

Regulations and perceptions of passenger motor transport driving personnel

Condiciones y Medio Ambiente de Trabajo del personal de conducción de transporte automotor de pasajeros

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Abstract

This article gives an overview of working conditions and the environment, considering both the regulatory framework and the perspectives of various stakeholders in the industry.

The safety of long-distance passenger transport operations depends on the understanding and management of associated risks. Working Conditions and Environment (CyMAT) play a significant role in contributing to these risks. Factors such as driver qualifications, length of working hours, integration of new technologies, driver selection and training strategies, vehicle design and condition, driver's position, and road infrastructure all impact the ability to prevent accidents. Each of these elements can either serve as a defense or highlight deficiencies in accident prevention capabilities.

Resumen

Este artículo ofrece una caracterización general de las condiciones y medio ambiente de Trabajo, atendiendo tanto al marco reglamentario como a la perspectiva de los diferentes actores del sector.

La seguridad de las operaciones que realiza el personal de conducción del transporte de pasajeros de larga distancia depende del conocimiento sobre los riesgos de la actividad y la forma de gestionarlos. Una fuente importante de estos riesgos proviene de las condiciones y medio ambiente de Trabajo (CyMAT) de quienes realizan estas tareas. Estos factores abarcan desde las calificaciones exigidas al conductor, la duración de la jornada de trabajo, la incorporación de nuevas tecnologías, las estrategias de selección y capacitación del personal de conducción hasta el diseño y estado del vehículo, el puesto del conductor y la infraestructura vial. Cada uno de estos elementos podría constituir una defensa o, por el contrario, representar una deficiencia en la capacidad para prevenir accidentes.

Introduction

Long-distance passenger transport driving staff must be aware of the dangers involved in their work and know how to control them in order to conduct operations safely. The Working Conditions and Environment (CyMAT, in its Spanish acronym) of employees who perform these duties is a significant source of risks. These variables include everything from the minimum requirements for a driver to the duration of the workday, the use of new technology, the recruitment and training methods for driving staff, the layout and conditions of the vehicle, the location of the driver, and the state of the roads. Any of these components might serve as a defense or, on the other hand, show a weakness in the capacity to prevent accidents.

Within the framework of a comprehensive approach to operational safety, the Transportation

Safety Board (Junta de Seguridad en el Transporte, JST) examines the CyMAT of people who operate long-distance vehicles. According to this concept, organizational choices connected to the system's design and operations are the cause of failures during employees' work activities. These choices are made in the case of long-distance passenger travel after debates and consensus-building among government, labor, and corporate organizations. Each party or actor involved thus contributes to the configuration of working conditions, the design of which may have an impact on both production and system protection.

Analyzing the rules governing the activity is one method to get a sense of the hazards related to working conditions and environment. Drivers can be safeguarded from situations that are likely to be dangerous by following laws, orders, resolutions, and conven-

tions. At the same time, the way the system is now operating can be explained by how organizational decision-makers perceive their employees' working conditions. Regulations and views both take into account the requirement to increase operational safety by analyzing and improving some CyMAT components.

The research conducted by the studies division of the National Department of Road Occurrences Investigation of the JST is summarized in this article, along with the key findings. The Agency's official website has access to the complete study.

CyMAT regulations controlling drivers of long-distance passenger transport vehicles

The laws listed in Table 1 were discovered after a methodical examination of data pertaining to CyMAT's legal rules.

Table 1. Summary of regulations

Regulations	Title
Law 20744	Employment Contract
Law 11544	Working Day
Law 24449	National Traffic Law
Decree 692/92	Working conditions, health care, hygiene, and workplace safety for public passenger road transport drivers
Decree 1335/1973	Workbook for public passenger transport employee
Decree 4257/68	Special retirement system (unhealthy work)
Resolution 239/1998	Timetable control
Resolution 1021/1952 and 115/2018	Two-up driving system
Resolution 149/2019	Safety protocol
Provision 207/2009 and 48/2019	System for acquiring driving licenses
CCT 460/1973	Collective labor agreement
2017 Act	Length of the working day and conditions to diagram trips under the two-up driving system
Standard 3810 ¹	Road safety – Good practices in public passenger transportation
Standard 39001 ²	Road safety management systems

1. Regulations not mandatory for this type of transport.

2. Id. Note 1.

These rules are intended to establish basic criteria for how things should work and behave in order to provide guidance to the drivers.

The following sentences provide an overview of the most significant findings:

1. The driving staff, who are responsible for driving or accompanying their driving partner, are included in the traffic staff as part of the CCT 460/73. Other tasks, such as loading and unloading packages, are not governed by any rules throughout the service.
2. Having a driver's license is the primary requirement for employment. The National Traffic Law 24449, Sections 207/09 and 48/2019, and Decree 692/92 all govern this procedure. The standards for evaluating the well-being of drivers and their impact on safety are a matter that need consideration.
3. The responsibilities of those who drive are mainly regulated by Decree 692/92 and must comply with traffic regulations, keep the company's equipment in good condition, check the condition of the vehicle and communicate anomalies, facilitate the ascent / descent of the service users and transporting objects. Driving employees have responsibilities and obligations in the event of an accident, according to Law 24449. There are hardly any obligations related to health and safety.
4. Driving is viewed normatively as a group position or task. A dual conduction regime is used to provide long-distance transportation services, according to Resolutions 1021/1952 and 115/2018. Only services that don't exceed 200 kilometers must use the single-drive system.
5. A maximum workday of 8 hours (plus 4 hours of overtime) and a daily rest period of 12 hours are set down in Law 20744. The working day is limited to six hours each day in jobs that have been deemed harmful. Similar standards are proposed by Law 11544. Staff can cover a total of 200 hours per month, according to CCT 460/73. A maximum 8-hour workday or 48 hours per week with an extension of 4 hours, as well as daily breaks of 12 hours at home or 10 hours away from home, are added by Decree 692/92. The 2017–2019 Accord permits the diagramming of 16-hour routes using the two-up operation system, which includes 8 hours of actual driving and 8 hours of operational downtime on board.
6. Decree 692/92 states that drivers are allowed 20 minutes for breakfast and a snack, and 45 minutes for lunch and dinner. Breaks per two hours of driving are established by the 2017–2019 Accord (or every 3 hours in exceptional cases). The proposed criteria for both regulations do not reveal the degree of tiredness recovery.
7. According to Law 11544, the employer is required to post the hours of work and break times. The use of a workbook is mandated by CCT 460/73 and Resolution 239/1998 to duplicate the registration of entry and departure times. The 2017–2019 Accord promotes the use of technological systems, which implies some worry about developing better solutions to control working hours.
8. CCT 460/73 states that drivers receive 6 francs per month, although it is unclear how these breaks are allocated. Also, according to these regulations, employees are entitled to paid annual and exceptional leaves. The requirement for a weekly day off is outlined in the 2017–2019 Accord.
9. In accordance with Decree 692/92 and Article 48/2018, applicants must be at least 21 years old. The fact that this age is within the category of young people, who experience more road fatalities and injuries than other age groups, is an essential aspect of this age limit.
10. The maximum age for applying in this occupation is based on the fact that, in line with Decree 692/92 or Law 24449, respectively, professional drivers cannot receive licenses after they are 55 or 65 years old. Although there is no maximum age for employment permanence, the frequency of psychophysical examinations rises after age 65. (Law 24449)
11. The monthly compensation method mandated by CCT 460/73 is based on the quantity of hours worked. The remuneration of the activity "by laps" is prohibited by Decree 692/92. According to CCT 460/73, hourly pay for night work, which is performed from 9 p.m. to 6 a.m., is equal to one hour and eight minutes of daytime work.
12. Law 20744 views on-the-job training as a right to be provided by the employer with the assistance of governmental authorities in terms of training. Technological innovation may give rise to requests from the union sector for the employer to create training. There are specified topics that should be included in the training, according to Decree 692/92. Workers are required to enroll in refresher courses once a year, per Article 48/2019. The 2017–2019 Accord emphasizes

es the value of training while also stressing the significance of rest and breaks.

13. CCT 460/73 is the only standard that regulates the possibility of workers participating in organizational decisions through a Complaints Commission comprised of three staff members.

14. According to Law 24449, the driver's seat must be ergonomically designed. The seat must be adjustable to the anthropometric characteristics of the driver, have adequate damping, anchorage, and structural rigidity, a three-point inertial seat belt with a quick opening lock, and a head restraint, according to Decree 692/92.

15. In terms of the vehicle, Law 20744 requires the employer to create a safe working environment. Law 24449 mandates general safety conditions (such as effective braking systems) as well as specific measures in passenger transportation (for example, emergency exits consistent with the number of seats). Decree 692/92 establishes environmental regulations concerning noise, lighting, and air quality. According to this Decree, the manufacturer is first responsible for the vehicle's safety conditions (must

comply with certain safety devices) and then the companies (must carry out the Mandatory Technical Review).

16. In terms of road infrastructure, Decree 692/92 mandates that road structure works adhere to basic road safety standards. If an unusual obstacle is discovered, the agencies in charge of the road must resolve the issue as soon as possible. This Decree also requires companies to provide sanitary and rest facilities in their terminals, headers, and hostels. Regarding road infrastructure, Decree 692/92 establishes that road structure works must comply with basic road safety standards. If an abnormal obstacle is found, the agencies responsible for the road must solve the problem quickly. This Decree also requires companies to offer sanitary and rest services in the headers, terminals and hostels.

17. IRAM Standard 3810 recommends good road safety practices for organizations involved in passenger vehicle transportation. This standard suggests some guidelines for specific aspects of working conditions, such as management's commitment to road safety policies, the definition of a driver profile, personnel evaluation, training content,

unit inspection and maintenance, and service layout. ISO 39001 is intended to supplement IRAM 3810, which has a broader scope and establishes requirements for developing a road safety management system.

Perceptions of key industry players

Another goal of this research was to learn about the perceptions of some representatives of central organizations in the sector about the working conditions and environment of the driving staff. To answer this question, 8 virtual interviews were conducted with 7 relevant actors for the activity: National Commission for Transport Regulation (CNRT), Automotive Tramway Union (UTA), Long Distance Business Chamber (CELADI), Business Chamber of Passenger Road Transport (CEAP), Argentine Chamber of Automotive Passenger Transportation (CATAP), Argentine Association of Automotive Transport Employers (AAETA) [in their Spanish acronyms], and a former driver as a key informant.

The interviews were organized into 13 thematic blocks that represented each actor's perceptions of CyMAT (see Table 2). Each section is summarized below, along with the main perceptions identified during the interviews.

Table 2. Synthesis of the perceptions of the actors interviewed

Perception of the CyMAT	
Block	Ideas and opinions
Required qualifications	Previous experience <ul style="list-style-type: none"> Lowered requirements during periods of increased demand
	Theoretical-practical training <ul style="list-style-type: none"> More emphasis on hands-on training
	Deficit of theoretical knowledge <ul style="list-style-type: none"> Attributed to licensing limitations

Worker's responsibility	<p>Safety and care of the vehicle</p> <ul style="list-style-type: none"> • These are not fulfilled due to disinterest or lack of professionalism • Opposing perspectives on mechanical activities • Loss of professional control scheme vs. non-liability
Working time limit	<p>Excessive working hours</p> <ul style="list-style-type: none"> • Companies' pressure • Failures in route layout • Increasing compensation • 8 hours (plus 4 hours overtime) Law • Impractical and non-specific 2017-2019 Accord • More adapted and beneficial
Pauses, rest and tiredness	<p>Differences between legally required and actual rest</p> <ul style="list-style-type: none"> • It is the driver's responsibility to get proper rest 2017-2019 Accord • Decreases rest opportunities • Different perceptions about maximum driving time before a break <p>Variations in the quality of rest depending on the place</p> <ul style="list-style-type: none"> • Lower level of recovery on board vs. outside the vehicle <p>Extreme tiredness (white sleep)</p> <ul style="list-style-type: none"> • Deficiencies: difficulty perceiving signs of fatigue, lack of technologies and control errors • Defenses: training and cooperative two-up couple
Personnel recruitment and selection	<p>Recruitment</p> <ul style="list-style-type: none"> • Labor market for workers with shortages <p>Selection of driving staff</p> <ul style="list-style-type: none"> • Evaluation: psychological, theoretical, and practical • Others: knowledge of the routes, history of infringements, employment references from other companies. • IRAM 3810 standard as a standardization strategy
Induction for personnel	<p>Initial instance</p> <ul style="list-style-type: none"> • Provides safety and customer service information • First outing with the vehicle • Assigning a driving partner
Driving staff training	<p>Necessary, beneficial, and permanent space</p> <ul style="list-style-type: none"> • Focused on sharing theoretical knowledge • Driving simulators' relative usefulness • Need to improve content on traffic laws and rest • While being limited in scope and efficacy, this resource is crucial for addressing technological advancements • Need for training provided by government organizations
Road infrastructure	<p>The route as a complex environment</p> <ul style="list-style-type: none"> • Diversity of terrain types • Road congestion • Low maintenance <p>Increased risk in adverse weather conditions</p> <ul style="list-style-type: none"> • Driver-dependent service suspension

Vehicle	<p>Vehicle safety</p> <ul style="list-style-type: none"> • Unwillingness to adopt new technologies • Heavy usage • Superficial controls • “Fixed car” impossibility <p>Control improvements</p> <ul style="list-style-type: none"> • Mainly those certified by IRAM 3810 Standard
CNRT control body	<p>Perception of shortcomings</p> <ul style="list-style-type: none"> • Inequalities in controls according to the country area and type of service • Fines for collection purposes • Workbook and tachograph limitations <p>Limitations of the CNRT</p> <ul style="list-style-type: none"> • Scarce inspectors and lack of training • Increase in fines • Lack of control at other points of the trip • Discontinuity of control and oversight policies <p>Usefulness of Psychophysical Control Units</p> <ul style="list-style-type: none"> • Control, promotion of health, and safety
Work book	<p>A tool that is prone to failure</p> <p>Suitable for:</p> <ul style="list-style-type: none"> • Rigid rules • Actual operation of the services <p>Overcoming limitations through the digital notebook</p> <ul style="list-style-type: none"> • Registration of more information • Better quality of controls • Creating a single system <p>Problems deploying the digital work book</p> <ul style="list-style-type: none"> • Regulatory framework’s rigidity
IRAM Standards	<p>Management tools</p> <ul style="list-style-type: none"> • Improve road safety • They are a “quality seal” • Standardize procedures • Establish a common framework of good practice <p>Questioning about a private entity’s evaluation of a public service</p>
CyMAT basics aspects	<p>Link between working conditions, health and safety Collective and multidisciplinary approach Variability of the CyMATs</p>

1) Qualifications needed for the job

- Previous driving experience, whether in passenger or cargo transport, is regarded as a critical factor, though this requirement tends to decrease during times of increased demand for services.
- The importance of understanding road rules and safe driving, as well as perceptual-motor skills, is emphasized, but practical learning is given more weight.

- It is argued that those who drive have a theoretical knowledge deficit due, in part, to the lack of rigor in the driver’s license application process.
- According to some participants, the difficulty in defining what constitutes a professional driver has an impact on qualification and training content.

2) The worker's level of responsibility

- Those who drive are perceived to be responsible for both passenger safety and vehicle maintenance. Although the trainings reinforce this aspect, some say worker may still refuse to take on these responsibilities due to disinterest or a lack of professionalism.
- Some actors argue that drivers should be able to fix basic mechanical flaws. It is perceived as a loss of “the professional part” if the driver is not capable of covering such tasks.

Other actors believe that those who drive have no mechanical responsibility or resources to solve this type of problems.

3) Working time limit

- Excessive working hours, whether daily or monthly, are regarded as common practice. The causes of this excess can be found in the pressure on companies to cover all services during times of increased demand, the layout of routes without considering intermediate stops, and the motivation of driving staff to increase their remuneration.
- The law, which mandates a daily working day of 8 hours plus 4 extra hours, is viewed as impractical and insensitive to the specifics of the activity. The 2017–2019 Accord, which allows for a 16-hour workday under a two-up driving system, is envisioned as a step forward in trip planning (it is a regulation more adapted to the extension of the country and avoids the limitations of the relay system).

- The actors express dissatisfaction with the current regulatory framework for regulating the working time limit. Some claim that the 2017–2019 Accord is the main regulation, while others claim that it is not in effect.

4) Breaks, resting and tiredness

- There are perceived differences between the legally required daily rest and the actual rest. It is assumed that the latter may include activities that do not promote recovery, which is dependent on the driver's individual responsibility.
- Because those who drive can work continuously for days, exchanging driving times with operational breaks on board, the 2017-2019 Accord is viewed as a regulation that reduces rest opportunities.
- Different perspectives exist on how to regulate breaks under the 2017–2019 Accord. Some claim that they must drive for 2 hours before taking their first break, while others believe that they can be ex-

tended to 4 or 8 hours, and a final group believes that those who drive freely choose how to organize their breaks. Some actors argue that on-board operating breaks do not allow for the same level of recovery as off-vehicle breaks or breaks.

- According to some actors, on-board operating breaks do not provide the same level of recovery as off-vehicle breaks or breaks.
- The concept of “white sleep,” defined as “sleeping with your eyes open,” is mentioned as a state of extreme exhaustion. To explain this phenomenon, the failures in subjective tiredness detection, the lack of technologies to identify this state, and the control of rest hours without taking into account working hours are highlighted. Training and the presence of a cooperative partner are perceived as risk factors for tiredness.

5) Personnel recruitment and selection

- According to the participants, the search for personnel takes place in a labor market populated by driving personnel with training deficiencies and socio-family issues, which has a negative impact on the workplace.
- The selection of driving personnel is viewed as a stage that is based on three evaluations: psychological, theoretical (road safety knowledge), and practical (road tests with an expert driver or use of driving simulators).
- Other factors considered in the selection include route knowledge, a history of infringements, and references from other companies.



- Other factors considered in the selection include route knowledge, history of infringements, and references from other companies.
- Some businesses use the IRAM 3810 Standard to standardize their recruitment and selection processes.
- According to the participants, road rules and rest should be addressed more aggressively.
- Training is perceived as an important resource in situations of use of new technologies incorporated into the workplace. However, it is argued that sometimes these trainings are aimed at a part of the driving staff and are not completely effective.
- It is assumed that the levels of attention and tension are affected by certain characteristics of the route (e.g., monotony of the route, signaling).
- Adverse weather conditions are perceived as a major risk. In these situations, it is pointed out that the suspension of the service depends exclusively on the driver (that is, there are no organizational mechanisms to make this decision).

6) Staff induction

- This stage is considered an initial instance, providing information to drivers about road safety, basic mechanics, customer service, first aid, and accident response.
- The first outing with the vehicle in the company of an expert driver who serves as an evaluator, as well as the assignment of a driving partner to deepen the practice of the task, are perceived as important moments during this stage.

“This study suggests that existing legislation should be strengthened, as it assumes that regulations are an important protection strategy against both foreseeable and active dangerous situations.”



7) Driving personnel training

- Training is seen as a necessary and beneficial space that should be maintained throughout one's career. Continuous training allows employees to adapt to changing workplace conditions.
- Trainings, it is argued, deepen the learning of basic task knowledge (e.g. customer interaction, safe driving).
- Despite the emphasis on practical learning, training is primarily concerned with the transmission of theoretical knowledge. The use of driving simulators attempts to balance this imbalance between practice and knowledge, but it is insufficient to achieve learning that can only be accomplished in a real vehicle.
- Training implementation is viewed as a strategy that directly falls on companies. This results in variations in the training of those who drive. There is a need for government institutions to develop training that includes the entire sector.

8) Road infrastructure

- Because of the variety of terrain and road congestion, the route is perceived as a complex environment. Participants claim that the environment has deteriorated and is out of date.
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9) Vehicle

- Participants point to some factors that influence the safety of the vehicle, such as the reluctance to incorporate new technologies in the workplace, the intensive use of the unit, the existence of surface controls at times of increased demand and the deterioration of driving performance due to the impossibility of maintaining a “fixed car”.
- Controls are thought to have improved, though only those with IRAM 3810 certification have a standardized procedure. It is stated that these companies use three forms to record vehicle information obtained through the maintenance sector's control. It is also mentioned that in some cases, a “witness report” (copy of the recorded data in the driver's possession) is used.

10) Perceptions about CNRT

- While participants report progress in the CNRTs' actions, a perception of their shortcomings prevails. Among the issues raised are the disparities in the rigor of controls based on the location within the country (lower requirements in the rural areas) and service type (absence of control in tour-

“The identification of these issues nor their resolution depend on the accountability of a single party, nor can they be boiled down to a particular cause. To the contrary, increasing the operational safety of drivers necessitates the joint engagement of all sectors that affect one of the fundamental criteria.



ism services), the use of fines for collection purposes or to “demonstrate management,” and the limitations of the workbook (vulnerable registration, obsolete, inconvenient, and expensive) and the tachograph (leads to errors when assigning speeding tickets).

- There are perceived barriers in the CNRT’s tasks, such as the small number of inspectors and their lack of training, the increase in fines caused by “one to one” control, the absence of control at non-terminal points of the trip, and discontinuities in control and control policies. Because of changes in government management.
- One of the CNRT’s actions that was specifically mentioned was the control of driving personnel in Psychophysical Control Units. This action is perceived not only as an instance of control, but also to improve their health and promote the service’s safety

11) The workbook as a control tool

- The work book is viewed as a fallible control mechanism,

but also as adaptable to the actual operation of services. The workbook, as opposed to rigid rules, is a flexible control tool that adapts to the current working conditions.

- Participants mention the digital workbook as a resource that could overcome the difficulties of the traditional strategy. The ability to record more data on working hours, the strengthening of controls, and the configuration of a single system for different jurisdictions stand out as perceived benefits.
- The rigidity of the regulatory framework is a barrier to implementing the digital workbook, as a more demanding control mechanism would result in an increase in infractions. As a result, any changes to the control tool must be accompanied by a regulatory update.

12) Perception of IRAM Standards 3810 and 39001

- The interviewees regard IRAM Standards 3810 and 39001 as management tools aimed at improving road safety and increasing a company’s quality. These standards allow for the standardization of security procedures and the creation of a common framework of good practices.
- The state is viewed as a body responsible for ensuring mandatory certification of these standards in order to reduce the risks associated with driving. The necessity of relying on a private entity to ensure the quality of a public service is called into question.

13) Basic aspects of CyMAT

- The interviews yield a series of insights into three fundamental aspects of the CyMAT, indicating that working conditions:

1. have an impact on driver health and safety;
2. they must be understood and modified through a collaborative and multidisciplinary approach capable of considering the various factors that influence driving (e.g. social, emotional, contextual); and
3. they change over time, as evidenced by variations in transportation policies caused by changes in government.

CONCLUSIONS

This work attempted to provide novel answers and raise new questions about two major issues: (1) what is the regulatory framework that governs CyMAT in long-distance passenger transport driving personnel of regular services in national jurisdiction? and (2) how do the various system actors perceive the drivers’ CyMATs?

Concerning the first question, this study reports on a broad regulatory framework aimed at regulating technical, social, organizational, and environmental aspects of management personnel’s operations. However, certain evaluation criteria for obtaining the National Interjurisdictional Transportation License (LiNTI); the definition of driver responsibilities, the clarification of work and rest times, and the search for a more consistent control tool have been identified as legal components that could be improved. As a result, this study suggests that existing legislation should be strengthened, as it assumes that regulations are an important protection strategy against both foreseeable and active dangerous situations.

Regarding the second query, actors express different perceptions about the characteristics,

problems and risks associated with the working conditions. If one considers the existence of the various interests between the parties, this is to be expected. There are a number of misconceptions that have been noted, including the inconsistencies in determining the requirements to hold the position, disagreements in defining an ideal working day and its breaks or rest periods, a lack of clarity regarding the tasks that a driver must perform while at work, the presence of environmental risks, the limitations of the audit and control body, and the contributions of the IRAM Standards. If these results are compared with data obtained in previous similar studies (Neffa, 1986; SRT, 2009; Diez et al. 2019) is observed that:



- CyMATs contribute to the fact that worker health is still a significant problem.
- The activity is characterized by excessive working hours and the resulting reduction in rest possibilities, which is supported by organizational and personal objectives. One of the most significant issues is this one, which calls for adjustments based on judgments that include the activity's range of interests and cultural specifics in addition to scientific and normative requirements.
- The routes are still seen as having a high frequency of vehicles and a poorly maintained environment. This paper adds worry about the excessive usage of vehicles, which is different from earlier studies. The workload and task risks may rise as a result of these environmental conditions.
- Although efforts are still needed to establish standard training commensurate with

the intended professional profile, training bodies have made positive progress.

The answers obtained to the two questions that gave rise to this work indicate that the CyMAT of drivers had certain flaws. A systemic perspective views these flaws as hidden (or less obvious) organizational factors that tend to have a detrimental impact on the management team's decisions and decrease operational safety. Overcoming these flaws rests on those players with more autonomy in decision-making, such as the state, company, and union, due to the organizational nature of the system. By altering normative, technological, socio-organizational, and environmental factors, these players, who are situated at the highest levels of organizations, can optimize the CyMATs. In this sense, neither the identification of these issues nor their resolution depend on the accountability of a single party, nor can they be boiled down to a particular cause. To the contrary, increasing the operational safety of drivers necessitates the joint engagement of all sectors that

affect one of the fundamental criteria.

In conclusion, this research makes significant strides toward identifying potential elements that can weaken or boost the system's defense mechanisms.

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