Task 2.1 Definition of Safety-Critical Scenarios

Objectives, methods & early results

Work Package 2 – Future Safety-Critical Scenarios

Automated Vehicle technologies are expected to reduce traffic collisions and casualties by removing some of the human causes like distraction, fatigue or infractions, and by sensing possible collisions and reacting autonomously with emergency maneuvers. But will we see new accident risks as these AVs increasingly become part of the traffic mix? Could their new behaviours cause mistakes or over confidence in other traffic participants? How will interactions between vehicles and VRUs change? We are working to predict the future traffic reality to proactively design safety solutions.

Task 2.1 Objectives

We are mining crash data bases and analysing naturalistic driving data to identify the most serious and frequent crash types currently threatening road users in the EU. The output will be an initial priority set of identified **Safety-Critical Scenarios***, together with their risk characteristics and the descriptors needed to reconstruct these scenarios in computer simulations. This knowledge is foundational for other tasks in the project, including detailed models of road user behaviours and interactions (Tasks 2.2, 2.3, 2.4) and the creation of simulated traffic environments in Task 2.5, to anticipate **Future Safety-Critical Scenarios** resulting from an evolving mix of automated and conventional traffic and vulnerable and unprotected road users.

*Details coming soon in Deliverable D2.6!

Work Package 3 – Collision Avoidance Systems

The automated active safety systems in current vehicles are indispensible in future automated vehicles and must be further improved to detect and avoid collisions with other road users resulting from poor visibility conditions such as rainy weather. This is especially critical for the vulnerable and unprotected road users who are often difficult for motorists to see and whose movements can be hard to anticipate, such as people, cycling, or walking.

What's new from SAFE-UP?

- Enhanced sensors for rainy and poor visibility conditions
- New automated avoidance functions – steering & braking
- Improved algorithms to determine emergency avoidance maneuvers and trajectories

Work Package 3 – Connected VRUs

In the evolving road mobility context in which vehicles increasingly communicate with each other, we can improve our safety when walking, cycling by taking advantage of the ability to share information through our mobile connected devices.

What's new from SAFE-UP?

- A new app that shares precise position data of VRUs with connected infrastructure and vehicles to prevent safety-critical scenarios through warnings delivered to vehicles and to the smart devices of cyclists and pedestrians.

Work Package 4 - Passive Safety Systems

Automated driving functions free up the driver, so these vehicles will have new seating postions to allow occupants to do other things during the trip.

What's new from SAFE-UP?

- Improved occupant protection in new seating positions
- Technology to detect and monitor occupant positions
- Adaptive restraint systems that adjust to occupants' positions

SAFE-UP

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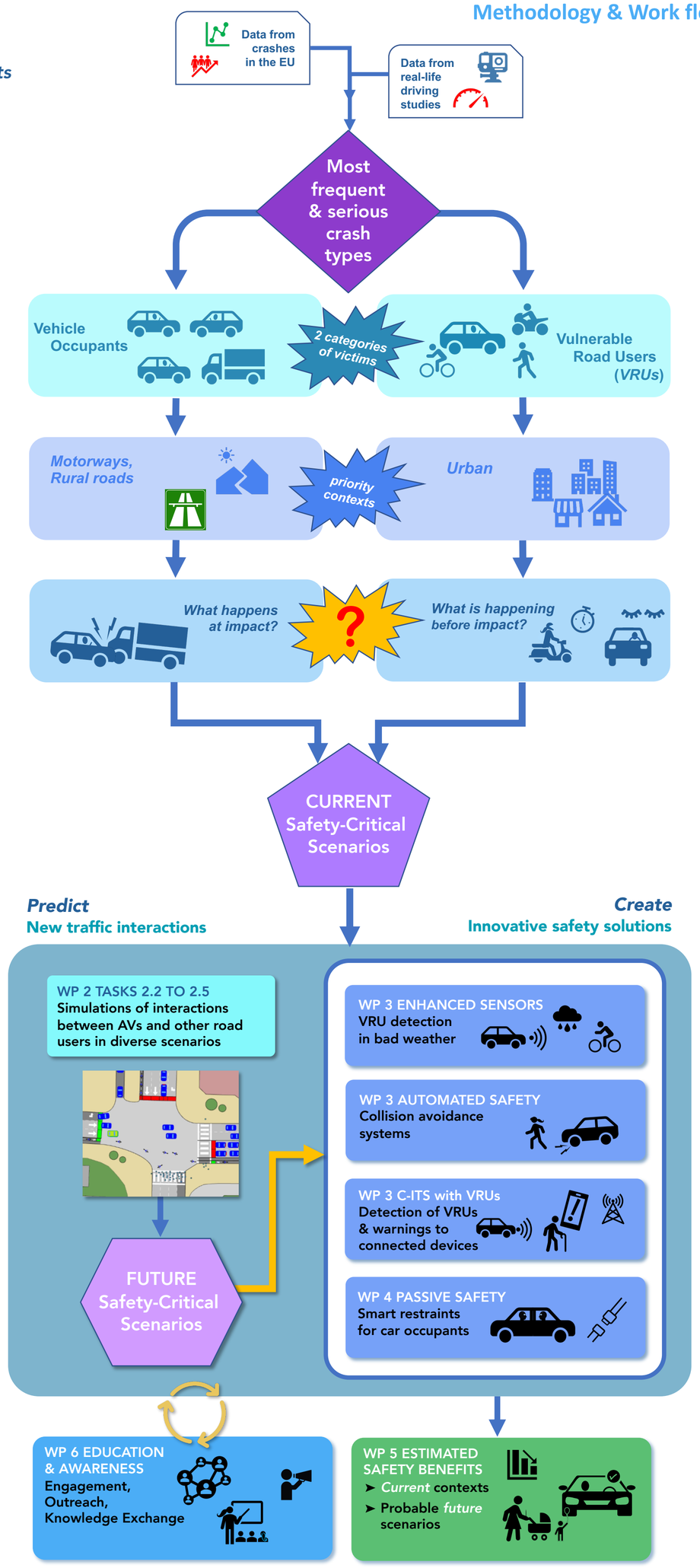
Methodology & Work flow



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Information on data sources used in Task 2.1

CARE database

This provides police-reported information on all road crashes resulting in personal injury in all EU countries. This large and comprehensive database provides a good representation of the current crash characteristics in Europe.

GIDAS - *German In-Depth Accident Study*
AMP & JAAD – *Two naturalistic driving studies*

These additional crash data sources provide more details about the environmental factors and circumstances of crashes. Information about the presence of controlled crossings, road rule infractions, and possible effects of weather are particularly important data to help us understand the causes of collisions between road users.

Early Results for Work Package 3 on VRU Collision Avoidance

Our analyses show that the majority of fatalities and serious injuries to people hit by cars while walking or cycing happen in urban areas.

Identified priorities

- Urban crashes between car drivers and cyclists happen predominantly at intersections.
- Pedestrians experience a lower incidence of crashes at intersections compared to cyclists.
- Bad weather increases the incidence of intersection crashes for both pedestrians and cyclists.
- Pedestrians are particularly at risk at undesignated crossings where their appearance may be unexpected by drivers.

Early Results for Work Package 4 Passive Safety

From our analysis of car occupant injuries and fatalities we identified car-to-car and car-to-heavy goods vehicle crashes in rural areas and motorways as the priorities on which to base the SAFE-UP occupant protection system which includes sensing (occupant monitoring system), actuation (restraint system) and logic (control algorithm).

From the most frequent and serious crash types in each context, and an extensive literature review, we determined the characteristics needed to perform finite element simulations (using Human Body Modelling) to guide the design of these safety innovations.

We must expect that future automated vehicles, with their new seating positions, may still be involved in crashes with mixed traffic. To address this we are using the currently available data to make assumptions about the best solutions for reducing occupant fatalities and mitigating injury severity in collisions. The WP 4 planned approach is described in deliverable D4.1, now available.

Work Package 5 Safety Assessment Methodologies

WP5 will perform the impact assessments on the safety systems developed in SAFE-UP, demonstrating the reductions in the number and severity of common crash types identified in Task 2.1.

Which of the known current risks will persist in future mixed traffic contexts? Will *new* Safety-Critical Scenarios emerge out of the growing introduction of driving automation into the traffic landscape?

SAFE-UP will also assess the expected safety benefits of its developed technologies into the far future. When driving automation is more advanced, and the risks due to human error have been reduced, will these systems continue to provide a safety benefit?

Work Package 6 Training, Knowledge Translation & Awareness Raising

Connected and automated traffic is an evolving, emergent reality. Driving automation systems are not yet perfect and have limitations that road users may not understand. We may need to learn new skills and traffic participation habits to stay safe when walking or riding on two wheels. SAFE-UP is working with vulnerable and unprotected road user advocacy groups, automotive manufacturers and road safety experts to develop strategies for creating and sharing up-to-date road safety and new technology knowledge with the public.