative accident data from Germany to 2019



- Update to the latest accident data from Germany.

CMC 2.0

- 4. Definition of relevant use cases based on accident type



- Which use cases frequently occur in the scenario groups?

CMC 2.0

- 5. Research module (RM) 1:

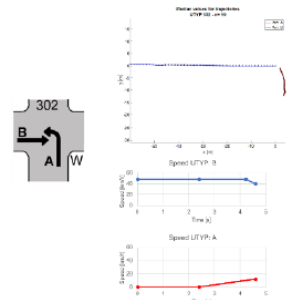
GIDAS-Analysis

- Why did the accident happen?

CMC 2.0

- 6. Research module (RM) 2:

GIDAS-PCM Analysis



- What can a test scenario for this use case look like, based on reconstructed and simulated accident data?

Topics covered so far:

1. « VRUs accidentology Europe », Renault
2. “In depth accident studies involving motorcycles / Powered two wheelers in accidents with cars.” Connected Motorcycle Consortium
3. “Publication upon ‘Benefit evaluation of V2X-enhanced braking in view obstructed crossing use cases”, Bosch
4. “Coalition for Cyclist Safety based on V2X deployments”, Bosch
5. “Results from European SECURE and German IMAGinE Projects” UTAC
6. “VRU Standards promoted by China”, CAIT

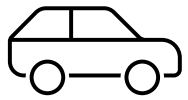
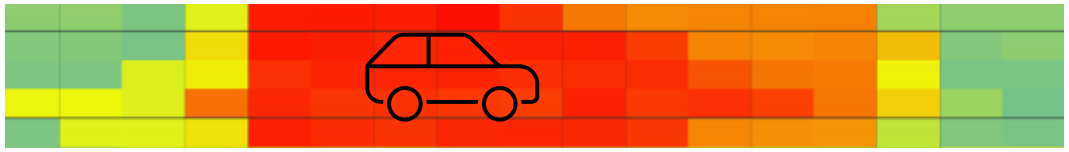
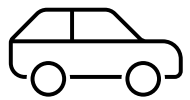
Future deliverables

Interaction with Emergency Break Warning

Action taken could also include any of (or combination of)

- Reduce speed action (brake, foot off accelerator, depress clutch, gear down)
- Abort lane change
- Abort acceleration
- Abort another maneuver
- Change lane

Driver // Driving task
Info for the driver
Info for the system

Navigation / Strategic	Maneuvering / Tactical	Control / Operational
Vehicle // Sensor ODD 	    AEB	
Preparation // Anticipation//Calibration	**Prediction Dynamic map 2D Space (Rear/Front/Lat)**	**Action**
Environment // Infra layout/ Sensor masking elements/Interferences com masking	Driver // Driving task Info for the driver Info for the « system »	Driver // Driving task Info for the driver Info for the « system »

Communication // Range/availability//trust/prediction

Many thanks to all participants of WG2 Meetings and thank you all!