



## **ROAD ASSET MANAGEMENT MANUAL OF THE WORLD ROAD ASSOCIATION PIARC**

**Darko Kokot<sup>1</sup>, Vittorio Nicolosi<sup>2</sup>**

<sup>1</sup>*Slovenian National Building and Civil Engineering Institute, Section for Road Maintenance and Management, Ljubljana, Slovenia*

<sup>2</sup>*University of Rome "Tor Vergata", Department of Enterprise Engineering "Mario Lucertini", Rome, Italy*

### **Abstract**

PIARC (World Road Association) is the world's oldest professional association in the field of roads and road transport, founded in 1909. The main technical and development activities are carried out in the Technical Committees, with Technical Committee 3.3 Road Asset Management preparing and developing a road asset management framework that enables road authorities to manage their activities, risks and administrative costs in an efficient manner. In its previous cycles, Technical Committee 3.3 produced an online manual with guidance on how to apply asset management principles for more effective management of road assets. In the latest cycle, new topics were added to the manual as well as translations to French language provided. The manual is aimed at national and local road administrations, regardless of the organisational competence of asset management (maturity level), and at all those involved in the management of road infrastructure. Management here means the short and long-term management of the capacity and performance of road infrastructure throughout its lifetime, including the timely implementation of maintenance measures and the identification and management of various risks. The manual also addresses the rationale for funding infrastructure maintenance and improving communication with the various stakeholders. In this paper we will briefly describe the manual, focusing attention on the innovations recently introduced, and we will highlight the peculiarities and positive aspects of this dissemination tool.

*Keywords: road asset management, resilience management, case studies, PIARC online manual*

### **1 Introduction**

The development of the asset management manual began in 2012 following the indications contained in the PIARC strategic plan for the four-year period 2012-2015. However, before starting this activity, the technical committee questioned the usefulness of developing a further manual, given that several already existed at the time. The answer lies in the characteristics that the new manual had to have:

- not a digital manual but online content,
- a dynamic and constantly evolving dissemination tool,
- a guide for all road managers in both industrialized and developing countries;
- a dissemination tool strongly oriented towards practice, concise and with many application examples.

At the end of the four-year period, a draft manual had been developed under the coordination of Stephen Gaj of FHWA (US). The draft of the manual had been developed in a form that was not entirely digitalised. Therefore, in the following cycle the committee finalized the work, initially completing and publishing the manual online, and then updating the manual to prepare a version to be translated into French and Spanish. Since October 2017, the PIARC Road Asset Management Manual (RAMM) has been available on the PIARC website (see Fig. 1) [1].



Figure 1 PIARC RAMM welcome website [1]

Having been conceived as a dynamic tool, the manual was already updated in the following work cycle (2020-23) both by broadening the audience of potential users, through translation into French, and by expanding its contents. In particular, a topic of particular importance, not already covered, has been added: Resilience management. In the meantime, another topic, Information digitalization and management is under preparation. The new work cycle which began in January 2024 will produce further changes both from the point of view of form, innovating the web tool used, and from the point of view of contents, by updating the sections of the manual, by adding further case studies to those already illustrated and also hosting video lectures (MOOPs). With this the PIARC Asset Management Handbook fits well into the currently accepted model for the dissemination of knowledge in the 21<sup>st</sup> century. This model, recently illustrated in a lecture at MIT by Sedgewick, is based on three pillars: textbooks, video lessons and web content [2].

## 2 PIARC Road Asset Management Manual

### 2.1 Manual framework

Organisationally, the manual is divided into four sections (corresponding to book chapters): Management, Data Modelling, Planning and Application. The first chapter looks at some of the key components and factors of asset management that an organisation should consider when contemplating adopting a formal approach to road asset management. Information about the infrastructure, its behaviour and condition, risks and lifecycle planning are the topics of the second chapter.

Chapter 3 describes the key considerations that road operators need to make when developing their activities. Application, the final chapter, looks at the use of asset management tools to implement the management plan and communicate of key information to the various stakeholders. Each section is divided into thematic groups reflecting the key activities that support the management of road assets in an organisation.

**Table 1** List of sections and chapters of the manual

Section	Chapter	Chapter title
-	-	Welcome (Home) website
1 Management	1.1	Implementation
	1.2	Organization
	1.3	Strategy
	1.4	Performance Management
2 Data Modelling	2.1	Inventory and Condition
	2.2	Performance Monitoring
	2.3	Risk
	2.4	Lifecycle Planning
3 Planning	3.1	Asset Management Plan
	3.2	Financial Plan
	3.3	Asset Valuation
	3.4	Programming
4 Application	4.1	Asset Management Tools
	4.2	Communication

## 2.2 Implementation of Asset Management

The PIARC online Manual suggests several steps for successful implementation of asset management:

- defining asset management objectives that align with an organisation’s mission and the expectations of various stakeholders,
- conducting a self-assessment and gap analysis to determine the maturity of asset management practises,
- developing an action plan with specific measures to improve the current situation.

For each of these steps, the manual gives advice on how to get started and suggests the key questions that organizations should ask themselves to implement road asset management, regardless of their size or the scope of the road network.

These key questions relate to the current status of an organisation’s assets, the level of service required by an organisation and which assets are critical to maintaining the required level of service. Organisations also need to ensure that they have an adequate budget to support optimal investment strategies. Therefore, some questions explore the best operational investment strategies and the best long-term funding strategy.

## 2.3 The basic contents and objectives of PIARC RAMM

The PIARC RAMM follows the basic principles and requirements for asset management as defined in the ISO 55000 standards [3]. ISO 55000 defines a set of interrelated elements for the establishment, implementation, maintenance and improvement of a system for managing assets, and can be applied to all types of assets and organizations. An asset management system as defined by the ISO standard consists of the following elements: Context of the organization, Leadership, Planning, Support, Operation, Performance evaluation and Improvement.

The first three elements are largely covered in the RAMM by the Management section (see Table 1) and partly by the Data Modelling section. Data modelling, Planning and Application can be linked to the Support and Performance evaluation elements of ISO 55000, while Planning and Application also cover parts of the Operation and Improvement elements of the standard.

## 2.4 RAMM as a tool for education and dissemination

The PIARC RAMM is aimed at a wide audience, experts involved in the management of road infrastructure, whether they work for national or local organizations. The manual is also intended for use in organisations that have varying levels of expertise in asset management and its principles, which have been introduced to help them identify strengths and weaknesses in relation to their objectives. To this end, the manual introduces a 3-level scale to measure the maturity of an organization, which applies to all four elements (sections) of the manual:

- Basic level: the organization has limited experience, relates assets mainly to costs and has not established support from its strategy, processes or tools;
- Proficient level: The organization can say what it does and has defined or developed the strategy, processes and tools;
- Advanced level: At this level, an organization can control, evaluate and improve all processes and is able to learn and adapt itself.

One of the main features of the manual is its multilingualism to ensure optimal outreach to experts around the world, with a particular focus on developing countries. It has already been translated and adapted into French, while the translation into Spanish is on its way. The concise text and the large space dedicated to the case studies of the manual are two other features that firstly facilitate the application of the concepts at the practical application level and secondly support the education and dissemination aspects.

## 3 PIARC RAMM as a dynamic knowledge tool: updates and changes

As already emphasised, the manual is published online and is therefore a highly dynamic dissemination tool. During the last work cycle, as mentioned above, the content of the manual was expanded by introducing new subsections: Resilience and Digitalization and information management for road owners and operators.

The first topic has already been published and is available in both English and French, while the second topic is currently being published and should be accessible within 2024.

Below you will find some information about the content of these new subsections and the reasons that led the technical committee to include them in the online manual.

### 3.1 Resilience management as a response to climate change

In recent years, many highway agencies have begun to focus on methods of managing adverse events that impact on the operation and service of road infrastructure. The focus of asset management activities is shifting from preventing threats or events that may occur and affect the performance of the asset itself to a new, comprehensive, “Resilience-based” approach to accelerate the recovery of the asset once disruptive events have occurred (see Figure 2).

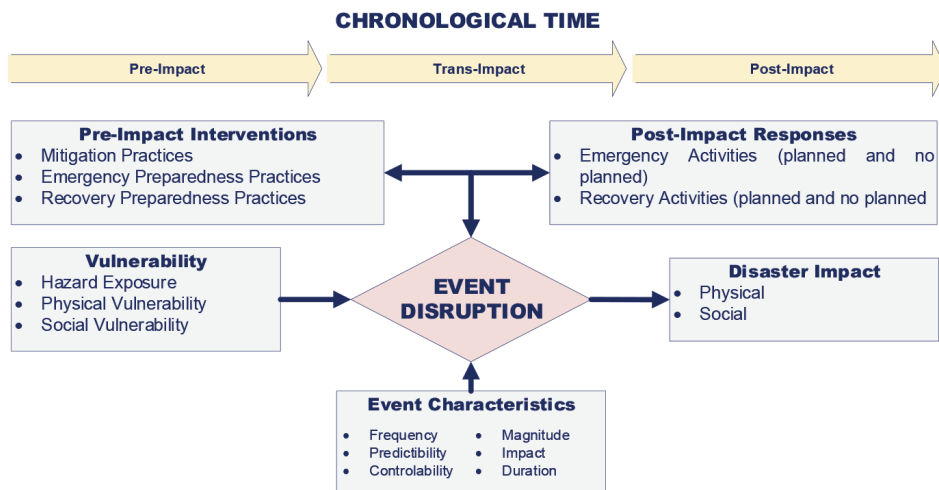


Figure 2 Contributing factors and possible actions in the three phases that characterize the occurrence of a disruption event in road infrastructures

This section of the manual explains how the concept of resilience can be integrated into asset management and is divided into four parts. The first part provides a brief definition of resilience and emphasises the difference between risk and resilience. Based on the definition of resilience, the second part outlines the steps necessary to incorporate a resilience assessment into road asset management processes. The third part focuses on resilience evaluation metrics, as the latter represent a fundamental step in their inclusion in road asset management systems. The approaches proposed in the literature are briefly explained, highlighting their strengths and weaknesses [3].

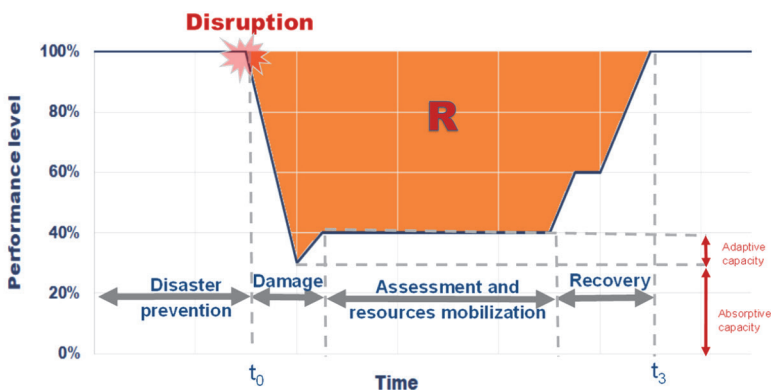


Figure 3 Hazard and disaster management scenario [3]

The fourth part shows the strategic approaches that can be used to improve resilience. These can be categorised into the following groups depending on the factors contributing to resilience: proactive actions, if they are concerned with improving robustness and redundancy, and post-event actions, if they are aimed at increasing resourcefulness and speed of recovery.

### **3.2 Information management: the relationships between AM and BIM**

Information systems are among the key elements of asset management systems. Digitalisation and virtual reality have led to a revolution in the field of information management (IM), which initially focused on the planning and construction phase of buildings (BIM). The ISO 19650 standard was a milestone in the field of BIM and recent versions of the standard have emphasised the importance of extending the general principles of information management not only to the operational phases, but also to linear or horizontal infrastructures as some define the roads, railways, pipelines, etc. One of the important concepts introduced by the standards is to promote the spread of non-proprietary data representation formats that enable interoperability, i.e. the use of information within different software applications. This sector is evolving rapidly and large-scale applications for the management of linear infrastructures are still very limited.

However, this section of the manual aims to open a window that explores the potential of this new approach to information management in the context of physical asset management, with particular reference to road infrastructure networks.

As this is a topic that many technicians are not yet very familiar with, a first part of the section is dedicated to introducing the nomenclature and concepts of IM as presented in the ISO 19650 standards. It also provides basic guidance for the implementation of information systems that comply with the ISO 19650 standards. The synergies between linear physical asset management systems and the ISO 55000 standards are then shown.

This section of the manual ends with the illustration of an extensive and detailed case study which allows the reader to appreciate the practical potential that the previously illustrated concepts can offer.

The maturity of the application of information management criteria in the context of linear or horizontal physical asset management systems is not comparable to that of the other topics covered in this PIARC RAMM manual, and the difference is noticeable. However, this section has been started with the idea that it can provide an impetus for the development of information management in road network management systems and that the results of this development can allow the manual to be improved and updated in the coming years, which, as already emphasised, is a dynamic tool.

## **4 Conclusion**

Road asset management, i.e. the coordination and optimisation of financial, operational, maintenance and other activities and the management of the associated risks, enables road administrations to increase the value of the road infrastructure entrusted to them. For this reason, PIARC Technical Committee 3.3 Road Asset Management has developed and continues to develop a framework for road asset management in accordance with ISO 55000 standards. It takes into account that this framework can be used by organisations at different levels of organisational competence to manage their assets.

The framework, which is freely available in the form of an online manual for road asset management, builds on the long-standing work of the Technical Committee, which has made updates over time to incorporate new and useful topics for road asset managers. The changes range from updates to the current content to the introduction of new case studies and translations into new languages.

## References

- [1] Asset Management Manual, PIARC (World Road Association), <https://road-asset.piarc.org/en>, February 2024.
- [2] Sedgewick, R.: A 21<sup>st</sup> Century Model for Disseminating Knowledge, Lecture at MIT, <https://openlearning.mit.edu/events/21st-century-model-disseminating-knowledge>, February 2024.
- [3] International Organization for Standardization. (2014). Asset management - Management systems – Requirements, ISO Standard No. 55001:2014, <https://www.iso.org/standard/55089.html>

