

Motor Vehicle Information Management Systems

A Framework for Improvement



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Website: www.globalroadsafetyfacility.org

Email: grsf@worldbank.org

Acronyms

EUCARIS	European Car and Driving License Information System
EU	European Union
ICT	Information and communication technology
INS	Instituto Nacional de Seguros (Costa Rica insurance corporation)
ITF	International Transport Forum
LMIC	Low and middle-income country
MTPL	Motor third party liability
MVIMS	Motor vehicle information management system
NEVDIS	National Exchange of Vehicle & Driver Information System
PAYD	Pay as your drive
PHYD	Pay how you drive
RDW	<i>Rijks Dienst Wegverkeer</i> (Netherlands Vehicle Authority)
RUNT	Registro Único Nacional de Tránsito (Colombia National Traffic Registry)
SOA	Seguro Obligatorio Automotor (Costa Rica motor insurance)
VIN	Vehicle identification number

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Executive Summary

Successive waves of motorization across the world have significantly enhanced the movement of people and goods. Motorization has improved the access of individuals and communities to a much wider range of social and economic opportunities, and the access of producers to much bigger markets far and wide. However, these benefits also come at a cost, impacting health¹, resource consumption², and even accessibility itself over the long run.

To reclaim the benefits of motorization while minimizing these various related costs, active management of transport systems generally, and motorization processes specifically, is required. One of the key processes that require active attention by governments and policymakers to address these broader issues of health, resources consumption, and accessibility is motorization—that is, how households and firms acquire, use, manage, and dispose of, motor vehicles. The management of these elements of motorization requires a governance framework that can improve the quality of the motor vehicle fleet being used on a country's roads. The centerpiece of that governance framework is the information management system—that is, the core vehicle registry and linked databases and processes which facilitate its utility. If structured and formulated well, a Motor Vehicle Information Management System (MVIMS) can promote synergies across a range of public policy outcomes and objectives.

Facilitating Public Policy Outcomes and Objectives

MVIMS have the potential to provide essential information to guide policies for improving the quality and quantity of national vehicle fleets. Aggregated population level data regarding vehicle kilometers travelled, fuel type and consumption are all examples of data which can assist sustainable mobility. We highlight here four

1 Health impacts are through numerous pathways, including fatalities and serious injuries from road crashes, chronic disease associated with exposure to poor air quality to which motor vehicles contribute, and chronic disease associated with car-based sedentary lifestyles.

2 Resource consumption costs can include consumption of (non-renewable) fossil fuels (which in turn leads to greenhouse gas emissions and affects countries' balance of payments), consumption of water for car washing, consumption of land and scarce government fiscal space to create and maintain infrastructure, and consumption of household resources.

significant public policy issues within the transport sector which can be better managed through establishing strong MVIMS and illustrates how good quality MVIMS design and operation can facilitate these outcomes.

Improving global governance of trade in used vehicles

The international trade in used vehicles is a significant factor in the rapid motorization of low- and middle-Income Countries (LMICs), with little or no meaningful regulatory control on the quantity or quality of the trade. A study in 2020 by the United Nations Environment Program concluded that there is a need for both high-income exporting countries to regulate the condition of exported vehicles, and for importing countries (mostly LMICs) to put stronger and more meaningful feature- or performance-based import criteria. Development of more effective MVIMS in LMICs would help these regulatory systems talk to each other and improve overall efficiency of the global trade in second-hand vehicles while improving the quality of the vehicles traded.

Improving compliance with vehicle standards

MVIMS can allow for early and remote assessment by the relevant regulatory institution regarding the compliance of the vehicle to any legally enforceable vehicle standards which apply as it enters the motor vehicle stock. Ideally, well-structured MVIMS should be able to interface with manufacturer data, including certification and conformity of vehicles to different levels of standards at their manufacture, and track changes and modifications.

Improving technical quality and upkeep of in-use vehicles

MVIMS can also be used to facilitate effective deployment and monitoring of national systems of Periodic Technical Inspection (PTI) to ensure compliance with basic standards of maintenance and upkeep (in terms of both safety and emissions) and track the health of vehicles and their relative levels of usage (through odometer readings) throughout their in-use life. A well-structured MVIMS can even track the exit of vehicles from the vehicle stock, through export or destruction.

Improving vehicle insurance operations and governance

Similarly with the importation and ongoing management of the used vehicle fleet, and the more specific requirements associated with vehicle technical inspection systems, a good quality MVIMS can facilitate and significantly enhance motor vehicle insurance markets. It provides insurance markets with a range of benefits, important risk exposure information such as the vehicle fleet size and composition. It also provides vehicle identity information which is essential to establishing the insurance contract and paying out any claim. This is particularly important in countries where insurance companies rely on vehicle information provided by the owner, as a lack of information integration and verification can create conditions which are conducive for fraud.

Current Practices on MVIMS in LMICs

To understand the state of current practice of MVIMS in LMICs, a survey was conducted regarding institutional arrangements and coverage of different regulatory activities, as well as specific practices on data capture, cleansing, integration, governance, analytics, security, retention and replenishment. The goal of the survey was to identify and document different practices and approaches regarding vehicle information registries and their interaction with various users and other data sources.

The findings presented in this report are based on 13 complete responses received at the time of writing, from the following regions and countries: from Latin America and Caribbean: Colombia, Costa Rica, El Salvador, República Dominicana, Paraguay, and Peru; from Asia-Pacific: Cambodia, Laos, and Timor-Leste; from Africa: South Africa, and Zambia; from South Asia: Bhutan, and from Europe and Central Asia: Georgia.

Vehicle information systems

All countries responding to the survey indicated that they have implemented vehicle information systems. In most cases, they follow transactional processes that include initial registry, control, modifications, and validation of such ownership over time. Of the 12 countries that provided information, eight capture technical information from the vehicle in addition to the verified VIN, six include information on the safety of vehicles, and six include environmental features. Three countries have technical information, verified VIN, safety, and environmental features. The National Government directly manages the information system in all but one of the 14 countries. In the remaining country, it has been outsourced.

Most countries require payment for vehicles to access the public road network (tax) and also instruct a revenue mechanism that funds the government when importing vehicles. Ten countries have adopted a periodic vehicle inspection requirement for both private and commercial vehicles, and seven have linked this information to the vehicle registry.

Even though motorcycles are growing at a fast pace, only four countries have specific provisions for their registration, insurance, or (rider) licensing. Even for those that do, however, two highlight that the provision refers to mandating the registration of such vehicles without a prescribed threshold for registration.

Compulsory motor insurance data systems

Respondents to the survey provided only partial information on the system's characteristics with respect to compulsory motor insurance. Five countries do not enforce compulsory motor insurance, while some are advancing its implementation. Of the nine countries where insurance is mandated, four countries implemented personal injury insurance, one has property damage insurance, and four require both types of insurance.

Unlike the vehicle registration system, countries with mandatory motor vehicle insurance tend to have multiple information systems, often as many systems as there are insurance companies providing coverage. Three countries documented single information systems for insurance, yet two were integrated into the vehicle registry. Just one country uses the same institution to manage vehicle information systems and compulsory motor information systems. This situation hampers any effort toward data integration since each institution has its own software, protocols, and corporate strategies and policies.

Driver license systems

All fourteen countries indicate that they have a single information system regarding driver's licenses that serves to identify enabled drivers in the country. The systems collect and keep records of drivers who obtained a permit to drive in the country, primarily serving to facilitate administrative procedures. Five countries have implemented a point system to promote road safety, two of which were only recently implemented; in these countries, the driver license data system also helps to track the accumulation of these points.

Six countries indicated that the driver license data system is under the jurisdiction of the same institution responsible for the vehicle information system. Ten countries have a single information system, and three have more than one.

The key findings from the survey include the following:

- All countries from the sample have information systems related to vehicles and driver licenses, and to motor insurance where it is compulsory. In the sample, motor vehicle information systems are overwhelmingly managed directly by the national government; only one outsources that management.
- Integration among systems of data is rudimentary. For example, among the ten countries reporting having Periodic Technical Inspection requirements, three do not link the PTI inspection results to the main vehicle database.
- Management of information systems typically relies on different institutions within the same country, which is likely to make it more difficult to integrate the various systems.
- Data quality is still a challenge for some countries, especially regarding vehicles. Validation protocols are not as strong as desired and, in some cases, allow information that does not meet the criteria that have been set.
- Countries are moving toward online processes to upload information, but batches of information can present a large delay time in some cases. Countries are moving toward cloud storage, replacing local servers.
- Even though countries handle large volumes of information, external publications with aggregated figures are rare and infrequent. Information tends to remain only for internal purposes.

Good Practice MVIMS

It is expected that the best practices in MVIMS programs would display common attributes that make them particularly useful to motor vehicle governance. However, different countries rely on different agencies to develop and administer motor vehicle information management systems. In addition, even though Well-structured MVIMS programs would be equally important within federal and unitary government systems, their structure would be different. For these reasons, it is important to understand the commonalities and differences among best-practice examples.

This paper examined the approach taken to the management of motor vehicle regulation across Europe, the Netherlands and Australia. Along with Colombia, a further and rather unique case is also described in Costa Rica, where the primary regulatory mechanism is actually an insurance scheme operating in a competitive market. The examples in the paper of Europe and Australia include reference to MVIMS which actually integrate a number of individual MVIMS managed by autonomous agencies. These federated systems provide critical links to different information systems to allow people and goods to move freely, and be regulated, across borders. The same principles apply, reflecting the various arrangements for legal sharing of information, institutional arrangements, and regulatory service delivery.

The case studies are summarized in Table 4 on page 46 in the document.

Characteristics of a Good Quality MVIMS

The analysis of motor vehicle information management systems in this report (with linkages to motor vehicle insurance and driver information systems) provides LMICs with a framework to consider the quality of their own MVIMS. A number of key principles for establishing high quality MVIMS are postulated.

Legal Framework

The legal framework governing any MVIMS system should strive to be clear and unambiguous in a number of key areas:

- Legal responsibility to capture data must be clearly spelled out.
- Legal responsibility for upward and downward cascading of data in federated systems must be clearly spelled out. There should be clear mandates within the legal system for sharing of data in both directions in the event of federated systems, such as might exist in Federal legal structures where a state, rather than the national (Federal) government, has jurisdiction / police power over motor vehicle operation.
- Legal responsibility on who, how, and under what circumstances data can be used, and under what circumstances it can (or must) be made available to the public should be clearly articulated in the legal framework. From a developmental standpoint, the goal in laying out such legal responsibility should be as expansive as possible.

How to obtain the above legal principles would require careful legal framework analysis in the context of each country (and possibly, state, in the case of federal systems).

Institutional setup

Institutional responsibility for MVIMS can vary from country-to-country. They are sometimes managed by entities or agencies under the purview of ministries of transport, but often they are under entities reporting to ministries of interior. Whatever their form, it is important to ensure that key functions within the MVIMS ecosystem are accounted for, clearly spelled out (through internal Terms of Reference or other such documents) and funded adequately. The following functions are considered integral:

- *Data capture:* Business Operating Procedures (BOP) within the institution(s) responsible for data capture should be as clear as possible, minimizing the number of open fields to reduce discrepancies in data intake.
- *Data quality assurance:* As with data capture, it is critical that the institution responsible for the MVIMS include BOP and staff with responsibility for ensuring the overall quality of the data included in the MVIMS.
- *Data access:* assuring data access among institutions, and even with the public, is a critical public policy objective in its own right.
- *Data integrity assurance:* The more extensively data is shared among institutions, and with the public, the more access points there are, and the more attention needs to be paid to data integrity throughout the life of the data, from intake through retention and ultimate destruction.

- *Data transformation and publishing:* Ensuring that public-facing versions of data are published in appropriate form and with sufficient frequency to allow the public to participate in public policy discussions, and to improve government transparency, is a key long-term function of the best MVIMS data systems.

To ensure accountability for the above-enumerated key functions, institutions charged with MVIMS need to assume leadership of many different elements within the regulatory system.

Information coverage

What information is collected and tracked by MVIMS systems, and with what periodicity, are critically important questions, particularly since, depending on the envisioned capabilities, the role of MVIMS could expand substantially from simply being a means to track motor vehicles on operating on public roads to a means to ensure adherence to a range of policies. MVIMS can support at least 18 different policy and regulatory functions, shown in **Error! Reference source not found.**1 on page 54, but for each function, it must track the appropriate data. A number of key principles regarding the coverage of information collected and tracked through a well-structured MVIMS emerges from these considerations

- MVIMS should be conceived and constructed as a “cradle-to-grave” asset tracking system. The VIN number should be traceable throughout the entire life of a vehicle within a country, from the moment it is imported or manufactured to the moment it is exported or destroyed with issuance of a Certificate of Destruction.
- MVIMS should adhere to a continuous registration principle: vehicles should be registered and periodically re-registered throughout their in-use life, especially but not only when title is transferred between owners. The system should incorporate active de-registration requirements, with recurring obligations accruing to the owner unless and until de-registration occurs (including penalties for non-insurance). For example, de-registration should be an obligation for export or for receiving a Certificate of Destruction. Such measures can also help increase barriers to cross-border vehicle smuggling.
- Over time, MVIMS systems should adapt to enable modular tracking of independent systems associated with the car. These systems could include chassis, engines, drive trains, batteries, etc. Block-chain technology can be instrumental in helping with this transition to modular data systems.

Information management

To improve MVIMS, thinking through core information management processes, in addition to legal framework, institutional, and information coverage issues will also be crucial. Key issues to be considered at the outset of any MVIMS improvement program include data management structure, how data is stored, how data are input, how to ensure data security, and how to ensure data access (again, with a developmental aim of being as expansive as possible while still ensuring data privacy and integrity).

Interfacing across different regulatory services

A good quality MVIMS enables many different regulatory functions and services. Not all of those functions are likely to be delivered by a single agency, however. It is important to take into account, therefore, not only the functions of the principal regulator in conceiving the structure of the MVIMS, but also the needs of the range of other entities that may need to access the database, either to retrieve data or to deposit new information.

Generally, the MVIMS will be run by the regulatory agency having direct jurisdiction over the national vehicle stock. These are typically agencies reporting to either Ministry of Transport or Ministry of Interior. This primary regulatory entity in charge of MVIMS needs to coordinate with other regulatory agencies who may need access to the MVIMS, such as a regulator of commercial transport services. On-road enforcement also requires access. Finally, various private sector actors also need to be able to access the MVIMS to be able to carry out their business effectively, and / or meet the needs of the clients who are contracting them. There are a range of good practice examples where all or a key part of the service is delivered by the private sector, working under a specific regulatory mandate. These include:

- Applying quality rules at port of entry, where private certification corporations can check vehicle compliance with relevant legislation.
- Insurance coverage, where public or private insurance corporations write compulsory motor vehicle injury policies in line with regulations.
- Periodic vehicle safety and environmental inspections, where private testing corporations are often granted the power to deliver regulated inspection services.
- Vehicle modification / repair, where private companies deliver a wide range of vehicle services which are required to meet certain standards.
- End of life treatment of vehicle, and related parts, where private companies deliver a wide range of vehicle services which are required to meet certain standards.
- Parking services, which are often delivered by local government.

Whether delivered by the public sector or the private sector, all of these services need a certain level of access to the MVIMS. They rely on the MVIMS to provide high quality information, and they add to the MVIMS by recording their regulated activity regarding each vehicle or person. As discussed above, however, the nature of that access needs to be circumscribed by the legal framework, the objective of which should be to safeguard data privacy and security while facilitating access.

Towards a Stronger MVIMS

The intent of this study has been to help further our understanding of MVIMS and its critical role in strengthening LMICs' management of national motor vehicle stocks and improving public policy outcomes. One key finding of the survey of motor vehicle, drivers' and insurance data practices in LMICs from the survey was that there appears to be minimal integration of data and methods among systems in the surveyed countries. Part of the reason seems to be that different information systems are managed by different institutions, which itself suggests a need to work on cross-agency governance systems.

A key objective of the present report is to set out a strategically-oriented process with key recommendations that LMIC governments and their development partners can use to help guide analysis of existing MVIMS and options for improvement. The process follows a simple pathway and improvement cycle: **Assess-Envision-Plan-Implement-Monitor**.

- *Assess*: a country considering investment and improvement in the information systems relating to motor vehicle regulation start with a strategic assessment of the MVIMS as it currently exists.
- *Envision*: Informed by the above assessment, a collaborative process should be undertaken involving relevant stakeholders, government Ministers, and the wider community as necessary, to establish a common vision and ambition for the MVIMS.
- *Plan*: A comprehensive MVIMS reform plan should be prepared, focusing on the specific projects which will be initiated and their sequencing and financing, based on the vision and reform roadmap which has been agreed.
- *Implement*: An MVIMS strengthening program should be implemented under a project management framework led by the agency with primary responsibility for motor vehicle regulation, but with as much participation from different government agencies and private sector representatives as appropriate, with separate funding and a cross-agency governance and oversight approach.
- *Monitor*: A monitoring program should be put in place to assess over time the development, delivery, maintenance and improvement of the strengthened MVIMS.



1. Introduction

Successive waves of motorization across the world have significantly enhanced the movement of people and goods. Motorization has improved the access of individuals and communities to a much wider range of social and economic opportunities, and the access of producers to much bigger markets far and wide. However, these benefits also come at a cost, impacting health³, resource consumption⁴, and even accessibility itself over the long run.

To reclaim the benefits of motorization while minimizing these various related costs, active management of transport systems generally, and motorization processes specifically, is required. Unfettered growth in motorization is inconsistent with the global policy goals that have been established across a variety of domains, and national governments are facing major challenges as a result. As an example, a new surge in motorcycle use in LMICs is significantly increasing exposure to injury risk, but this surge is driven, at least in part, by a deterioration in public transport systems.

One of the key processes that require active attention by governments and policymakers to address these broader issues of health, resources consumption, and accessibility is motorization—that is, how households and firms acquire, use, manage, and dispose of, motor vehicles. A World Bank study of motorization and its management⁵ identified five key pillars of motorization management:

- Inclusive, transparent and forward-looking policy making frameworks
- Fostering the creation and use of data eco-systems for policy analysis for continuous analytics
- Clear promulgation of vehicle and fuel standards

³ Health impacts are through numerous pathways, including fatalities and serious injuries from road crashes, chronic disease associated with exposure to poor air quality to which motor vehicles contribute, and chronic disease associated with car-based sedentary lifestyles.

⁴ Resource consumption costs can include consumption of (non-renewable) fossil fuels (which in turn leads to greenhouse gas emissions and affects countries' balance of payments), consumption of water for car washing, consumption of land and scarce government fiscal space to create and maintain infrastructure, and consumption of household resources.

⁵ R Gorham, D Bose, M Cordeiro, G Darido, J Koupal, R Krishnan, K Neki, and Y Qiu (2022). Motorization Management for Development. An Integrated Approach to Improving Vehicles for Sustainable Mobility. Washington, DC: World Bank.

- Strong motor vehicle governance practices; and
- Adequate credit / funding for vehicle stock growth and turnover

Collectively, these pillars can build a motorization management framework that can improve the quality of the motor vehicle fleet being used on a country's roads. Deterioration or stagnation in that quality has been associated with three key negative outcomes resulting from the technology embedded in the vehicle and how it is maintained:

- The number of people killed or seriously injured in motor vehicle crashes.
- The level of harmful air pollution such as carbon monoxide, fine particulates, or sulfur oxides, particularly in cities.
- The volume of fossil fuel consumed and, consequently, the greenhouse gas emitted.

Good quality motor vehicle regulatory systems—regarding, for example, the number of motor vehicles, the profile of the vehicle fleet, and the ongoing management and use of the vehicles—are essential to successfully managing these important social, health and environmental outcomes.

The centerpiece of any governance system over motor vehicles is the information management system—that is, the core vehicle registry and linked databases and processes which facilitate its utility. If structured and formulated well, a Motor Vehicle Information Management System (MVIMS) can promote synergies across these various outcomes and objectives. A vital enabler to realizing these benefits is an MVIMS which can provide governments with confidence that the vehicle fleet can be regulated, and improved over time, in line with a sustainable transport agenda.

Report structure

This study discusses how MVIMS work in relation to the services delivered to support various policy objectives. Like any regulatory service system, it is only as effective as the wider legal and institutional arrangements in place, and the service design work which the related information and communication technology (ICT) system responds to.

Chapter Two provides a quick survey of a range of public policy issues which rely on a good quality MVIMS, Chapter Three provides insight to the current state of MVIMS in rapidly motorizing countries by reporting on a survey of MVIMS practices across several LMICs in Asia, the Pacific, Latin America, and Africa. Chapter Four summarizes practices for MVIMS in select countries considered to have good practices.

Chapter Five then consolidates these lessons, laying out what are considered to be the characteristics of a good quality MVIMS. Finally, recommendations are made for analyzing and improving existing MVIMS, supported by a process map and a checklist. This is intended as a first step towards preparing and testing an assessment framework and toolkit to enable rapid evaluation of MVIMS systems, and a detailed guide to apply in the assessment of MVIMS in LMICs and their improvement.

Policy perspective

It is valuable to consider this report on MVIMS as part of the bigger analytical framework within the transportation sector which addresses “motorization management”. The World Bank’s 2022 study “Motorization Management for Development” described and analyzed motorization management as “a deliberate, diligent, and coordinated process to shape, through public policies and programs, the profile, quality, and, to some degree, quantity and intensity of use of the motor vehicle stock as it progresses through a country’s motorization process.”

This “life-of-vehicle” approach helps to illustrate, amplify and promote policies and measures at different phases of vehicle life—essentially vehicle entry, active vehicle use, and vehicle exit—as critical means of improving safety, environmental, and fuel consumption outcomes within the transportation sector. However, the focus of the Motorization Management framework deliberately goes beyond particular policies to address the entire governance ecosystem, considering, for example, the development and strengthening of related institutions to carry out essential tasks and run robust policy-making processes.

Associated with this conceptual framework, *Motorization Management for Development* laid out a policy context to provide some general principles related to vehicle life cycle, within which MVIMS is relevant.⁶ These are reproduced in Table 1 below.

Table 1. Ten Policy Concepts for Managing Motorization

Vehicle entry	Vehicle importation or manufacturing regulations should protect public health and safety and can be supported by economic incentives
	Regulatory systems should focus on specific safety, air quality or fuel efficiency intensity characteristics, rather than vehicle age alone
Active use	Lifestyle or economic transition points should be used to influence household and firm decisions about vehicle fleets
	Regulatory systems should support good decision-making regarding vehicle roadworthiness, injury insurance and appropriate use
	Enforcement actions should be accompanied by communication and education/dissemination programs
Vehicle exit	Changing the permitted uses of vehicles as they age may be more politically acceptable than abruptly banning their use
	Assigning lifetime usage limits when vehicles enter the national fleet could equitably address the challenge of an ageing fleet
	Incentivizing turnover of commercial transport vehicles is as important as the quality of commercial vehicles brought in
	Management of end-of-life vehicles, batteries and tires should be built into national systems
Motorization demand	The use of vehicles is the source of both environmental and safety costs and accessibility benefits
	Managing motorization is one element of a broader, sustainable transport agenda

Source: Gorham et. al. 2022

⁶ R Gorham et al, Op Cit.

This report starts with the Motorization Management framework and looks in more detail at the information systems through which motor vehicles are managed. The value of an MVIMS is not that it presents answers to these complex challenges within the transport system, or wider society; a high quality MVIMS operation can be associated with poor policy outcomes. Rather, the value of an MVIMS is that it facilitates effective responses to these challenges and thereby improved outcomes. An essential element of this study is to set out an analytical framework and improvement process which supports this.



2. Facilitating Global Outcomes through MVIMS

This chapter surveys the range of public policies that can be facilitated through a well-structured MVIMS, beyond simply governing the use of specific vehicles by specific owners. Motor vehicles have been registered by public authorities for well over a century, based on the premise that if the vehicle is going to use public roads, public authorities have jurisdiction and need a mechanism to surveille that use and implement requisite enforcement actions. The use of the motor vehicle information collected, along with information about licensed drivers and other related matters, continues to grow and develop today. Many different public policy outcomes are now facilitated through the use of this information, including economic regulation of insurance markets, protection of the community from injury and protection of the environment from degradation.

Increasing attention was given during the 20th century to managing the most deleterious effects of motor vehicle use, starting with basic safety and insurance requirements. Notably in the United States of America, vehicle policy efforts directed at significantly reducing motor vehicle pollution and crash related trauma ramped up during the 1960s and 1970s. A good example of this following the 1973 oil crisis was the Corporate Average Fuel Economy standards designed to reduce the fuel intensity of cars and light trucks. Sustained consumer programs supported by legislation continue to make a significant contribution to improved outcomes, particularly in high income countries, and increasingly in middle income countries—for example, India's rapid improvements in new vehicles' safety. As motorization has rapidly increased across LMICs, more needs to be done to strengthen the capacity of countries to halt the deterioration and then improvement of safety and environmental outcomes.

MVIMS have the potential to provide essential information to guide policies for improving the quality and quantity of national vehicle fleets. Aggregated population level data regarding vehicle kilometers travelled, fuel type and consumption are all examples of data which can assist sustainable mobility. Several recent international studies have been undertaken to look further at potential reforms of motorization management systems in LMICs to improve sustainable mobility outcomes. This section looks at four significant public policy issues within the transport sector which can be better managed through establishing strong MVIMS, and illustrates how good quality MVIMS design and operation supports governments to take significant steps forward in sustainable mobility.

2.1 Improving Global Governance of Trade in Used Vehicles

The international trade in used vehicles is a significant factor in the rapid motorization of LMICs, with little or no meaningful regulatory control on the quantity or quality of the trade. A major study of the trade published by the United Nations Environment Program (UNEP) in 2020 concluded that:

“There is a patchwork of measures that govern the flow of used vehicles, but currently no regional or global agreements that harmonize the flow to ensure the transfer of best available technology. Used vehicles are notably absent in global, regional, and national strategies for air pollution control, climate mitigation and road safety. While some measures seeking to govern end-of-life vehicles exist, they are not fully developed or consistently adopted.”⁷

There is a case for high-income exporting countries’ regulating the condition of exported vehicles. These countries have strong regulatory systems which can easily be changed to put stronger end-of-life and vehicle exit controls in place. There is also a case for low and middle-income importing countries strengthening their MVIMS, which would both improve the effectiveness of these trade controls and facilitate improvements in the quality of vehicle import controls.

The UNEP study illustrates the significance of the regulatory environment on national motor vehicle fleets, particularly in LMICs, and was based on a comprehensive survey of regulations associated with used light vehicle imports.

Of the 146 countries studied, 87 had some used light duty vehicle import regulations in place, and 59 countries had none. All vehicle manufacturing countries had some form of regulation. The following policies were being applied:

- Complete ban on used vehicles entering the country.
- Age limit, whereby a vehicle’s model year must fall below a specified age/year before it can be registered locally.
- Emissions standards, whereby a vehicle must meet a minimum emissions standard.
- Fiscal instruments or (dis)incentives using customs and registration tariffs, based on vehicle age, engine size, or emission standards.
- Vehicle labels that include emission and/or fuel economy information.
- Selective technology ban, such as a ban on the import of diesel engines.
- Safety standards that include roadworthiness and crash tests’ ratings.

The outcomes achieved through each of these regulatory measures depends on the quality of the relevant MVIMS. This begins with the MVIMS in the exporting country, through which the identity of the vehicle, the technology installed in the vehicle, and the condition of the vehicle at the time of export is recorded. The quality of the MVIMS in the importing country provides essential consumer assurance regarding the vehicle, and facilitates ongoing management of the vehicle according to national public policy goals and related laws.

⁷ UNEP (2020). Used Vehicles and the Environment: A Global Overview of Used Light Duty Vehicles: Flow, Scale and Regulation. Nairobi.

Identifying the various regulatory regimes across these measures, the study developed a Regulatory Environment Ranking, based on policies to restrict the age of vehicles and/or vehicles emissions standards. Four rankings were established, with an additional “Banned” ranking. The rankings are:

- *Very Good*: A used light duty vehicle (LDV) Euro 5 or more emissions standard adopted and/or age limit of 3 years or below.
- *Good*: Used LDV Euro 4 emissions standard adopted and/or age limit of 4 or 5 years.
- *Weak*: Used LDV Euro 3 emissions standard adopted and/or age limit of between 6-8 years.
- *Very weak*: No used LDV Euro emissions standard adopted and/or age limit of 9 years plus or no age limit.
- *Banned*: Represents a complete restriction on used vehicle imports.

The headline results across the 146 countries surveyed were:

- 82 countries (around two thirds) had ‘weak’ or ‘very weak’ policies to regulate the import of used vehicles
- 47 countries had ‘good’ or ‘very good’ policies
- 17 countries banned used vehicle imports
- Asia was the only region where there more good (or ‘very good’) policies (11 countries) than weak (or ‘very weak’) policies (9 countries)
- There were only 10 countries in Africa with ‘good’ or ‘very good’ policies and 40 countries with ‘weak’ or ‘very weak’ policies
- 28 countries had vehicles emissions standards, though 14 were at Euro 2 or 3
- 68 countries limited the age on imported vehicles.

A ban on used imports may be used by some countries (often vehicle manufacturing) as a means of protecting local industry, and by some (often vehicle importing) countries as a means of stopping importation of unsafe and/or heavily polluting vehicles. But it is not clear that the environmental and safety benefits are outweighed by additional costs to society or limiting access to advanced vehicle technology. Depending on the regulatory environment of the original country of manufacture, some imported used vehicles are likely to have better safety or environmental technology than the vehicles produced locally.

It is important to note that in 2022 the UN Economic Commission for Europe (UNECE) was able to report some progress against this UNEP analysis.⁸

- The number of countries with ‘good’ or ‘very good’ policies had increased from 47 to 62.
- 15 West African countries (the ECOWAS region) had adopted Euro 4 equivalent emission standards.
- Cambodia had also adopted Euro 4 emission standards, and Peru had adopted Euro 6 emission standards.

⁸ UNECE (2022). Safer and Cleaner Used Vehicles for Africa. United Nations, Geneva. <https://unece.org/sites/default/files/2023-05/Safer%20and%20Cleaner%20Used%20Vehicles%20for%20Africa%20%28Final%29.pdf>

UNECE manages the UN vehicle regulatory system based on several international agreements and technical regulations, for which a good quality MVIMS is critical for implementation.

A subsequent study of the global used car trade by the International Transport Forum (ITF) which had a focus on the electric vehicle transition, reinforces the central role of MVIMS in both high-income countries and LMICs.⁹ The study encouraged developed economies to support decarbonization efforts within emerging economies by supporting trades in used electric vehicles.

One of the key ITF recommendations was to “improve the traceability of internationally traded used cars”, having revealed from an analysis of importer and exporter data for used vehicles entering Hungary, Morocco, and Romania that two to five times more used vehicles were reported to be imported into these countries than were reported to be exported to these countries. The report emphasized that “the ability to trace used vehicles is essential to enforce restrictions on their export or import and improve the quality of traded vehicles... to ensure the proper disposal of old vehicles via extended producer responsibility and monitor the treatment of end-of-life batteries and their high-value critical material components... (and) helps choose the optimal locations for recycling and disposal services”.

In a global sense, the quality and scope of MVIMS is important in both importing and exporting countries if the UN Sustainable Development Goals are to be realized in regard to sustainable mobility. This requires establishing electronic registers of motorcycles, cars, buses, and light and heavy trucks. The registers should contain an accurate record of the vehicle identity and ownership and record essential features which allow safety and environmental outcomes to be tracked, such as fuel type, and equipment such as emissions and safety technology. These records make it easier for governments to improve regulation of vehicle standards, such as those discussed below. Systems should be in place to allow the vehicle to be tracked annually over its life through revenue measures and periodic inspection, and to manage its exit from the national vehicle stock.

2.2 Improving Compliance with Vehicle Standards

A good quality MVIMS facilitates effective regulation of vehicle standards, whether national or international. Regulation should begin well before a motor vehicle is permitted entry to the road network—the national MVIMS should be connecting with the MVIMS of the exporting country, or with the certification process of any in-country vehicle manufacturer.

The MVIMS can allow for early and remote assessment by the relevant regulatory institution regarding the compliance of the vehicle to any legally enforceable vehicle standards which apply as it enters the motor vehicle stock. Ideally, well-structured MVIMS should be able to interface with manufacturer data, including certification and conformity of vehicles to different levels of standards at their manufacture, and track changes and modifications throughout that vehicles’ life in use, prior to initial registration in a country of interest.

⁹ ITF (2023). “New but Used: The Electric Vehicle Transition and the Global Second-hand Car Trade”, International Transport Forum Policy Papers, No. 125, OECD Publishing, Paris.

2.3 Improving Technical Quality and Upkeep of In-Use Vehicles

MVIMS can also be used to facilitate effective deployment and monitoring of national systems of Periodic Technical Inspection (PTI) to ensure compliance with basic standards of maintenance and upkeep (in terms of both safety and emissions), and track the health of vehicles and their relative levels of usage (through odometer readings) throughout their in-use life. A well-structured MVIMS can even track the exit of vehicles from the vehicle stock, through export or destruction.

The Global Road Safety Facility has been working closely with the Comité International d'Inspection des Véhicules Automobiles (CITA) on these issues. The collaborative development of CITA's Assessment of Vehicle Inspection Systems (AVIS) studies does not focus on MVIMS. Nevertheless, the AVIS study methodology is a strong analytical mechanism to begin assessing the safety and environmental quality of a national vehicle stock. It addresses both the entry-phase vehicle importation system and the use-phase periodic technical inspection system, and reveals the importance of the national MVIMS for facilitating implementation of both sets of regulation.

AVIS studies have been subsequently completed or are underway in several countries in Africa, Asia, Eastern Europe and Latin America. The first study in Togo highlighted several major issues:¹⁰

- It was difficult to provide a definitive estimation of the size of the fleet as there are multiple sources that do not provide consistent results. However, it was concluded that 94 percent of the vehicles are more than 5 years old, and 90 percent are more than 10 years old.
- There were no technical requirements for the importation of vehicles to Togo, regardless of the age of the vehicles—the commercial value of the vehicle is simply estimated to calculate the importation and custom taxes.
- There were significant issues in the vehicle inspection system, such as an extremely low rejection rate, no supervision of the private sector activity, poorly integrated equipment, no assessment of vehicle pollution, and an insufficient inspection capacity for the size of the fleet.

Three sets of recommendations were addressed:

1. Requirements for the vehicles entering the country (that vehicles should be registered once it has been confirmed that they meet the specific technical requirement, and that Togo applies the technical specifications developed through the UN agreements)
2. Capacity building for the government agency to manage the periodic technical inspections,
3. Upgrading of existing inspection stations, including the size of the network

The first set of regulations relates to the “core” vehicle safety technology standards promoted by the World Health Organization, as illustrated in

¹⁰ A Khalifi, D Subit, V Sogodel (2018). AVIS Mission Report: Vehicle Type-Approval and Road Worthiness Test in Togo. International Motor Vehicle Inspection Committee, Brussels. <https://citainsp.org/2018/07/20/vehicle-type-approval-road-worthiness-test-in-togo/>

Table 2 below.

Table 2. Number of Countries with Legislation on Core Vehicle Safety Standards, by Income, 2022

	Total	Income Levels			
		High-income	Upper-middle-income	Lower-middle-income	Low-income
	N=170	N=51	N=43	N=46	N=27
Vehicle safety standards					
National law on front and side impact protection	52	39	9	4	0
National law on seatbelts and seatbelt anchorages	88	44	21	16	7
National law on electronic stability control	49	39	8	2	0
National law on pedestrian protection	44	35	7	2	0
National law on braking systems	56	38	11	6	1
National law on periodic vehicle testing	134	46	30	35	20

Source: WHO (2023) Global Status Report on Road Safety 2023. World Health Organization, Geneva.

Another AVIS study was undertaken in Cameroon,¹¹ where a vehicle must be approved before it can be registered. The Ministry of Transport has appointed a company to assist in the evaluation and technical analysis of vehicles presented for approval. The approval report it produces generally includes the vehicle identification number (VIN) and descriptions of make, model and manufacturer, mass and dimension, transmission, engine, pollution control system, suspension, brakes and lighting.

However, there was no standardized procedure for vehicle approvals and the verification thresholds are defined for only a few functions, including mass and dimensions, which are decided by CEMAC (a regional grouping of central African states). Likewise, there was no auditing procedure for the technical service company responsible for issuing approvals, and no pollutant emission requirement defined for the approval of vehicles to be registered in Cameroon.

The parameters for technical approval were linked to several legal instruments, but the study found that the overall legal structure was insufficient, and could not guarantee the efficiency, uniformity, equity, and transparency of the vehicle inspection system.

Recommendations from the AVIS report regarding Cameroon focused on:

- Applying UN regulatory frameworks for both approval and inspection, and an associated strengthening of the legal, regulatory, and organisational framework.
- Strengthening the administration's capacity to formalise the activities of vehicle inspection centres and ensure the compliance of operators with administration guidelines.
- Standardising inspection centre procedures and operations.

¹¹ A Khalifi, D Subit, V Sogodel (2020). AVIS Mission Report: Vehicle inspection and approval in Cameroon. International Motor Vehicle Inspection Committee, Brussels. <https://citainsp.org/2020/07/14/avis-project-cameroon/>

Based on these studies, CITA has sought to develop a more quantitative approach to AVIS assessments and has recently issued a technical manual on that process.¹² How the proposed assessment approach links to MVIMS specifically is discussed in **Error! Reference source not found.** The Global Road Safety Facility continues to support qualitative assessments of vehicle inspection systems, and is also preparing more detailed guidance on how to do these qualitative assessments.

Box 1. Linkage Between CITA Quantitative AVIS Methodology and MVIMS Outcomes

CITA'S quantitative AVIS manual details a method of assessing both the legal or "theoretical" framework, and the implementation of that framework – that is the standards and the compliance. While focusing on the vehicle inspection system, it includes analytical categories covering some fundamental aspects of MVIMS, particularly on the vehicle approval process through which the vehicle enters the national fleet. For example, the AVIS manual proposes the following key binning values for assessing how a country classifies vehicles for inspection, and the nature of the data collected:

Vehicle Categories

This concerns the legal definition of vehicle categories, and how those vehicles should be inspected. The purpose is to encourage a wider adoption of international regulations to achieve a standardized global approach.

1. Local regulation covers minimum technical requirements to use the vehicle (no reference to international standard/legislation).
2. Technical requirements checked in national approval system.
3. Local regulation requires UN-compatible type approval regulations or Certificate of Conformity.
4. UN-compatible type approval regulations.
5. Each model is inspected to check compliance with technical inspection procedures and tests.

Vehicle database

This concerns the central database of vehicles with data related to each vehicle.

1. Database exists, but noticeable proportion of vehicles not registered.
2. National centralized database, "all" vehicles registered.
3. Database includes technical data, modifications.
4. Vehicle inspection results integrated in the registration database.
5. Database records vehicle inspection history (owners, origin, modifications, collisions, technical inspection results, mileage, participation of recalls, etc.).

This CITA analysis is an important illustration of what can be done to analyze the MVIMS in any a particular country.

Source: World Bank Team

¹² E Morger, E Fernández (2023). *Assessment of Vehicle Inspection Systems Manual*. International Motor Vehicle Inspection Committee, Brussels. <https://citainsp.org/wp-content/uploads/2023/09/CITA-AVIS-Manual-Version-1.0-20230825.pdf>

2.4 Improving Vehicle Insurance Operations and Governance

Similarly with the importation and ongoing management of the used vehicle fleet, and the more specific requirements associated with vehicle technical inspection systems, a good quality MVIMS can facilitate and significantly enhance motor vehicle insurance markets.

There are many legal variations in motor vehicle insurance markets around the world. Some contracts cover injury or property only, or both. Almost all are run by privately owned insurance corporations, but some insurance markets are run by government owned monopoly corporations. Some markets are better regulated than others, but all of them can benefit from an MVIMS in the delivery of services in a variety of ways.

A good quality MVIMS provides insurance markets with a range of benefits. It provides important risk exposure information such as the vehicle fleet size and composition. It also provides vehicle identity information which is essential to establishing the insurance contract and paying out any claim. This is particularly important in countries where insurance companies rely on vehicle information provided by the owner, as a lack of information integration and verification can create conditions which are conducive for fraud.

Insurance based risk analysis has been further improved through additional information collected during the life of the vehicle, such as odometer readings. More recently, the increasing shift towards pay as you drive policies (PAYD, focused on the length of risk exposure) and pay how you drive policies (PHYD, focused on the scale of risk exposure) means that insurance markets are in a position to feed important mobility information back into an MVIMS. This pricing and risk acceptance dynamic further illustrates the essential interaction between insurance markets and MVIMS.

Finally, insurance markets rely on high levels of compliance with vehicle standards and with compulsory insurance law. The vast bulk of the global population live in countries with national mandating third-party liability insurance for motor vehicles.

Motor third party liability (MTPL) insurance covers a driver or owner of a motor vehicle for damage to the health and property of a third party—it protects the asset base of the first party and prevents losses to the third party if the first party is unable to pay for bodily injury or property damage. Compulsory MTPL insurance is a common approach to regulating this relationship, and an adequate MVIMS is essential for its enforcement.



3. Current Situation in LMICs

To begin to build a picture of what a successful MVIMS project would look like, it is important to understand the state of the practice. This chapter and the next look empirically at how MVIMS are structured in different countries around the world. The next chapter (Chapter 4), looks at select good practices from mature vehicle management systems around the world. The present chapter, however, looks at current MVIMS practices in LMICs. To do so, a survey was conducted regarding institutional arrangements and coverage of different regulatory activities, as well as specific practices on data capture, cleansing, integration, governance, analytics, security, retention and replenishment.

The goal of the survey was to identify and document different practices and approaches regarding vehicle information registries and their interaction with various users and other data sources. The survey instrument is reproduced in Appendix 1.

Because of very slow response rates, the survey remains ongoing, and GRSF will continue to receive responses and update its database on a continual basis. For the purpose of this report, however, the findings are based on 14 complete responses received at the time of writing, from the following countries:

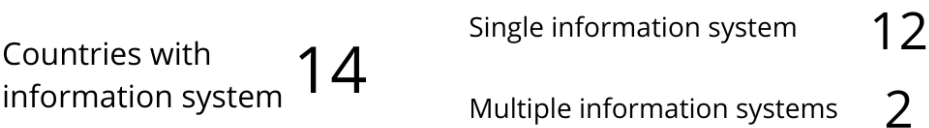
- *Latin America and Caribbean:* Colombia, Costa Rica, El Salvador, República Dominicana, Paraguay, and Peru
- *Asia-Pacific:* Cambodia, Laos, Samoa, and Timor-Leste
- *Africa:* South Africa, and Zambia
- *South Asia:* Bhutan
- *Europe and Central Asia:* Georgia.

The questions were separately asked about information management regarding vehicles, insurance, and drivers, and the results as they stood at the time of this writing are presented accordingly.

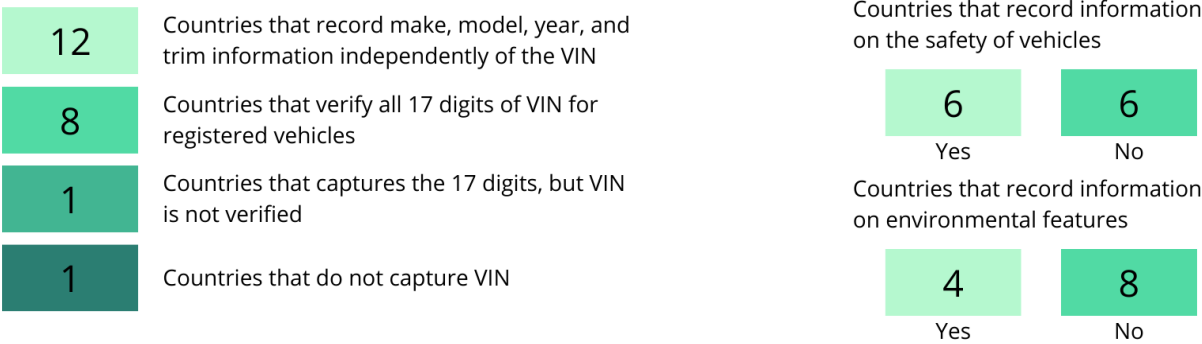
3.1 Vehicle Information Systems

General Description

All countries from the survey indicated that they have implemented vehicle information systems. In most cases, they follow transactional processes that include initial registry, control, modifications, and validation of such ownership over time.

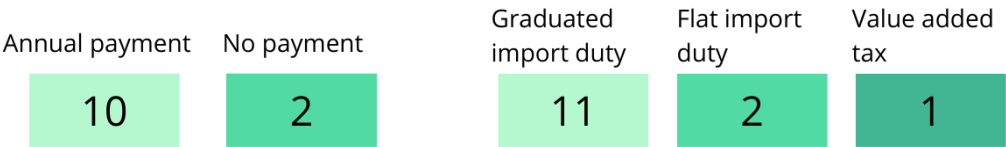


Completeness and quality of information varies among countries. Of the 12 countries that provided information, eight capture technical information from the vehicle in addition to the verified VIN, six include information on the safety of vehicles, and six include environmental features. Three countries have technical information, verified VIN, safety, and environmental features.



The National Government directly manages the information system in all but one of the 14 countries. In the remaining country, it has been outsourced.

Most countries require payment for vehicles to access the public road network (tax) and also have a revenue mechanism that funds the government when importing vehicles.



Ten countries have adopted a periodic vehicle inspection requirement for both private and commercial vehicles, and seven have linked this information to the vehicle registry.

Even though motorcycles are growing at a fast pace, only four countries have specific provisions for their registration, insurance, or (rider) licensing. Even for those that do, however, two highlight that the provision refers to mandating the registration of such vehicles without a prescribed threshold for registration.

Technical Characteristics

Two out of fourteen countries rely on a decentralized data system network. In a centralized network, all users are connected to a central server that stores complete network data and user information. By contrast, a decentralized network has several groups of users, and each group has a separate server that stores data and information relevant to that particular group.



For storage requirements, countries can use network-attached storage (servers) or cloud storage. One server-based country is currently moving to cloud storage.

Some countries undertake third-party security checks to avoid data breaches, modifications, unauthorized downloads, tampering, or any action resulting in data loss, with different periodicity.



All fourteen countries have implemented data mirrors or safe backups to guarantee business continuity. Thirteen adopted the rule of preserving information forever, and one discards the information at some point.

Data Feed, Validations, Usage, and Treatment Rules

The original data to feed the vehicle information system came from different sources, especially from legacy systems in the form of physical records and volumes allocated in transit offices along the country or gathered internal taxes general management info.



Countries are moving toward online processes to capture new records. However, six of the eleven countries reporting on this still use paper forms. Sources for such information come from various institutions, including importers, producers, transit offices, notarial (physical and digital), judicial, and administrative documents.

The frequency of collecting and gathering the information is rather high. Apart from those five countries which already have online procedures, two rely on batches of information every few hours, four on a daily basis, and one relies on weekly batches of information.



- 7 Strong validation process: only allowing correct information in the system
- 4 Some validation: pending on type of inconsistencies data is allowed
- 1 Some validation: all data input is allowed

All countries that provided information include filters for validation to assist with data quality and avoid or prevent access to some data. Most validations occur during the data capture process, except for two countries, where the first validation occurs while processing the information. Additional validations are performed while querying or retrieving data.

All countries have rules of validation. Regarding information treatment, eleven countries preserve initial data and its modifications for tracking purposes, and two delete inconsistencies and replace them with updated data.

Eleven countries produce periodical reporting based on available (consolidated) data. However, available information for the public varies from one country to the other. Six countries publish the information on their web pages with different timeframes, most commonly every month, one daily, and another annually. Reporting is not always available to the public. For instance, one country does not release information, and the monthly report is addressed to the Director for monitoring purposes.

Regarding the extent of access to particular information, three countries deny browsing. In contrast, five countries allow individuals to browse consolidated and personal information, two limit browsing to personal information, one allows querying consolidated data, and two allows querying consolidated, personal, and information from others.

Data Integration

The survey findings show that, across all countries, data integration from the vehicle information system with drivers, crashes or injuries, and compulsory motor insurance information systems is quite limited. None integrates them all, and one documents no integration whatsoever. It is worth pointing out that five countries have no compulsory motor insurance.

The main point of integration in most countries sits with traffic fines and offenses to validate compliance with transit regulations and law enforcement. Nonetheless, one country reports that information is used to identify victims of road crashes, and another reports that insurance companies require this information to underwrite policies.

Countries	Drivers	Insurance	Crash/Injuries	Other
1	•		•	
1		•	•	
1	•			
2		•		
4				•

Operations

Seven countries from the sample have an annual fixed budget to run the information system, and six do not. Nine countries use bespoke software to run their information operation, while three have licensed software. In ten countries, the personnel responsible for the information system are employed in-house while two rely on outsourcing.

Updates

The survey also asked questions about how and how frequently the information system is updated. One country has introduced major modifications to the vehicle information system in the last 25 years, two countries in the last ten years, and seven countries in the last five years. Notable major changes will come in seven countries, including updating the software and the IT technology with state-of-the-art options, online secure registration, integration with other systems, and online document submission.

3.2 Compulsory Motor Insurance Data Systems

Respondents provided only partial information on the system's characteristics with respect to compulsory motor insurance. As previously noted, five countries do not enforce compulsory motor insurance, while some are advancing its implementation. Of the nine countries where insurance is mandated, four countries implemented personal injury insurance, and five require both types of insurance.

Unlike the vehicle registration system, countries with mandatory motor vehicle insurance tend to have multiple information systems, often as many systems as there are insurance companies providing coverage. Three countries reported having separate information systems for insurance, of which two had mechanisms to integrate these into the vehicle registry.

Only one country uses the same institution to manage vehicle information systems and compulsory motor insurance information systems. This institutional mismatch may hamper any effort toward data integration since each institution has its own software, protocols, and corporate strategies and policies.

Technical Characteristics

Those countries that reported information on their network structure indicated that they all rely on a centralized network. Only one of them used cloud storage, while the rest use network-attached storage (servers). However, some respondents indicated that there are efforts to move toward a combination of storage servers and cloud processes.

For the three countries that reported having separate information systems for motor vehicle insurance, they indicated they had third parties check security to avoid data breaches, modifications, unauthorized downloads, tampering, or any action resulting in data loss. One performs security checks every six months, and another does it every two years. They have also implemented data mirrors or safe backups to guarantee business continuity and adopted the rule of preserving information forever.

Data feed, Validations, Usage, and Treatment Rules

Original data to feed the insurance information system came from insurance companies, and they are responsible for feeding new records and updating any field as required. All three have fully online procedures.

All countries include filters for validation to assist with data quality and avoid or prevent access to some data. In contrast to the vehicle information system, two countries have a strong validation process allowing correct information in the system, while the other has some sort of validation and, pending the type of inconsistency, allows data entry.

Most validations occur during data capture, while additional validations are performed during the storing and querying process, which is a big difference from the validations performed in the vehicle information system. These two elements support the hypothesis that insurance companies have more reliable data.

All three countries have rules of validation and preserve initial data and its modifications for tracking purposes.

Regarding data analytics, all countries produce and publish regular reporting based on available (consolidated) data. However, two countries preserve information for the inner circle of insurance companies, and some aggregated information is published on web pages. Individuals can query their information in all three countries, two allow queries regarding others.

Data Integration

The surveys revealed that there is little or no data integration from the compulsory insurance system with the vehicle information system to support compliance verification. Countries have not harnessed this opportunity, and enforcement largely depends on the police force and their capabilities for validation.

Operations

One country has an annual fixed budget to run the information system. Nonetheless, three countries have bespoke software to run the information system, and one uses licensed software. Similarly, all countries hire personnel to run the information system.

Updates

Two countries introduced major modifications to the insurance information system in 2022 and are undertaking additional improvements. The other country has not introduced updates to the information system, yet it is an ongoing project for the coming

3.3. Driver License Systems

All fourteen countries indicate that they have a single information system regarding driver's licenses that serves to identify enabled drivers in the country. The systems collect and keep records of drivers who obtained a permit to drive in the country, primarily serving to facilitate administrative procedures. Five countries have implemented a point system to promote road safety, two of which were only recently implemented; in these countries, the driver license data system also helps to track the accumulation of these points.

Six countries indicated that the driver license data system is under the jurisdiction of the same institution responsible for the vehicle information system. Ten countries have a single information system, and three have more than one.

Technical Characteristics

Eleven countries rely on a centralized network, and two on a decentralized network. All countries from the sample have data mirrors or safe backups to guarantee business continuity, preserving the information forever.

Some countries undertake third-party security checks to avoid data breaches, modifications, unauthorized downloads, tampering, or any action resulting in data loss, with different periodicity. Compared to vehicle registries, there are more security checks for this information system than for the vehicle information system.



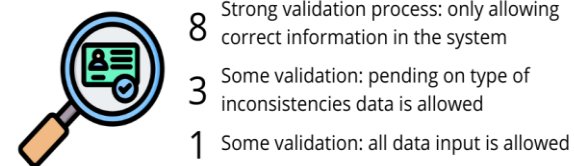
Data Feed, Validations, Usage, and Treatment Rules

Original data to feed the driver's system came from historical records kept at the local or national level, including transit offices, driving formation centers, and municipalities. Only one country signals interaction with the civil registration system.

New information proceeds from different sources, most of them driving formation centers and transit offices. Paper forms are still common, yet 6 countries shifted to online processes. For those with paper forms, batches of information are compiled within hours or daily at the most.



Distribution of countries regarding filters for validation to assist with data quality and avoid or prevent access to some data is similar to vehicle registries, with one more country having a strong validation process.



As foreseen in the vehicle information system, nine countries enforce validations during the capturing processing of the information, while two countries have the first validation during the processing of the information and the following stages of data processing.

All countries have rules of validation. When updating data, all countries except one preserve initial data and its modifications for tracking purposes.

Regarding data analytics, ten countries produce and publish regular reporting based on available (consolidated) data. Three do not.

Data Integration

There is no major data integration from the driver's system with others. One country, though, integrates it with both the insurance and the crash/injuries system. For instance, one country validates if the driver has pending traffic offenses before renewing the document.

Countries	Insurance	Crash/Injuries	Other
1	•	•	
1		•	
5			•

Operations

Seven countries have an annual fixed budget to run the information system, nine countries use bespoke software to run it, and nine countries rely on direct personnel while three outsource it.

Updates

Similar to the finding for vehicle registration system, six countries have updated their driver information systems in the last five years, two did it in the last ten years, and one had its last update 15 years ago.

Only one country indicated that it captures biometric data through the driver licensing system.

- All countries from the sample have information systems related to vehicles and driver licenses, and to motor insurance where it is compulsory. In the sample, motor vehicle information systems are overwhelmingly managed directly by the national government; only one outsources that management.
- In many countries, integration among systems of data is rudimentary. For example, among the ten countries reporting having Periodic Technical Inspection requirements, three do not link the PTI inspection results to the main vehicle database.
- Management of information systems typically relies on different institutions within the same country, which is likely to make it more difficult to integrate the various systems.
- Data quality is still a challenge for some countries, especially regarding vehicles. Validation protocols are not as strong as desired and, in some cases, allow information that does not meet the criteria that have been set.
- Countries are moving toward online processes to upload information, but batches of information can present a large delay time in some cases. Countries are moving toward cloud storage, replacing local servers.
- Even though countries handle large volumes of information, external publications with aggregated figures are rare and infrequent. Information tends to remain only for internal purposes.



4. Good Practice MVIMS

This chapter describes the approach taken to the management of motor vehicle regulation across Europe, the Netherlands and Australia. Along with Colombia, a further and rather unique case is also described in Costa Rica, where the primary regulatory mechanism is actually an insurance scheme operating in a competitive market.

MVIMS is equally important within federal and unitary government systems, though the precise way that the system would be structured might be different for each. The examples here of Europe and Australia include reference to MVIMS which actually integrate a number of individual MVIMS managed by autonomous agencies. These federated systems provide critical links to different information systems to allow people and goods to move freely, and be regulated, across borders. The same principles apply, reflecting the various arrangements for legal sharing of information, institutional arrangements, and regulatory service delivery.

4.1 Europe

The European Car and Driving License Information System (EUCARIS) is a multilateral, treaty-based information-exchange system that connects vehicle and driver authorities across 32 European countries. EUCARIS is not a function of the European Union but rather has been formalized by a treaty between States which are members.

EUCARIS was established to:

- Fight vehicle-related crime, by checking whether the vehicle, its number plates or documents are signaled in a EUCARIS country as being stolen.
- Ensure that vehicles are registered and licensed for use on the public road in an efficient way, by transferring the vehicle data that is available in the country of origin to the country of re-registration.
- Improve the quality of the national vehicle registrations in the countries by minimizing the need for manual data entry, to guarantee the availability of accurate vehicle data for national and international procedures.

EUCARIS began in 1994 and is managed by the Association of European Vehicle and Driver Registration Authorities (Ereg). Ereg membership comprises 28 vehicle registration authorities (including Gibraltar and Jersey) across 26 countries in Europe. The organization seeks to make vehicle registration and driver licensing policies work as effectively and efficiently as possible to improve the mobility and safety of vehicles and drivers in Europe. It achieves this by assisting with policy implementation, sharing knowledge and best practices, influencing regulations, harmonizing technical and operational practices, and promoting effective data exchange.¹³

The various authorities are public agencies, with the exception of Austria, where this function is performed by the insurance industry. They mostly operate under the supervision of a transport or infrastructure Ministry. As each authority operates under their own national law, they perform different functions, as shown in Table 3.

¹³ See <https://www.eucaris.net> for more information on EUCARIS and <https://www.ereg-association.eu> for more information on EReg. This case is drawn largely from EReg (2022). The Vehicle and Driver Chain in Europe. Association of European Vehicle and Driver Registration Authorities, Brussels.

Table 3. Functions Performed by Vehicle Authorities that are Ereg Members

	Type Approval	Registration	Taxation	Insurance	Tracing & Enforcement	Technical Inspection	Other
Austria		•		•			
Belgium		•			•		
Croatia		•	•		•	•	•
Cyprus	•	•	•	•	•	•	
Estonia	•	•				•	
Finland	•	•	•			•	
France		•	•		•		•
Germany	•	•		•			•
Gibraltar		•				•	•
Greece	•	•			•	•	
Hungary		•		•	•		
Iceland	•	•					
Ireland		•	•				
Jersey*	•	•		•	•	•	
Latvia	•	•	•			•	•
Lithuania		•					
Luxembourg		•		•			•
Malta		•	•	•	•	•	•
Netherlands	•	•		•	•	•	•
Norway	•	•			•	•	
Poland	•	•					
Portugal	•	•				•	
Slovakia		•		•			
Slovenia	•	•			•	•	
Spain		•			•		
Sweden	•	•	•	•			
Switzerland	•	•					
United Kingdom		•	•		•		

* A British Crown Dependency

All perform vehicle registration¹⁴ activities, with about half responsible for type approval, tracing and enforcement, and technical inspections. Fewer are involved in regulatory processes and taxation, while only ten authorities handle vehicle insurance.

Authorities cooperate with governmental and public/private organisations. Legislative frameworks are usually set by the European Union (EU) and national ministries, with common tasks executed in cooperation with various partners like the police, insurance companies, tax authorities, vehicle manufacturers, and more.

¹⁴ Note that EU processes refer to vehicle "licensing" rather than "registration" when referring to motor vehicles being permitted to use roads from year to year. For the purposes of consistency in this report, this is referred to as vehicle registration.

Type Approval

Type approval is a process through which EU technical, safety, and environmental standards are set for a vehicle, before it is allowed on the EU market. The manufacturer chooses an EU type approval authority for this process, where their pre-production vehicles are tested for compliance safety and noise requirements, and emission limits. Any EU country can issue this approval and it is recognised by all member states. Type approvals are subject to a legislative framework at UNECE and EU level. This system reduces the burden on both manufacturers and local authorities. The data is not yet standardised in a digital form but will be from 2026.

A Certificate of Conformity is subsequently issued by the manufacturer which serves as an assurance that the vehicle has been manufactured in compliance with processes covered under the Type Approval. The certificate provides comprehensive technical data about the vehicle, including details like the brand, model, year of manufacture, and the Vehicle Identification Number (VIN), among other technical specifications.

Registration

Vehicle registration is required for the legal use of a vehicle on public roads, typically for a one-year period. There are two main types of registration systems: vehicle-based and person-based. These cover registration documents and procedures, number plates, vehicle classes, and mileage standards. Some countries link the registration number to the vehicle owner's residential region and other identifying information. These registrations can be suspended, and there are mandated electronic registers for taxation and enforcement purposes.

Public access to vehicle registers is limited. Stolen vehicle information is added by either the registration authorities or the police, and insurance companies may gain access in case of a crash. Some countries allow companies to request non-personal statistical data from the vehicle register.

Most countries register similar types of vehicles: cars, trucks, buses, motorcycles, mopeds, large trailers, agricultural tractors and special category vehicles. Light electric vehicles are registered by five countries, but there is no European framework for them. Ereg has recommended a legal framework to create a central database with mileage recordings. Most countries register mileage during roadworthiness tests, but there is no requirement to register this information in a national database, though odometer fraud is considered a punishable offence.

When a vehicle is exported to another European country, re-registration is required within that country. The process is primarily based on the data from the vehicle licence issued by the country of origin. Electronic data exchange supports this process.

Taxation

Vehicle registration authorities are heavily involved in taxation, providing necessary data such as vehicle age, weight, engine capacity, and CO₂ emissions for taxes related to vehicle purchase, ownership, or usage, for example. Some European registration authorities are also responsible for tax collection. In countries like Finland, Sweden, and Austria, there is a strong link between vehicle registration and tax systems. In some instances, non-payment of taxes prevents vehicle inspections or renewal of registration details.

Insurance

Registration authorities play insurance roles through verifying vehicle identity, maintaining central insurance registers, and providing vehicle information to insurance companies. Most European countries require proof of insurance for registration or usage. Some registration authorities also register insurance information, while others rely on private insurance companies or associations. Cross-border exchange of insurance information is supported by an EU Directive, but the detection and enforcement of uninsured vehicles or drivers is compromised by the differences between insurance and registration systems at a national level, and the lack of harmonisation across borders.

Tracing and Enforcement

Out of 28 national vehicle authorities surveyed by Ereg, 13 engage in tracing and enforcement through roles such as data provision, but this task mostly falls on law enforcement authorities. There are still significant variations in procedures for the tracing and enforcement of damaged vehicles, and different levels and types of national enforcement activity across unregistered and uninsured vehicles more broadly.

Technical Inspections

Technical inspections are categorised into inspections needed for vehicles to enter the vehicle fleet and access public roads, and inspections for vehicles which are already allowed on roads such as roadside inspections (RSI) and periodical technical inspections (PTI). RSIs are unannounced and mandatory, conducted by each Member State for both EU and non-EU registered vehicles. The frequency of PTIs varies, but for passenger cars is at most four years after first registration and then at least every two years. All vehicles and their trailers within the EU undergo PTIs at regular intervals as per EU legislation. The European Commission is currently considering proposals to harmonise the inspection regime, introduce additional checks based on mileage, electronic record-keeping, and make the exchange of information like odometer readings mandatory.

Other

Urban access regulations, such as environmental zones, tolls on urban roads, and access regulation schemes, aim to reduce air pollution and congestion. This is driven in part by the EU Green Deal, aiming for a 55% reduction in greenhouse gas emissions by 2030. The most polluting vehicles are generally either restricted from entering these zones or required to pay a fee. This is particularly prevalent in countries like Germany, the Netherlands, France, Belgium, United Kingdom, Denmark, Sweden, Norway, Hungary, and Italy.

Recalls are issued when a serious defect is identified in a vehicle or component which compromises safety. If the manufacturer fails to address these defects, market surveillance authorities ensure that defective vehicles are recalled.

There is an EU Directive aimed at minimising waste from end-of-life vehicles by promoting eco-design, prohibiting the most hazardous substances, and setting high reuse/recycling/ recovery targets. However, the current legislative framework lacks mandatory registration for vehicles being destroyed, which results in a substantial percentage of these vehicles going unaccounted for.

The international exchange of data, such as emission data and owner/holder data, is essential for the functioning of registration authorities. With increasing digitalisation, this exchange is becoming more structured and regulated, considering aspects like data protection. Ereg supports these developments and fosters the exchange of best practices and experiences among its members.

4.2 Netherlands

The Netherlands Vehicle Authority (*Rijks Dienst Wegverkeer*, RDW) is a public service provider with both statutory and assigned responsibilities for:

- Licensing vehicles and vehicle parts on the Dutch and European market
- Monitoring the technical conditions of vehicles
- Accreditation of companies which deliver regulatory services and
- Gathering, storing, updating, and managing data concerning vehicles, their owners and vehicle documentation, and providing information to interested parties
- Issuing documents that are required for vehicles or owners, including vehicle registration certificates, and driving licenses.

RDW arranges transfers and suspensions through registration centers, and car dealers, garages and demolition firms record changes relating to change of ownership, business stock and demolition.

RDW is an independent governmental body of the Ministry of Infrastructure and the Environment, though in practice policy is often jointly formulated between them. It has a two-person board, as well as a five-person supervisory board, which oversee all five divisions (Supervision & Assessment, Vehicle Regulation & Admission, ICT, Registration & Information, and Toll Collection) as well as its eight staff departments. In principle it is financed by cost recovery charges—that is, the fees and charges for the regulatory services it delivers cover the cost of delivering the service.

EUCARIS was set up in part by RDW, and RDW serves as both the chair and secretary for Ereg. It is also a member of CITA.

Type Approval

Type approval is handled exclusively by the Vehicle Standards Development department at RDW, which conducts its own type inspections in the Netherlands and at manufacturers around the world. This department has responsibilities for the development of regulations on behalf of the Dutch Government in the EU and the UN. RDW is one of the most internationally active approval authorities of Europe. For example, it is responsible for about 80% of the worldwide certification of tires and conducts conformity of production audits for the purposes of surveilling testing infrastructure. RDW also has an independent testing institute for vehicle technology and offers a combination of services and products for research and development, homologation testing and national and international certificates.

Registration

Registration is handled exclusively by RDW and operates on a strictly vehicle-based system. Its underlying principle is continuous registration, meaning a vehicle must appear in the registration system without interruption from the cradle (admission—“entry” to the national fleet) to the grave (demolition or export—“exit” from the national fleet). Vehicle obligations in terms of taxation, inspection and insurance are related to holding the vehicle, rather than its use, meaning that registration provides the basis for vehicle obligations in

the Netherlands. Vehicle registration certificates are issued in a credit card format, with authenticity features and a chip.

First registration occurs when the license number and license plate codes are issued. Changes of ownership in the vehicle register are processed at a registration counter or at one of the car companies authorized for this purpose. These are all connected to authorized providers who have a connection to the RDW vehicle register. The driver license is checked online, as are the presented vehicle documents. Vehicle holders must actively deregister their vehicles. If they fail to do so, they remain liable for the vehicle obligations, which ensures the register is kept up to date. Details on stolen vehicles are held in the register as well. The RDW also registers mileage and parking data. RDW provides information to other public bodies free of charge. Information to other interested parties is provided for a fee.

Taxation

The Ministry of Finance and RDW are responsible for taxes. The private motor vehicle and motorcycle tax (BPM) is a kind of luxury tax, paid once by the owner when they acquire a new vehicle from a dealer or imports a vehicle. The BPM is based on CO₂ emissions. This “holding tax” must be paid either monthly, quarterly, or annually, and is not linked to the use of the vehicle. There is no registration fee as such, but the registration documents must be paid for.

Insurance

As with all vehicle obligations, responsibility lies with the registered owner. A vehicle must be insured from the moment it is registered, with an insurance company authorized to make entries in RDW’s central insurance register. Insurance companies are obliged to report all insurance policies and all cancellations to RDW. The companies’ files are linked to those of the RDW and if no insurance is reported on the vehicle, the owner will automatically receive a sanction in the mail.

Tracing and Enforcement

Responsibility for tracing and enforcement lies with the Ministry of Security and Justice, law enforcement agencies, and RDW. RDW regularly compares vehicle and holder details in the vehicle register with insurance and inspection details. If a vehicle is registered but has not been properly insured or inspected, RDW sends the holder a settlement offer that specifies a certain fine. If the holder does not respond to this, RDW passes the matter on to the Ministry of Justice. The police make extensive use of cameras in detecting traffic violations. The consequent follow-ups account for a large proportion of the queries made on the vehicle register by the police.

Technical Inspections

Technical inspections are carried out by both RDW and private companies. For passenger vehicles they are compulsory after three/four years and then approximately every year depending on the fuel type. Commercial vehicles and trailers above 3,500 kg are inspected yearly, due to the greater impact of failures. The inspections are conducted by around 10,000 private garages accredited by RDW for this purpose. RDW monitors the activities of these garages, including through random checks.

4.3 Australia

Austroads is a standards and policy body comprising the various road traffic agencies of Australia and New Zealand, originally established as the Conference of State Road Authorities in 1934. Austroads is managed by a Board comprised of senior executive representatives from its eleven member organizations. These member organizations comprise: a government department in each of Australia's six states, as well as in the Northern Territory and Australian Capital Territory, and the federal government of Australia, the Australian Local Government Association, and a government agency in New Zealand. Each of these members except the Australian Local Government Association holds significant vehicle regulatory responsibilities. In Australia, the federal government regulates all aspects of the entry of motor vehicles into the national stock, and state and territory governments regulate all other aspects (as well as all driver licensing and injury insurance matters). New Zealand's Austroads member manages all vehicle and driver regulation.

National policy reform and harmonization in vehicle registration and driver licensing has always been a major focus of Australian transport agencies, and Austroads. A primary point of collaboration in Australia is the National Exchange of Vehicle & Driver Information System (NEVDIS) which was established in 1998 and is managed by Austroads. Each Australian registration authority has its own ICT system to manage its own jurisdictional responsibilities, and NEVDIS enables the authorities to exchange essential vehicle and driver information across state borders. In addition to information supplied by registration authorities, NEVDIS collects VIN data from vehicle wholesalers, stolen vehicle information from police, and written off vehicle records from insurance agencies. It also supports information to public and private sector organizations to facilitate provenance checking on vehicles, verification of Australian driver licenses for client identification purposes, exchange of information on the State or Territory in which compulsory injury insurance is carried, and vehicle safety recalls which are administered by the federal government.

Authorities generally allow individuals online access to their own vehicle and driver license information, as well as information about the insurance status of another vehicle in some cases. Some provide a vehicle registration status service that can be used to check the basic identification and model details of a specific vehicle, which is increasingly used by business and community organizations. The federal government also operates the Personal Property and Securities Register which interfaces with NEVDIS and allows anyone to conduct a search on a motor vehicle (and other forms of private property) to find out whether it is encumbered by a security, such as a lease or hire purchase agreement.

All aspects of motor vehicle regulation are a government activity, with some delegated involvement from the private sector and not-for-profit bodies in some circumstances. There is significant variation in the division of responsibilities between states within Australia. For example, in New South Wales, Transport for New South Wales is in charge of strategy and policy, but Roads and Maritime Services acts as the regulator, while Service New South Wales conducts all customer-facing transactions. In Queensland, by contrast, all these duties are fulfilled by the Department of Transport and Main Roads. The current trend is towards the three-party approach found in New South Wales, with the core transport services provider playing a critical role, along with a regulatory service provider.

From a national perspective, the motor vehicle information management tasks are very similar to Europe, covering the lifespan of a vehicle, from the set-up of legislation and the production of the vehicle to its registration, its use and finally its controlled destruction. Regulation of heavy vehicles has been separated out over the last decade with the establishment of a single National Heavy Vehicle Regulator which administers laws for vehicles above 4.5 tons and is not a member of Austroads.

Vehicle Type Approval

Vehicle standard setting is the responsibility of the Australian Government, which develops Australian Design Rules (ADRs), based on international regulatory standards developed through UNECE. While established at a time when Australia was still manufacturing light duty vehicles, the ADRs continue to allow the Australian Government to determine what vehicles may be imported up to the point of first supply to the Australian market. Once a vehicle has been supplied to the market, state and territory governments become responsible for continued regulation throughout the vehicle's lifecycle.

Registration

The individual assigned responsibility for a vehicle is referred to as the 'registered operator'. In most Australian jurisdictions the registered operator is legally obliged to ensure the vehicle is registered for use on public roads, although the registered operator might not always be the legal owner of the vehicle. Legal ownership doesn't have a significant bearing on vehicle registration.

Vehicle registration is mandatory in Australia once a vehicle is to be used on public roads. Each jurisdiction maintains a vehicle register, which includes information like the registered operator's details, the vehicle registration plate, vehicle identification number, and registration expiry date. This information can be shared with other organizations, such as law enforcement, for authorized purposes.

Vehicle theft and registration plate theft has been a significant issue in Australia. All jurisdictions also maintain a 'written-off vehicle register', which helps prevent stolen vehicles from being 'rebirthed' and ensure that repaired vehicles meet acceptable standards before re-registration. Plate production is highly secure, and technological developments aim to improve the readability of plate details by automated number plate recognition systems.

Previously, all registration authorities required vehicles to display a registration sticker on the windscreen, but this practice has been discontinued due to efficiency reasons and the availability of online databases. A registration certificate is issued with various vehicle identifiers and details to the registered operator or person responsible for the vehicle.

Taxation

A stamp duty tax is due in Australia upon new registration or transfer of a motor vehicle registration which, along with registration fees, are collected by State and Territory authorities on behalf of their government. A fuel excise tax is remitted directly by retail fuel suppliers to the Australian Government's taxation office, which also collects a goods and services tax on vehicle sales, and a luxury car tax. Aside from related goods and services tax, heavy vehicle charges combine registration and fuel-based road user charges, with revenue shared between various entities, including state and territory agencies and the National Heavy Vehicle Regulator.

Insurance

The only vehicle related insurance which is managed through registration authorities is third-party personal injury insurance. This is mandatory in all States and Territories, which each regulate their own motor vehicle

injury insurance market slightly differently. For example, the Victorian scheme is run by a government-owned monopoly, but in South Australia consumers choose from a set list of regulated providers.

All states and territories 'bundle' injury insurance premiums and registration fees so that a vehicle which is uninsured for personal injury insurance is also unregistered by definition. Other types of motor vehicle insurance can be added on top, but third-party property damage insurance is not compulsory.

Tracing and Enforcement

Law enforcement agencies across Australia have access to motor vehicle registration and driver licensing registers via in-vehicle terminals, to assist in traffic policing. Some registration authorities conduct limited on-road enforcement activities, generally confined to commercial transport operations, or taxis and buses. However, there is widespread automated enforcement throughout the country which makes constant use of vehicle registers to generate fines for major offences such as speeding, mobile phone use, non-seatbelt use, and in some jurisdictions unregistered/uninsured vehicle use.

Technical Inspections

In most jurisdictions, there is no regular inspection requirement for light vehicles used privately. Some States and Territories require an annual inspection for light vehicles, like New South Wales does for vehicles older than five years. Almost all require a roadworthiness test as a prerequisite for transferring a vehicle's registration.

Vehicles can also be subject to roadside inspections by law enforcement officers, who may issue a "defect notice" specifying issues to be resolved. The defect notices are centrally recorded, and a "clearance" certificate is issued once the defects are addressed. A vehicle with a defect notice can't be used on the road until clearance is registered, and some jurisdictions are considering automating these defect notice-related processes to expedite vehicles' return to commercial use. To tackle odometer fraud, some Australian jurisdictions record odometer readings.

4.4 Colombia

The National Unified Traffic Registry (Registro Único Nacional de Tránsito, RUNT) was established in 2009. A private company operates it under a concession from the Ministry of Transportation and is responsible for:

- Achieving a secure flow of information from its origin at the start of every procedure to its registration in RUNT and later consultation.
- Enabling the State Administration so that, as a whole, it ensures the reliability of information and therefore guarantees, among other things, drivers' suitability and ownership of the vehicles.
- Increasing the quality and relevance of the information from the Ministry, so they may define policies for planning, controlling, and regulating traffic and transport.
- Validating, registering, and authorizing transactions related to eleven registries.
- Making the registry system a national model of excellence with great service.

Every citizen involved in procedures related to transportation in the country (vehicles, machinery, trailers, driver licenses, among others) must be registered in RUNT. Registration is a personal and on-site procedure performed at any transit office or the Ministry of Transportation's jurisdictional office.

This information system can record and keep up-to-date information in a centralized, controlled, and validated way regarding all data from the registries it comprises. RUNT performs three critical functions concerning vehicles: it validates data, approves any procedure that must be presented to the transit authority, and records any information update after the approval of the procedure. All processes are conducted online and in real-time. Every interaction with RUNT requires a service fee which funds the information system.

Type Approval

Vehicles must comply with a typical range of technical, mechanical, safety, environmental weight, dimension, and security requirements set by the Ministry of Transportation. Colombia only grants permission to import new vehicles.

Registration

All vehicles with Colombian license plates must be registered in the RUNT. The first registration occurs for imported or manufactured vehicles. The importer must also be registered in the system and is responsible for registering imported vehicles. The same rule applies to manufacturers.

Vehicle obligations regarding taxation, inspection, and insurance are related to holding the vehicle, meaning that registration provides the basis for vehicle obligations. However, inspection and insurance fines will arise only if the vehicle is found on the road without fulfilling such obligations. Vehicle registration certificates are issued in a credit card format with authenticity features.

Taxation

Colombia imposes taxation when importing vehicles. Afterward, every owner must pay a yearly tax for the possession of the vehicle, calculated based on its commercial value, with the Ministry of Transportation providing the taxable basis for each vehicle on an annual basis. For new vehicles, the taxable value is taken from the invoice. For others, the Ministry uses a Taxable Base Information System to evaluate market value (which includes accounting for depreciation, international valuation standards, exchange rates and inflation). Exceptions to this tax apply to motorcycles with engines smaller than 125 cc, agricultural machinery, construction machinery, industrial vehicles (as long as they do not use roads), and public transportation vehicles for passengers and cargo. Each state in the country establishes the due dates, and some include discounts if paid on a previous date. Municipalities and states are entitled to levy fuel taxes.

Insurance

Colombia requires compulsory motor insurance for all vehicles using its road. Obligatory National Traffic Accident Insurance (Seguro Obligatorio de Accidentes de Tránsito, SOAT) is a no-fault insurance covering medical expenses, disability, and death. Insurance companies interested in this type of insurance require permission from the Financial Superintendence of Colombia (Superintendencia Financiera de Colombia, SFC), under the finance ministry, to offer it in the market and must interact with RUNT. Once granted permission, an insurance company must sell it to anyone who requires and requests it.

Premiums are regulated, and prices vary according to the type of vehicle, age, and motor capacity. For some vehicle categories, the criteria for pricing depend on passenger or cargo capacity. Surcharges on insurance premiums fund the road safety agency (3% of premiums), and compensation for victims of hit-and-run vehicles (14.2% of premiums). After the SFC establishes the premiums, the law requires an additional levy that funds the health and social security system (52% of premiums). In addition to SOAT, vehicles used for high-capacity commercial transportation (buses, metros, trains, trams, and trucks) are required to have compulsory liability insurance.

Insurance companies must be connected to RUNT to capture the vehicle information to determine the corresponding category and pricing. After issuing the insurance policy, the insurance company provides RUNT with information about dates (purchase, beginning and end of coverage) whether SOAT is bought online or at a physical store. SOAT can be renewed before its expiration, and the system ensures coverage does not overlap. Should a vehicle require SOAT and is overdue, the coverage will begin the next day of acquisition. RUNT publishes the historical SOAT record for a vehicle.

Tracing and Enforcement

Traffic authority in Colombia is spread across the Ministry of Transportation, governors, mayors, traffic offices in the states or municipalities, the National Police through Transit Police, police officers, and the Transportation Superintendency.

There are two ways to impose penalties: Control on-site by police officers, with or without mobile devices to support the procedure, and electronic detection supported with video cameras resulting in a fine to be delivered to the email or physical address of the owner of the vehicle. Cameras per-se do not generate fines but provide visual evidence that authorities will analyze to determine possible sanctions. RUNT serves as proof of compliance for authorities to impose traffic fines.

Technical Inspections

Technical inspections are carried out by Automotive Diagnostic Centers, which must be certified by the Colombia's national accreditation body, enabled by the Ministry of Transportation, and interact with RUNT.

Technical inspections are mandatory for all vehicles, and due dates vary according to the type of vehicle and vehicle age. Private vehicles must submit to inspections after six years of initial registration (five years for new vehicles registered after May 2023 under a new law) and must be inspected yearly thereafter. Public service vehicles and motorcycles must submit to inspections after two years of initial registration and must also be inspected yearly thereafter.

4.5 Costa Rica

The Ministry of Public Works and Transportation is responsible for regulating surface transportation, and planning, executing and improving related infrastructure. The Road Safety Council (COSEVI) is an administratively independent body within the Ministry and is the governing institution responsible for road safety.

Instituto Nacional de Seguros (INS) is the state-owned insurance corporation designated underappointed Traffic Law 7331 (1993) to offer comprehensive compulsory motor insurance (Seguro Obligatorio Automoto, SOA).

Type Approval

Costa Rica allows importation of new and used vehicles for registration, based largely on technical inspection and certification requirements set by the Ministry and managed by an authorized private service provider.

Registration

Every vehicle in Costa Rica must be registered in the National Property Registry (Registro Nacional) which records the ownership of motor vehicles. The registration process requires the applicant to purchase a validation sticker known as the “Marchamo” which demonstrates compliance with applicable requirements and serves as identification, and to display this on the vehicle’s windshield. In order to register the vehicle, the application must have a valid Marchamo and either have no traffic violations or demonstrate that the fines associated with them have been paid.

The National Property Registry collects ownership data for every vehicle registered in the country, but the Marchamo provides the most credible information on the size and composition of the motor vehicle fleet in Costa Rica—this is due to the quality of the information systems and the nature of the information which it collects. The Marchamo includes validated information on the registration period, as well as the vehicle identification information—the plate and engine number, make, car body, engine displacement, model, occupancy, and type of fuel.

Taxation

All vehicle owners must make an annual Marchamo payment. This includes a road tax, injury insurance premiums (SOA), other surcharges stipulated in the traffic law and, when necessary, fines. The Marchamo covers a set timeframe from 1 January to 31 December each year and must be paid in advance between November and December of the previous year.

Insurance

Costa Rica was one of the first countries in Latin America to introduce compulsory motor vehicle insurance. Since the introduction of SOA in 1973, INS has been the sole provider for this insurance in the country (after having been largely the sole insurer over the course of the twentieth century). This has continued even after

Law 8653 (2008) reformed the Insurance Market Law and removed INS's monopoly, as a result of commitments included in the Free Trade Agreement (DR-CAFTA) reached with the USA.

Marchamo in Costa Rica is a responsibility of INS, which includes the SOA's premiums. Thus, INS collects all surcharges Marchamo comprises and distributes resources to the corresponding institution. In that sense, INS information has become a primary means of managing the national vehicle fleet information and trends regarding road safety.

Tracing and Enforcement

A major reform has been initiated to move the Marchamo compliance permit from a windshield sticker to an integrated information system which is expected to improve enforcement. The INS initiated the Digital Marchamo project in collaboration with stakeholders in October 2022 (see Box 2). The project builds upon previous efforts to strengthen operational capacity as part of the digital transformation strategy.

The project's primary goal is to introduce a different mechanism to certify compliance with Marchamo, replacing the windshield sticker with a radio frequency identification (RFID) tag capable of providing information to a particular device. This tag will be stamped onto the windshield and is expected to last about ten years.

Digital Marchamo will allow leverage of information provided by the compulsory motor insurance, license points, and vehicle technical inspection systems, all of which produce comprehensive information for road safety policies based on evidence. Once implemented, Digital Marchamo will significantly increase the scale of service since it can support future improvements such as imposing fines at the time of infringement, producing real-time information for traffic management purposes, and support traffic law enforcement.

Technical Inspections

Technical inspection requirements are set by the Ministry with advice from COSEVI. Vehicle owners must take their unit to a Vehicle Technical Inspection Center which is licensed by COSEVI to conduct such inspection.

Mandatory technical inspection for all vehicles includes mechanical, electric, and electronic inspection, emissions, and active and passive safety features in the vehicle. The frequency of inspection depends on the type of service the vehicle provides—six monthly inspections for vehicles for public service or carriage of hazardous materials requires, annual inspections for heavy vehicles and for light vehicles older than five years, and once every two years for light vehicles younger than five years.

Other

Costa Rica is one of the few countries in Latin America that has fully implemented driver licensing penalty points to promote safer driving. It is being enforced by utilizing high quality data management systems (such as that provided by the Marchamo) and by equipping police with mobile devices that are connected to the Drivers Evaluation System (Sistema de Evaluación Permanente de Conductores).

Box 2. Reform Process in Costa Rica

Since having its monopoly removed in 2008, the public insurer INS has undergone a process of internal transformation. It adopted a strategic plan for digital transformation in 2021, and initiated the Digital Marchamo project in collaboration with stakeholders in 2022.

Two immediate benefits from Digital Marchamo are expected to reinforce its role as the critical element within Costa Rica's entire ecosystem of services regarding vehicles:

- INS will no longer be required to produce and manage physical stickers, which removes cost and risk associated with ongoing activity related with the design, production, storage, custody, and country-wide distribution of a sensitive document.
- Vehicle owners will no longer be required to attend a physical office to pay for the Marchamo and receive the sticker, which is expected to reduce compliance costs for owners by shifting to online transactions and reduce evasion of enforcement.

There are four key lessons learned from this reform.

1. *Establish a strong institutional foundation:* Digital Marchamo has been led from the highest authority at the INS as part of a transformational strategy. The project has permanent supervision and monitoring by INS's President and senior executives and has been publicly backed up by Costa Rica's President.
2. *Use in-house strengths first, then add expertise as necessary:* Digital Marchamo has taken an in-house approach, strengthening teams as required, but also hiring required individuals to deliver the project successfully.
3. *Understand and directly address key local issues:* Through Digital Marchamo, INS is holistically addressing four significant challenges:
 - a. *Political:* Even though Digital Marchamo serves a primary purpose intended for a particular corporation, its deliverables impact other areas of public interest (health, mobility, justice), which were involved from the beginning.
 - b. *Technical:* This project requires standardization and common technical definitions and agreed acceptance criteria across institutions for seamless integration. Digital Marchamo has benefitted from previous analysis of its data management systems and prior efforts toward digitalization within INS.
 - c. *Communications:* This project requires continuous communication inside INS, within partner organizations at different levels, and with the general public.
 - d. *Cultural:* INS is addressing public concerns regarding the use of new technologies to transform compliance with traffic regulations—as INS's president suggests “there is no technological transformation if there is no cultural transformation.”
4. *Ensure major project status is accorded significant regulatory reform:* Project governance has proved to be critical with considerable attention given to ensuring that Digital Marchamo secured the required funding and personnel. INS estimates a total investment of USD 10 million, including data management and security and is one of the largest regulatory investments of its type in Central America.

Digital Marchamo represents a significant challenge due to the size, reach and scope of the process. It will cover about 2 million vehicles, including two-wheelers, and requires two public procurement processes to acquire RFID tags and related software. INS has a parallel (back-up) process for Marchamo as usual which will be in place ahead of the full implementation phase of Digital Marchamo in 2024. Further developments are planned.

The case studies just reviewed are summarized in Table 4 below:

Table 4. Summary of Best Practice Case Studies

Parameter	Europe	Netherlands	Australia	Colombia	Costa Rica
General information	European Car and Driving License System is a multi-lateral, treaty-based information exchange system; 32 country members; not under EU; harmonizes country information into international framework.	Dutch Vehicle Authority (RDW) is main vehicle regulator and manages MVIMS in Netherlands. Was a prime motivator behind EUCARIS.	Austroads is standards and policy body for both Australia and New Zealand; each state / territory has its own registration authority that manages its system; Austroads developed NEVDIS to facilitate exchange of information among these systems; Federal government's Personal Property and Services Register interacts with NEVDIS.	National Unified Traffic Registry (RUNT) established in 2009, operated by private company. Both vehicle and person based. Every individual involved in transport-related activities must be registered in RUNT. Funded through service fees.	Vehicles registered as personal property with National Property Register, recording ownership; each vehicle must purchase validation sticker to use vehicle on public streets, called "Marchamo". To register vehicle, applicant must have Marchamo and no outstanding traffic violations. Marchamo database is effectively the MVIMS for CR. CR tracks driver behavior using points; these are tracked through the Marchamo database system.
Type approval	15 member countries carry out Type Approval and Conformity; remainder rely on countries that do; data to be standardized under EUCARIS by 2026.	RDW one of most active Type Approving authorities in Europe.	Federal government responsible for determining import eligibility under Australian Design Rules; unclear how it interfaces with NEVDIS.	Established by Ministry of Transport. Colombia allows importation of new model year vehicles only.	Vehicles registered as personal property with National Property Register, recording ownership; each vehicle must purchase validation sticker to use vehicle on public streets, called "Marchamo". To register vehicle, applicant must have Marchamo and no outstanding traffic violations. Marchamo database is effectively the MVIMS for CR.

Parameter	Europe	Netherlands	Australia	Colombia	Costa Rica
Registration	All countries in EUCARIS register vehicles; Most countries register same typology of vehicles in EUCARIS; most countries measure odometer readings during PTI, but not a requirement.	Vehicle-based registration system managed by RDW, on a continuous registration principle; wealth of information collected during the process.	Registration on a continuous registration principle, as in the Netherlands.	Registration through the RUNT. Vehicel obligations (taxation, inspection, insurance) tracked and validated through RUNT.	The Marchamo includes validated information on the registration period, as well as the vehicle identification information—the plate and engine number, make, car body, engine displacement, model, occupancy, and type of fuel.
Taxation	EUCARIS used to record tax obligations; non-payment of taxes and prevent registration renewal.	RDW administers BPM (property tax on motor vehicles based on CO2 emissions) on behalf of Ministry of Finance. Calculation of mounts due and records of payment are tracked through MVIMS and recorded into EUCARIS.	Stamp duty tax is due in Australia upon new registration or transfer of a motor vehicle registration which, along with registration fees, are collected by State and Territory authorities on behalf of their government.	Colombia imposes importation and yearly ownership tax, both enforced through the RUNT.	Annual Marchamo payment is comprised of various components, including a road tax.
Insurance	EUCARIS used to verify registration information for vehicle insurance and to verify insurance coverage; EU requires cross-border exchange of insurance information, but insurance and registration systems are not harmonized through EUCARIS, limiting this in practice.	Insurance companies report all insurance policies and cancellations to RDW. Companies' files are harmonized with RDW database. RDW issues fines for non-compliance.	Only 3rd party liability is enforced through registration authorities.	Compulsory motor insurance (SOAT) for all vehicles is required, sold by private companies licensed by Financial Superintendency; interaction with RUNT is a requirement of these licenses. Companies use RUNT data to calculate premiums for different products, and then report back to RUNT on	One of the components of the Marchamo payment is injury insurance premium. INS is national insurer; through Marchamo, it maintains information on insurance and driver and vehicle insurance information.

Parameter	Europe	Netherlands	Australia	Colombia	Costa Rica
				the insurance status. RUNT publishes historic SOAT record for each vehicle.	
Tracing and enforcement	13 of the EUCARIS member countries use vehicle database for enforcement actions when carried out by law enforcement authorities.	RDW regularly compares vehicle and insurance / inspection details using MVIMS, and refers ongoing non-compliance to Ministry of Security and Justice.	Law enforcement agencies across Australia have access to motor vehicle registration and driver licensing registers via in-vehicle terminals, to assist in traffic policing. Automated enforcement throughout the country makes constant use of vehicle registers to generate fines for speeding, mobile phone use, non-seatbelt use, unregistered/uninsured vehicle use.	Traffic fines issued by different entities, RUNT used to track compliance with fine payment.	Major effort underway to transform Marchamo from sticker-based to RFID-tag based; this will facilitate all sorts of tracing and enforcement actions
Technical inspections	13 of the EUCARIS member countries require PTI, but procedures are not harmonized.	PTI carried by both RDW and private companies; private companies accredited by RDW; must conform to requirements for access to MVIMS.	Only NSW requires PTI for LDVs older than 5 years; for other jurisdictions, random roadside testing may be used. Results recorded in state and territorial vehicle registers.	PTI carried out by Automotive Diagnostic Centers, certified by accreditation body. All ADCs must interact with RUNT.	PTI required; results integrated into Marchamo information collection.



5. Characteristics of Good Quality MVIMS

Over recent decades, private corporations and public institutions have invested large amounts of resources in technology to collect, store, and process data for different purposes. Building large databases or registries and data management systems to manage them comes with great challenges. Data storage needs to be transformed from physical paper documents into electronic form, and different sources of data need to be integrated within information systems which allow the data to be used according to the specific goals intended.

Information systems aim to produce credible and complete information to stakeholders in a form which is suitable for their needs at the right time. This is critical for knowledge and evidence-based public policy and investment decisions. However, institutions can often find it difficult to realize the benefits of information systems due to a variety of obstacles, and this is the case of vehicle information systems in LMICs worldwide. Technical limitations, procedures disruption, and/or administrative constraints can all impede the ability of public institutions to develop, maintain or improve vehicle registries and support effective regulation, according to national goals.

There is a widespread need for motor vehicle information systems in LMICs (at whatever stage of manual or electronic management) to continue to shift away from isolated data warehouses and towards integrated sources of information. A cohesive strategy is needed to reduce the embedded cost of securing such information, improving its quality, usability, reliability, and security, while embracing available technology according to particular needs.

This analysis of motor vehicle information management systems (with linkages to motor vehicle insurance and driver information systems) provides LMICs with a framework to consider the quality of their own MVIMS. This section lays out some key principles considered necessary for good quality MVIMS to be able to support the various public policy goals reviewed in Chapter 2. We identify key features needed, as well as some practical issues related to their attainment. For the purpose of presentation, we discuss these principles and issues in terms of legal framework, institutional setup, information coverage, information management, and enablement of regulatory services.

5.1 Legal Framework

The legal framework governing any MVIMS system should strive to be clear and unambiguous in a number of key areas.

- Legal responsibility to capture data must be clearly spelled out. There should be clear legal authority for different entities to be able to capture information and governing how this information capture should occur. This authority needs to establish mandates not only for the public sector or their agents to capture information from individuals and manufacturers and importers (in the case of motor vehicle distributors), but also regarding transfers of data from private to public (e.g. in the case of motor vehicle insurers).
- Legal responsibility for upward and downward cascading of data in federated systems must be clearly spelled out. There should be clear mandates within the legal system for sharing of data in both directions in the event of federated systems, such as might exist in Federal legal structures where a state, rather than the national (Federal) government, has jurisdiction / police power over motor vehicle operation. This establishment of legal responsibility itself must be made at the appropriate level(s) in a federated system. In some cases, adherence to the system of rules regarding cascading of data may depend more on conditions for budget transfers between levels of government than on legal responsibility *per se*, but the structure and requirements should be thought about.
- Legal responsibility on who, how, and under what circumstances data can be used, and under what circumstances it can (or must) be made available to the public should be clearly articulated in the legal framework. From a developmental standpoint, the goal in laying out such legal responsibility should be as expansive as possible. In many countries, legal frameworks around data have emerged from a culture of institutional data propriety, (see World Bank 2021¹⁵), in which government institutions do not share data with each other, let alone with the general public. From the standpoint of innovating policies to improve road safety, environmental performance, and potentially other public policy purposes, sharing data about motor vehicle stocks among institutions and with the public as much as possible should be a goal in and of itself. Obviously, however, safeguards need to be in place regarding how to share that data, how to protect privacy of individuals and businesses, and which entities have what obligations in that process. This may require substantial rethinking of the legal framework.

How to obtain the above legal principles would require careful legal framework analysis in the context of each country (and possibly, state, in the case of federal systems). In general, the overall legal framework for MVIMS comprises three main levels of legal documents:

1. *Primary legislation*: Acts of a Parliament, or a Congress or an Assembly, which set high level requirements regarding motor vehicle registration, insurance and driver licensing, and authority for public institutions or persons to specify further requirements or take compliance related action (Acts that protect and regulate information management, such as privacy law, are also relevant).
2. *Secondary legislation*: Government regulations or other instruments which are approved by a minister, through which the government of the day specify detailed information management

¹⁵ World Bank. 2021. Data for Better Lives. World Development Report. Washington, DC: World Bank.
<https://www.worldbank.org/en/publication/wdr2021>

requirements within which the MVIMS operates, such as the information which a regulator may seek from any person.

3. *Tertiary legislation*: Any formal guidance, forms, instructions etc. which have been lawfully prepared by a regulatory body which can be enforced under primary or secondary legislation to regulate motor vehicles.

Beyond these three main levels, regulatory bodies and major service providers need a documented series of internal processes and procedures (or inter-agency memoranda of understanding) to ensure consistent application of regulatory requirements to regulated parties. These various levels of legislation may also need to function across different levels of government—particularly in federal systems or unitary systems where local government is delivering services.

MVIMS related legislation tends to focus on:

- The powers of institutions or appointed persons to collect and manage information and make regulatory decisions based on that information, which includes the form in which information is able to be collected or managed, as well as accessed and shared.
- The regulatory services which are able to be delivered by those institutions—that is, all the things which can or must be done by regulatory institutions and regulated parties.

Each country has its own legal framework which is critical for enabling effective regulation of motor vehicles and related activity. A key part of the legal framework for MVIMS is the controls in place across the regulatory jurisdiction to ensure that all the information and data belonging to a regulated party is appropriately managed. Significant advances in citizen rights have reinforced the importance of this framework. Governments are under pressure to use digital data to “reduce costs and enhance convenience, speed, efficiency, and accountability,”¹⁶ but also to “ensure that the necessary regulatory framework exists to enable digital transformation while protecting citizens’ rights.”¹⁷ This requires constant vigilance within institutions to ensure they are handling personal or property data appropriately, to protect it from external cybersecurity threats.¹⁸

Some LMICs are struggling with colonial era legislation which needs to be replaced, but even modernized legal frameworks need regular review and updating, for four key reasons:

1. *Technological development*: Rapidly evolving technology-based information systems mean the legal and regulatory framework needs to keep up with growing societal expectations regarding the use of personal data, and how it is protected through improved cybersecurity for example.
2. *Public policy*: Sustainable mobility and other major development issues will continue to create demand on MVIMS, and the legal framework needs to be able to respond to an increasingly complex information system to ensure it is current, accurate, suitable, and relevant.

¹⁶ Cate, Fred H. “Government Data Mining: The Need for a Legal Framework.” Digital Repository @ Maurer Law, 2008, www.repository.law.indiana.edu/facpub/150/.

¹⁷ Ahmed, Rozha K. and Muhammed, Khder H. and Lips, Silvia and Nyman-Metcalf, Katrin and Pappel, Ingrid and Draheim, Dirk, A Legal Framework for Digital Transformation (February 28, 2021). Available at SSRN: <https://ssrn.com/abstract=4182028> or <http://dx.doi.org/10.2139/ssrn.4182028>

¹⁸ Bélanger, France, and Robert E. Crossler. “Privacy in the Digital Age: A Review of Information Privacy Research in Information Systems.” MIS Quarterly, vol. 35, no. 4, 2011, pp. 1017–41. JSTOR, <https://doi.org/10.2307/41409971>. Accessed 23 Oct. 2023.

3. *Information sharing:* Increased complexity of systems, including interaction between private and public systems, increases the need for information governance, and the rules about what, when, and in some cases, how information can be legally shared, as well as acceptable conduct and protocols (such as selective anonymization) for officials to do so.
4. *System capability:* The legal framework must require data integrity to ensure accurate, complete, and up-to-date data is appropriately stored and linked, and systems which are capable of facilitating regulatory services and are secure.

The legal framework must also address the sometimes complex interaction between information about an individual in their role as a vehicle owner or driver, and information about a motor vehicle. This interaction includes proof of ownership, vehicle taxes, compulsory motor insurance, technical inspections, and traffic violations.

5.2 Institutional Setup

Institutional responsibility for MVIMS can vary from country-to-country. They are sometimes managed by entities or agencies under the purview of ministries of transport, but often they are under entities reporting to ministries of interior. They are usually closely associated with the administration and delivery of regulatory services within a large government agency. That agency may take several forms—it could be an integrated roads and traffic authority (responsible for all aspects of road network management and regulation of all road transport activity) an independent transport regulator, operating at arm's length from a Minister, or an enforcement entity such as the traffic police. The agency may also be a provider of a range of government services.

Whatever their form, it is important to ensure that key functions within the MVIMS eco-system are accounted for, clearly spelled out (through internal Terms of Reference or other such documents) and funded adequately. The following functions are considered integral:

- *Data capture:* Business Operating Procedures (BOP) within the institution(s) responsible for data capture should be as clear as possible, minimizing the number of open fields to reduce discrepancies in data intake.
- *Data quality assurance:* As with data capture, it is critical that the institution responsible for the MVIMS include BOP and staff with responsibility for ensuring the overall quality of the data included in the MVIMS. This means having a comprehensive approach to the overall data governance framework and all its component parts, including regular data audits, ensuring implementation of and adherence to validation rules, standardizing data formats, data cleaning operations, periodic (and random) source checking, and other methods of data quality assurance.
- *Data access:* as mentioned above, assuring data access among institutions, and even with the public, is a critical public policy objective in its own right. Institutionally, this means that there would ideally be dedicated staff whose job description includes not only enabling the data to be shared, but also in thinking about the formats in which it can best be used and facilitating its transformation as necessary.

- *Data integrity assurance:* The more extensively data is shared among institutions, and with the public, the more access points there are, and the more attention needs to be paid to data integrity throughout the life of the data, from intake through retention and ultimate destruction.
- *Data transformation and publishing:* This means ensuring that public-facing versions of data are published in appropriate form and with sufficient frequency to allow the public to participate in public policy discussions, and to improve government transparency. There are two general approaches to making MVIMS data available to the public: publishing aggregations of data (and indicators) to enable a broad understanding of trends, and/or publishing synthetic micro-datasets (synthetic in order to assure sufficient anonymity and privacy) to facilitate analysis and public policy discussion. Unfortunately, this aspect of data management is too frequently an afterthought for government institutions which manage data, but, on the contrary, should be thought of as an integral part of the data process. Institutions would need to establish BOPs and dedicated staff to do this effectively.

To ensure accountability for the above-enumerated key functions, institutions charged with MVIMS need to assume leadership of many different elements within the regulatory system. There is a growing body of guidance on good regulatory practice,¹⁹ which tends to focus on the following:

- Delivering services within the bounds of the law, in order to achieve public policy goals which have been set.
- Acting transparently, fairly and ethically in regulatory actions, and ensuring that regulated parties have access to their own information in a reasonable manner.
- Reviewing the capacity of the regulatory system to support current and future service delivery needs, and ensuring that the regulatory requirements remain relevant and justified.
- Ensuring that adequate resources are being raised and allocated to sustain the regulatory activity and invest in future improvements.
- Documenting the quality of service which regulated parties can expect and monitoring and reporting their own performance against that quality of service.

Collectively, these principles would help ensure that the MVIMS delivers positive outcomes at an acceptable cost, that it is an asset, not a liability.

The institutions charged with overseeing and delivering MVIMS should meet several key characteristics. First, at a broad, governmental level, there should be a formal separation of powers between government ministers who are charged with setting public policy goals and priorities for motor vehicle regulation on the one hand, and public administrators who are charged with the stewardship of the regulatory agency and its functions (including MVIMS), on the other. Second, it is important that the organization with immediate responsibility for MVIMS be structured in a way that promotes the objectives of the MVIMS. The organization must be accountable for the following core functions:

¹⁹ See, for example, Organisation for Economic Cooperation and Development (2012) Recommendation of the Council on Regulatory Policy and Governance, <https://www.oecd.org/governance/regulatory-policy/2012-recommendation.htm> and, at a national level, Treasury (2017) New Zealand Government Expectations for Good Regulatory Practice <https://www.treasury.govt.nz/sites/default/files/2015-09/good-reg-practice.pdf>

- Regulatory policy, focusing on the ongoing review and development of strategic and operational policy ranging from new regulatory tasks and outcomes through to revised operational processes.
- Service delivery, focusing on ensuring the quality of services for the regulated party, which may cover a range of service channels (online, face-to-face, regional etc.), while ensuring those services meet regulatory requirements.
- Technology systems, which underpin all other operations by organizing and securing information within an electronic environment, and which underpin all service delivery capability.
- Compliance, which ensures that there are effective compliance systems in place which promote willing compliance and follow up situations where regulated parties have chosen not to comply.

The organization may not need to literally structure itself according to these functions, but it must assure that they are accountable in that structure.

Finally, funding of the operations of the MVIMS is also an important function, not only because revenue is often a key part of the regulator's mandate, but also because MVIMS require resources to keep running, and ideally those resources should be generated from within the eco-system of users. Regulatory fees for motor vehicle registration, insurance, PTI, and other motor vehicle related services should be set in a way which recovers the cost of the MVIMS. Specific charges can also be made for the information process itself—for example, a fee to record data for every new vehicle introduced in the market or for every compulsory insurance underwritten annually.

5.3 Information Coverage

What information is collected and tracked by MVIMS systems, and with what periodicity, are critically important questions, particularly since, depending on the envisioned capabilities, the role of MVIMS could expand substantially from simply being a means to track motor vehicles on operating on public roads to a means to ensure adherence to a range of policies.

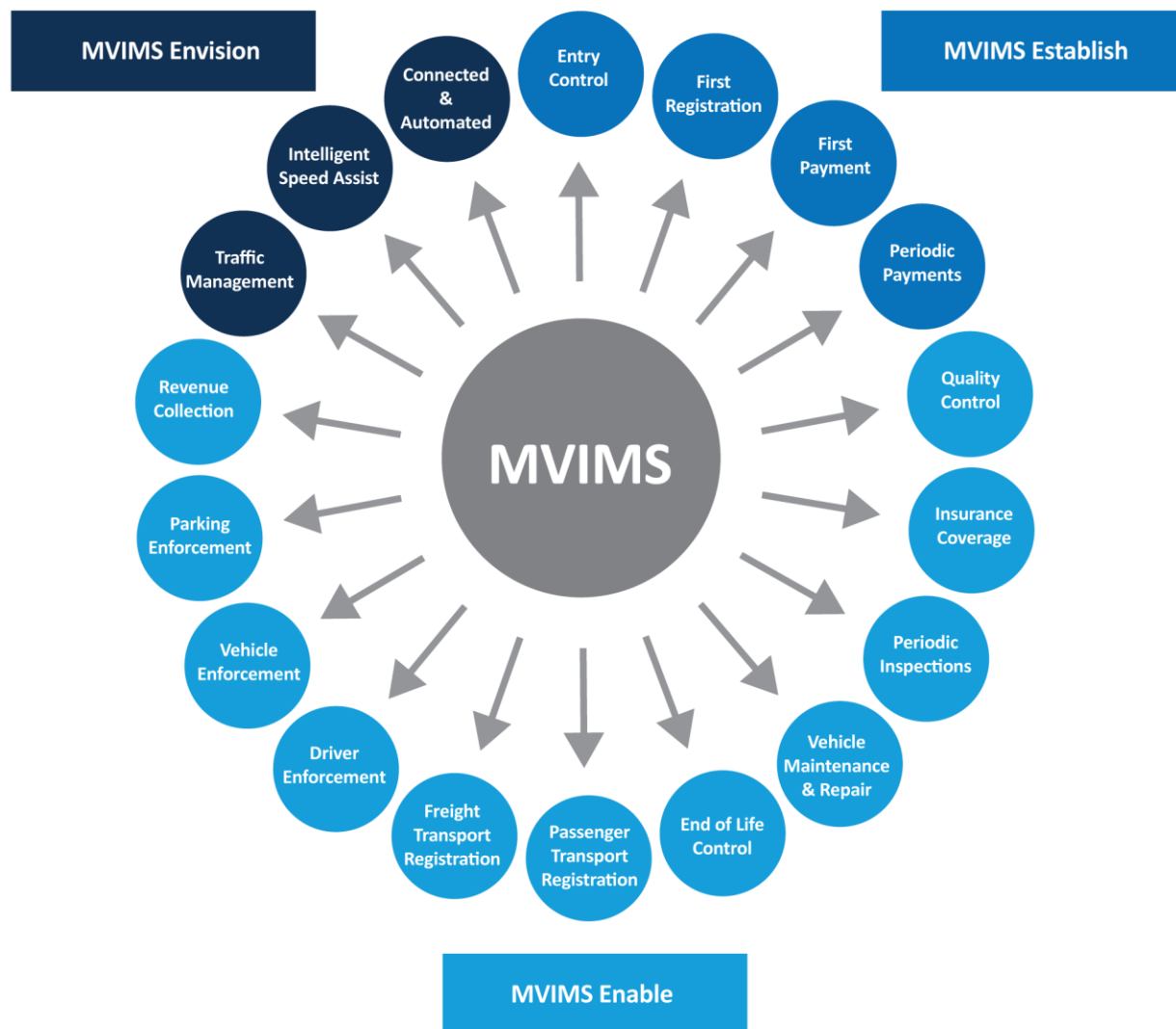
MVIMS can support at least 18 different policy and regulatory functions, which have been grouped into three basic levels. The extent of the information coverage to be included in an MVIMS system depends on the envisioned capabilities and outcomes. At the most basic level, called **MVIMS Establish**, the core governance tasks for the motor vehicle fleet are incorporated into the MVIMS, allowing a vehicle to be identified, entered in the system, and charged a regulatory fee.

More specifically, this basic level of capability includes the following:

- Controlling entry to the national vehicle stock
- Ensuring first time vehicle registration
- Ensuring first time payments, for example duties or title transfer fees
- Ensuring payments of recurring charges, for example annual licensing fees

A sound point of entry into the regulatory system allows for all future management of the vehicle, including the exit of the vehicle (including parts) from active use, and its disposal.

Figure 1. Capabilities of an MVIMS



Essential information management controls such as data protection and privacy standards need to be fully addressed in this level of capability level, and flow through to others.

The intermediate level, labelled ***MVIMS Enable***, strives for an information management system which enables delivery of a range of motor vehicle regulatory services required to generate various public policy outcomes (such as safety, health, or environmental goals) beyond the basic registry functions of *MVIMS Establish*. These consist of the following:

- Applying quality rules at port of entry
- Ensuring insurance coverage, particularly motor vehicle injury
- Supporting and improving periodic technical inspections of vehicles to ensure ongoing safety and environmental performance
- Governing motor vehicle modification / repair

- Ensuring adequate end-of-life treatment of vehicles, batteries, and other related parts
- Regulating commercial passenger transport
- Regulating commercial freight transport
- Enforcing on-road behavior and compliance of drivers (for example, speeding)
- Enforcing maintenance compliance of vehicle owners (for example, safety and emissions roadworthiness control)
- Enforcing parking regulations
- Collecting revenues

This capability illustrates the interaction with other essential information management systems, most notably insurance, driver licensing and enforcement. Along with essential monitoring and evaluation systems which use the MVIMS to help track progress toward objectives, insurance and driver licensing systems need to interact with the MVIMS. Driver licensing systems are particularly essential to MVIMS because they provide personal identification which is important for data validation and compliance purposes.

It is possible to consider which of these enabling capabilities are more important than others in theory. Those capabilities that control the standards applying to the entry of vehicles, drivers and commercial operators into the transport system, for example, are essential before addressing how they are treated through modification or enforcement. In practice, it is likely that the importance of different capabilities will vary depending on the particular context of the national MVIMS being considered. Each country has an MVIMS, however rudimentary. Analysis is required to identify which part requires the most attention, and how this need relates to other parts of the MVIMS.

The most advanced level, labelled ***MVIMS Envision***, strives to use the information management capabilities of MVIMS to support ICT and sensing-enabled systems to improve operational systems in real time. These systems might include:

- Real-time traffic management
- Intelligent speed assistance
- Increasing degrees of autonomous operation of connected and automated vehicles

This capability extends well beyond the vehicle itself and into the “internet of things” where the vehicle is part of a network of physical objects that are embedded with sensors, software, and other technologies for the purpose of connecting and exchanging data with other devices and systems through various mechanisms. However, this capability brings additional challenges to the MVIMS, particularly additional cybersecurity risks. All the capabilities of Establish, Enable, and Envision levels of the MVIMS improvement cycle are shown in **Error! Reference source not found.**1, above.

In addition, it is important to recognize the centrality of the revenues collection capability of the MVIMS. An MVIMS could be entirely funded through annual government budget systems, but it is desirable that the cost of regulating motor vehicles should be borne by those parties who are engaged in use of motor vehicles. This creates public policy opportunities to influence every aspect of motorization management and associated outcomes by creating direct financial incentives and disincentives for motor vehicle owners and users.

Based on the above considerations, a number of key principles regarding the coverage of information collected and tracked through a well-structured MVIMS emerges.

- MVIMS should be conceived and constructed as a “cradle-to-grave” asset tracking system. The VIN number should be traceable throughout the entire life of a vehicle within a country, from the moment it is imported or manufactured to the moment it is exported or destroyed with issuance of a Certificate of Destruction.
- This means adhering to a continuous registration principle: vehicles should be registered and periodically re-registered throughout their in-use life, especially but not only when title is transferred between owners. The system should incorporate active de-registration requirements, with recurring obligations accruing to the owner unless and until de-registration occurs (including penalties for non-insurance). For example, de-registration should be an obligation for export or for receiving a Certificate of Destruction. Such measures can also help increase barriers to cross-border vehicle smuggling.
- Over time, MVIMS systems should adapt to enable modular tracking of independent systems associated with the car. These systems could include chassis, engines, drive trains, batteries, etc. Such modular tracking will become increasingly necessary as transitions from ICE to BEV occurs. For example, it will be increasingly important to track Lithium-Ion battery units independently from the cars they are in, to track battery State of Health, facilitate End-of-Life Battery actions and other needs of the energy transition. It can also be helpful to track vehicle tampering, such as removal of advanced collision avoidance or emissions control equipment. Block-chain technology can be instrumental in helping with this transition to modular data systems.

5.4 Information Management

To improve MVIMS, thinking through core information management processes, in addition to legal framework, institutional, and information coverage issues will also be crucial. Increasingly sophisticated information systems have helped governments tackle many different challenges, including motor vehicle regulation, which require collecting and using personal data at different levels in vast databases, including some maintained by the private sector. While collection, storage, and use of information were once time-consuming, expensive, and difficult to use, digitization has eased those processes and facilitated the creation of new databases with different purposes for everyday activities and allowed integration between those various data sources.

The core information management issues to be addressed include how information is integrated from among many different potential sources, how it is structured, how it is stored, how data are input, how data security is assured, and how data access is assured. These are discussed below. *Integrating data from different sources.* Countries and institutions that manage motor vehicle registries, compulsory motor insurance, and driver licenses are encouraged to direct their efforts toward securing an information system capable of collecting, storing, and processing data to comply with traffic laws. Without setting specifications for MVIMS, it is important that several key aspects of information management are addressed.

There are generally two approaches to integrating information systems from multiple registries:

1. Some countries prefer to manage a single information system that comprises every registry related to vehicles. This approach simplifies the process of integrating data from various sources, but some institutions can balk at yielding their current information systems to another institution.

2. Other countries have empowered different information systems managed by different players, and established a technical and legal architecture that integrates those systems. This approach allows stakeholders to query and leverage available information without actually taking control of it but can be more challenging since it requires technical integration and administrative commitment between parties.

However accomplished, integrating vehicle, driver and insurance systems manifests numerous benefits, including:

- Improving the quality and useability of information
- Eliminating redundant information
- Strengthening information security
- Improving the quality, integrity, and confidentiality of information
- Facilitating data updates
- Improving the accessibility and speed of data queries
- Increasing the possible leverage gained from the information
- Validating real-time compliance with traffic laws
- Reducing the embedded cost of managing information systems

To realize these benefits, the integration of these three data systems (vehicle, drivers, and insurance) should occur as expeditiously as possible. If possible, there should be only one database for each of these systems, to facilitate that integration and ensure maximum exchangeability of information among systems.

Data management structure

The ICT system can be developed and managed as either a centralized or decentralized network. In a centralized network, all users are connected to a central server that stores complete network data and user information. By contrast, a decentralized network has several user groups with separate servers that store data and information relevant to only that particular group.

A centralized server monitoring the complete flow of network data works best applications organizations that require greater network control and visibility as is the case with MVIMS, where so much is dependent upon vehicle and user identity. Centralized IT structures tend to offer more cost savings, especially for large organizations or functions. They are highly dependent on network connectivity, but there are significant data quality and regulatory compliance issues for motor vehicle regulators which facilitate different systems across different jurisdictional regions.

How data is stored

Data storage is another major factor to consider, for which there are two main options:

1. Cloud storage, in which digital data is stored on servers in off-site locations. The servers are maintained by a third-party provider who is responsible for hosting, managing, and securing data stored on its infrastructure.

2. Network-attached storage, a dedicated file storage system that enables multiple users and heterogeneous client devices to retrieve data from centralized disk capacity. Users on a local area network access the shared storage via a standard ethernet connection.

It may be argued that the amount of data held on network-attached storage devices has grown so dramatically that maintaining storage capacity, rather than the storage system itself, has become a greater task. However, cost and control associated with cloud storage, as well as internet connectivity, may be issues for LMICs. Elements like cost, reliability, accessibility (especially when a disaster occurs), control, and ownership must be considered while deciding the more suitable option.

How data are input

To the extent possible, all aspects of data collection, quality control, integration, storage, and modification should be digitized. Manual entry of data should be minimized across all vehicle related processes, including intake of the vehicle into the country (whether through importation or manufacture), ownership and titling of the vehicle, registration and re-registration, change in ownership or registration, reporting results from Periodic Technical Inspections or on-scene accident or incident reports, de-registration, and destruction or export.

Online processes to enter information into the systems reduce the possibility of mistakes, improve integrity, and support constant updating of the information. Online processes also allow the validation of rules to ensure that only correct information is allowed in the system, enhancing data quality.

The data input systems need to be designed in a manner which unequivocally identifies every vehicle and every individual, including situations where the identity has been changed or altered, or different names or identity markings have been used. Data validation checks should be introduced at data entry as much as possible, for example, by ensuring that any manual entry of Vehicle Identification Number includes all 17 digits. Data needs to be standardized wherever possible, with a prescribed list of possible entries to any data field. Any manual entry of data should be based on drop-down lists as much as possible, and opportunities to record free-form information should be minimized. Artificial Intelligence can be used to standardize any formerly entered free-form data. In case any information requires any modification, it is best to preserve initial data and its modifications for tracking purposes, while ensuring that data is retained only when justified.

Ensuring data security

Regarding security, best practices rely on third parties engaged in checking security to avoid data breaches, modifications, unauthorized downloads, tampering, or any action that produces data loss. For business continuity, data mirrors or safe backups are also recommended.

Securing data access

A final point regarding information management relates to the connectivity of the necessary institutions (and sub-units of institutions) to the core data. Hardware and system architecture need to be robust, to ensure that key personnel that need access to the core data—both to receive and deposit information—are able to do so even from field locations as needed or under adverse conditions. This means establishing an architecture and making investments in redundancy over multiple agencies and their branches, particularly those located in remote, rural areas.

5.5 Interfacing Across Different Regulatory Services

Linked to the last point in the previous section, it is important to recognize that a good quality MVIMS enables many different regulatory functions and services. Not all of those functions are likely to be delivered by a single agency, however. It is important to take into account, therefore, not only the functions of the principal regulator in conceiving the structure of the MVIMS, but also the needs of the range of other entities that may need to access the database, either to retrieve data or to deposit new information. Some of these entities may be other government agencies, while some may be from the private sector.

In general, the MVIMS will be run by the regulatory agency (or agencies, in the case of federal systems) having direct jurisdiction over the national vehicle stock. It is important for this agency—which may have direct control over the entry to the national vehicle stock, the first-time vehicle registration, and all payments which recover the relevant cost of agency operations and/or raise revenue for government—to have primary control over the MVIMS system. This requires some coordination with other entities (such as a Customs Department which controls the cross-border flow of goods, or the delivery of specialist ICT services from the private sector), but it is based upon direct control over the vehicle register, and applications which facilitate the collection and transfer of revenues. This regulator often also directly controls the register of drivers, as well.

This primary regulatory entity in charge of MVIMS needs to coordinate with other regulatory agencies who may need access to the MVIMS. The regulation of commercial passenger transport and commercial freight transport may be undertaken by the same agency which runs the MVIMS, but often it is not. Passenger transport is often managed at a local or regional government level for example. Effective regulation of commercial transport requires easy access to vehicle and driver records—both to verify identity and manage compliance. The MVIMS also provides an important platform to support the development and management of a register of licensed commercial transport operators.

On-road enforcement also requires access. Trust and integrity of this activity, which may impinge on citizen rights, in pursuit of public policy goals, depends entirely on the quality and capacity of the MVIMS. Best practice coordination allows enforcement agencies real-time access to the MVIMS on the roadside, with other options including roadside access to recent copies or batches of the MVIMS (updated daily or weekly), or the ability to call for information to collect or verify vehicle or driver information.

Finally, various private sector actors also need to be able to access the MVIMS to be able to carry out their business effectively, and/or meet the needs of the clients who are contracting them. There are a range of good practice examples where all or a key part of the service is delivered by the private sector, working under a specific regulatory mandate. These include:

- Applying quality rules at port of entry, where private certification corporations can check vehicle compliance with relevant legislation.
- Insurance coverage, where public or private insurance corporations write compulsory motor vehicle injury policies in line with regulations.
- Periodic vehicle safety and environmental inspections, where private testing corporations are often granted the power to deliver regulated inspection services.
- Vehicle modification/repair, where private companies deliver a wide range of vehicle services which are required to meet certain standards.

- End of life treatment of vehicle, and related parts, where private companies deliver a wide range of vehicle services which are required to meet certain standards.
- Parking services, which are often delivered by local government.

Whether delivered by the public sector or the private sector, all of these services need a certain level of access to the MVIMS. They rely on the MVIMS to provide high quality information, and they add to the MVIMS by recording their regulated activity regarding each vehicle or person. As discussed above, however, the nature of that access needs to be circumscribed by the legal framework, the objective of which should be to safeguard data privacy and security while facilitating access.



6. Towards a Stronger MVIMS

The intent of this study has been to help further our understanding of MVIMS and its critical role in strengthening LMICs' management of national motor vehicle stocks and improving public policy outcomes. The study has sought to highlight key information management challenges that MVIMS can help leverage in meeting specific policy challenges, set out a framework for future analysis of MVIMS, report on the findings of a survey of MVIMS in a number of LMICs, and describe the characteristics of a good quality MVIMS.

One key finding of the survey of motor vehicle, drivers' and insurance data practices in LMICs was that there appears to be minimal integration of data and methods among systems in the surveyed countries. Part of the reason seems to be that different information systems are managed by different institutions, which itself suggests a need to work on cross-agency governance systems. Data quality remains a challenge for some countries, highlighting the need for validation protocols to be embedded in operations. The use of data for external publication and policy making is also rare. This should be understood as a lost opportunity; countries are sitting on large volumes of information (with cloud storage replacing local servers), but those data are not put to work to help them address their biggest motorization and developmental challenges. External publications with aggregated figures are rare and infrequent. The particular challenges are not uniform between countries, but there are opportunities for them to be assessed and addressed in a systematic way.

In addition, the LMIC survey indicates that integration stands as a significant obstacle for countries in MVIMS, hindering optimal data access and sharing, consequently compromising the quality of information within MVIMS and impeding governments from attaining key policy objectives. Understanding the underlying reasons for integration difficulties is crucial, as challenges may stem not only from technical aspects but also legal encumbrances in granting third parties rights over data, whether it be personal data protected by law, data subject to intellectual property rights, or highly confidential public sector data.

Ultimately, the analytical framework set out in this report points to the need for a full-fledged assessment framework and toolkit. This would support:

- High-quality diagnosis of any particular MVIMS.
- Preparation of practical recommendations for the MVIMS improvement, given the particular LMIC context.
- Decision making which gives due recognition to the importance of MVIMS in facilitating societal outcomes.

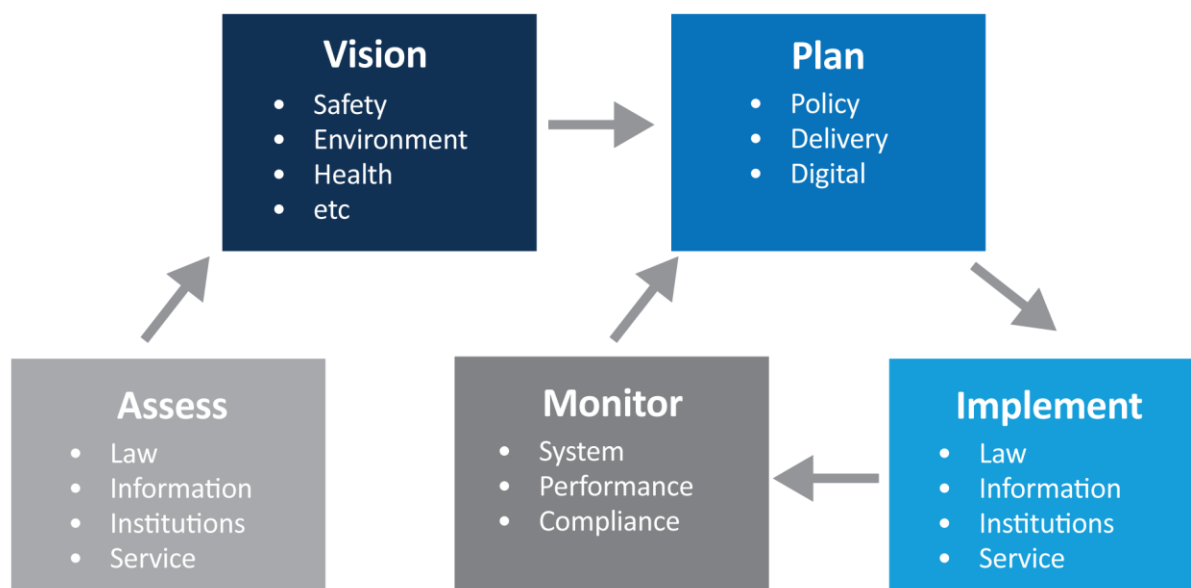
Institutions with responsibility for an MVIMS are encouraged to discuss the issues raised in this paper within their own organization, with those they report to (including government ministers), and the stakeholders which rely on the MVIMS to deliver their own services. The information compiled in this study could form the basis for such a framework / toolkit, but the objective in the present report is more modest, namely to set out a strategically-oriented process with key recommendations that LMIC governments and their development partners can use to help guide analysis of existing MVIMS and options for improvement. The process follows a simple pathway and improvement cycle: Assess-Envision-Plan-Implement-Monitor.

6.1 Proposed Process for Improving MVIMS and Related Systems

A country which is considering investing in and improving information systems relating to motor vehicle regulation should engage in a thorough scoping of this critical area of activity, to understand not only what needs to be improved and how these improvements should be sequenced, but also how the overall process should be managed. The following recommendations reflect the significance of MVIMS to successful regulation within the transport sector, and the interconnectedness between these systems and the achievement of societal outcomes.

Strengthening an MVIMS requires a strategic approach, deliberately moving through development and implementation towards a continuous improvement cycle.

Figure 2. Strengthening and Continuously Improving MVIMS



A thorough **assessment** is needed to lead to development and agreement of a **vision**, from which a comprehensive and detailed **plan** is prepared, which is then **implemented**. A mechanism to **monitor** the new MVIMS needs to be established to evaluate operations and make any adjustment of the system processes to improve overall performance.

a. Assess

It is recommended that a country considering investment and improvement in the information systems relating to motor vehicle regulation start with a strategic assessment of the MVIMS as it currently exists.

The assessment is important irrespective of the quantity or quality of motor vehicle information that is currently collected, or how it is managed. Use of the well-established SWOT framework²⁰ could be an effective framework for this assessment. It requires:

- A critical analysis of the policies, processes and practices relating to the:
 - Legal framework applying to motor vehicle regulation and information management
 - Collection and management of information (including the design and implementation of safeguards)
 - Institutional arrangements for managing the information
 - Regulatory services which use the information
- Engagement with key stakeholders both inside and outside government to prepare this documentation, and to develop a common understanding of the issues associated with and the opportunities to strengthen the MVIMS.

Questions

Questions to consider during this phase are:

- a) What is the current purpose of the MVIMS and the outcomes it is seeking to support?
- b) What plans are currently in place for strengthening the MVIMS?
- c) How do these plans relate to the various elements of the various information systems?
 - i. The legal framework which is currently in place
 - ii. The information which is currently being collected
 - iii. The institutional arrangements within and between relevant agencies, and
 - iv. The regulatory services which are being delivered?
- d) What are the primary Strengths and Weaknesses of the current system, Opportunities for improvement of the MVIMS, and Threats or challenges in doing so?

²⁰ Assessment framework that systematically addresses Strengths, Weaknesses, Opportunities, and Threats

b. Envision

Informed by the above assessment, it is recommended that, a collaborative process be undertaken involving relevant stakeholders, government Ministers, and the wider community as necessary, to establish a common vision and ambition for the MVIMS.

This envisioning process should connect different aspects of government policy and direction, including at least:

- The transport and mobility sector, particularly any commitments made or directions set regarding safety and environmental outcomes, and objectives toward advanced use of Intelligent Transportation Systems in traffic enforcement
- Current or projected approach to ICT management within government and the relationship between this and the delivery of regulatory services
- Other policies and directions within the finance, justice, health or environment sector which may influence the scope of a future MVIMS.

The assessment provides an information base from which these different aspects of government develop a common view of a future state of the MVIMS. As the MVIMS is essentially a facilitator, this future state needs to articulate the outcomes which are being sought, the potential regulatory reform, the information which will need to be managed, the institutional change which may be needed, and the service which will be experienced by the community.

A high-level reform roadmap should be prepared, based on an agreed vision and ambition regarding the future state, with consideration about short- and medium-term priorities and sequencing of investment.

Questions

Questions to consider during this phase are:

- a) What are the future outcomes which the MVIMS needs to support?
- b) What are the key performance measures which should be in place to assess MVIMS progress towards those outcomes?
- c) What reform projects need to be developed to support this future state, and how will they need to connect with each other?
- d) What are the strategic directions which will guide implementation of these projects?
- e) What roles will various institutions need to play, and what cross-agency governance structure will be needed?
- f) How will implementation of the reform program be managed in terms of planning, financing and reporting?
- g) What are the implications of the proposed system in terms of data sharing, the need to protect data, and the need to protect privacy? Would a data protection impact assessment (DPIA) or privacy impact assessment (PIA) be needed or useful?
- h) What is the legal framework for the MVIMS, and how well does it facilitate changes to regulatory requirements and service delivery?

c. Plan

It is recommended that a comprehensive MVIMS reform plan be prepared, focusing on the specific projects which will be initiated and their sequencing and financing, based on the vision and reform roadmap which has been agreed.

A significant planning effort is required to move from an agreed future state through to the implementation. Reform of an MVIMS is likely to be one of the more complex projects that a transport agency or Interior ministry will undertake, and the chances of success will depend upon the quality of the planning. The plan will need to address at least four key themes:

- Reform of regulatory policy to increase the benefits available from an improved MVIMS
- Reform of the ICT systems to strengthen both the immediate capacity and reach of the systems, and their capacity to deliver the reform roadmap
- Reform of MVIMS management and customer service delivery within institutions to leverage a strengthened MVIMS to improve compliance with the law and control costs
- Harnessing the major opportunities associated with digitisation for future regulation and service delivery.

The inter-connectedness of these themes reflects complexity of the process which should be embraced. For example, the opportunity of embedding regulatory reform or service delivery improvements within a major ICT system strengthening should not be passed up. The systems strengthening requires a clear picture of what services are required and how they will be delivered, and the capabilities of the various institutions to successfully deliver change underpin every other aspect of the plan. The whole plan needs to be considered in terms of the legal framework which permits the activity; changes to that framework may also need to be considered under the auspices of the plan. Finally, to be implementable, the plan should clearly prioritize the projects which will need to be delivered in a first stage of reform, together with their scoping and funding identification.

Questions

Questions to consider during this phase are:

- a) What is the scale of change required for the legal framework, and how will any change need to be sequenced with other aspects of the reform program?
- b) What specific regulatory reforms are being anticipated, what is the level of impact on law and on service delivery and do these reforms have political support?
- c) What institutional strengthening is required across different agencies to deliver and maintain the reform program?
- d) What are the regulatory and service delivery opportunities which are possible from a digital strategy, and which of these will be pursued?
- e) What are the major projects that will need to be delivered in the first stage of reform and how do these support the future state?

- f) What is the estimated investment need for delivering the reform program, and the expected cost of the first set of major projects?
- g) How will the projects be funded?

d. Implement

It is recommended that any MVIMS strengthening program be implemented under a project management framework led by the agency with primary responsibility for motor vehicle regulation, but with as much participation from different government agencies and private sector representatives as appropriate, with separate funding and a cross-agency governance and oversight approach.

The potential significance of a reform programme, and its complexity extends into direct personal engagement with very large proportions of the population. This means that implementation of the plan needs to be exceptionally well managed.

During the implementation phase, particular attention needs to be given to:

- Essential project management disciplines regarding governance, scope, objectives, deliverables, timeframes, budget, stakeholder engagement, and communications.
- Developing and implementing systems and processes for each level of the MVIMS—from high level decision making to frontline service delivery—and across each of the services delivered through the MVIMS
- The interconnectedness among different elements of the program, and ensuring that different institutional and functional representatives are working through this complexity
- Building the capacity of the relevant institutions to play its respective role in developing, implementing and maintaining a strengthened MVIMS, while ensuring safeguards are in place for data sharing and transparency in respect of MVIMS data processing operations
- Maintaining political support and priority for the reform program, including regular provision of information to elected representatives and engagement on issues of their interest
- Promoting a change agenda within relevant organizations, so that those with project responsibilities are empowered, and that regulatory staff have the necessary understanding and knowledge to operate, maintain and sustain a good quality MVIMS
- Matching the new and existing information that needs to be managed, new systems for information collection and management, and any information management rules within government which need to be complied with such as only retaining necessary information.

Regarding the MVIMS itself, there are four generic options that will need to be considered:

- Create—move from a manual system to a series of electronic registers which can support frontline delivery, in person and online as required
- Replace—develop and implement a new ICT system to replace an old or limited system which is unable to be cost-effectively upgraded

- Integrate—upgrade information registers and develop applications which allow different sources of information to be drawn upon and support each other
- Upgrade—significantly upgrade the quality and usability of existing systems where cost-effective and providing significant uplift in frontline delivery and enforcement.

Questions

Questions to consider during this phase are:

- a) Are there well specified project plans in place?
- b) Are the overall project governance, funding and reporting systems working sufficiently well to support delivery?
- c) What are the major risks involved in the projects, have these been analyzed through a risk management framework and what is the current state of these risks?
- d) Are the project deliverables, timeframes and budget being met, have any critical issues arisen and how are they being resolved?
- e) Is there sufficient communication to elected representatives, stakeholders, and staff, as well as to prepare the public for changes in service delivery?
- f) Which safeguards must be put into place for the data? These safeguards might include classification of data, limiting access to sensitive data such as personal injuries, security measures in accessing the data, producing synthetic datasets to protect identifying information, and similar measures. Is transparency being ensured regarding MVIMS data processing operations?

e. Monitor

It is recommended that a monitoring program be put in place to assess over time the development, delivery, maintenance and improvement of the strengthened MVIMS.

Motor vehicle regulatory services touch every part of society and are delivered within a complex and dynamic environment. Any monitoring program needs to include different components of the system, the functioning of the system as a whole, and its impact on regulatory compliance. It should also include the delivery of the reform project itself. Monitoring of initial implementation is critical not only for actual delivery, but also to understand lessons learned in future aspects of the programme. Ongoing monitoring is important to promote a continuous improvement culture in both the systems that are being managed and the services that are being delivered.

Different aspects will require different levels of monitoring:

- System level monitoring may take place only once a year—for example, the governance mechanisms, the overall benefits of the stronger MVIMS etc.
- Performance monitoring needs to be more frequent—monthly and quarterly—so that when there are system or delivery issues, they be addressed more immediately.
- Compliance monitoring is a daily and weekly record of activity which allows for more immediate feedback on the volume and quality of services which are being delivered.

Questions

Questions to consider during this phase are:

- What do we need to monitor in order to track the progress being made through this reform programme and how this can inform future work?
- When will we conduct a major system-wide evaluation of the reform programme?
- What daily, weekly, monthly and quarterly reports are required, how will they be used, and who will use them?
- What external reporting is required for the reform programme and the various projects it comprises?

6.2 Embedding a Culture of Continuous Improvements to the MVIMS Process

To truly ensure the full potential of MVIMS to play an increasingly relevant role in motorization and traffic management, beyond what we have termed establish and enable, toward more comprehensive envision roles such as ITS assisted traffic management, intelligent speed assistance, and facilitating connected and automated vehicles, the five-step process discussed above should itself be repeated periodically, to ensure that emerging trends are captured in a forward looking system. Like master planning or policy development in many other areas, the process of improving MVIMS should be a continuous one, fostering constant renewal and refreshment.

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Appendix: Country Survey

A survey instrument was prepared in spreadsheet form to collect country information on vehicle information systems, compulsory motor insurance (applicable for those countries where it is compulsory), and driver information systems.

There were five sets of questions across each of these information systems:

1. General Description: In this section, countries could document a brief description of the information systems for all three information systems. This section has 15 questions in total for each information system.
2. Data capture: In this section, countries could document the process for collecting information for all three information systems. This section has 7 questions in total for each information system.
3. Cleansing, integration, governance: In this section, countries could document procedures to secure data quality, use available data, and the rules for the treatment of information for all three information systems. This section has 6 questions in total for each information system.
4. Analytics, security, life cycle: In this section, countries could document openness to share information, degree of security, and length of life for available information for all three information systems. This section has 8 questions in total for each information system.
5. General questions: In this section, countries could document information regarding vehicle registries. This section has 17 questions in total.

There was also an open section for countries that want to provide any further information or response to the questionnaire.

Questions

The questions asked in the survey and the answer format provided are set out here.

QUESTION	ANSWER FORMAT
General Description	
Does the registry exist for the entire country or most of the states within?	YES NO
If question 1 is YES, how many registries does the country have?	- Just one - More than one
Which institution is responsible for the maintenance of the registry? If more than one registry, please indicate all that apply.	Free text
What are the main goals of the registry?	Free text

QUESTION	ANSWER FORMAT
Is it centralized or decentralized? ²¹	- Centralized - Decentralized
Does the registry have any particular characteristic worth highlighting?	Free text
Which institution is responsible for the registry's budget?	Free text
Is the budget fixed annually?	YES NO
Does the registry run on bespoke software, or is it licensed?	- Bespoke - Licensed
Do employees responsible for the registry work for the institution, or are they outsourced?	- Employee - Outsource
When was the last time (date) the registry experienced significant changes?	Date (MMM/YYYY)
Are there plans to make important changes to any of the items described in this survey in the future?	YES NO
If question 12 is YES, please briefly describe the changes. For example, are there plans to change the access to the data, add additional data sources, integrate with other databases, or use the data for a new purpose?	Free text
Where is data stored?	- Cloud storage ²² - Network-attached storage (Servers) ²³ - Other
Who is the main contact person if we have questions about this survey response? (Name and email)	Free text
Data Capture	
Was the data originally imported from a previous (legacy) system?	Free text

²¹ In a centralized network, all users are connected to a central server that stores complete network data and user information. On the contrary, a decentralized network has several peer-to-peer user groups wherein each group has its separate server that stores data and information relevant to only that particular group.

²² Cloud Storage is a mode of computer data storage in which digital data is stored on servers in off-site locations. The servers are maintained by a third-party provider who is responsible for hosting, managing, and securing data stored on its infrastructure.

²³ Network-attached storage (NAS) is dedicated file storage that enables multiple users and heterogeneous client devices to retrieve data from centralized disk capacity. Users on a local area network (LAN) access the shared storage via a standard Ethernet connection.

QUESTION	ANSWER FORMAT
Does the data entry for new records rely on a paper form, or can it be done fully online?	<ul style="list-style-type: none"> - Data entry uses a paper form - Data entry is fully online
What is the source of the data items?	Free text
How often is new data added to the registry?	<ul style="list-style-type: none"> - Online - Batch: every few hours - Batch: daily - Batch: Weekly - Batch: Monthly - Batch: Yearly - Other
Which institution is responsible for feeding new information or updating existing data?	Free text
Are there rules (validation filters) on new data to assist with data quality and avoid or prevent access to some data? (bad quality, incomplete, inaccurate, others)	YES NO
What actions are taken when inconsistencies of information are detected?	<ul style="list-style-type: none"> - No validation during data input. All information is allowed - Some validation, yet all data input is allowed - Some validation, pending on the type of inconsistencies data, is allowed - Data validation: only correct info is allowed
Cleansing, Integration, Governance	
At which points in the process or where can any inconsistency in data be detected? Capturing data	YES NO
At which points in the process or where can any inconsistency in data be detected? Processing data	YES NO
At which points in the process or where can any inconsistency in data be detected? Storing data	YES NO
At which points in the process or where can any inconsistency in data be detected? Retrieving data	YES NO
At which points in the process or where can any inconsistency in data be detected? Publishing data	YES NO

QUESTION	ANSWER FORMAT
When updating data, does the registry preserve initial data and its modifications, or does it delete inconsistencies and replace them with updated data?	<ul style="list-style-type: none"> - Preserve initial data and its modifications - Delete inconsistencies and replace them with updated data
Is the registry linked electronically with any other registries, such as those for drivers or insurance or crashes/injuries?	<ul style="list-style-type: none"> - Drivers - Insurance - Crashes injuries - All of the above - Drivers and insurance - Drivers and Crash/injuries - Insurance and Crash/injuries - Others - None
If question 25 is different from NONE, what is the purpose of the interaction, and what are the results in practice?	Free text
Does the registry have rules for the treatment, usage, and leverage of the information?	YES NO
Which organizational unit is responsible for the maintenance of the database infrastructure?	Free text
Analytics, Security, Life Cycle	
Does the registry produce and publish regular reporting based on available (consolidated) data?	YES NO
If question 29 is YES, where are they published, and how often are they updated?	Free text
Can individuals or institutions browse their own information, information of others, or consolidated information?	<ul style="list-style-type: none"> - Their own - Others - Consolidated - All of the above - Their own and others - Their own and consolidated - Others and Consolidated - None
Are third parties engaged in checking security to avoid data breaches, modifications, unauthorized downloads, tampering, or any action that produces data loss?	YES NO
How often does the registry run security checks, drills, and reviews?	- At least once a month

QUESTION	ANSWER FORMAT
	<ul style="list-style-type: none"> - At least once every six months - At least once a year - At least once every two years - At least once every five years - Other
When was the last time the registry had a security check or review?	Date (MMM/YYYY)
Are there data mirrors or safe backups to guarantee business continuity?	YES NO
Is data in the registry considered to be preserved forever, or is there a maximum period after which it is discarded?	<ul style="list-style-type: none"> - Preserved forever - Discarded at some point
General	
Are VINs recorded for all registered vehicles?	<ul style="list-style-type: none"> - NO, VIN is not captured - YES, but capture of 17 digits VIN is not verified - YES, all 17 digits of VIN are verified
Does the system record information on Make, Model, Year, and Trim independently of the VIN?	YES NO
Does the system record information on specific vehicle safety features?	YES NO
Does the system record information on specific vehicle environmental features?	YES NO
What proportions of new vehicle registration and registration renewals are performed online?	Free text
Is the vehicle registry administered by the National government, by State governments, or any other?	<ul style="list-style-type: none"> - National government - State governments - Other
If question 42 is State governments, is there a national data exchange for sharing vehicle registry data?	YES NO
Is a regular payment required for each vehicle to access the public road network?	<ul style="list-style-type: none"> - 1 year - 2 years - Other term - None
Is there any government revenue mechanism linked to the importation of a vehicle?	<ul style="list-style-type: none"> - Flat import duty - Graduated import duty based on

QUESTION	ANSWER FORMAT
	vehicle features - Value added tax only - None
Is there a compulsory vehicle insurance requirement relating to property damage and/or personal injury?	- Property damage only - Personal Injury only - Both - None
If question 46 is different from NONE, is this insurance data linked to the vehicle registry?	YES NO
Is there a periodic vehicle inspection requirement for each private vehicle?	YES NO
If question 48 is YES, is this inspection data linked to the vehicle registry?	YES NO
Is there a periodic vehicle inspection requirement for each commercial vehicle?	YES NO
If question 50 is YES, is this inspection data linked to the vehicle registry?	YES NO
"Can the vehicle registry be used to generate a report each year on the number and details of: 1. vehicles entering the national fleet? 2. vehicles in the fleet? 3. vehicles which exit the fleet?"	- All of the above - 1 and 2 - 1 and 3 - 2 and 3 - None
Is there a specific provision for motorcycle registration, insurance, or (rider) licensing?	YES NO

Questions

An abbreviated set of questions drawn from the survey are set out below. They may be useful for discussion with stakeholders during an assessment phase, and amongst stakeholders during the vision and plan phases.

1. What is the purpose of the MVIMS and the outcomes it is seeking to support?
2. What plans are in place or are being considered for how to strengthen the MVIMS?
3. How do these plans relate to the current information systems, the relevant legal framework, the institutional arrangements, and the regulatory services which are being delivered?

4. What consideration has been given to the leadership of the MVIMS, the accountabilities for MVIMS operations, new and existing standards which are in place, the funding requirements for implementation of plans, and the professional capacity required to deliver?
5. What is the legal framework for the vehicle information system, and when was it last completely reviewed?
6. Which institution is responsible for the vehicle information system?
7. Do employees responsible for the registry work for the institution, or are they outsourced?
8. Which other institutions are engaged in making significant use of the system?
9. What regulatory services does the vehicle information system support?
10. Are there plans to expand the number of regulatory services supported?
11. Is it a national vehicle information system or a system which is connected into a federal system?
12. Is it a centralized or decentralized ICT system?
13. How is data stored—on servers or on the cloud?
14. Is the budget fixed annually?
15. What is the source of funding for the system?
16. When was the last time (date) the registry experienced significant changes?
17. Does the data entry for new records rely on a paper form, or can it be done fully online?
18. Are there validation rules on new data to assist with data quality?
19. Is the registry linked electronically with any other registries, such as those for drivers or insurance or crashes/injuries?
20. Does the registry have rules for the treatment, protection, and use of the information?
21. Is (consolidated) data regularly produced and published?
22. Can individuals or institutions browse their own information, information of others, or consolidated information?
23. Are third parties engaged in checking security to avoid data breaches, unauthorized downloads etc?
24. How often does the registry run security checks, drills, and reviews?
25. Are there data mirrors or safe backups to guarantee business continuity?
26. Are VINs recorded for all registered vehicles?
27. Does the system record information on specific vehicle safety or environmental features?
28. Is a regular payment required for each vehicle to access the public road network?
29. Is there any government revenue mechanism linked to the importation of a vehicle?
30. Is there a compulsory vehicle insurance requirement relating to property damage and/or personal injury?
31. Is there a periodic vehicle inspection requirement for each private vehicle?

32. "Can the vehicle registry be used to generate a report each year on the number and details of:
vehicles entering the national fleet; vehicles in the fleet; and/or vehicles which exit the fleet?"
33. Is there a specific provision for motorcycle registration, insurance, or (rider) licensing?



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WORLD BANK GROUP

www.globalroadsafetyfacility.org

grsf@worldbank.org

