

# Advancing Traffic Safety Culture: Developing a Conceptualisation of Cultural Maturity Among Traffic Safety Stakeholders

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**Abstract.** In the road sector, the safety culture concept is usually applied to road users at work, focusing on the organisational culture in their organisations, or at the community level, focusing on the traffic safety culture (TSC) of road users as citizens in social units like nations, regions, local communities, peer groups, or even families. When we link the TSC concept to Safe System implementation, it is however evident that the concept also should be applied to stakeholders in the road transport sector (e.g. authorities, NGOs, insurance companies). Previous research indicates insufficient implementation of Safe System policies, even in pioneering countries. A major factor impeding the implementation of Safe System policies is insufficient TSC and low cultural maturity among traffic safety stakeholders. The study therefore aims to review previous research on TSC in general and stakeholders in specific, to develop a conceptualisation of TSC among stakeholders. The study is part of the EU-funded TRUST project.

**Keywords:** Traffic safety culture, Safe system implementation, Stakeholders

# 1 Introduction

## 1.1 Background

Safe System has become the state-of-the-art approach for traffic safety management, and it is recommended to countries worldwide [7]. At the same time as Safe System has risen as a dominating policy concept, focus has also been directed to the concept of traffic safety culture (TSC). There has been an increasing number of studies on the topic in recent years, but the concept is not well developed in the sense that there is an agreed understanding of how the concept should be defined and operationalised [8]. The TSC concept is important, as it denotes shared ways of thinking and acting that are relevant to traffic safety. Previous research indicates that such shared ways of thinking and acting is related to individual traffic safety behaviour and thus accident involvement [8]. While Safe System refers to the formal aspects of traffic safety management (e.g. formal laws, policies and procedures), TSC refers to the informal aspects, (i.e. what we actually do). TSC is important, as there often is a discrepancy between formal and informal aspects of traffic safety.

According to the TRUST definition of TSC, it encompasses shared values, beliefs, attitudes, norms, and patterns of behaviours that shape how traffic safety is understood and enacted within a meaningfully defined group of actors in the transport system. This meaningfully defined group of actors can refer to road users, organizations, authorities, or other actors within the transport system [12]. TSC provides frames of reference that guide individuals' interpretations of actions, hazards, and their identities. This motivates and legitimizes behaviours that have an impact on safety [6].

In the road sector, the safety culture concept is usually applied to road users at work, focusing on the organisational culture in their organisations, or at the community level, focusing on the TSC of road users as citizens in social units like nations, regions, local communities, peer groups, or even families [6]. However, linking the TSC concept to Safe System implementation, it is evident that the concept also should be applied to stakeholders in the road transport sector, involved in the implementation of Safe System policies. Previous research indicates insufficient implementation of Safe System policies, even in pioneering countries. Based on analyses from Norway, it is estimated that the number of road fatalities in Norway can be reduced by 50– 70% by following the Safe System principles [1]. Recent studies of Safe System implementation barriers find that the challenges in implementing the Safe System strategy are generally neither technical nor scientific – they are primarily social, cultural and political [5, 9, 10]. These studies direct the attention to factors impeding and facilitating change; or in other words the insufficient TSC and low cultural maturity of traffic safety stakeholders involved in Safe System policy implementation.

## 1.2 Aims

The aims of the study are to:

- 1) Describe current models of TSC, which focus on the community level (private road users) and the organisational level (road users at work).

- 2) Describe previous research on “stakeholders” and their TSC.
- 3) Develop a conceptualisation of TSC among stakeholders, based on these two lines of research.

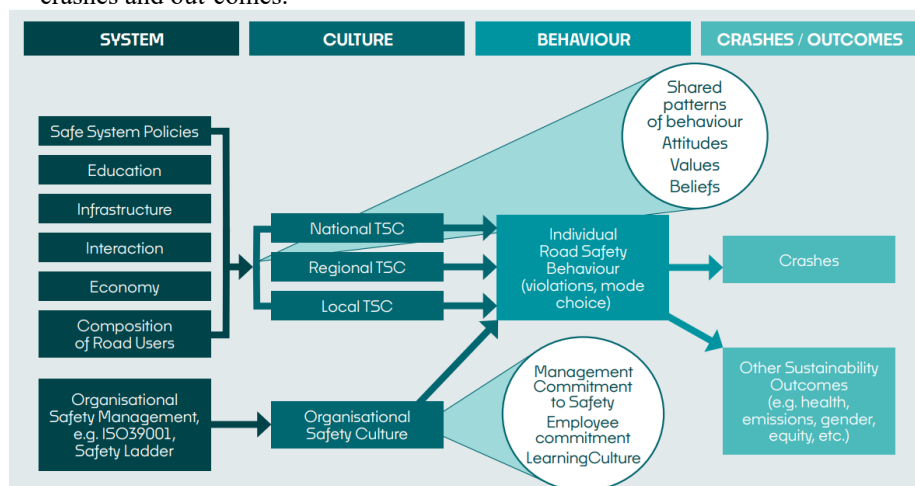
This study provides an overview of TSC as concept and research field as basis for further studies and implementations within the EU-project TRUST: “TSC a systematic transition towards shared responsibility for safe and sustainable mobility in the EU”. (Grant agreement ID: 101197992) The background of TRUST is that progress on traffic safety has stalled, and current efforts may fall short of the EU's goal to reduce the number of fatalities by 50% by 2030. The challenge is growing a more positive TSC. In this paper, we elaborate on the role of traffic safety stakeholders to advance on that goal.

### 1.3 Method

The review of previous research on TSC, focusing on the community and organisational level is based on Nævestad [6]. The review of previous research on TSC among “stake holders” is based on a systematic scoping review of Safe System research, conducted by Nævestad et al. [7].

## 2 Current Understanding of TSC

We have developed a model summing up previous research, based on a review by Nævestad [6]. The model discerns between four analytical levels: 1) System, 2) Culture, 3) Behaviour and 4) Crashes/Outcomes. These levels are important, as they describe a causal relationship starting with system factors influencing culture, to culture at different levels, which influence behaviour which in turn influence crashes and out-comes.



**Fig. 1.** Model of traffic safety culture at the organisational and community level. Developed based on Nævestad [6]. Illustration made in the TRUST project.

Safety culture is created in interaction in groups and shared among members of groups.

The model separates between two different key types of target groups, separating between culture at the organisational level (addressing road users at work) and the community level (addressing citizens as road users). The latter denotes e.g. the national, regional, local level, which are influenced by system factors like traffic safety policies, infrastructure, education, composition of road users etc. The organisational level is special, as this is a more established research field than for the community level, as drivers at work are often part of organisations with a management. Key cultural aspects are employees' perceptions of management commitment and safety systems. The model in Figure 1 indicates that TSC typically has been studied at two levels, capturing behaviour and culture among road users. However, these do not fully address stakeholders who influence system-level conditions shaping both.

### 3 Previous Research on Stakeholders

As stated above, the organisational safety culture related to the roles and activities of traffic safety stakeholders have yet not gained sufficient attention in research. This concerns societal actors such as national and local authorities in their roles as road managers and in land-use planning and urban design. The culture in relation to traffic safety in these roles and activities are affecting the way professionals in these contexts are viewing and considering traffic safety in their work. This affects priorities and decisions and, in the end, if and how traffic safety is implemented in the road transport system.

In the context of Vision Zero and Safety System, emphasising the shared responsibility of traffic safety, the roles and activities of various stakeholders with the possibility to influence traffic safety are of great interest. Hysing [3] describes four categories of system designers: road administrators (state, municipalities, and private), the automotive industry, actors procuring or providing transport services (taxi, bus, and truck), and actors responsible for various support systems, such as the police (monitoring and enforcement), driving schools (education), and emergency services, health care, and rehabilitation professionals.

In a similar vein, Wennberg and Dahlholm [11] underline that local authorities hold several roles in which they are influencing traffic safety: as road manager and planner, as setter of requirements for maintenance and construction phases, as employer (possibly influencing employees travel and transport) and purchaser in procurement of services and transport affecting traffic safety, as setter of traffic safety requirements for own vehicles, and as influencer in relation to citizens behaviour in traffic. These roles constitute municipalities' sphere of influence in terms of traffic safety. Even though municipalities wield their most significant influence on traffic safety through their role as road managers and planners, there are few studies on TSC in relation to these roles.

In a scoping review summing up the focus in the studies on cultural maturity of stakeholders, Nævestad et al [7] concludes that the two major themes in the studies examining stakeholders' cultural maturity are: 1) Conceptualisations of system owner

and forward-looking responsibility and 2) The extent of a system perspective. There are some studies focusing on issues related to the cultural maturity of stakeholders. These studies primarily seem to focus on authorities at national, regional or local level. Otto et al. [9] write that developing a TSC and adopting the Safe System approach requires organizational change. Lasting change is more likely to occur and be sustained when organizations are ready for change. Changeability and willingness are driven by perceptions that: 1) The change is in line with the organization's culture, 2) The organization (e.g. management, employees) is committed to the change, 3) 4) The organization has the resources needed to implement the change

Muir et al. [5] present a case study of the institutional change required to support the transition to a holistic approach to traffic safety planning and management in Victoria, Australia. Writing about social, political and cultural barriers, they state that although many governments claim to be developing strategies based on Safe System thinking, actions depend largely on what politicians consider to be publicly acceptable. Schell and Ward [10] write that adopting the Safe System approach requires a significant paradigm shift related to how stakeholder organizations: 1) Understands the transportation system, 2) Interprets their role in the system, 3) Interacts with other system elements, 4) Defines a vision for the system's success.

Fosdick et al. [2] develop a model to examine how culturally mature organizations are in relation to Safe System thinking and practice. They refer to this as the Safe System Cultural Maturity Model (SSCMM). Understanding how far traffic safety authorities have come in implementing Safe System principles and practices is important to ensure consistency in implementation and monitoring, as well as to identify where further support is needed.

Keefe et al. [4] adapt and use the Community Readiness Assessment (CRA) tool, a well-known model in public health, to assess and inform community-based interventions in seven Vision Zero communities in a US state. Levels of "readiness" varied across the six dimensions measured, with community-related dimensions (e.g., community culture) receiving lower scores than the "readiness" levels for knowledge, leadership, and resources.

## 4 Traffic Safety Culture among Stakeholders

### 4.1 Towards Conceptualisation

Combining the current understanding of TSC (Figure 1) and previous research on stakeholders, it is evident that the safety culture of stakeholders refers to factors influencing the System level factors influencing TSC (left column). This refers to e.g. Safe System policies, infrastructure, enforcement, driver training, for private road users, and the level of organisational safety management system (e.g. ISO:39001) for drivers at work. Thus, studying stakeholder TSC is important, as it refers to the factors influencing the TSC at the community level and at the organisational level.

However, to understand the crucial role of stakeholder TSC, we need to develop a clear understanding of who they are. Based on Hysing [3], we may define traffic safety

stakeholders as: 1) System Designers (e.g. national ministries, road authorities, municipalities, urban planners), 2) System Operators (e.g. Transport companies (bus, truck, taxi), 3) System Supporters (e.g. Police, enforcement agencies, driving schools, emergency services, 4) Influencers/Intermediaries (e.g. insurance companies, industry organisations, unions, NGOs, citizen groups, media). We can study cultural maturity in all these different roles. The above-mentioned studies [9,5,2,4] are largely directed to authorities at different levels, and not the scope of different stakeholder types that we focus on, based on Hysing [3]. Thus, existing research on cultural maturity has largely been authority-centric, and there is a research gap regarding cultural maturity of other stakeholder types (e.g., transport operators, NGOs, insurers, enforcement bodies). We could say the same about different authority roles (e.g. strategy, planners, maintenance).

Another area of improvement in the mentioned studies, is that they do not fully explore the different types of roles that stakeholders have, in line with the description of Wennberg and Dahlholm [11]. The unit of analysis is usually “the authority” (as a single actor), not the diverse functions or roles it plays. In addition to focusing on different stakeholder types, it is also important to focus on different stakeholder roles. Cultural maturity can be measured according to each of the different types of roles mentioned by Wennberg and Dahlholm [11], e.g. as: 1) Road manager and planner, 2) Setter of requirements for maintenance and construction phases, 3) Employer, 4) Purchaser in procurement, 5) Setter of traffic safety requirements for own vehicles, and 6) Influencer in relation to citizens behaviour in traffic.

Based on the reviewed research and the TRUST definition of TSC, we may define stakeholder TSC as shared values, beliefs, attitudes, norms, and patterns of behaviours that shape how traffic safety is understood and enacted related to their role as traffic safety stakeholders, more specifically as shared frames of reference that guide individuals’ interpretations of actions, hazards, and their identities. This motivates and legitimizes behaviours that have an impact on safety [6,8]. This refers e.g. to stakeholders shared understandings of their responsibility as system owners, level of systems thinking and perceptions of their roles influencing traffic safety, as described by Wennberg and Dahlholm [11].

Understanding the above-mentioned cultural factors, we may use concepts from both the organisational culture domain and the TSC domain. We may use the former, as the stakeholders are likely to be part of organisations. Thus, their performance regarding traffic safety is influenced by organisational safety culture topics (e.g. top management commitment to traffic safety) and more general traffic safety topics like the level of perceived system owner responsibility for traffic safety, integration of Safe System values and ways of working, like e.g. the application of scientifically validated measures, data driven solutions, continuous improvement, the use of safety performance indicators, learning, reporting etc. Table 1 provides an overview of questions that can be used to measure stakeholder TSC: These questions are primarily adapted to authority roles, and must be selected and/or adapted to different types of stakeholders.

**Table 1.** Examples of questions that can be used to measure stakeholder TSC. Answers are given on a scale from 1 (totally disagree) – 5 (totally agree).

<b>1) Stakeholder Roles (Wennerg &amp; Dalholm (2024))</b>	
<b>Road manager &amp; planner</b>	My organisation sees road safety as a non-negotiable value that should guide all planning and design decisions, even when it conflicts with costs
<b>Setter of requirements for maintenance/construction</b>	In my organisation, strict safety requirements in maintenance and construction projects are essential, even if it increases project costs or timelines
<b>Employer</b>	My workplace has clear and well-known guidelines for speed and driving style that employees who drive for work must follow
<b>Purchaser/Procurer of transport &amp; services</b>	When awarding contracts for transport and services, my organisation requires safety management systems (e.g. ISO:39001) from providers
<b>Setter of requirements for own vehicles/travels</b>	When choosing vehicles to purchase, my organisation chooses the highest available safety standards, regardless of cost
<b>Influencer of citizen behaviour</b>	My organisation aims to change social norms about what is considered acceptable behaviour in traffic
<b>2) Management commitment (based on organisational safety culture research)</b>	
	Traffic safety is very important to the top management of the organisation where I work
	Traffic safety is very important for my immediate manager
<b>3) Safe systems view on responsibility and system thinking (based on Nævestad et al., 2025)</b>	
<b>Views on system responsibility</b>	As a road system owner, my organisation perceives that it is our ultimate responsibility to prevent traffic accidents on our roads
<b>Level of system thinking</b>	In my organisation, we actually design the traffic system to tolerate (unintended) errors made by the road users
	In my organisation, we actually design the traffic system so that the external forces in accidents do not exceed the human bodies' tolerance for biomechanical impacts

## 4.2 Knowledge needs

- 1) Develop a checklist for defining Safe System maturity for different stakeholders, including different stakeholder roles.** Safe System maturity refers to the actual measures and policies implemented by the stakeholders. (e.g. the level of Safe System infrastructure, the level of Safe System enforcement and driver training).

This can be combined with the cultural maturity tool described above (Fig 2).

- 2) The role of stakeholder TSC in light of Agenda 2030.** The role of professional stakeholders in traffic safety implementation is even more pronounced with the introduction of the 2030 Agenda for Sustainable Development emphasizing traffic safety as a necessary part of sustainable development. Traffic safety is increasingly framed within the SDGs and related policy frameworks as a cross-cutting sustainability issue; linked to health, urban development, work environments, and organisational responsibility; yet the implications of this broader SDG integration perspective for traffic safety culture remain underexplored.

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