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# RECOMMENDATIONS FOR ACTION FOR THE INTELLIGENT COMBINATION OF REGULATION AND STANDARDISATION IN CONNECTED AND AUTOMATED DRIVING (CAD)

## Executive Summary

This short paper examines how standardisation can support the complex and challenging system and type approval processes of new, innovative functions for automated and connected driving. To this end, the current procedure for the creation of regulations, laws and standards was analysed and the working methods in regulation and standardisation were considered. Based on this, recommendations for action were developed. These recommendations are intended to explain how the rapid development of innovative and by now very complex functions in the field of automated and connected driving can be accompanied safely and in line with market requirements by means of customised and coordinated standardisation. In the future, standardisation work should be used more often as a foundation or supplement to regulation. Close coordination in the creation of legal requirements in conjunction with the voluntary technical regulation via standards can help to bring new, innovative driver assistance systems or systems for automated driving to market quickly and safely.

## 1 Challenges and description of the current approach

### 1.1 Challenges

In today's automotive industry, new functions for automated and connected driving are being developed in rapid succession. These functions are intended to significantly support vehicle drivers in fulfilling their driving task or relieve them of it. At the same time, these systems and functions are intended to contribute to increasing road safety. The challenge is to quickly approve these new, innovative features for widespread introduction in global markets without neglecting safety requirements.

As a result, the automotive industry today faces the challenge of introducing innovative technologies, particularly in the field of automated driving, under the current UNECE regulations. However, the complexity of these technologies requires a flexible approach. Innovation cycles are shortened by using software. Solutions must be rethought, and field knowledge must be able to be integrated quickly. Current regulation only allows the use of this potential to a limited extent and thus makes it difficult to introduce innovations quickly. In the field of automated driving, the details of regulation often need to be developed alongside vehicle development.

In addition, the procedure for type approval is not standardised worldwide. Europe and many other countries apply UNECE regulations for this purpose. In contrast, North America currently lacks specific regulations for driver assistance systems. However, it is common practice in the USA for regulations to demonstrate compliance with the requirements contained therein without a state certification body by means of self-certification.

In particular, the legal framework cannot be created or changed quickly without sufficient examination of the hazards and risks. Additionally, new functions often need to meet the requirements of various, and sometimes outdated, regulations standards. These existing regulations are often highly detailed, and to ensure reliable verification, typically established technological solutions are used. This often unnecessarily limits technological advancements or alternative solutions. Consequently, existing regulations in Europe, while ensuring a very high level of safety, potentially delay the introduction of innovations in the market. As an example, the current requirement according to *Regulation No 79 UN/ECE — Uniform provisions concerning the approval of vehicles with regard to steering equipment* should be mentioned, in which the driver's attention must be monitored by means of the ‘driver has his hands on the steering wheel’ test. Other innovative approaches, such as observing the driver's line of vision instead of the ‘hands on the steering wheel’ test, are currently not recognised as proof of the attention test.

Due to the high complexity of innovative systems, safety verifications require statistically relevant amounts of data, which are typically not obtainable through test drives alone. Instead, this data is generated when the technology is used in the market. However, current type approval regulations impede this process. Furthermore, this data is often requested during the preparation of the regulatory framework. As a result, developers of such functions are forced to move to other markets to gather the necessary data. In contrast, companies operating in regions with more liberal regulations can use their technology directly in their domestic markets, giving them a competitive advantage in data collection.

## 1.2 Legal regulations for the UNECE area and standardisation

Statutory regulations are developed in UNECE committees, while voluntary, industry-driven standardisation takes place in national, European and international standardisation committees. The division of labor is limited to the understanding that the legislator specifies limit values and basic requirements for safety and environmental protection. At present, the members of the respective committees work largely independent of each other.

Industry-driven standardisation preferably describes interfaces, quality requirements or usable technologies for implementing or measuring safety requirements. Experts in the automotive industry, such as those in ISO/TC 22, proactively develop important standards related to various aspects of automated and connected driving. They also provide updates on the status of these projects during UNECE working group meetings. However, there is neither a defined, clear separation of tasks of statutory regulation and any supplementary standardisation, nor is there any agreement or coordination of the contents of standards and technical rules. Only in exceptional cases does the regulation refer to ISO standards.

# 2 Recommendations

## 2.1 In General

The UNECE regulations define guardrails with the aim of creating basic safety. An agile approach to cooperation between regulation and standardisation and more flexibility in implementation could accelerate the acquisition of necessary field experience.

The following three main objectives have been identified in this paper:

- Objective 1: Simplified collection of the database for the state of the art
- Objective 2: Balanced regulation
- Objective 3: Coordinated interaction between regulation and standardisation

and recommendations have been formulated to do justice to the development of these complex technologies and the demand for safety.

## 2.2 Simplified collection of the database for the state of the art

Both the creation of standards and the development of statutory minimum requirements for safety and environmental protection require data and empirical values to reliably describe and evaluate the state of the art.

In order to approve new functions for market launch, standardisation and regulation would practically have to take place before the availability of the ‘state of the art’, which in turn is the result of experience with market deployment.

To date, approvals and admission of systems/functions have been possible as part of development through prototype testing. Examples include the type approval of functions based on UN/ECE R79 for steering systems or UN/ECE R13H for brake assistance systems or for systems according to SAE level L1 for automated driving (see SAE J1316 respectively ISO/SAE PAS 22736). Due to the complexity, in many cases it is no longer sufficient to collect the necessary data to prove reliability and exclude risks during development through such test drives. To counter this, multi-level procedures are used. This so-called “multi-pillar approach” is no longer based solely on statistically proven data, but also includes other evidence of the functioning of safety concepts. It is now also required for “Automated Lane Keeping Systems” (ALKS) and in future also for “Driver Control Assistance Systems” (DCAS).

The inclusion of statistical evidence (e.g. via “Key Performance Indicators”) as an additional option and part of the approval processes is now used in many companies and follows the requirements of ISO 21448 “Road vehicles - Safety of intended functionality”.

A positive risk balance could be drawn up by using a corresponding number of vehicles or applications in the field over a dedicated period of time for a reliable statistical data basis. However, this is not possible due to existing regulations in the UNECE area. It is also conceivable that the system provider could provide evidence via simulations. Although standards already provide guidance for this, these simulations are carried out according to in-house framework conditions, which does not guarantee their recognition. As complexity increases, customer field data plays a key role in the further development of functions and in maintaining the security of the functions on the market.

Due to the complexity, it is also necessary to be able to update and or change functions or systems in the field, for example through “updates via wireless interfaces (Over The Air = OTA)”, in order to adapt original assumptions for the use of the functions at short notice if required. However, this can only be done in accordance with strict legislative requirements, as approval-relevant parameters may not be changed.

This regulatory situation in the UNECE area is therefore increasingly leading to car manufacturers shifting the introduction of complex, innovative functions to other markets, where vehicle safety is confirmed in practice in accordance with the self-imposed protection targets. The industry only introduces functions comprehensively if they are safe. Strict and narrow regulation is not necessarily a prerequisite for safety.

A new approach is needed to obtain the necessary and complex data from trials, field experience and simulations in the domestic market and to combine them efficiently. The following ideas provide corresponding approaches that would have to be verified in further investigations and projects:

- Analysis of best practices for determining statistically relevant field data in Germany and Europe; (use of existing manufacturer-independent databases, studies and anal-yses from different countries and regions as a basis for information, as well as estab-lishment of suitable databases)
- Application of Regulation (EU) 2018/858, Article 39: Exemptions for new technologies or new concepts; (use of this exemption and, if necessary, its adaptation and further development as a standard route in combination with ISO standards (see Chapter 3.3)
- Application of small-series authorisation without reference to all existing regulations; (using the limitation on the number of units or variants per year or their adaptation as a launch scenario for innovative functions, with subsequent adaptation of the regulation)
- application of the concept of real-world laboratories or the so-called ‘sandbox regula-tion’ (definition of an observation framework by the national regulatory authorities for a limited period so that the state of the art can mature).
- Use of simulations according to recognised and standardised specifications and framework conditions.

Through open and trusting collaboration between the automotive industry and regulatory authorities in Germany and Europe, viable solutions can be developed based on the options for action outlined above. The associated risks must be acceptable to both the industry and law-makers.

## 2.3 Balanced regulation

The regulator is currently pursuing specially defined protection goals, such as increasing road safety. These protection goals are supported and endorsed by the industry. Vehicle safety and the prevention of traffic accidents are priorities in the development of automated and assisted driving systems.

However, the regulator is increasingly no longer limiting themselves to defining new protection targets or limit values. To rule out all eventualities, technological specifications and information on verification are also being included in the regulations in addition to protection targets.

The industry is also striving for international harmonisation, which the regulator supports in principle, but which poses additional challenges to the coordination process. In particular, the requirement of unanimity in decision-making within the framework of the UNECE can quickly lead to blockade situations.

This goal ─ along with the effort to regulate technological implementation and verification ─ is making the international regulatory landscape increasingly extensive, restrictive, and complex.

It can be assumed that, even if the regulator only limits itself to defining the safety objectives, the legal certainty required by the industry will continue to be provided by the regulatory system if the multi-pillar approach is pursued. After all, every manufacturer is committed to the safety of their products.

The goal must therefore be to streamline the current process of rulemaking, i.e. to limit it to effective regulations with a description of the protection goals. Standards can supplement these operating regulations with detailed specifications. A highly developed automotive industry with high customer requirements will be intrinsically motivated to advocate standards that support and ensure the protection goals of the regulation with suitable tests and specifications. Standards mean the representation of a state of the art that not only ensures safety but also ensures the acceptance of technologies in the long term without permanently hindering innovation.

The interaction could follow the sequence shown in Figure 1. The regulatory framework describes basic safety objectives, the provisional introduction of the innovation based on simulations and special authorisations is supported by provisional standards and provides a data-base for any necessary tightening of the safety objectives in coordination with the state of the art described in standards. Focussing on basic protection goals thus creates room for innovation without neglecting safety.


*Figure 1: Interaction of regulation and introduction of new technologies*

To achieve this, closer cooperation of regulation and standardisation through jointly developed roadmaps and coordinated planning would be beneficial. This would foster early dialogue between regulators and the industry, ensuring a unified approach that accelerates regulation while still meeting safety and protection targets. Open discussion of the objectives and concerns surrounding new technologies is a basic prerequisite.

Requirements that lead to technological limitations should be resolved by clearly defined basic protection objectives as follows:

(1) identify barriers to innovation, if any, in regulations

(2) identify concerns on the part of the regulator

(3) derive protection goals / transfer into protection goals

(4) identify standards if already present in other markets, or

(5) establish standards or revise existing ones

At the same time, regulators and industry should closely coordinate which aspects need to be addressed in the operating regulations or standards in order to interlink.

## 2.4 Coordinated interaction between standardisation and regulation

This section takes up the recommendation for action described in Chapter 3.3 and explains how regulation and standardisation could be intelligently linked in the future. This is based on the process of European standardisation according to the so-called New Legislative Framework (NLF).

### 2.4.1 Orientation towards the NLF

By introducing harmonised standards as a supplement to European regulations or directives, Europe has found a way not only to create a common internal market but also to promote innovation-friendliness.

While the European regulations set the basic objectives for safety and the protection of the environment and society, the standards commissioned from the European standardisation organisations complement their implementation by describing the technological solutions according to the state of the art.

Since European standards can also be provided with national deviations during national adoption, the term ‘hEN’ was introduced. National deviations are no longer permitted for these standards. The Commission therefore usually mandates hEN and cites them in the European Official Journal as implementing provisions to be observed for the statutory regulations.

The standardisation work supported by the economy thus enables the industry to test and standardise several technological implementation paths and at the same time to react very flexibly to technological advances in compliance with the basic safety objectives defined in the operating specification.

An example is the European Parliament and Council Regulation on alternative fuels infrastructure, which specifies the required charging technology while regulating its safety design and compliance testing through European standards. This flexible approach drives progress in fast-evolving technology areas while ensuring market access remains competition-neutral.

Transferring the NLF approach to the global level could help to make the rigid UNECE regulation more flexible with the support of standardisation in ISO. A focus on basic protection goals could enable technological progress, including the introduction of innovative functions in assisted and automated driving, while at the same time ensuring safety.

When considering the European model of the NLF, however, it is also important to learn from the limitations of the concept. The principle of the NLF was unnecessarily complicated after its introduction. The standards cited in the Official Journals were regarded as part of European legislation delayed in time after their introduction. This resulted in additional requirements for such hEN. The standards drawn up by the industry experts and intended for citation in the Official Journal must now be reviewed by independent legal experts at the latest at the end of the drafting process. This review is intended to ensure that the requirements for European jurisdiction are also met by the text of the standards. For this purpose, the industry experts are supported by so-called ‘HAS consultants’ financed by the Commission. Listing in the Official Journal of the EU only takes place after the review. This approach is now proving to be a clear impediment as the subsequent ‘treatment’ of the standards by ‘HAS consultants’ often leads to delays and conflicts between the industry experts drafting the standard and the independent legally trained auditors for multiple reasons.

This subsequently introduced bureaucratic hurdle thwarts the original idea of the NLF and leads to a similarly complex, extensive and restrictive approach as in the current regulatory process for the automotive industry. The European economy therefore criticises the implementation practice, which deviates from the original idea of the NLF, and points out that this approach does not lead to more safety but rather to more bureaucracy.

### 2.4.2 Derived proposal

A standard drawn up in accordance with the rules of the European or international standardisation organisation does not necessarily have to become a regulatory component of a regulation via the harmonisation process. Rather, trust should be placed on the personal responsibility of the experts in the preparation of standards as well as on the responsible liability of the industry when applying ISO or EN standards.

Therefore, an alternative solution to the established regulation of vehicles could be to create an analogous process to the European NLF between UNECE and ISO. Coordination with the responsible working groups at ISO/TC 22 or other responsible TCs, integrated and coordinated with the development of regulations in the responsible WP.29 working groups, could efficiently link technology openness and safety and accelerate the market launch of new assistance and automation functions. This solution would not only create synergies but also ensure a more efficient evaluation of standards to accelerate the innovation process.

Figure 2 below provides a corresponding proposal for the desired process.

The regulatory process shown in light blue is coordinated with the parallel standardisation process shown in light yellow. Several review steps, which are connected to the phases shown, ensure that the content of the basic requirements from the regulation is adapted in conjunction with the solution-specific requirements from international standards.

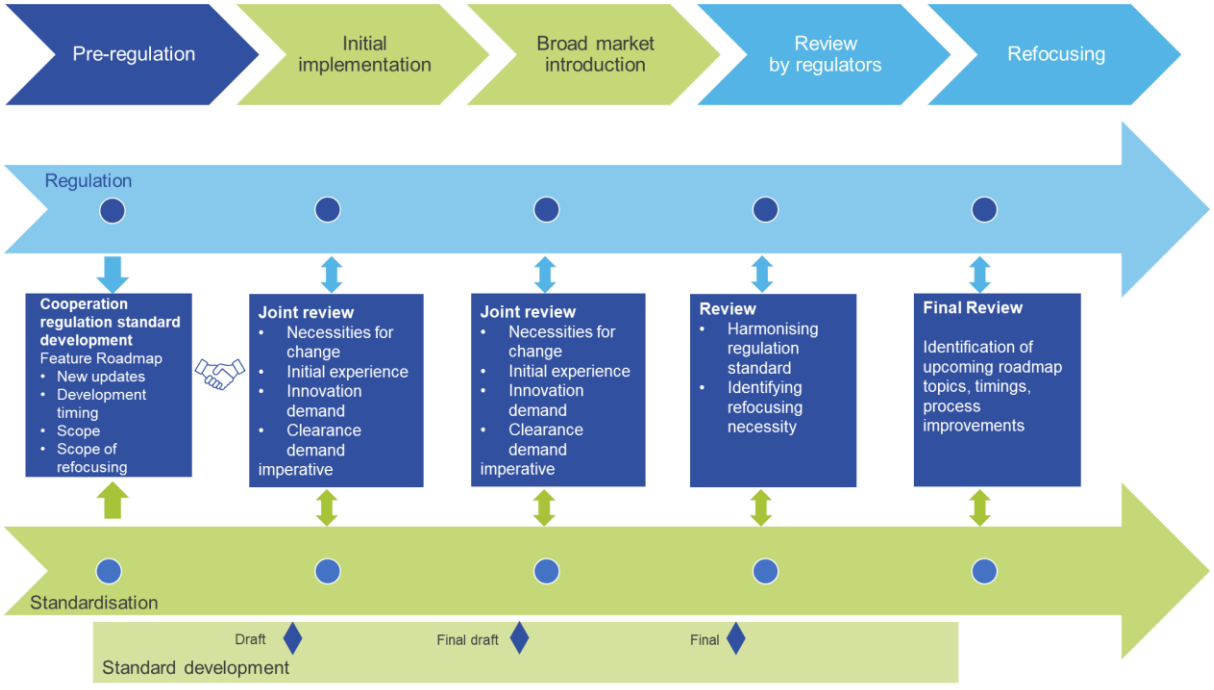


*Figure 2: Interaction of standardisation and regulation - process overview*

# 3 Conclusions and recommendations for action

The possibility of a faster introduction of innovative functions for assisted and automated driving from development to testing to market maturity in cooperation with politicians strengthens the competitiveness of the automotive industry in Germany. Furthermore, the rapid introduction of new, innovative technologies supports the overarching transport objectives. These include maintaining the flow of traffic by avoiding congestion and increasing road safety. In addition, this secures the innovative capacity of the German automotive industry and strengthens it in the long term. Prioritising development and testing on the domestic market therefore makes a significant contribution to achieving these goals.

The automotive industry is undergoing a technological transformation and is therefore at a turning point where flexibility and innovation are crucial. Policy makers need to capitalise on existing experience and find new ways to support the domestic industry.

A more efficient and innovation-friendly approach can be created by working with industry to develop regulations in conjunction with the coordinated development of standards to verify compliance with the requirements. In designing this cooperation, the proposed flexible and agile mechanism can be applied without fundamentally changing established regulatory approval processes at UNECE and the process of developing and adopting international standards at ISO.

In summary, this analysis results in three recommendations for action:

(1) Introduction of an innovative approach to demonstrating the safety of new functions, including test data, simulations, validation concepts and exemptions;

(2) reducing type approval to the technology-neutral description of basic safety objectives;

(3) intelligent linking of type approval regulations with ISO standards via a defined coordinated process between the regulator and the standard-issuer.

These recommendations for action strengthen the competitiveness of the German automotive industry and help to advance safe and innovative vehicle technologies worldwide. They are intended to support political decision-makers in setting the course for future-oriented and flexible regulation.

# Abbreviations used

| | |
|---|---|
| EN | European Norm |
| HAS | Harmonised Standard |
| hEN | harmonised European Norm |
| ISO | International Standardisation Organization |
| ISO/TC 22 | Technical Committee 22 for road vehicles at ISO |
| NLF | New Legislative Framework |
| PAS | Publicly Available Specification |
| SAE | Society of American Standards (US standardisation organisation) |
| UNECE | United Nations Economic Commission for Europe |

## About the Expert Group

*The Expert Group Transformation of the Automotive Industry (ETA) is an independent advisory body of the Federal Ministry of Economic Affairs and Climate Action (BMWK). The Expert Group develops target and recipient-based recommendations for action for politicians, business and society in general, which can be used to successfully shape long-term structural change in the industry. The overarching goal is to achieve climate neutrality, in addition to securing value creation, jobs and apprenticeships in Germany as an automotive location.*

*The ETA consists of 13 people from the scientific community, business and society who were appointed by Federal Minister Dr. Robert Habeck for the 20th legislative period. Other experts, in addition to relevant institutions and stakeholders, are involved in the work of the ETA via flexible and agile work formats. The members receive no remuneration or expense allowance for their involvement in the ETA. The group of experts is supported by a process and scientific monitoring team commissioned by the BMWK. The ETA has a sister body, the Expert Advisory Council on Climate Action in Mobility (EKM) at the Federal Ministry for Digital and Transport (BMDV). Both bodies are integrated into the Federal Government's Transformation of the Automotive and Mobility Industry Strategy Platform (STAM).*

*The ETA is responsible for the content. It develops statements, position papers and reports partly in its working groups, then deliberates and decides on them in plenary session, and subsequently publishes them under its own responsibility.*

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