ROADVIEW

Robust Automated Driving in Extreme Weather

Project No. 101069576

Deliverable 8.6

Initial KPI Specifications

WP8 – Integration and demonstration

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Lead participant	FORD
Delivery date	31 August 2024
Dissemination level	Public
Type	Report

Version 1.0

Co-funded by the European Union

Co-funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or European Climate, Infrastructure and Environment Executive Agency (CINEA). Neither the European Union nor the granting authority can be held responsible for them. Project grant no. 101069576.

UK participants in this project are co-funded by Innovate UK under contract no.10045139.
Swiss participants in this project are co-funded by the Swiss State Secretariat for Education, Research and Innovation (SERI) under contract no. 22.00123.

Revision history

Author(s)	Description	Date
Leila Ghasemzadeh (FORD)	Draft deliverable	30/07/2024
Maikol Funk Drechsler (THI), Eren Erdal Aksoy (HH), Isabelle Morvan (CRF) Mikko Tarkiainen (VTT), Matti Kutila (VTT), Jyri Maanpää (FGI), Petri Manninen (FGI)	Input	14/08/2024
Eren Erdal Aksoy (HH), Leila Ghasemzadeh (FORD)	Draft revision 1	20/08/2024
Mattias Hjort (VTI)	First version revision 1	21/08/2024
Frédéric Bemardin (CE)	First version revision 2	27/08/2024
Leila Ghasemzadeh (FORD)	Second version	28/08/2024
Leila Ghasemzadeh (FORD)	Final version	30/08/2024
Alexandra Furio (accelCH), Mario Ceccarelli (accelCH)	Formal check	31/08/2024

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Partner short names

HH	Hogskolan Halmstad
THI	Technische Hochschule Ingolstadt
VTI	Swedish National Road and Transport Research Institute
RISE	RISE Research Institutes of Sweden AB
FGI	Maanmittauslaitos – Finnish Geospatial Research Institute
VTT	VTT Technical Research Centre of Finland Ltd
KO	Konrad GmbH
FORD	Ford Otomotiv Sanayi A. S.
CRF	Canon Research Centre France
accelCH	accelopment Schweiz AG
AVL	AVL Software and Functions GmbH

Abbreviations

CAV	Connected and Automated Vehicles
CCAM	Connected, Cooperative and Automated Mobility
D	Deliverable
GNSS	Global Navigation Satellite System
KPI	Key Performance Indicator
LiDAR	Light Detection and Ranging
MRM	Minimal Risk Manoeuvre
ROMI	Return On Marketing Investment
RMSE	Root Mean Square Error
SMART	Specific, Measurable, Attainable, Relevant, Time-Bound
V2X	Vehicle-to-Everything
WP	Work Package

Executive summary

The ROADVIEW project, funded by the European Union, aims to enhance the safety and reliability of Connected and Automated Vehicles (CAVs) under adverse weather and different road conditions. As a critical component of this initiative, Work Package (WP) 8 (Integration and Demonstration) focuses on integrating and demonstrating the ROADVIEW system in real-world scenarios. FORD (as the leader) and AVL, VTT, THI (as the contributors to this WP) are responsible for specifying and assessing Key Performance Indicators (KPIs) to evaluate the system's performance in Task (T) 8.7.

This deliverable (D) 8.6, Initial KPI Specifications, outlines the initial set of KPIs that will be used to measure the effectiveness and resilience of the ROADVIEW system. These KPIs are crucial for ensuring that the system can operate safely and efficiently in harsh weather conditions, addressing key aspects such as system uptime, weather resilience, execution times, and human interventions.

The initial KPIs presented in this document are designed to provide clear, measurable, and actionable insights into the performance of the ROADVIEW system. They will serve as the foundation for continuous performance assessment and improvement throughout the project lifecycle. This deliverable marks the first step in a series of evaluations, with subsequent reports refining and expanding the KPIs to encompass new metrics and evolving use cases.

Objectives

The primary objective of this deliverable is to define a comprehensive set of Key Performance Indicators (KPIs) for evaluating the performance of the ROADVIEW system and its subsystems. These KPIs are essential for:

- **Measuring System Resilience:** Assessing the ability of the ROADVIEW system to function effectively under various adverse weather conditions, such as rain, snow, and fog.
- **Evaluating Operational Efficiency:** Monitoring the execution times of system components and the overall system uptime/downtime.
- **Identifying Failure Points:** Tracking the number of failed cases where the system or its subsystems stop working.
- **Assessing Human Interaction:** Recording the number and types of human interventions required during test runs, providing insights into areas needing improvement.
- **Facilitating Continuous Improvement:** Establishing a baseline for performance assessment, with the intention of refining and extending the KPIs throughout the project lifecycle.

This deliverable aims to provide a solid foundation for the ongoing evaluation and enhancement of the ROADVIEW system, ensuring that it meets the highest standards of safety and reliability in real-world applications. By systematically measuring and analysing these KPIs, the project team can identify strengths, address weaknesses, and drive continuous improvement in the development of autonomous driving technologies.

1 KPI Introduction

Peter Drucker famously said, “What gets measured gets done [1].” Measurement is a crucial management tool because it allows us to assess the impact of our work, show its value, manage resources effectively, and target areas for improvement. All businesses are vested in tracking their progress, figuring out what works and fixing what doesn’t. That’s where KPIs come in.

1.1 Definition

KPI stands for key performance indicator, a quantifiable measure used to gauge a project’s overall long-term performance [2]. KPIs specifically help determine a project’s strategic, financial, and operational achievements, especially compared to those of other businesses or projects within the same sector. By analysing KPIs, projects can identify areas of strength and weakness, make data-driven decisions, and take actions to optimise performance. KPIs are used to assess success, track performance, and understand progress towards achieving strategic goals and objectives. Regularly reviewing and adjusting key performance indicators is crucial.

KPI and metrics are related, but they’re not the same. Both are designed to measure performance, yet they serve different purposes and are utilised differently by businesses. Metrics are general measures used to track progress and assess success, while KPIs are specific metrics that are directly linked to particular goals within a defined time frame [3].

1.2 Types

- **Strategic:** Strategic KPIs primarily evaluate an organisation’s overall progress in achieving its long-term goals. These indicators offer insights into how well the organisation is advancing towards its mission and vision, supporting high-level decision-making and monitoring the effectiveness of various initiatives. Examples of strategic KPIs include market share, revenue growth, customer lifetime value, and brand recognition.
- **Operational:** Operational KPIs focus on tracking and managing the daily performance of an organisation’s activities and processes. These KPIs are more detailed and actionable, helping frontline employees and supervisors optimise their tasks and identify areas for improvement. Examples of operational KPIs include production cycle time, on-time delivery rate, inventory turnover, and employee productivity.
- **Functional Unit:** Functional KPIs are tailored to specific departments or functions within an organisation, such as sales, marketing, finance, or customer service. These indicators measure the performance and efficiency of individual departments in contributing to overall organisational goals. Examples include customer acquisition rate, Return On Marketing Investment (ROMI), accounts receivable turnover, and customer satisfaction scores.
- **Leading vs Lagging:** KPIs can also be classified as leading or lagging indicators. Leading KPIs are predictive and forward-looking, offering insights into future performance and helping to identify trends that could impact outcomes. Examples of leading KPIs include website traffic growth, lead conversion rate, and employee training hours. Conversely, lagging KPIs measure past performance and outcomes, providing a retrospective view with metrics such as revenue, profit margin, and customer churn rate.

1.3 Characteristics

Not all relevant metrics are suitable as KPIs. For a KPI to be effective, it should adhere to the SMART criteria, which stands for Specific, Measurable, Attainable, Relevant, and Time-bound. The SMART framework helps organisations determine which metrics are most important to focus on as key performance indicators [4].

- **Specific:** KPIs need to be based on precise goals. Vague objectives like "improve business" or "increase customer success" are insufficient. Clear, specific metrics ensure that everyone is aligned and make it easier to identify and measure the steps necessary to achieve better business outcomes and customer value.
- **Measurable:** KPIs are designed to track progress towards goals, so if progress can't be measured, the KPI isn't effective. Measurable KPIs allow you to identify which actions are contributing to your objectives and enable you to evaluate and report on performance.
- **Attainable:** While ambitious goals can inspire innovation, KPIs should be realistic to avoid wasting time and discouraging employees. KPIs should challenge teams to reach new heights, but they must also be achievable to ensure success rather than setting the organisation up for failure.

- **Relevant:** KPIs should be directly linked to the goals that matter most to your business. It's essential to focus on indicators that truly contribute to success and to regularly reassess KPIs to ensure they remain aligned with current strategies and objectives.
- **Time-Bound:** Effective KPIs must have deadlines to create urgency and keep teams moving forward. However, timelines should also be flexible to accommodate changing objectives and unexpected challenges.

To make the SMART framework even more robust, consider expanding it to SMARTER by adding "Evaluate" and "Re-evaluate." KPIs should not be static; they need continuous assessment to ensure they remain achievable and aligned with your goals [5]. The iteration over these characteristics for each set of KPIs is shown in Figure 1.

1.4 Development

To create and develop effective KPIs, the following steps are essential:

- **Define Objectives:** Start by clearly defining the overarching goals and objectives of the project. The connection between these goals and the KPIs is crucial. Effective KPIs should be developed with a thorough understanding of how they relate to specific objectives or desired business outcomes.
- **Engage Stakeholders:** Involve all relevant stakeholders to understand their expectations, requirements, and perspectives on what defines success. It's important to clearly communicate the targets to ensure alignment and accountability among all parties involved.
- **Identify Potential KPIs:** Establish the primary KPIs by considering the project's nature and applying the SMART framework to ensure they are Specific, Measurable, Attainable, Relevant, and Time-bound.
- **Regularly Update KPIs:** Recognise that KPIs are dynamic and should be periodically reviewed to assess their relevance and effectiveness. If goals or strategies change, the KPIs should be adjusted accordingly. Regular reviews not only help track progress and performance but also provide insights into the effectiveness of the KPI selection and development process.

1.5 Measurement & Analysis

After defining the KPIs, the next step is to calculate them. This involves the following process:

- **Identify Performance Metrics:** Determine specific, detailed measures that provide the necessary data to evaluate the performance of each KPI. These metrics are the concrete calculations or measurements that offer insight into whether the KPI targets are being met.
- **Data Collection:** Gather the required data to calculate the KPIs. This can involve using software and systems to automatically collect data from sensors, logs, and databases, or, if automation isn't possible, gathering data through surveys, observations, and manual logging.
- **Data Analysis:** Analyse the collected data to calculate the performance metrics and assess the corresponding KPI. This typically involves mathematical calculations, statistical methods, ratios, percentages, or other forms of measurement.
- **Interpreting the Results:** Interpret the analysis results to determine whether the goals have been achieved. Use the results to identify strengths and areas needing improvement, comparing the calculated performance metrics against the predefined KPI targets.
- **Reporting:** Regularly report KPI results to relevant stakeholders. These reports help stakeholders understand performance and manage the process of achieving strategic goals. Utilise dashboards, reports, and visualisations to effectively communicate the results.
- **Creating an Action Plan:** Based on the KPI analysis, determine if action is needed to improve performance or achieve goals. If so, create and implement an action plan. Continuously review KPI measurements and adjust them as needed to enhance accuracy and relevance.

KPI calculation is an ongoing process, and the selected KPIs may need revision or updates over time. This allows for adaptation to changing conditions and more effective performance management. Consider prioritising a few key KPIs that are directly aligned with your objectives and have the greatest impact on the project's success, with quarterly reviews as a recommended frequency.

1.6 Importance & Limitation

Setting and following the KPIs keep the teams aligned, accountable, provide a health check and make adjustments. While KPIs are helpful, they do have some drawbacks. For example, it can take a long time for KPIs to provide useful data, and they often need to be watched closely and updated regularly to stay effective.

All the necessary steps through designing, developing and applying KPIs are shown in Figure 1.

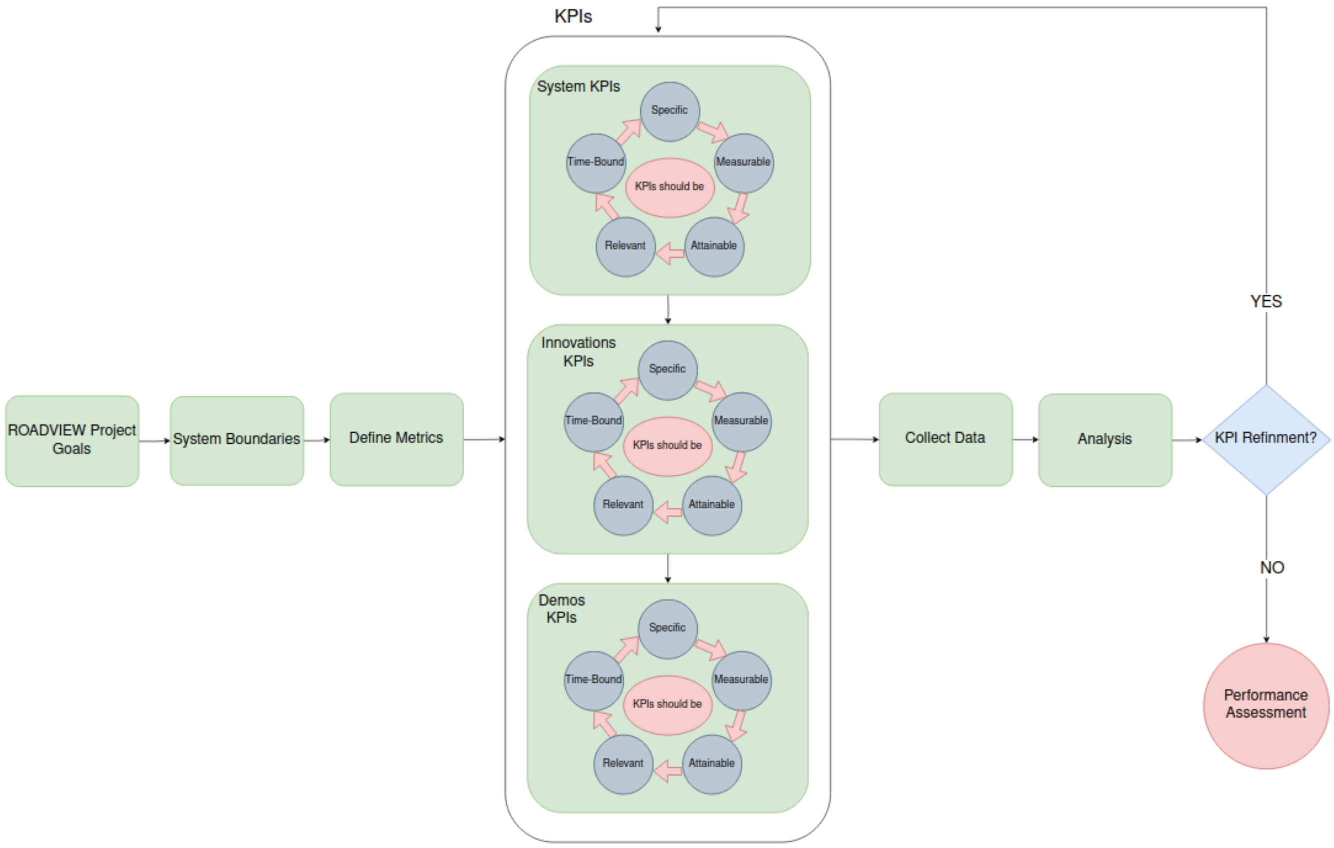

Figure 1 The full cycle of defining KPIs

2 ROADVIEW KPIs

To design and develop the KPIs, the project goals and the system boundaries should be defined clearly, then high-level to low-level key performance indicators should be specified.

2.1 Project Goals

The ROADVIEW project aims to achieve several key goals to enhance the safety, reliability, and acceptance of CAVs under various weather and traffic conditions. These goals include:

- **Enhancing Safety and Reliability in Adverse Weather Conditions:** Develop and integrate a sophisticated in-vehicle system-of-systems capable of advanced environment and traffic recognition, prediction, and decision-making to ensure CAVs can operate safely and reliably in harsh weather conditions such as rain, snow and fog.
- **Improving Perception and Decision-Making Systems:** Create an embedded in-vehicle perception and decision-making system based on enhanced sensing, localisation, and improved object/person classification, including vulnerable road users, to accurately determine the appropriate course of action in real-world environments.
- **Developing Cost-Effective Multisensory Solutions:** Innovate a cost-effective multisensory setup with advanced sensor noise modeling and filtering to enhance the robustness and accuracy of CAV systems in various scenarios and weather conditions.
- **Advancing Collaborative Perception and Simulation-Assisted Testing:** Implement collaborative perception techniques and simulation-assisted testing methods to rigorously test and validate the performance of the ROADVIEW system under different scenarios, ensuring it reaches Technology Readiness Level 7 by the end of the project.

- **Contributing to the Connected, Cooperative and Automated Mobility (CCAM) Partnership:** Support the co-programmed European Partnership CCAM by developing more powerful, fail-safe, resilient, and weather-aware technologies, thereby advancing the overall development and adoption of CAVs.
- **Leveraging Consortium Expertise and Testing Infrastructure:** Utilise the unique portfolio of testing sites and infrastructure provided by the consortium members, including hardware-testing facilities, rain and wind tunnels, and test tracks north of the Arctic Circle, to thoroughly evaluate and demonstrate the ROADVIEW system's capabilities.

2.2 System Boundaries

The five general system boundaries of the projects are:

- The ROADVIEW system must be designed to operate effectively in adverse weather conditions such as rain, snow and fog.
- Development and integration of advanced environment and traffic recognition, prediction, and decision-making capabilities.
- Ensuring the ROADVIEW system maintains high uptime and minimal downtime during operation.
- Minimising the need for human interventions during system operation.
- Rigorous testing and validation of the system using facilities like rain and wind tunnels, and test tracks under varied environmental conditions.

2.3 System KPIs

To define the KPIs we use the cascade method, starting from high-level KPIs to low-level ones [6]. As the high-level key performance indicators, we need to define the ROADVIEW system's KPIs first.

1. System Resilience (ID: S-KPI1):
    - **KPI:** Percentage of operational time in adverse weather conditions (rain, snow, fog).
    - **Measurement:** The proportion of time the ROADVIEW system remains fully functional during specified weather conditions.
2. Failure Rate (ID: S-KPI2):
    - **KPI:** Number of failed cases where the system or subsystems stop working.
    - **Measurement:** Total count of system failures per test run or operational hour.
3. Uptime/Downtime (ID: S-KPI3):
    - **KPI:** System uptime versus downtime in harsh weather.
    - **Measurement:** Hours of continuous operation without failure compared to hours of downtime.
4. Human Intervention (ID: S-KPI4):
    - **KPI:** Frequency and types of human interventions.
    - **Measurement:** Number of times human intervention is required during system operation, categorised by intervention type.
5. Execution Time (ID: S-KPI5):
    - **KPI:** Average execution time of ROADVIEW components
    - **Measurement:** Time taken for critical system components to perform their tasks, measured in milliseconds or seconds.

2.4 Innovations KPIs

In the ROADVIEW project, there are eleven innovations for Vehicles-to-Everything (V2X) which were proposed and are being developed, for each innovation the necessary KPIs are as follows.

2.4.1 Infrastructure-Based Perception System including Weather Conditions (V2X)

1. Accuracy of Weather Condition Detection (ID: I-KPI1):
    - **Baseline:** Current accuracy level of weather detection.
    - **Target:** Improvement percentage in accuracy with the new system.
2. System Latency (ID: I-KPI2):
    - **Baseline:** Current system response time.

- **Target:** Less than 750 ms between the roadside sensor data acquisition and the reception of perceived objects by the onboard system

2.4.2 Weather-Aware Infrastructure-based Manoeuvre Cooperation (V2X)

1. Manoeuvre Coordination Success Rate (ID: I-KPI3):
   - **Baseline:** Currently, there is no implementation of Minimal Risk Manoeuvre (MRM) request triggered from the V2X system.
   - **Target:** 90% of acceptance by the onboard system to follow an MRM request proposed by the infrastructure-based system in case of harsh weather.

2.4.3 Environment-Aware High-Definition Mapping

1. Real-Time Global Navigation Satellite System (GNSS) Positioning Accuracy (ID: I-KPI4):
   - **Baseline:** Current accuracy of vehicle GNSS positioning.
   - **Target:** Improvement percentage with high-definition mapping.
2. Size of the HD Map representation (ID: I-KPI5):
   - **Baseline:** Size of NDT HD Map
   - **Target:** Smaller map size without losing accuracy of positioning

2.4.4 Optical Measurement of Road Grip and Surface Conditions

1. Grip Prediction Accuracy (ID: I-KPI6):
   - **Baseline:** Root Mean Square Error (RMSE) of a single grip measurement from an optical sensor extended over the whole measurement area.
   - **Target:** Lower grip prediction RMSE when the grip map is predicted pixelwise over the whole road area.
2. Fraction of Ground Truth Grip Measurements within 95% Prediction Confidence Interval (ID: I-KPI7):
   - **Baseline:** Fraction of ground truth grip measurements within a 95% confidence interval of a normal distribution estimated from 100 last grip measurements from an optical sensor.
   - **Target:** Higher fraction of ground truth grip measurements within 95% prediction confidence interval when grip confidence map is predicted pixelwise over the whole road area.

2.4.5 Fast and Accurate Multi-Sensor Fusion

1. Fusion Processing Time (ID: I-KPI8):
   - **Baseline:** Current processing time for sensor fusion (including Camera, LiDAR, and Radar).
   - **Target:** Reduction in processing time.
2. Accuracy of Fused Sensor Data in 3D object detection and semantic segmentation tasks (ID: I-KPI9):
   - **Baseline:** Current accuracy of multi-sensor data.
   - **Target:** Enhanced accuracy with joint multi-task learning (including both 3D object detection and semantic segmentation).

2.4.6 Fast and Memory Efficient Outlier Detection

1. Detection Speed (ID: I-KPI10):
   - **Baseline:** Current speed of conventional statistical outlier detection in 3D point cloud data.
   - **Target:** Faster detection times.
2. Accuracy of Outlier Detector (ID: I-KPI11):
   - **Baseline:** Current accuracy (Mean Intersection over Union (mIoU)) of conventional statistical outlier detection in 3D point cloud data.
   - **Target:** Enhanced accuracy in outlier detection.

2.4.7 Fast Free Space Detector Using LiDAR Clouds

1. Free Space Detection Accuracy (ID: I-KPI12):
    - **Baseline:** Current accuracy of free space detection (Mean Intersection over Union (mIoU)) in LiDAR point clouds.
    - **Target:** Improvement in detection accuracy.
2. Processing Speed (ID: I-KPI13):
    - **Baseline:** Current speed of free space detection in LiDAR point clouds.
    - **Target:** Increased processing speed.

2.4.8 Semantic-Aware Pseudo Point Cloud-Based 3D Object Detector

1. 3D Object Detection Accuracy (including vehicles, pedestrians, and cyclists) (ID: I-KPI14):
    - **Baseline:** Current accuracy (mean Average Precision (mAP)) of 3D object detection in point clouds.
    - **Target:** Enhanced detection accuracy.
2. False Detection Rate (ID: I-KPI15):
    - **Baseline:** Current false detection rate in point clouds.
    - **Target:** Reduction in false detection rate.

2.4.9 Real-Time Multimodal Weather Type Detector

1. Weather Type Detection Accuracy (ID: I-KPI16):
    - **Baseline:** Current accuracy of weather type detection in fused multimodal sensor data.
    - **Target:** Improvement in weather type detection accuracy.
2. Detection Response Time (ID: I-KPI17):
    - **Baseline:** Current response time for weather detection.
    - **Target:** Faster response times in multimodal sensor setup.

2.4.10 Harsh Weather Visibility Estimator

1. Visibility Estimation Accuracy (ID: I-KPI18):
    - **Baseline:** Current accuracy of the visibility estimator. The automotive industry is not using visibility range estimation functionality in actual environment perception systems.
    - **Target:** Visibility estimation capability installed, and range measurement is measured against radar detection range. The visibility estimator should provide output which gives optical sensor device measurement +-10 % tolerance in turbulent dry snowy and mid-dense fog.
2. Visibility Estimation System Reliability (ID: I-KPI19):
    - **Baseline:** Current reliability of the visibility estimator. No visibility range reference system at the automotive level is available. There are only infrastructure side expensive systems (> 10 k€) which do not meet automotive requirements.
    - **Target:** The reliability needs to be 85% or higher. The true-positive rate of seeing reference targets is more than 90 % while the false-positive rate is less than 20 %.

2.4.11 Weather Conditional Velocity Controller

1. Velocity Adjustment compared to the experienced human driver (ID: I-KPI20):
    - **Baseline:** Velocity adjustments done by experienced human drivers according to road slipperiness.
    - **Target:** Velocity limitations done by the velocity controller in slippery conditions should be lower than the human driver.
2. Robust Traction Control (ID: I-KPI21):
    - **Baseline:** Number of traction loss events in automated driving mode (when accelerating or braking) without weather conditional velocity controller.
    - **Target:** Improvement in the number of traction loss events with weather conditional velocity control.

2.5 Demonstration KPIs

As the last step to define the KPIs, the demonstration success rate needs to be considered.

1. Scenario Performance (ID: D-KPI1):
    - **KPI:** Success rate in diverse demonstration scenarios.
    - **Measurement:** Percentage of scenarios where the system performs as expected without failures.
2. Environmental Adaptability (ID: D-KPI2):
    - **KPI:** System adaptability to changing weather conditions during demonstrations.
    - **Measurement:** Number of successful adaptations to weather changes (e.g., transitioning from rain to snow) during a single demonstration.
3. Real-Time System Performance (ID: D-KPI3):
    - **KPI:** Real-time processing and decision-making accuracy during demonstrations.
    - **Measurement:** Latency and accuracy of real-time system responses in demonstration environments.
4. Safety Metrics (ID: D-KPI4):
    - **KPI:** Safety performance in live demonstrations.
    - **Measurement:** Number of safety incidents or near-misses recorded during demonstrations, aiming for zero occurrences.
5. Timeliness of Demonstrations (ID: D-KPI5):
    - **KPI:** Adherence to scheduled demonstration timelines.
    - **Measurement:** Percentage of demonstrations conducted on or before the planned dates.

2.6 Performance KPIs

The performance metrics will be initially described in the D7.2. These will be further integrated into the next deliverables related to KPI's as well as in the final evaluations of the automated driving systems in the different test tracks and demonstration sites.

Below in Table 1, the innovations and their related KPIs are listed. In further analyses and reports, the KPI IDs will be used. IDs starting with 'S' are related to the system/project, KPIs starting with 'I' are related to innovations, and those starting with 'D' are defined for demonstrations.

Table 1 List of identified innovations and their corresponding KPIs.

No	Main Responsible	Title of Innovation	Number of KPIs	KPI ID
1	CRF	Infrastructure-based perception system including weather conditions for collaborative perception solution using V2X (Vehicle-to-Everything)	2	I-KPI1, I-KPI2
2	CRF	Weather-aware infrastructure-based manoeuvre cooperation for vehicle control and decision-making system using V2X (Vehicle-to-Everything)	1	I-KPI3
3	FGI	Environment-Aware High-Definition Mapping method for Real-Time Positioning of an Autonomous Vehicle on the map	2	I-KPI4, I-KPI5
4	FGI	Optical measurement of road grip and road surface conditions in front of the vehicle	2	I-KPI6, I-KPI7
5	HH	Fast and Accurate Multi-sensor Fusion for Joint Multitask Learning	2	I-KPI8, I-KPI9
6	HH	A Fast and Memory Efficient Outlier Detector for 3D LiDAR Point Clouds	2	I-KPI10, I-KPI11
7	HH	A Fast Free Space Detector using LiDAR Point Clouds	2	I-KPI12, I-KPI13
8	HH	Semantics-aware Pseudo Point Cloud-based 3D Object Detector	2	I-KPI14, I-KPI15
9	HH	A Real-time Multimodal Weather Type Detector for Autonomous Vehicles	2	I-KPI16, I-KPI17
10	VTT	Harsh weather visibility estimator for safe automated driving	2	I-KPI18, I-KPI19

11	VTT	Weather Conditional Velocity Controller for safe automated driving in harsh weather conditions	2	I-KPI20, I-KPI21

3 Conclusions

The ROADVIEW project represents a pivotal advancement in the field of CAVs, particularly in addressing the challenges posed by adverse weather and different road conditions. By integrating a complex in-vehicle system capable of advanced environment and traffic recognition, prediction, and decision-making, ROADVIEW aims to enhance the safety and reliability of CAVs under diverse and harsh conditions. The project's rigorous approach, involving cutting-edge innovations such as multisensory setups, noise modelling, and collaborative perception, ensures a comprehensive evaluation and improvement of CAV performance. Through detailed KPIs and performance metrics, the project will systematically assess and optimise system resilience, reliability, and overall operational efficacy, thereby contributing significantly to the development of fail-safe and weather-aware autonomous driving technologies.

As the project progresses, the continuous monitoring and assessment of the defined KPIs will provide critical insights and drive further enhancements in system design and functionality. The measurable outcomes, such as increased operational time in adverse weather, reduced failure rates, and improved decision-making accuracy, will validate the project's success and readiness for real-world implementation. Additionally, the focus on innovation and timely execution will ensure that ROADVIEW not only meets its technological objectives but also sets new standards for the industry. The collaborative efforts of leading universities, research institutes, SMEs, and industry leaders within the consortium underscore the project's potential to make a substantial impact on the future of autonomous driving, paving the way for safer and more reliable CAVs on our roads.

4 Next steps

In WP8, there will be 2 more deliverables which are the next steps of this D8.6:

- D8.7: Final KPI specifications
- D8.9: Report on performance assessment according to KPIs

Following the completion and review of D8.6, the next steps involve finalising the initial KPI specifications with feedback from all partners. This collaborative effort will establish a strong foundation for developing D8.7, where the initial KPIs will be evaluated and refined based on additional feedback and preliminary performance data. The performance metrics from T7.2 will be integrated into the final KPI specifications, ensuring a comprehensive assessment framework. Stakeholder engagement will validate the KPIs, and the final document will be reviewed and approved by all partners.

As the project progresses, the list of KPIs will be reviewed and extended annually after M24, ensuring they remain relevant and comprehensive. During the period from M30 to M48, performance data for the integrated ROADVIEW system will be collected and analysed based on the finalised KPIs. This analysis will form the basis of D8.8, a detailed performance assessment report. The draft report will be reviewed by partners, and feedback will be incorporated to finalise it. These systematic efforts will enhance CAV safety and reliability under adverse weather conditions, contributing to the achievement of the ROADVIEW project's objectives.

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