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GENERAL CONCEPT AND REQUIREMENTS FOR ASSET MANAGEMENT TRAINING COURSES

TECHNICAL COMMITTEE *D.1 ASSET MANAGEMENT*

WORLD ROAD ASSOCIATION
MONDIALE DE LA ROUTE

STATEMENTS

The World Road Association (PIARC) is a nonprofit organization established in 1909 to improve international co-operation and to foster progress in the field of roads and road transport.

The study that is the subject of this report was defined in the PIARC Strategic Plan 2016– 2019and approved by the Council of the World Road Association, whose members are representatives of the member national governments. The members of the Technical Committee responsible for this report were nominated by the member national governments for their special competences.

Any opinions, findings, conclusions and recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of their parent organizations or agencies.

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GENERAL CONCEPT AND REQUIREMENTS FOR ASSET MANAGEMENT TRAINING COURSES

TECHNICAL COMMITEE D.1 ***DISSEMINATION AND EDUCATION ROAD ASSET MANAGEMENT***

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EXECUTIVE SUMMARY

2019R38EN

GENERAL CONCEPT AND REQUIREMENTS FOR ASSET MANAGEMENT TRAINING COURSES

The Asset Management ISO 55000 standard defines an asset as

> *"… an item, thing or entity that has potential or actual value to an **organization**. The value will vary between different **organizations** and their stakeholders, and can be tangible or intangible, financial or non-financial"*. The same standard defines Asset Management as the *"... coordinated activity of an **organization** to realize value from assets"*.

Asset Management thus focuses first on the recognition of the external and internal stakeholders of the respective organization. From the perspective of the road administration or the concessionaire, the stakeholders are the owners of the road infrastructure, whose objectives are derived from the objectives of the road users and the road environment, while respecting ecological and social constraints. After that, Asset Management focuses on optimizing processes and decision-making tools, such as PMS or BMS, to achieve the best effect from the available assets.

During the cycle of 2011-2015, the comprehensive Asset Management Manual was developed and presented as a draft version at the 2015 Road Congress in Seoul, Korea. The first full on-line version of the manual was made available in 2017. Asset Management Manual is available on the PIARC website at the following link:

https://www.piarc.org/en/knowledge-base/road-assets-management/Road-Asset-Management-Manual/

PIARC recognized that technical progress and the dissemination and implementation of modern management techniques and skills are fundamental to increase efficiency and to gain maximum value from the road infrastructure asset. Only by adapting the technical solutions to the external and internal context of the respective organization, sustainable development and progress can be achieved.

Asset Management is not a "high level" discipline addressed exclusively to strategic management. On the contrary, Asset Management should be "lived" at every workplace in the organization, so that the managed asset, such as the road infrastructure, can be optimally operated, maintained and expanded. To achieve this, the organizational measures - ideally the implementation of an asset management system - must be undertaken and at the same time and the Asset Management awareness of all employees of the organization should be permanently sharpened. It is therefore important that some of the basic principles of Asset Management are familiar to the widest possible range of employees, so that they can plan and execute their business in accordance with their rules.

The most important target group for Asset Management education are senior and project management level staff. However, Asset Management has also become more and more interesting to people who are not working in road authorities and who are not directly concerned with the management of road infrastructure.

EXECUTIVE SUMMARY

There are three main forms of education which are recommended in PIARC's Asset Management education concept:

- Short courses (see Chapter 3),
- Long courses (see Chapter 4),
- Self-education (see Chapter 5).

Short courses have been the basis for Asset Management education in recent years. These courses are offered in various forms by numerous educational institutes worldwide. Short courses are usually one-day events or in special cases up to three days in length. The courses are intended to prepare the following three documents for each course, one of which is optional:

- Rough concept, includes a list of topics that should be presented during the training.
- Fine concept (optional), describes the detailed contents of the training courses for each topic specified in the rough concept.
- Course documents (PowerPoint presentations and additional files), including annotated slides with supporting exmplanations, when appropriate.

During the cycle 2016-2019, the members of Working Group D.1.2 created a series of short courses on Asset Management. Each of these short courses are designed to be delivered in approximately 30 minutes with the exception of one which is designed to be delivered in three hours. Presentations were prepared for each of the five chapters of the Asset Management Manual.

Although short courses are the basis for dissemination of Asset Management approach, the importance of long courses cannot be underestimated. The long courses include individual modules of 30 to 45 hours each.

When a new discipline is introduced, it is often difficult to find a suitable form of stationary education that meets the specific needs of participants. In such cases, interested participants make use of manuals, publications in specialist journals, conference contributions or articles on specialized websites. For this reason, it is anticipated that in the case of Asset Management, the interest in self-education will continue to grow for the foreseeable future.

During regular education courses, part of the training period is typically scheduled for independent work. Most of the time is needed for studying the literature, especially standards, regulations and case studies. The educational concept developed as part of the activities of Working Group D.1.2 must therefore also support self-education. The Asset Management Manual on the PIARC portal supports this task.

CONTENTS

1. STARTING POINT & PROBLEM DESCRIPTION

1.1. INADEQUATE MANAGEMENT SKILLS AS A BIG CHALLENGE FOR THE ROAD INFRASTRUCTURE SECTOR

Transport infrastructure, and the road infrastructure in particular, is typically the most valuable asset owned by the public sector in most countries. Once constructed, the asset must be maintained and upgraded successively. The consequence of the lack of systematic maintenance and renewal is accelerated deterioration of the asset condition which then requires a more expensive treatment to return the asset to a serviceable condition. The rational planning of the development and maintenance of road infrastructure has to consider the current and future expectations of society.

The road infrastructure managers are confronted with the following challenges:

- Significant restrictions on investment expenditures for road infrastructure due to competing funding needs. These restrictions have increaed since the financial crisis of 2008 with most agencies practicing a policy of austerity.
- Increasing shortage of suitably qualified employees.
- Strong competition with other funding needs.
- The necessity to plan the treatments in such a way that the level of service remains acceptable throughout the entire life-cycle fo the asset.
- Significant and burdensome restrictions on construction activities resulting from legal, technical and environmental boundaries. The questions of ownership, expropriation processes and other similar problems are serious obstacles to road infrastructure investment.
- Necessary coordination of road construction activities with other asset management activities such as road system expansion, underground utilities, lighting, traffic management and safety improvements.
- Difficult negotiations with lenders to finance road investments.
- Increasing complexity of tenders and contracts. The legal issues are an excessive burden to the manager.

While facing these challenges, the technical issues often play a subordinate role for several reasons. The technical qualifications of the staff in road authorities and road construction contractors, as well as their professional skills, are often at a high level. The differences in technical training are becoming ever smaller worldwide. The exchange of students and the associated knowledge promotes technical progress. In addition, many of the construction contractors that operate worldwide, employ personnel of the respective region and thus contribute to the dissemination of new technologies and skilled practitioners.

The situation is different with respect to the personnel qualifications that are required for the management of transport infrastructure. The exchange of experience and best practices between managers is considerably more difficult than between technicians. This is primarily due to the fact that most technical solutions can be deployed universally throughout the world, while management solutions must always take into account the individual context of the respective organization. The management solutions must therefore be developed in the individual countries and in the particular organizations.

Moreover, commonly used managerial methods and techniques derived from the past, concentrate on systematical response to problems as they arise, with the application of technical solutions. This is a sound approach. It generally allows for appropriate solutions, even if not always oriented toward the long term. Nonetheless, social expectations and requirements for modern infrastructure are constantly growing. In order to meet these challenges, road infrastructure administrators must reach for new methods, adequate to address contemporary conditions. Methods need to include comprehensive organizational strategies that provide utilities with the means to meet the top challenges such as aging infrastructure, high attrition and high customer expectations.

The new discipline of Asset Management (see Chapter 1.2) assists in developing management solutions that take into account the state-of-the-art on the one hand and the respective maturity level on the other. It offers a common platform for the implementation of management solutions tailored to local requirements in the increasingly complex decision-making environment. However, in order to make a valuable contribution to the use and creative extension of Asset Management, professionals working in this discipline should be familiar with the fundamentals of this new discipline. This affects all with ambitions to successfully manage the road infrastructure, including engineers and representatives of other disciplines. Asset Management provides the appropriate tools and, above all, the common language between the representatives of different disciplines.

Asset Management is not a "high level" discipline addressed exclusively to strategic management. On the contrary, Asset Management should be "lived" at every workplace in the organization, so that the managed asset, such as the road infrastructure, can be optimally operated, maintained and expanded. To achieve this, the organizational measures - ideally the implementation of an asset management system - must be undertaken and at the same time and the Asset Management awareness of all employees of the organization should be permanently sharpened. It is therefore important that some of the basic principles of Asset Management are familiar to the widest possible range of employees, so that they can plan and execute their business in accordance with their rules.

In recent years, PIARC has noted that although awareness of the necessity and advantages of Asset Management is increasing in the individual countries, the degree of maturity of its implementation differs widely. Some Anglo-Saxon states, in particular Australia, New Zealand and the UK, have had great success in disseminating the discipline and, as a result, have significantly improved the efficiency of their infrastructure management. In most other states, however, the establishment of Asset Management is not yet fully adequate. The aim of the working group Dissemination and Education of the Technical Committee Asset Management, established in the 2016-2019 cycle, was to extend the scope of the discipline through proposals for targeted training and educational courses and specialist publications.

The basic principles of Asset Management are documented in the ISO 55000 standard. The hermetic and formal language of the ISO standard makes it difficult to understand and limits the spread of standard suitable training and continuing education. In this case, PIARC recommends following the Asset Management Handbook. The Asset Management Manual complies with the general and universal principles of Asset Management and with general practices for road infrastructure management.

Many management positions in the road sector are held by engineers who have direct influence not only on technical decisions, but often also on the management solutions which influence the

design and further development of management procedures. Similarly, many engineers have laid the foundations for economic approaches. Such examples show how important it is to combine engineering competence with management knowledge and skills.

1.2. ASSET MANAGEMENT FOR INCREASING MANAGEMENT COMPETENCE

1.2.1. Asset Management as a new Discipline

Asset Management is a term that is used by more than one discipline. If one enters "Asset Management" into Google, the search engine delivers more than 100 million results with many related to financial asset management. In recent years, professionals thinking and acting Asset Management are a driving force for the progress optimizing the benefits from transportation assets. However, others use this term only as a catchword with which one can decorate texts and utterances.

Asset Management has been the subject of significant discussion worldwide which plays a vital role among road management professionals. However, the term “Asset Management” is often used in a way that is not in line with the intentions of the professionals that contributed to the creation of this new discipline more than 20 years ago. Even though there are numerous initiatives to promote Asset Management in the road sector and to explain its nature and its main principles, it is necessary to specify the term “Asset Management” to avoid misunderstandings and to implement modern tools and procedures more efficiently.

With the foundation of the discipline Asset Management in the mid-1990s, especially in Australia, New Zealand and the UK, a process of continuous rethinking began. The unique nature of this new discipline considers the asset from the perspective of the respective organization, which is the asset's owner or operator.

The emphasis of the organization is no coincidence. It stresses that all procedures, methods and techniques have to consider the framework of the respective organization. This framework is typically referred to as the "context" of the organization. It is impossible to decide on the appropriateness of a technical solution without knowing this organizational context and without confronting the solution with the external and internal constraints of the organization. Therefore, there are no objectively proper procedures, but those which are aligned with the objectives of an organization and which respect and fulfil its relevant boundary conditions. The identification of stakeholders and their goals as well as all relevant restrictions is the starting point for the decision for the selection of appropriate technical procedures. Thus, Asset Management also deals with technical and economic issues, but always from the perspective of an organization.

1.2.2. Asset Management Standards

The expansion of Asset Management, especially after the first standard, PAS 55[1], published in 2004, led to a breakthrough in the perception of assets and in particular infrastructure assets.

The group that developed Asset Management, first and foremost the Institute for Asset Management (IAM) and the British Standardization Institute (BSI), have been particularly interested in infrastructure assets from the beginning. The first issue of PAS 55 in 2004 was titled *"Specification*

[1] The Institute of Asset Management: PAS 55-1:2004, Part 1: Specification for the optimized management of physical infrastructure assets, PAS 55-2:2004, Part 2: Guidelines for the application of PAS 55-1, 2008

for the optimized management of physical infrastructure assets". This document was directed toward authorities that were responsible for the management of infrastructure such as airports, water and energy systems and road infrastructure. Only the second edition from 2008[2], after the interest of owners and operators of other asset classes has grown, focused on *"physical assets"* in general. The ISO 55000 standard released in 2014 focused not only on infrastructure but on all technical assets.

In order to ensure that the ISO 55000 is of a universal nature and applies to different disciplines and fields, the rules and requirements had to be described in a fairly general way in the standard. On the other hand, this universality disappoints those who were hoping for solutions to specific questions. Sometimes, the versatility of the content, formulated in the norm, leads to interpretive issues. Moreover, the strongly formalized language used reduces the circle of users.

That is why many sectors have decided to develop their own "quasi-standards" and manuals to specify and clarify the general rules and requirements of the standards ISO 55000[3] and to present them for practical applications. Thanks to the improved "readability" and the "user-friendly" structure and language of these documents, the practical application of the rules formulated there is increasing.

A number of other disciplines addressed to managers of various asset types have thus emerged around Asset Management. **Figure 1** shows the connection between some of these semi-disciplines with each of them representing a derivation of Asset Management based on its superordinate rules.

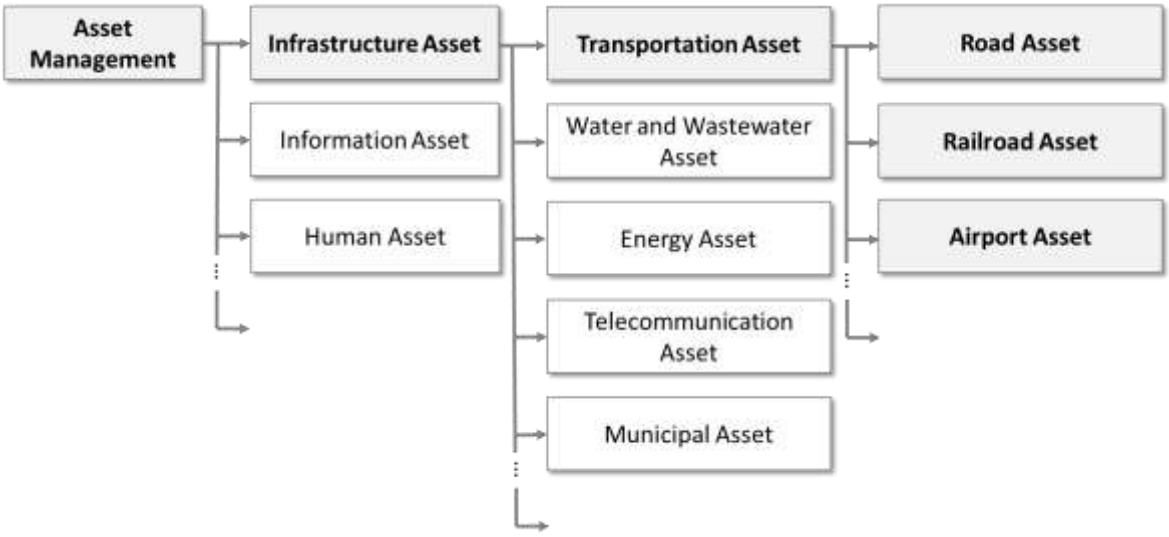


Figure 1: The links between selected semi-disciplines of Asset Management.

When reading various documents and manuals for the implementation of Asset Management for different types of infrastructure, it becomes evident that the general requirements and rules are similar or even identical. Nevertheless, these documents still keep their practical and professional relevance which helps to explain the high popularity of the standard for Infrastructure Asset Management: *International Infrastructure Management Manual (IIMM)*, whose latest edition of 2015 also followed the ISO 55000 standard[4].

[2] The Institute of Asset Management: PAS 55-1:2008, Part 1: Specification for the optimized management of physical assets
[3] Asset Management – Overview, principles and terminology (ISO 55000), Management systems – Requirements (ISO 55001), Management systems – Guidelines for the application of ISO 55001 (ISO 55002)
[4] Institute of Public Works Engineering Australia (IPWEA): *International Infrastructure Management Manual*, 5th edition, 2015

A strong interest in the new approach was the result of many factors with global nature. The world has gradually entered a phase where not only profit and technical progress, but the aware usage of products and services is crucial. Uncritical promotion of the application of procedures, even those that have become established worldwide, without considering the respective technical, social, economic, legal, cultural or ecological context would not be sustainable and contradictory to the basic principles of Asset Management. The regional and global economic aspects and in particular the differences between the developed or developing economies and the different levels of awareness, developmental maturity and capacities of the specific organizations play a crucial role in the decision-making process.

The advantages of the systematic application of Asset Management rules and principles, considering the organizational context in contrast to a "purely technical" approach, have been documented in many publications using of specific examples. It is very important to spread and promote these rules and principles. In the case of road infrastructure, the benefits for society and the economy from the implementation of the Asset Management approach are particularly high. For this reason, the general rules of (modern) Asset Management and the interpretation of the requirements derived from them for all technical processes must be spread out as widely as possible. Some of these Asset Management principles are not widespread yet and must be included in the education programs.

1.2.3. Mistakable use of the term “Asset Management“

If one follows discussions of road construction professionals in many European countries, the term Asset Management is often used for the entire spectrum of technical and economic aspects associated with road infrastructure management in the broad sense. In this understanding, Asset Management is sometimes the sum of Pavement Management Systems (PMS), Bridge Management Systems (BMS) and possibly also other accompanying systems, such as drainage, geotechnical features and sign management. In such an interpretation, Asset Management fulfills the role of an aggregator for all these systems. This explains why it is often referred to as the "complex management of road infrastructure." However, the intention of the teams that have laid the foundations for Asset Management and numerous experts who act in accordance with ISO 55000 standards is a different one.

While the subject of the Pavement Management System is pavement, the central subject of the Road Asset Management is not only the road infrastructure asset but also the organization responsible for managing the road infrastructure. This highlighting of the organization and its unique characteristics was a breakthrough in the rational management of assets. The definition of an asset already emphasizes its connection with the organization.

The ISO 55000 standard defines an asset as *"… an item, thing or entity that has potential or actual value to an **organization**. The value varies between different **organizations** and their stakeholders, and can be tangible or intangible, financial or non-financial”*. The same standard defines Asset Management as the *"... coordinated activity of an **organization** to realize value from assets”*.

Asset Management thus focuses first on the recognition of the external and internal stakeholders of the respective organization, especially owners and operators, and its objectives as well as on other relevant conditions. It also focuses on optimization processes and decision-making tools, such as PMS or BMS, to achieve the best whole life performance of the assets. In addition, action

compliant with Asset Management requires that the entire *"asset portfolio"* remains in focus, i.e. not only the road infrastructure but also other physical assets that enable the organization to function, such as machinery, buildings, technical equipment and other asset types as human assets, information systems and intangible assets. Also, financial assets should be considered (**Figure 2**).

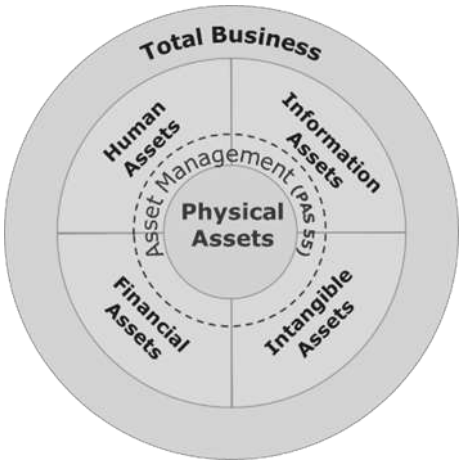


Figure 2: Types of asset taken into account by Asset Management (PAS 55).

Asset Management is typically performed at different levels. At the object level, the entire life cycle is optimized. The efficiency of the system is optimized at the network level (e.g. the entire road network or sub-networks). Asset Management also focuses on the entire technical portfolio of the respective organization, i.e. it also takes into account, for example, the technical equipment or real estate of the road authority or concessionaire. Asset Management System according to PAS 55 or ISO 55000 is oriented to all these three decision levels (**Figure 3)**.

Figure 3: Decision-making levels in Asset Management (PAS 55).

1.2.4. Asset Management vs. Managing Assets

The term "Asset Management" is used to describe different approaches. As a consequence, the addresses of various publications and educational offers are often (unconsciously) misled.

The discussion on the clear labelling of "technical" Asset Management (e.g. PMS) and organization-focused Asset Management has been going on for some time. In order to avoid misunderstandings, a distinction is made between *"Asset Management"* and *"managing assets"*. The importance of this distinction has even motivated the International Organization for Standardization ISO to comment on the subject. The Technical Committee for Asset Management Systems of ISO, TC 251, which is responsible for the development and maintenance of the ISO 55000 family of standards has published the paper *"Managing Assets in the context of Asset Management"* in May 2017[5]. In the introduction to this document the following is provided:

This document addresses a simple question: Do you mean Asset Management or Managing Assets?

People and organizations have been caring for assets since mankind first invented tools. Over the years we have derived entire disciplines to help define the best ways to care for those assets through their lives and as such we have been Managing Assets for ever. With the advent of the formal discipline of Asset Management some 20 years ago there has been a development of structured approaches to assure stakeholders that those care activities are focused on deriving value for the organization and not just promoting 'gold-plated' care arrangements. In this pursuit Asset Management and Managing Assets are not alternatives.

It must be emphasized that Asset Management is not an advanced form of managing assets and that there is no predominance of the Asset Management approach over the managing asset approach. It will always be necessary to optimize all technical and economic processes such as pavement monitoring and condition assessment, procedures for optimizing the resource distribution or the life-cycle planning, and to disseminate the corresponding expertise.

At the same time, it must be recognized and accepted that the successful, practical implementation of a procedure depends not only on its technical maturity but also on its compliance with the context of the respective site and the particularities of the respective organization. In recent years, the Asset Management discipline has developed a valuable framework of universal management procedures and approaches which have been successfully implemented in practice in many sectors, including road management. These management methods also are disseminated in Asset Management education.

As part of the activities of the Working Group D.1.2, a short (30 minutes) and a long presentation (2 hours) explaining the fundamentals of (Road) Asset Management have been prepared.

1.3. CONTRIBUTION OF PIARC TO THE DEVELOPMENT OF ASSET MANAGEMENT

PIARC has been supporting and promoting modern forms of road management for years. Several innovative approaches in this field can be traced back to the initiative of various PIARC committees. PIARC has always been at the cutting edge of technology and has tried to disseminate modern

[5] https://committee.iso.org/sites/tc251/home/news/content-left-area/news-and-updates/new-article-managing-assets-in-t.html [accessed July, 15th 2018]

methods among road authorities worldwide, still respecting local conditions and particular degrees of maturity.

As early as 1999, intensive work on asset management began in the Technical Committee on Road Management (C6). When the new discipline of Asset Management was spread by the work of The Institute of Asset Management and in 2004 by the first Asset Management semi-standard (PAS 55), PIARC began gradually creating the frameworks for the implementation of this new, general approach among road authorities. Since that time PIARC has constantly supported the new discipline of Asset Management and has made efforts to support this development through the activities of various technical committees.

PIARC always followed the following principle:

- Discovering and explanation of the new approaches or procedures,
- Investigation and evaluation of experiences and practical applications in particular countries,
- Formulation of PIARC recommendations for the future developments.

In 2005, the Technical Committee on Road Management (C6) published a report *"Asset Management for Roads - an Overview"*. In this report we can read:

> *"A very great deal of work has been done in recent years in developing the Asset Management concept. At the forefront have been OECD, PIARC, and road administrations in the United States, Finland and Australasia. The US Federal Highway Administration established an Office of Asset Management in 1999. But, as far as we know, no country has yet implemented a fully operational comprehensive Asset Management framework".*

This report is considered to be one of the first ever explaining the general rules for the application of modern Asset Management to the road sector. At this earlier stage, the experiences with the implementation of Asset Management at different levels of development worldwide were also presented and assessed. However, it should be stressed that almost all of the practical applications described in this PIARC report were related to Managing Assets rather than to Asset Management (see chapter 1.2.4 *"Asset Management vs. Managing Assets"*).

In 2008 Technical Committee C4.1 Management of Road Infrastructure Assets published a further report devoted to Asset Management *"Asset Management Practice"*. In this report, a bridge was built between the universal rules of Asset Management and the possible applications in the road sector (we would say Managing Assets today). Finally, the examples from different countries were presented and the recommendations for the implementation of Road Asset Management were made.

Key Performance Indicators (KPIs) are an indispensable component of any Asset Management System. They are sometimes referred to as High Level Indicators. In 2012, the Technical Committee D.1-Management of Road Infrastructure Assets published a report: *"High Level Management Indicators"* in which stakeholders in Road Asset Management and the Key Performance Indicators suitable for them were formulated. This report was a milestone on the way to establishing the rules for Asset Management in the road sector and is still considered an essential reference work.

Road Asset Management issues were also discussed in other PIARC committees. In 2013, the Technical Committee D.2 - Road Pavements discussed in its report *"Maintenance Methods and*

Strategies" the aspects of maintenance methods, strategies and measures in connection with the implementation of Asset Management. The report thus provides a very important contribution to the link between the organizational aspects of Asset Management and the practical aspects of maintenance planning.

In a further report, "*The Importance of Road Maintenance*", published by PIARC in 2014, a clear statement was formulated to focus on the principles of Asset Management and also to take into account the just published international standard, ISO 55000 Asset Management:

> *"Clear evidence has emerged of an international consensus on the need for adopting an asset management approach. Recent years have seen consistent recommendations from the International Transport Forum (…), the American Association of State Highway and Transportation Officials (…), the International Infrastructure Management Manual (…) and the international standard ISO 55000 (…). The key aspects which underpin all approaches to asset management, based on evidence from case studies, show the real benefits of adopting an asset management approach."*

In 2016, Technical Committee 1.5.1 Risk Management published the report *"Role of Risk Assessment in Policy Development and Decision-Making"*. In this report was also highlighted the necessity of implementation in asset management of risk management according to the standard ISO 31000 Risk Management. Numerous case studies from several countries were also presented and discussed. This was an important further contribution to the implementation of Asset Management according to international standards.

The current version of the *"Asset Management Manual"* also strongly takes into account the fact that the application of an Asset Management approach, including ISO 55000, provides new impetus for increasing efficiency in the road sector.

The sharpening of managers' awareness of the link between organizational and technical aspects in holistic Asset Management was also the subject of numerous contributions to PIARC seminars.

The above excerpt from some recent PIARC reports and publications shows that the topic of modern Asset Management (and not just Managing Assets) has already been dealt with in earlier cycles and in various Technical Committees and has made a significant contribution to the further development of the discipline of Road Asset Management.

2. REQUIREMENTS FOR THE TRAINING MODULES

2.1. TARGET GROUPS AND EDUCATION FORMS

The most important target group for Asset Management education are senior and project management level staff. However, Asset Management has also become more and more interesting to people who are not working in road authorities and who are not directly concerned with the management of road infrastructure. Such target groups include:

- Representatives of local governments,
- Construction companies,
- Banks investing in infrastructure,
- Insurance institutions,
- Representatives of the media,
- Other disciplines, e.g. the automotive industry.

There are three main forms of education which are recommended in PIARC's Asset Management education concept:

- Short courses (see Chapter 3),
- Long courses (see Chapter 4),
- Self-education (see Chapter 5).

2.2. GENERAL TERMS

The most important terms used for describing the Asset Management education concept are explained below.

The educational projects are implemented within the framework of education faculties. An education faculty can offer training courses, e.g. under the name "Asset Management for the Local Government," as closed and time-limited sequences of training (courses) which are carried out during a longer period. The courses can also be repeated.

This can have different shapes, e.g.:

- Teaching subject and postgraduate studies at the university,
- Permanent program of an education institute,
- A training course or a closed series of training.

The education faculty organizes the training course(s). A training course is always limited in time and focused on specific topics. It could be a one-day, a multi-day (e.g. weekend or a week) training, a one-week summer school or even a semester-long teaching course at the university. A training course is mostly common for all involved participants.

Each training module has specialized subject-matter and consists of several training topics. **Figure 4** illustrates the hierarchy of these educational categories.

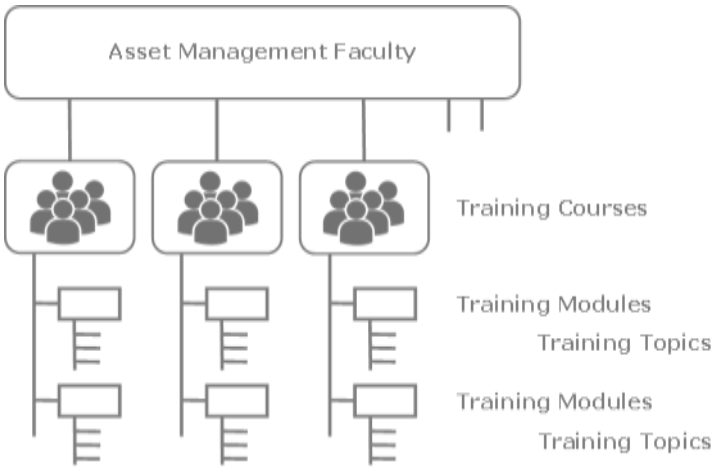


Figure 4: Hierarchy of educational categories.

2.3. TYPES OF TRAINING MODULES

The training modules are the basic elements and "bricks" of all of the training courses. The courses are assembled from training modules depending on customer needs.

The modules form closed units and need to be completed at the pace desired by the customer. The contents of the modules must be unambiguous so that the customer recognizes the content.

The Asset Management modules provided are combined in the following main groups:

- General modules,
- Specialized (technical) modules,
- Modules with methods and tools.

Figure 5 shows the connection and relation between these modules.

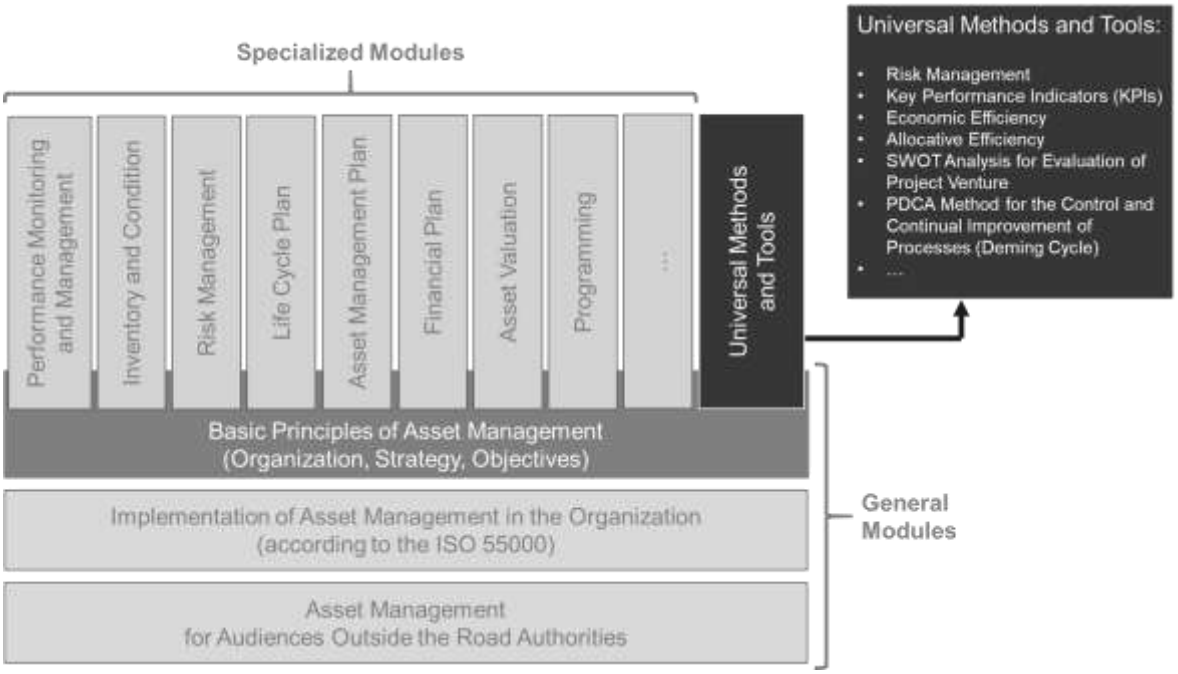


Figure 5: General structure of Asset Management training modules.

2.3.1. General modules / Basic principles of Asset Management

The general module refers to the rules of Asset Management and explains its basic principles and the advantages of applying Asset Management in road authorities. It addresses general issues such as AM Policy, AM strategy, AM objectives and so forth. This general module also describes the most important specialized topics and their mutual relationships, but without going into specific details.

For some participants, it is possible to complete the Asset Management course with this module only to gain basic knowledge of Asset Management which may be used to acquire knowledge for the management of all types of infrastructure assets.

For other participants, this module would serve as an introduction to the further Asset Management education and as guidance in assembling a detailed educational program, i.e. setting of specialized modules in a goal and task-oriented way.

2.3.2. General modules / Implementation of Asset Management in the organization

With the introduction of the ISO 55000 standards by the International Standards Organization in 2014, users have access to a well-recognized set of rules. The Asset Management System defines the organizational framework for Asset Management. The Asset Management System includes:

- Asset Management Policy,
- Asset Management Objectives,
- Asset Management Strategic Plan (SAMP),
- Asset Management Plan(s).

In addition to these core elements, a number of processes are defined which are necessary for planning, support, operation, evaluation and improvement of the system.

Figure 6 shows the processes and the associated components of the standard. The numbers refer to the individual chapters of the ISO 55001 standard[6].

[6] Heller, S., Balck, H., Alfen, H.W., Korn, M.: Guidelines für ein Infrastructure Asset Management im Freistaat Bayern, Darmstadt/Leipzig, 2018 (unpublished)

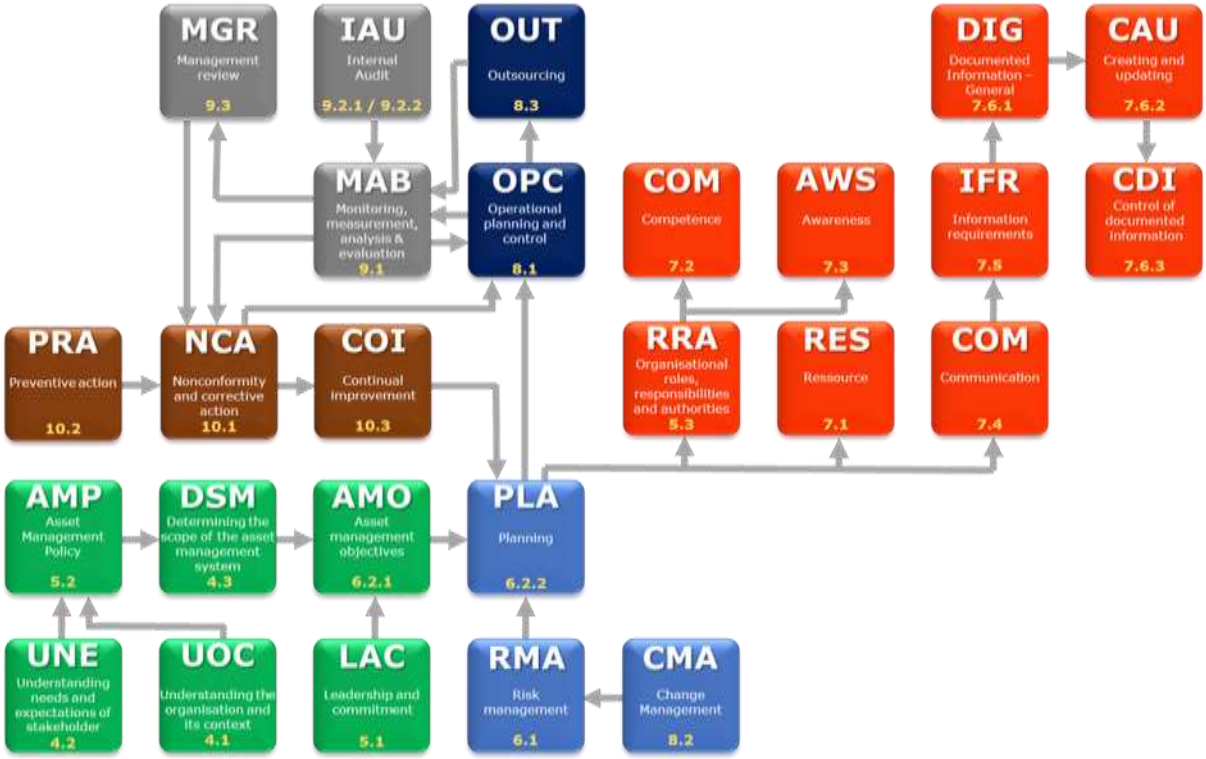


Figure 6: Asset Management System (in the organization).

The primary purpose of these modules is to prepare the respective organization (usually the road administration) for the implementation of Asset Management Systems according to ISO 55001. An important part of this is to adapt the technical procedures to the previously defined objectives and the external and internal context of the organization.

Often, but not always, the organization strives for certification according to ISO 55001. In this context, this module could be an important "bridge" between the universal ISO 55000 courses and the specialist courses.

2.3.3. General modules / Asset Management for audiences outside the road authorities

Asset Management has recently become of more interest to professionals who are not working in road authorities and who are not directly concerned with the management of road infrastructure. Such target groups include:

- Representatives of local governments,
- Construction companies,
- Consultants,
- Banks investing in the infrastructure,
- Insurance institutions,
- Representatives of the mass media,
- Other disciplines, e.g. the automotive industry.

Experience from several countries show that these target groups are also interested in Asset Management training courses. Asset Management provides an important linkage between the road administration and those institutions mentioned above.

2.3.4. Specialized modules

As a rule, the specialized modules represent the majority of the whole training offer on the educational market for Asset Management. Most of the course participants are interested only in the specialized modules, since they are focused on the solution of technical issues. Such modules cover subjects as:

- Performance Monitoring and Management,
- Inventory and Condition,
- Risk Management in Road Asset Management,
- Life Cycle Plan,
- Road asset valuation.

The PIARC-compliant Asset Management training principles formulate additional requirements for specialized modules. They are always presented in the context of Asset Management. Above all, the general objective of the particular activity, its role in Asset Management, its place within the Asset Management Plan and the connections to other key activities are explained.

Each specialized module consists of the following four parts (**Figure 7**):

- **Fundamentals**: Explanations of the contents and general objectives of the particular activity for the whole Asset Management System, the role within the Asset Management Plan and the crossing point to the other modules.
- **Requirements**: The requirements the module has to fulfill in order to contribute to achieving the organization's goals, depending on the particular maturity level of Asset Management within the organization.
- **Best Practice**: Presentation of proven practical solutions, but also demonstration and discussion of problematic solutions.
- **Tools**: Aids for supporting the work with the module, very often infomration technology (IT) solutions, e.g. PMS.

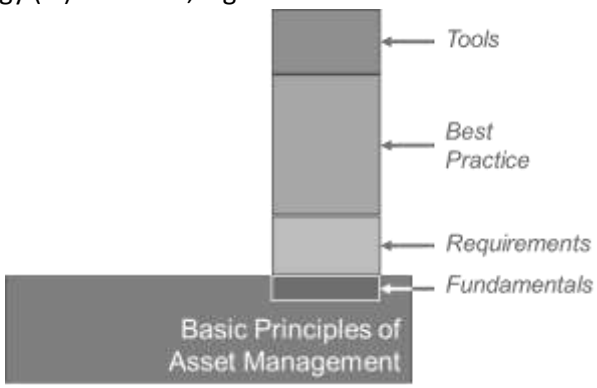


Figure 7: Required components of specialized modules.

Many institutes offer courses that focus exclusively on using tools for detailed Asset Management questions. Although the need for tool-oriented training is never questioned, it is suggested that they always include the remaining three parts (fundamentals, requirements and best practice).

2.4. MODULES WITH METHODS AND TOOLS

Asset Management uses numerous universal methods and tools that have been applied in other fields such as:

- Risk Management,
- Key Performance Indicators (KPIs),
- the Deming Cycle,
- the SWOT (Strengths, Weaknesses, Opportunities and Threats) analysis,
- the economic-efficiency analysis include the triple bottom line approach,
- selected optimization tools.

The efficient use of such universal tools and methods is the prerequisite for the active and creative application of Asset Management in practice. Experience shows that a lot of professionals lack adequate knowledge to apply these tools in practice.

3. SHORT COURSES

3.1. INTRODUCTION

Short courses have been the basis for the activities in the field of Asset Management education for several years. They are offered by numerous educational institutes worldwide in various forms (for a detailed description see the Report of the WG D.1.2 "*Survey of existing Asset Management courses from around the world*").

The short courses are usually one-day events or in special cases last up to three days and are held either at the client's location (in-house course) or a central venue. An example of a special type of short course is a summer school which usually takes up to five days.

PIARC's intention is to spread the importance of the new discipline of Asset Management and to present the advantages of its implementation in addition to the dissemination of best practices for educational forms and content.

The knowledge gained to date indicates that this task is of a permanent nature and must be continuous since the discipline of Asset Management is fairly new. The standardization by the ISO only took place in 2014, and the awareness of the importance of this field, as well as its practical applications, is still at a low level.

Secondly, the partly innovative educational patterns and organizational forms proposed in this cycle (2016-2019) have yet to be validated before the final solutions can be implemented. Continuous improvement of the developed solutions with greater inclusion of the participants and institutions involved is essential. Every educational institution involved in the preparation and implementation of short courses has to solve the organizational and logistical tasks and ensure that the courses are state-of-the-art and meet the requirements of the customer.

Working Group D.1.2 was able to concentrate exclusively on this second goal. As far as the organization of the courses is concerned, WG D.1.2 has limited itself to ensuring the required professional level of the short courses.

3.2. PREPARATION AND DOCUMENTATION OF THE SHORT COURSES

It is assumed that the short courses are offered by specialized educational institutes and directed to the employees of a company (mostly in-house courses) or to the broader spectrum of participants from various institutions (at a central venue) who are interested in enhancing their qualifications and skills in a particular subject.

Most educational institutes often offer a wide range of courses and are therefore not always able to evaluate the technical content of the courses provided by external trainers by their staff. The required evaluation refers to the technical correctness and the client's expectations (required training profile). This is particularly important for a relatively new discipline, such as Asset Management, that still leads to confusion and misinterpretations. Therefore, the Working Group D.1.2 proposes to establish a group of experts who can verify and validate the course concepts.

The courses are provided as PowerPoint presentations and include the preparation of three documents for each course, one of which is optional (**Figure 8**):

- Rough concept

- Fine concept (optional)
- Course Documents (PowerPoint-file and additional files)

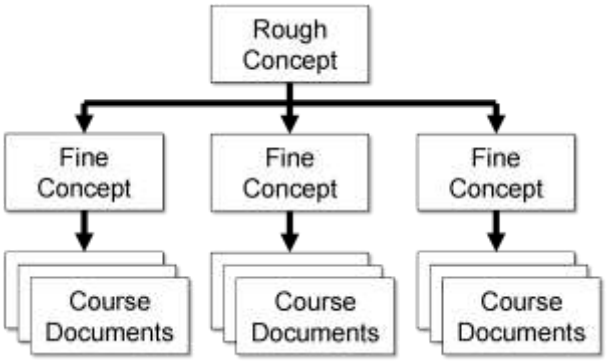


Figure 8: Documents for short courses.

3.2.1. Rough concept

The rough concept includes a list of topics that should be presented during the training and contains the following information:

- Target audience,
- Goals of the training and desired results,
- Necessary skills and knowledge of the participants,
- Duration of the training.

The rough concept is generally customized by the training provider based on the perception of market demand. It can also be requested by the customer (i.e. road authority) as an element of their education strategy. An excellent solution for this is an in-house training for one customer or training for two or more customers with similar needs. In the case of open courses, the rough concept is usually presented on the homepage of the training provider. One example of a rough concept is presented in **Appendix 1**.

3.2.2. Fine concept (optional)

The optional fine concept describes the detailed contents of the training courses for each topic specified in the rough concept. These contents must correspond with the goals and expectations of the interested participants defined in the rough concept. Based on the rough concept, the training institution (course provider) will ask the chosen trainer or several qualified trainers to prepare the fine concept. The fine concept is provided to the participants for review prior to the training session. An example of the fine concept can be seen in **Appendix 2**.

3.2.3. The course documents

The course documents include presentation slides with comments and additional remarks, when appropriate. They are delivered to the participants during the training courses or afterwards, either digitally, usually as a PDF file, or printed as a handout. If the training takes into account the interaction with participants in the form of textual or graphical contributions, they can be photographed or filmed and added to the course documents. The trainer is responsible for the preparation of the course documents. **Figure 9** shows the three groups of course documents.

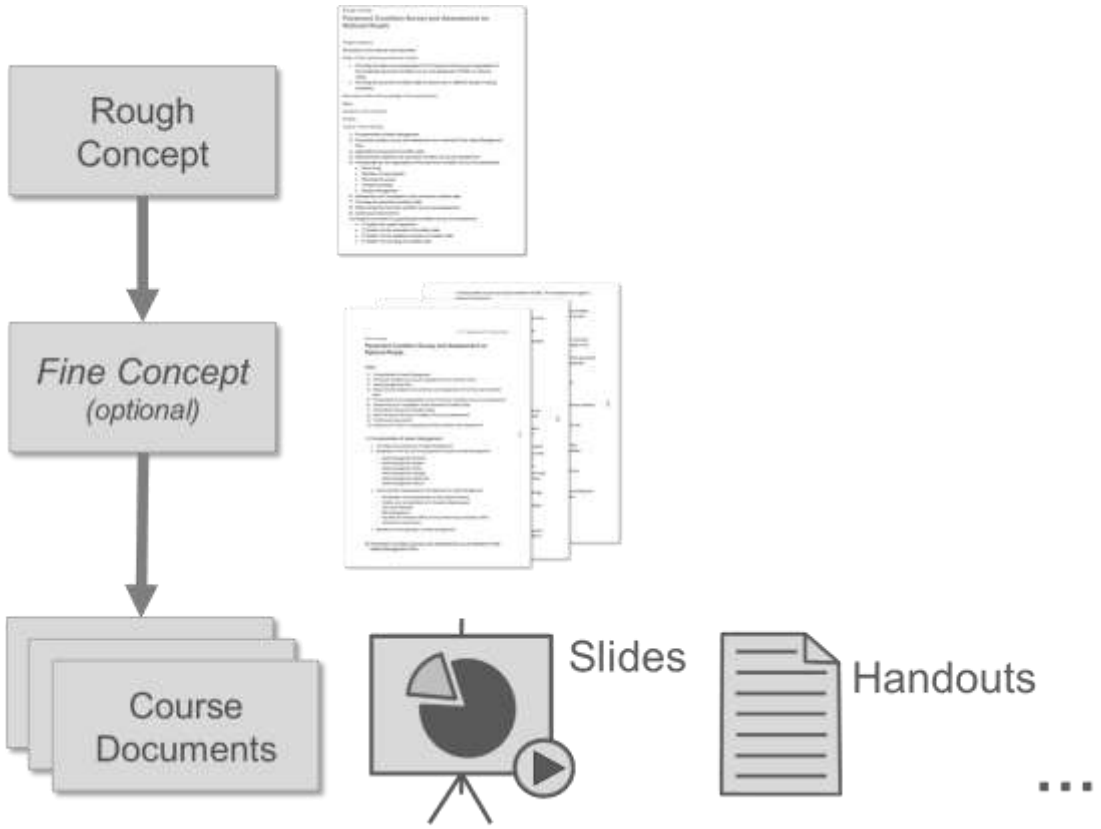


Figure 9: Preparation and documentation of the short courses.

3.3. EXPERTS

Experience shows that in most cases the educational institution alone is responsible for preparing the rough concept. In this way, it reacts to the demands of the market. The fine concept often includes the requirements of a target institution, i.e. a road administration, with a preference for the courses to be delivered in-house.

The rough concept thus contains information about the target audience, intended goals, required basic knowledge and duration of the training (**Chapter 3.2.1**). The course provider will rarely have the appropriately qualified teaching staff as permanent employees for the entire spectrum of learning services offered. That would not make sense because in the case of such a modern discipline as Asset Management, trainers with diverse, practical experience are needed, who are mostly employed by the administrations or consulting companies.

The fine concept (**Chapter 3.2.2**) may be regarded as an element of the offer of the applicant trainer if the educational institution has to carry out the call for tenders for the courses. For the evaluation of the fine concept, independent experts are often required to check the conformity of the fine concept submitted with the requirements of the rough concept. Also, they evaluate the extent to which the fine concept corresponds to the state-of-the-art. In such a case, the support of qualified experts for the evaluation of the fine concepts and later also for the assessment of other course documents (slides, handouts, etc.) should be obtained (**Figure 10**). Therefore, an expert register with up-to-date information on their qualifications and availability must be available to the education institutions (**Chapter 6.1**).

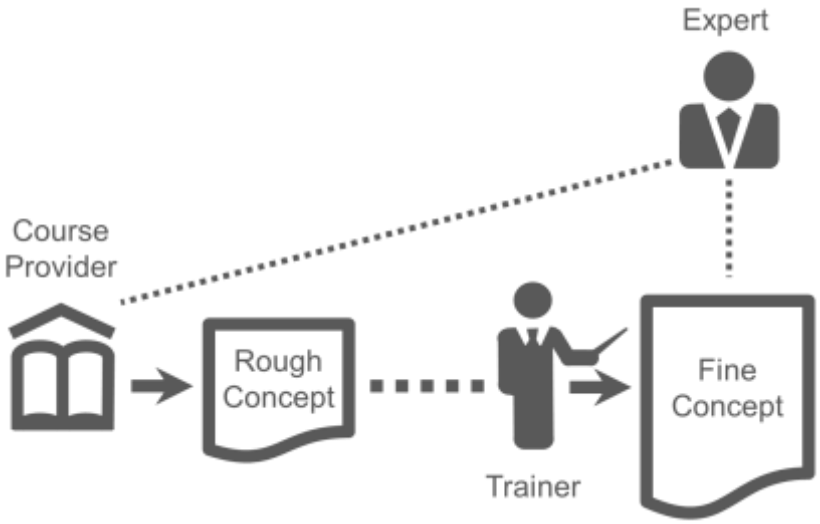


Figure 10: The role of experts in Asset Management education.

Examples of rough and fine concepts have been included in this report. In the current development phase, these examples shall only illustrate the structure of the particular documents. Their content should not be considered completed but rather customized for a particular training event or agency. It is possible and entirely acceptable that trainers prefer a different form of presentation than PowerPoint, for example, flipcharts or ready-made panels.

3.4. EXAMPLES FOR THE SHORT COURSES PREPARED BY WG D.1.2

3.4.1. The aim of the sample presentations

During the cycle 2016-2019, the members of Working Group D.1.2 created some elements of short courses as PowerPoint presentations. Each of these presentations are designed to be delivered in about 30 minutes with the exception of one module which is designed for a course of about three hours. The presentations provide a platform for discussing and elaborating the requirements for the courses.

The presentations were prepared following the chapters of the Asset Management Manual:

- Basic principles of Asset Management,
- Inventory and condition,
- Performance and monitoring,
- Risk,
- Life cycle planning.

Selected slides for each presentation are presented in **Appendix 3**.

The presentation on the basic principles of Asset Management was divided into two presentations: *"Basic principles of Asset Management"* and *"Implementation of Road Asset Management System."*

Furthermore, general guidelines were formulated for the presentations. However, the guidelines were primarily oriented on the form and some more general requirements. Since each presentation reflected the authors' individual experiences and preferences, they differed significantly. This allowed testing a wide range of different approaches to create the courses, thus offering a broad and comprehensive basis for further educational projects.

3.4.2. Use of the presentations & copyrights

As already mentioned, the presentations can be used freely by the educational institutions and trainers for educational purposes. If parts of the presentations have to be included in other presentations, the source must be specified. All elements of the presentations are free of third-party rights. This applies in particular to the figures and illustrations. The liability lies exclusively with the author or authors of the presentations.

3.4.3. Additional presentations

The presentations have been uploaded to the PIARC Portal Asset Management Manual. One of the goals of the portal is to continuously incorporate further presentations. They will be primarily created by the members of Working Group D.1.2 or by other members of Technical Committee D.1.

It is also conceivable to open the portal for the presentations of third parties, whereby certain content and quality criteria must always be taken into account. The expert group is entrusted with checking the compliance of the presentations with the formulated requirements (**Chapter 6.1**).

The presentations of third parties are also provided for free use and must meet the same copyright requirements.

4. LONG COURSES

Although short courses are the basis for dissemination of Asset Management knowledge, the importance of long courses cannot be underestimated. However, the general prerequisites for disseminating Asset Management via short and long courses differ greatly.

The long courses have a total length of about 30 hours and are offered primarily at universities. Unlike the short courses, the long courses extend over a longer period of time, usually one semester (15 weeks).

It is self-evident that the contents of the long courses are always determined by the specific characteristics of the respective university. Above all, the experiences and preferences of the professors are in the foreground. Many professors and lecturers have contributed to the development of the discipline of Asset Management, and they will focus on their vision during the lectures. It should also be noted that Asset Management is an interdisciplinary subject. Professors are therefore often supported by other people from the same or other faculties.

The structure of the long courses is strongly focused on the Asset Management Manual and the courses are to be prepared and made available online on the Asset Management Manual site for interested universities:

1. Management: Asset management implementation,
2. Management: Organization,
3. Management: Strategy,
4. Management: Performance Management,
5. Data and modeling: Inventory and condition,
6. Data and modeling: Performance monitoring,
7. Data and modeling: Risk,
8. Data and modeling: Life-cycle planning,
9. Planning: Asset Management Plan,
10. Planning: Financial plan,
11. Planning: Asset valuation,
12. Planning: Programming,
13. Application: Asset Management tools,
14. Application: Communication.

Taking into account that the manual explains WHAT the problem or goal of each issue is, the long courses will include three main concepts:

- HOW to solve the problem/HOW to achieve the goal,
- WHEN to solve it, and
- give EXAMPLES from similar experiences.

Each course lasts about two hours and includes approximately 50-60 slides. Comments and explanations will be added to each slide, especially to slides with little textual content.

The following elements are to be integrated into each presentation which refers to the specialist topics:

- Introduction/Fundamentals/Methodology: Explanations of the contents and general objectives of the particular activity for the whole Asset Management System, the role in the Asset Management Plan and the touch points to the other modules.
- Requirements: The requirements the module must fulfill in order to contribute to achieving the organization's goals, depending on the particular maturity level of Asset Management within the organization.
- Examples/Best Practice/Discussion: Presentation of proven, practical solutions, but also demonstration and discussion of problematic solutions.
- Bibliography.

5. SELF-EDUCATION

When a new discipline is introduced, it is often difficult to find a suitable form of stationary education that meets the specific needs of participants. In such cases, interested participants make use of manuals, publications in specialist journals, conference contributions or articles on specialized websites. For this reason, it is anticipated that in the case of Asset Management, the interest in self-education will continue to grow for the foreseeable future. Due to the growing complexity of decision-making practices and the decision-making environment, it will become increasingly difficult to ensure a good match between educational opportunities and specific individual needs. That is why self-education must be considered and supported actively.

Also, during the regular education courses, part of the training period is specifically intended for independent work. In the case of postgraduate studies, more than 50 percent of the total learning time is designated for this purpose. Most of the time is needed for studying the literature, especially standards, regulations and case studies. The educational concept developed as part of the activities of Working Group D.1.2 must therefore also support self-education. The Asset Management Manual on the PIARC portal supports this task well. However, it is necessary to advertise this work specifically and to update the manual regularly to keep up the required high level.

In addition, the portal will provide presentations on selected topics from the entire spectrum of Asset Management. Users of this information offer must be aware that this is a consistent and PIARC-compliant concept. The structure of the presentations and their contents must, therefore, be suitable for both the use within the regular education courses and individual education. So, we recommend supplementing the PowerPoint slides, which are clearly reduced to keywords or images, with explanatory texts. These texts can be written as a separate script or as notes directly in the PowerPoint file.

The associated experts should evaluate the presentations according to their ability to support self-education.

In addition to the Asset Management Manual and presentations, the most important literature sources that are best suited for self-education should be listed. The list is intended to be a "technical literary canon" and should remain relevant over a longer period of time (see Chapter 0 References).

6. SUPPORTING ACTIVITIES

The survey completed during this cycle clearly shows that some educational institutes offer complex training courses on Asset Management successfully. However, in most cases, the training is only available on selected topics without any connections between the single themes. In addition, the courses are either devoted to specialized technical topics of the road sector or topics of Asset Management as a general discipline, mostly in the context of the ISO 55000 standard, without regard to the road-specific concerns.

In order to meet the objectives of PIARC in a sustainable manner, it is necessary to offer the complex spectrum of Road Asset Management topics within the scope of one training program. All relevant technical content should be considered. This content should include both the general Asset Management principles and the special technical topics. Only a few organizations offer courses for different target groups. Nevertheless, the results of the study carried out were helpful for drafting the present concept.

The main task is to encourage and support the educational institutions in establishing a new educational field (faculty): Road Asset Management. Also, the concept will help to plan the courses and provide practical advice and aids for their realization.

The website of the PIARC Asset Management Manual:

https://www.piarc.org/en/knowledge-base/road-assets-management/Road-Asset-Management-Manual/

includes a specific section dedicated to the dissemination and education of Asset Management. It includes main aspects that may help both students and teachers to obtain information about educational offers and material regarding Asset Management (**Figure 11**).

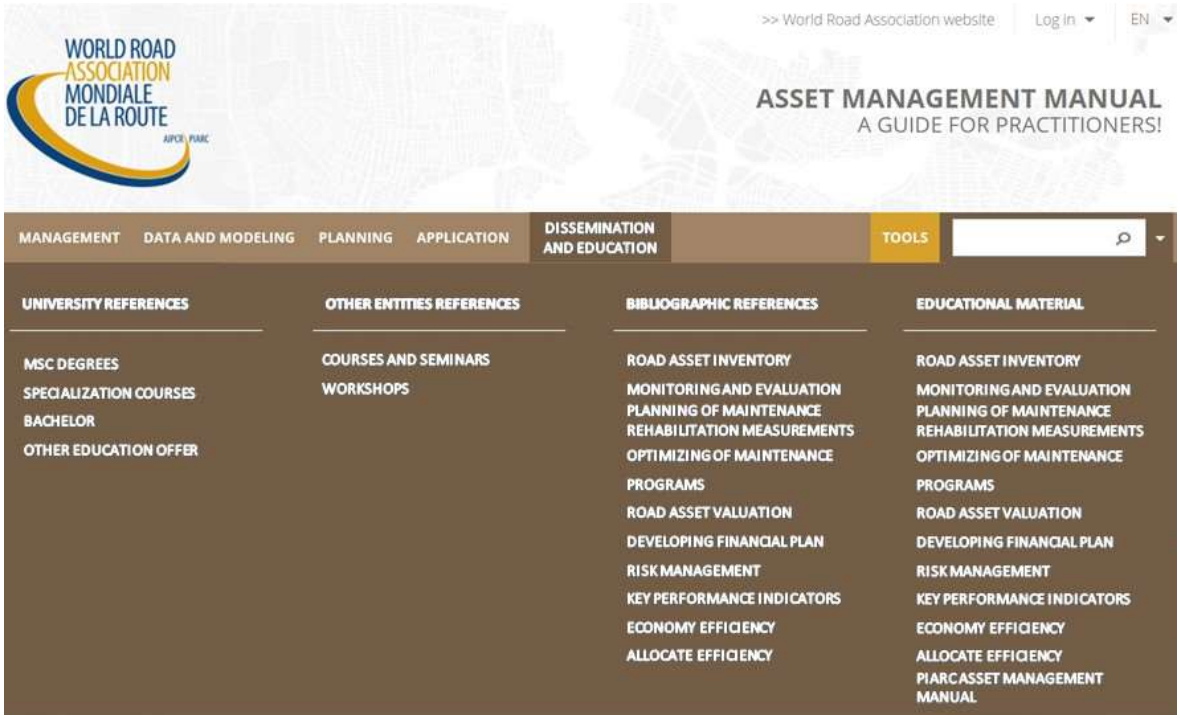


Figure 11: Website of the PIARC Asset Management Manual with a section dedicated to dissemination and education.

6.1. OBJECTIVE

For students, the dissemination and education section of the website outlines current offers from both universities and other entities. It also encompasses bibliographic references and offers educational material that teachers can use for their training sessions.

This section of the website aims to provide sources where to find adequate training courses in the field of Asset Management, being a worldwide reference for future training purposes. It allows both students to know the specialized education offer they should attend according to their needs, and teachers to have additional material to give their classes.

The training offers are divided according to the different areas, levels and profiles of knowledge, so that the desired education can be easily found. **Appendix 4** of this document includes a detailed description of the dissemination and education section of the manual.

6.2. MAINTENANCE

This part of the website will be maintained by the Technical Committee D.1.2 Dissemination and Education Asset Management, in collaboration with the Department "Civil Engineering: Construction, Infrastructure and Transport" from the Universidad Politécnica de Madrid.

The Technical Committee has developed a database of experts who will be involved in revisions of the technical content of the dissemination and education section (**Figure 12**).

. Any expert that would like to be a part of this process will need to be approved by the Technical Committee and the template included in **Appendix 4** of this document ("Expert's information") should be filled in.

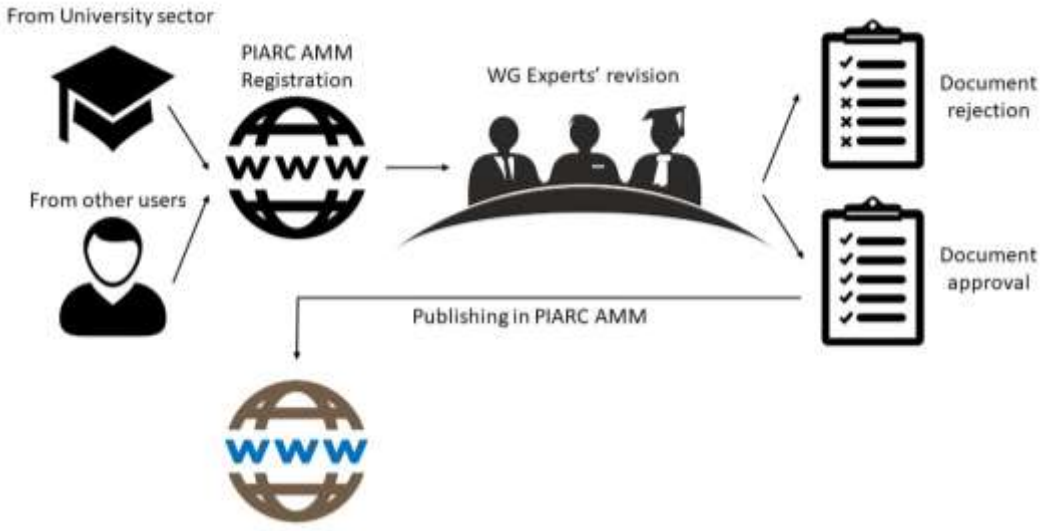


Figure 12: Involving experts in revisioning the technical content of the dissemination.

6.3. CONTENTS

All chapters of this section have a baseline structure according to subjects that should be covered in a certain way to obtain appropriate training in Asset Management. These subjects are Road Asset Inventory, Monitoring and Evaluation, Planning of Maintenance Rehabilitation Measurements,

Optimizing of Maintenance Programs, Road Asset Valuation, Developing Financial Plans, Risk Management, Key Performance Indicators, Economy Efficiency and Allocate Efficiency.

The dissemination and education section also contains a chapter about University references in which current university offerings and locations are described based on the level of title or degree that can be obtained, apart from the educational planning of the degrees, modules, subjects and ECTs.

The chapter dedicated to other entities includes information on courses, seminars and workshops, and their locations. There are also two chapters that contain bibliographic references and educational material, organized by subject.

This part of the website will include a section in which information or documents can be registered by any user. This information will be analyzed by the Technical Committee and published on the website if approved.

The process of publishing information on the website is as follows:

1. The document, from both the University sector and other kinds of users, should be registered on the website of the PIARC Asset Management Manual.
2. The document will be sent to the experts of the Working Group (according to their qualifications and specialization as per the Experts' Database).
3. The experts will review the document following the corresponding checklist (questionnaire for technical documents).
4. If the document is approved by the experts, it will be published on the website.

Thus, as mentioned above, the content of this section is divided into four sub-sections, which are described in the following subsections.

6.3.1. University references

This chapter describes the schemes and locations of current university offers based on the level of title or degree that can be obtained (Masters Degrees, Specialization courses, Bachelor or others), apart from the educational planning of the degrees, modules, subjects and ECTs.

Figure 13 shows the University offerings based on the level of coverage that each offer reaches according to the baseline structure of subjects. These subjects are: Road Asset Inventory, Monitoring and Evaluation, Planning of Maintenance Rehabilitation Measurements, Optimizing of

Maintenance Programs, Road Asset Valuation, Developing Financial Plan, Risk Management, Key Performance Indicators, Economy Efficiency and Allocate Efficiency.

			Management				Data and modeling				Planning				Applications	
		Subjects	Asset management implementation	Organization	Strategy	Performance management	Inventory and condition	Performance monitoring	Risk	Lifecycle planning	Asset management plan	Financial plan	Asset valuation	Programming	Asset management tools	Communication
Education level	**Offer**	**Training institution**														
First level	MsC Degree 1	University A	✓	✓		✓	✓		✓						✓	✓
	MsC Degree 2	University A		✓	✓		✓	✓			✓		✓	✓		
	MsC Degree 3	University B		✓			✓				✓					
	MsC Degree 4	University B	✓			✓			✓							✓
	MsC Degree 5	University C	✓	✓	✓	✓	✓			✓	✓			✓		
	MsC Degree 6	University D		✓			✓	✓						✓	✓	
	Specialization course 1	University A	✓	✓						✓						
	Specialization course 2	University A						✓			✓					
	Specialization course 3	University B	✓			✓					✓					
	Specialization course 4	University D	✓			✓									✓	
	Specialization course 5	University E		✓	✓						✓					
Second level	Subject 1	University A	✓	✓						✓						
	Subject 2	University A						✓			✓					
	Subject 3	University B	✓			✓					✓					
	Subject 4	University B	✓			✓									✓	
	Subject 5	University C		✓	✓						✓					
	Subject 6	University E	✓	✓										✓		
	Subject 7	University E	✓	✓										✓		
Third level	Seminar 1	University C	✓	✓						✓						
	Seminar 2	Institution A						✓			✓					
	Seminar 3	Institution B	✓			✓					✓					
	Seminar 4	Institution C	✓			✓									✓	
	Seminar 5	Institution D		✓	✓						✓					

Figure 13: Example of Asset Management educational offer according to subject's coverage.

The location of the offerings is displayed in a map, since the location is considered a crucial aspect. Finally, each educational offer is described in detail, including the corresponding syllabus.

6.3.2. References of other entities

This chapter is dedicated to courses, seminars and workshops given outside the university context. The structure of this section is similar to the previous one.

Before publishing in this subsection, the training offers will be reviewed by experts analyzing if the main aspects of Asset Management, according to PIARC's Asset Management Manual, are covered. The questionnaire these experts should fill in is attached to this document in **Appendix 4** ("Questionnaire for educational offer to be filled in by experts before publication into Dissemination and Education section").

6.3.3. Bibliographic references

This chapter contains bibliographic references, organized by subject. Each subject includes published websites, magazines and books that may be useful for the dissemination and education of each subject.

Before publishing in this subsection, the training offers will be reviewed by experts analyzing if the main aspects of Asset Management, according to PIARC's Asset Management Manual, are covered. The questionnaire these experts should fill in is attached to this document in **Appendix 4** ("Questionnaire for technical documents offer to be filled in by experts before publication into Dissemination and Education section").

6.3.4. Educational material

This last chapter contains educational material considered relevant for future Asset Management trainers/teachers. It is submitted by members of the Technical Committee and organized by subject.

Before publishing in this subsection, the training offers will be reviewed by experts analyzing if the main aspects of Asset Management, according to PIARC's Asset Management Manual, are covered. The questionnaire these experts should fill in is attached to this document in **Appendix 4** ("Questionnaire for technical documents offer to be filled in by experts before publication into Dissemination and Education section").

6.4. INITIAL DATA COLLECTION

For the successful dissemination of the Asset Management education initiative, it is necessary to obtain detailed information from the crucial addressees or other stakeholders about the training courses they can offer related to Asset Management.

Among the most important stakeholders are:

- Central or local governments,
- Ministers of Education,
- Ministers of Transportation and other Road Construction Authorities,
- Technical Universities.

The working group proposes to prepare a letter with a questionnaire and send it to the selected educational institutes. The questionnaire lists the most important topics of Road Asset Management.

The sample letters and questionnaire are attached in **Appendix 4** ("Questionnaire for educational offer to be filled in by experts before publication into Dissemination and Education section" and "Letters to potential stakeholders (examples)").

6.5. SUPPORT FROM EXTERNAL EXPERTS

The general concept of Asset Management education and the course materials published on the PIARC AM-Manual Portal can have a significant influence on the development of this new discipline. PIARC's responsibility in this regard should not be underestimated. At the same time, the capacities of the teams responsible for the development of the materials published are limited. Due to staff shortages and limited time, it is difficult to produce all documents affecting various Asset Management fields in equally high quality. Furthermore, the Asset Management discipline is still undergoing dynamic development, and some of the aspects are still in development stages. Therefore, it is particularly important to present the matters correctly.

To better legitimize the activities of the Working Group D.1.2 and the Technical Committee D.1, a group of external experts, should assess the results of the work. The concept of recruiting experts and the procedure for integrating them into the evaluation of products by a Working Group has already been developed and is described below. The realization of the concept is planned for the next cycle.

7. REFERENCES

The contents of the Asset Management education concept proposed by PIARC are created on universal and non-product-oriented principles. They are based on the PIARC *Asset Management Guide* and are compliant with other crucial reports developed by PIARC.

The fundamentals of Asset Management presented during the education are also in line with the most important Asset Management standards and well-established works. These include for instance:

[1] *The Institute of Asset Management: PAS 55-1:2008, Part 1: Specification for the optimized management of physical assets, PAS 55-2:2008, Part 2: Guidelines for the application of PAS 55-1, 2008 ISO 5500x,*
[2] *International Organization for Standardization: Asset Management – Overview, principles and terminology (ISO 55000), Management systems – Requirements (ISO 55001), Management systems – Guidelines for the application of ISO 55001 (ISO 55002),*
[3] *Institute of Public Works Engineering Australia (IPWEA): International Infrastructure Management Manual, 2015.*
[4] Austroads Guide to Asset Management, 2018

It is particularly important that the most important terms are defined uniformly. If these terms (e.g. "Asset", "Asset Management", "Asset Management System", "Risk" etc.) are defined in standards, these definitions shall be used.

The "PIARC courses" will be marked by the mission to spread the principles of Asset Management. If commercial products are to be presented within the framework of the courses, the presentation must take place in the general Asset Management context. Experience shows that this leads to increased acceptance on the part of the public administration.

To ensure that the programs of the courses remain stable over an extended period, a set of technical literature must be defined. This literature provides the basis for the trainer and the participants of the courses.

The most important literature is the PIARC *Asset Management Manual* and the standard works listed above. Moreover, the following additional positions of technical literature are recommended:

[5] *Woodhouse, J.: Asset Management is growing up. Evolution of the discipline. Core concepts. Setting standards: PAS55 to ISO55000, The Institute of Asset Management, February 2014*
[6] *Implementation Guide for an ISO 55001 Asset Management System. A Practical Approach for the Roads Sector in Europe, CEDR, October 2016,*
[7] *Total Asset Management Manual, NSW Government Asset Management Committee (GAMC), August 2003*
[8] *Asset Management Primer, US Department of Transportation, 1999*
[9] *Transportation Asset Management Guide, AASHTO, 2013*
[10] *Asset Management for Roads - an Overview, PIARC, TC C6 (Road Management), 2005*
[11] *Asset Management Practice, PIARC, TC 4.1 (Management of Road Infrastructure Assets), 2008*
[12] *Integration of Performance Indicators, PIARC, TC 4.1 (Management of Road Infrastructure Assets), 2008*
[13] *High Level Management Indicators, PIARC, TC 4.1 (Management of Road Infrastructure Assets), 2012*
[14] *Guidelines for Infrastructure Asset Management in Local Government, Provincial and Local Government, Republic of South Africa, Pretoria, 2009*

[15] *Keeping Europe Moving - A Manifesto for long-term, effective management of a safe and efficient European road network, European Union Road Federation (ERF), 2013*
[16] *Asset Management, Getting Started Guide*
https://suma.org/img/uploads/documents/asset_management_getting_started_guide.pdf

8. ABBREVIATIONS

Abbreviation	Explanation
BMS	Bridge Management System
BSI	British Standard Institution
IAM	The Institute of Asset Management
IIMM	International Infrastructure Management Manual
KPIs	Key Performance Indicators
KRIs	Key Results Indicators
PAS	Publicly Available Specification
PCSA	Pavement Condition Survey and Assessment
PIARC	World Road Association
PMS	Pavement Management System
SAMP	Strategic Asset Management Plan
SWOT	Strengths, Weaknesses, Opportunities, and Threats

APPENDIX 1

Example of a raw concept for the short course

ROUGH CONCEPT:
PAVEMENT CONDITION SURVEY AND ASSESSMENT ON NATIONAL ROADS

Target audience:
Employees of the national road authorities
Goals of the training and desired results:

- Providing the basis and prerequisites for the long-term planning and organization of the systematic pavement condition survey and assessment (PCSA) on national roads.
- Providing the pavement condition data for optimal use in different decision-making processes.

Necessary skills and knowledge of the participants:
None
Duration of the training:
4 hours
Topics of the training:

1. Fundamentals of Asset Management
2. Pavement condition survey and assessment as an element of the Asset Management Plan
3. Applications of pavement condition data
4. Requirements related to the pavement condition survey and assessment
5. Prerequisites for the organization of the pavement condition survey and assessment

- Set of rules
- Definition of sub-projects
- Planning the survey
- Tenders/contracts
- Quality management

6. Assessment and visualization of the pavement condition data
7. Providing the pavement condition data
8. Risks during the pavement condition survey and assessment
9. Continuous improvement
10. Systems and tools for supporting the condition survey and assessment

- IT-System for quality assurance
- IT-System for the evaluation of condition data
- IT-System for the statistical analysis of condition data
- IT-System for providing of condition data

APPENDIX 2

Example of a raw concept for the short course

FINE CONCEPT:
PAVEMENT CONDITION SURVEY AND ASSESSMENT ON NATIONAL ROADS (GERMAN EXPERIENCES)

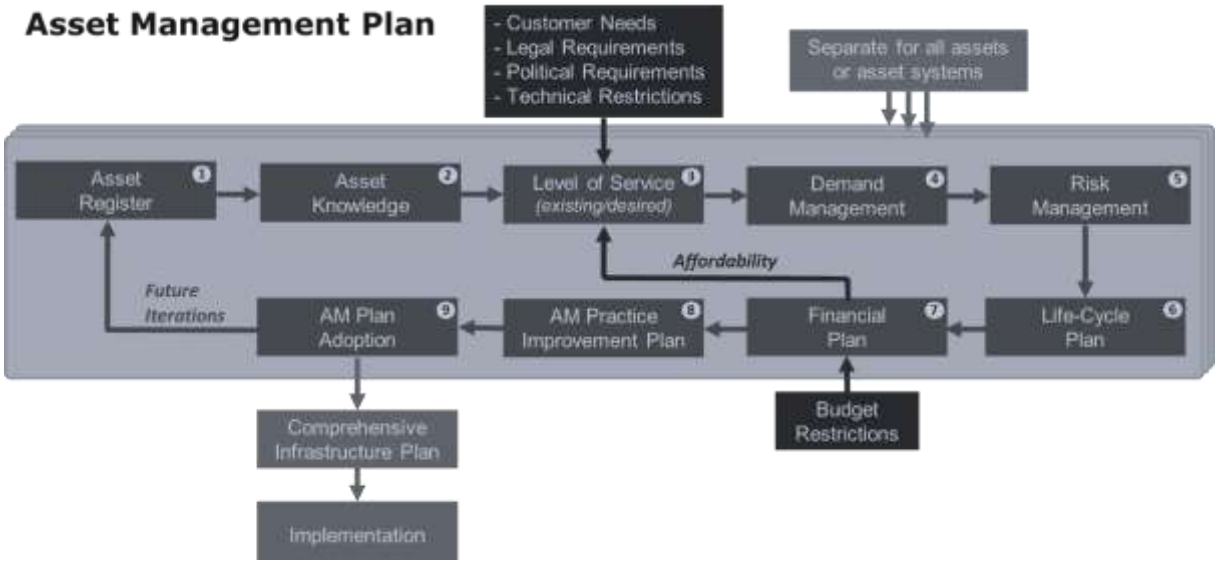
1) Fundamentals of Asset Management

- The historical development of Asset Management
- Explanation of the key terms and general principles of Asset Management:
  - Asset Management Pyramid,
  - Asset Management System,
  - Asset Management Policy,
  - Asset Management Strategy,
  - Asset Management Objectives,
  - Asset Management Plan(s).

- Most important characteristics of the approach to Asset Management:
  - Identification of the stakeholders and the target hierarchy,
  - Holistic view (consideration of all important asset groups),
  - Life-Cycle-Approach,
  - Risk Management,
  - Key Results Indicators (KRIs) and Key Performance Indicators (KPIs),
  - Continuous improvement,
- Benefits from the application of Asset Management.

2) Pavement Condition Survey and Assessment as an element of the Asset Management Plan

- Explanation of the Asset Management Plan and its main elements.



- Pavement condition survey as an element of the "Information and Data Collection" (Step 1).
- Importance of the pavement condition data for the single elements of the Asset Management Plan:
  - Asset Knowledge (Step 2),
  - Level of Service (Step 3),
  - Demand Management (Step 4),
  - Risk Management (Step 5),
  - Life-Cycle Plan (Step 6),
  - Improvement Plan (Step 7).

3) Applications of Pavement Condition Data

Network-wide pavement condition data is used for a variety of tasks. The applications of this data include:

- Basis for short and medium-term maintenance planning (PMS according to the budget scenario),
- Determination of financial requirements in order to achieve or keep a given condition (PMS according to the quality scenario),
- The basis for the long-term prognosis of pavement condition,
- Analysis of the safety potential,
- Supporting of the road safety auditing,
- Accounting for the road infrastructure,
- Performance monitoring of the maintenance policy (KPIs),
- Validation of the building materials and construction technologies,
- Data for the automotive industry.

4) Requirements related to the Collection and Assessment of the Pavement Condition Data

- There is a clear separation between the collection (measuring) and the assessment of the pavement condition data. The data collection is task-neutral, i.e. it provides the universal basis for as many different applications as possible (see list above).
- The results of the data collection are available as elementary data (and not as pavement condition quantity or value). The formats and contents of the files with this elementary pavement data must be defined exactly and unambiguously.
- The data collection is repeated at regular time intervals (e.g. every two, three or four years).
- The methods for collecting the data should be stable over a longer period of time, due to the analysis of the pavement condition dynamic and the prediction of pavement condition.

- The assessment and evaluation of the pavement condition data is always task-related.
- The quality of the collection results must be ensured by an independent company or the road administration, according to uniform rules that have been stable over a long period of time.

5) Prerequisites for the Organization of the Pavement Condition Survey and Assessment
In order to meet the objectives of the collection and assessment of the pavement condition data, certain prerequisites must be fulfilled.

Development and supply of a set of rules
The set of rules (or guidance) refers to all processes of the data collection and assessment as well as the binding data formats. It is the prerequisite for the comparability of the data in both the sub-networks and the subsequent survey campaigns, and thus the prerequisite for the analysis of the pavement condition development.
All sub-projects are listed in the set of rules and the requirements for the results' quality are defined there as well.

Setting of sub-projects
The entire survey campaign of collecting and assessing pavement condition data is divided into the following sub-projects:

- Provision of the network basic data (SP-N),
- Collection of pavement evenness (SP-E),
- Collection of grip (skid resistance) data (SP-G),
- Collection of macro texture data (SP-T),
- Collection of surface damage data (SP-D),
- Collection of bearing capacity data (SP-B),
- Quality assurance (SP-Q),
- Assessment and Evaluation of data (SP-A).

Planning of the condition survey
The data collection is organized and managed by the administration of the national roads. However, the representatives of the regional administration branches are always involved, too. A coordination group is formed, which includes the organizers (administration) and the companies involved.
The management of the national roads determines the scope of the collection and provides all necessary network data. This includes the network maps, the list of traffic lanes to be surveyed as well as the relevant elements of the road reference system.

Tendering, contracts
The data collection and the assessment can be carried out either by the specialized units of the road administration or by external companies.
The whole road network is divided into sub-networks. A sub-network is considered the smallest spatial unit of one survey contract. The single contracting (so-called "lot") can be carried out for one such sub-network and for one sub-project (i.e. the collection of pavement evenness on one sub-network).
It is possible to make an agreement with one contractor according to one or more lots.

Quality assurance
Quality assurance includes the following elements:

- Operating license of the monitoring vehicle (every year),
- Sample checks of measurement results by independent companies or administrations,

- Self-check of the monitoring company,
- Control of the monitoring progress (so-called early warning system),
- Checking the completeness of the measurement.

6) Assessment and Visualization of the Pavement Condition Data
The assessment and evaluation of pavement condition data can be realized by applying different methods. Each method of evaluation depends on the particular tasks (see point 3). The evaluation methods differ, among other things, according to the following criteria:

- The length of the evaluation sections (e.g. 100 meters),
- Indicators of the pavement condition,
- Statistical indicators,
- Patterns of the visualization.

The input data for the assessment represents in any case the elementary condition data.
In order to ensure the uniformity of the results and the comparability of the pavement condition data for the whole network of national roads, one unified method of assessment for supporting the maintenance planning is defined und implemented in the scope of the survey campaign. However, different methods can be used for other tasks and applications. This universal method of assessment and evaluation consists of the following steps:

- Splitting of the network into the evaluation sections,
- Aggregation of the elementary data among the evaluation sections and calculation of the pavement condition indicators (i.e. IRI or rut depth),
- Evaluation of pavement condition and computation of complex indicators (i.e. usage value or substance value),,
- Visualization of elementary data on road profiles,
- Visualization of indicator values on thematic maps,
- Calculation of statistical key figures (Key Results Indicators and Key Performance Indicators) for the sub-networks and their presentation on dynamic reports.

7) Providing the Pavement Condition Data
The pavement condition data is only valuable when it is integrated into the decision-making processes. If possible, this must happen shortly after the data collection, quality assurance and the evaluation. The goal is to provide the pavement condition data according to the requirements of the particular addressees.

8) Risks during the Pavement Condition Survey and Assessment
The most relevant risks include:

- The company charged with the pavement condition survey is not able to fulfill the commissioning properly. The consequence is a considerably delayed data delivery.
- A road accident occures during the collection of data. The consequence is again a delayed data delivery.
- The data is not recorded correctly.

All relevant risks must be identified and evaluated before starting the pavement condition survey and assessment campaign. Appropriate treatments must be carried out as well.

9) Continuous improvement
The technology for data survey is subject to constant improvements. The new, improved pavement indicators are developed to better consider the pavement condition data in the decision-making processes.
However, it must be ensured that the continuous improvement and progress in the pavement condition survey does not jeopardize the required continuity, which is the fundamental requirement on the pavement condition data.

10) Systems and Tools for supporting the Data Collection and Assessment
IT-Systems for quality assurance
The systems *MeldungOnline* and *TP0_Check* of the BASt (Federal Road Research Institute) for controlling the data collection progress (public domain).

IT-System for the verification of pavement condition data
The system *OnKo* has been implemented in all federal countries of Germany for the visualization and verification of elementary pavement condition data.

IT-System for the evaluation of condition data
The system *GeoRohRaste*r of the BASt (Federal Road Research Institute) for the assessment of the elementary data, for the unified computing of pavement condition indicators and for the pavement evaluation (public domain).

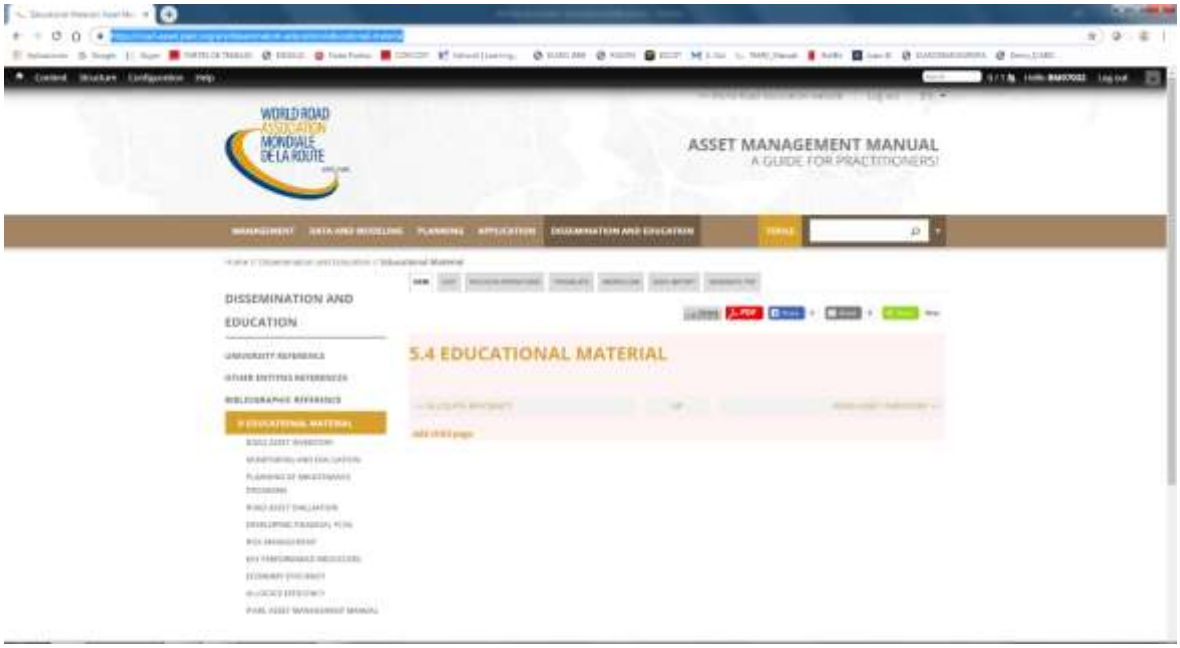
IT-System for statistical analyses of condition data
The system *hiATLAS* for the online presentation of Key Results Indicators and Key Performance Indicators on dynamic reports.

IT-System for providing condition data widely
The system *IT-ZEB* Server of the BASt (Federal Road Research Institute) for providing and visualizing current and historical pavement condition data online (public domain).

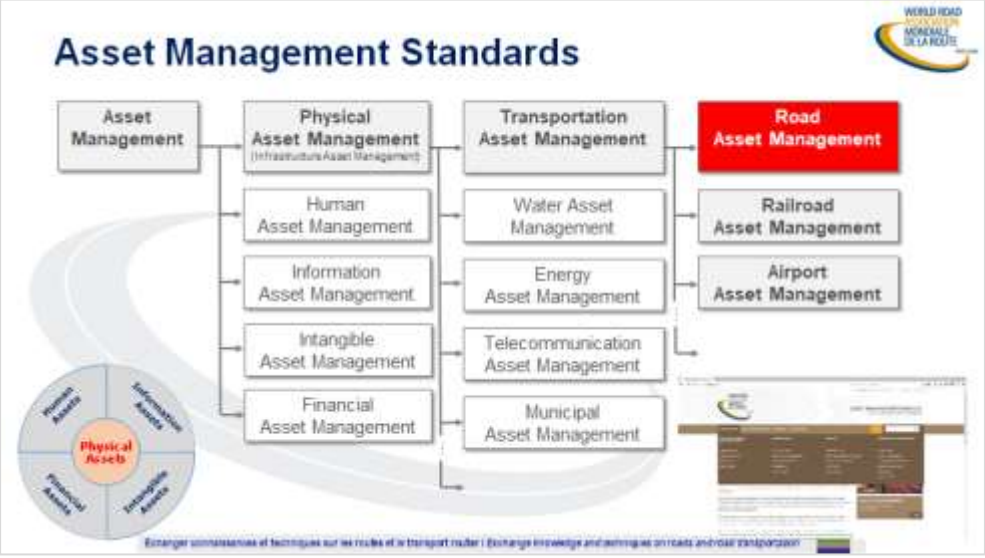
APPENDIX 3

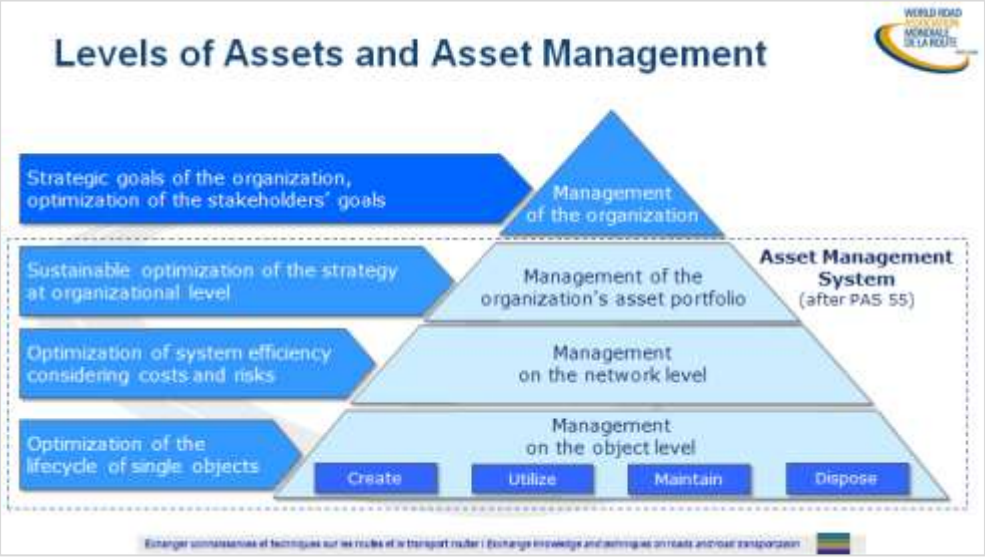
Selected slides for short-presentation.

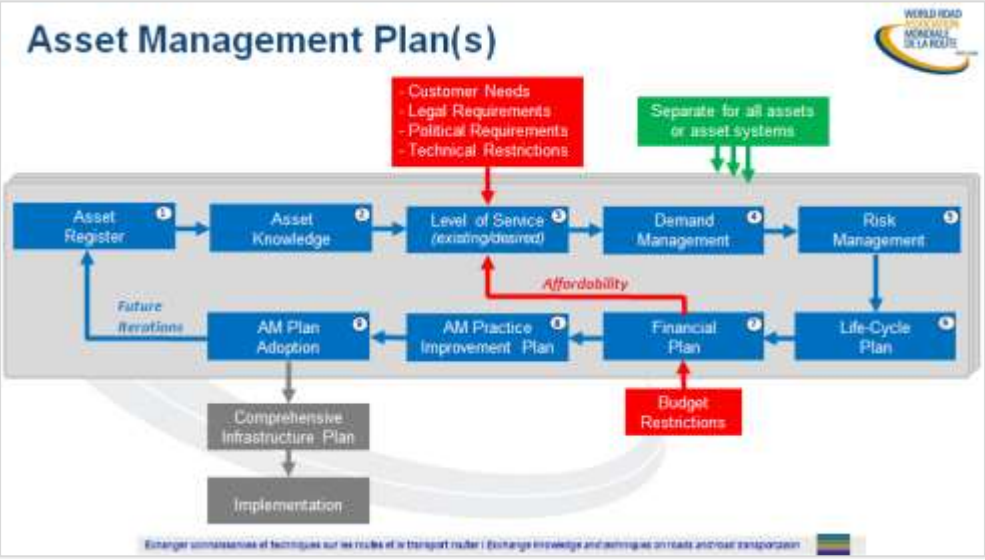
After the extension of the website with the Online Manual all presentations will be available here: https://road-asset.piarc.org/en/dissemination-education/educational-material



BASIC PRINCIPLES OF ASSET MANAGEMENT







IMPLEMENTATION OF ROAD ASSET MANAGEMENT SYSTEM

Levels of a road organizations maturity

For organizations with little or no data concerning their assets and little or no experience in undertaking analysis as well as agencies with a wealth of information, there are five key questions, as listed in the following table that are the goal to be able to answer.

Question
1. What is the current state of the assets?
What are the owned assets?
Where are located?
What condition is it in?
What is its remaining useful life?
What is its remaining economic value?
2. What is the required level of service/ performance level?
What is the stakeholders demand for services?
Are there regulatory requirements fulfilled?
What is the actual performance?
3. Which assets are critical to sustained performance?
How does it fail? How can it fail?
What is the likelihood of failure?
What are the costs to repair?
What are the consequences of failure?
4. What are my best operations investment strategies?
What alternative management options exist?
Which are the most feasible options for the road organization?
5. What is the best long-term funding strategy?
What revenues will be acquired?
What is the investment gap or surplus to meet asset condition goals?
What is the revenue gap to keep the asset within accepted risk tolerance level?
What would be the optimum mix of the following? i. Preservation and preventive maintenance ii. Reactive maintenance iii. Rehabilitation iv. Replacement
What is the revenue gap to keep the asset within accepted risk tolerance level?

Echanger connaissances et techniques sur les routes et le transport routier / Exchange knowledge and technique on roads and road transportation

Getting started

No matter the size of the road organization, its inventory, or the information and data it has concerning its assets, asset condition and network, the road organization should get started with the information it has.

Step 1:
Establish the asset management goals and objectives that align with the agency's mission, desired outcomes and business strategy. Getting started, questions to ask may include the following:

- What assets does road organization own and what condition are they in?
- Does the road organization have an inventory?
- Is the inventory and condition information of the road organization assets in a paper file or in a computer file, or does the road organization have a computerized management system?

...

Echanger connaissances et techniques sur les routes et le transport routier / Exchange knowledge and technique on roads and road transportation

Maturity models

Asset Management Maturity Scale

Road AM Maturity Scale Level	Generalized Description
Initial	No effective support from strategy, processes, or tools. There can be lack of motivation to improve.
Awakening	Recognition of a need and basic data collection. There is often reliance on heroic effort of individuals.
Structured	Shared understanding, motivation and coordination. Development of processes and tools.
Proficient	Expectations and accountability drawn from asset management strategy, processes and tools.
Best Practice	Asset management strategies, processes and tools are routinely evaluated and improved.

Echanger connaissances et techniques sur les routes et le transport routier / Exchange knowledge and technique on roads and road transportation

INVENTORY AND CONDITION

Data collection needs

In order to handle and manage large amount of data it must be managed in structured way. It is important that we can link data to reality. Data have to be structured and manage in a common language for us to collect and store the information as well as use it for analysis. When data storage is secured, inventory of assets must be started. Inventory of the assets which we want to manage is necessary to compare data over the years.

Step 1:
Inventory of all assets an agency wants to manage!

Inventory: What is my network?
- Local networks in states
- National road network
- Municipal road network

A common language:
- Network must be split up into sections who are manageable
- All sections should be identified with a unique name (preferably georeferenced)

Source: BRRC

Example of a database structure

Example from Sweden

Structured knowledge of assets (single individual → complete system)
- Asset register
- Carrier of metadata and maintenance data linked to the asset
- Maintenance contracts linked to the asset
- Documentation
- Maintenance program (PM)

Manages the operational maintenance process
- Controls the flow of work (Preventive and Corrective maintenance) to the right person and at the right time:
  Ordering, Planning/Coordination, Performance, Approval/Invoicing

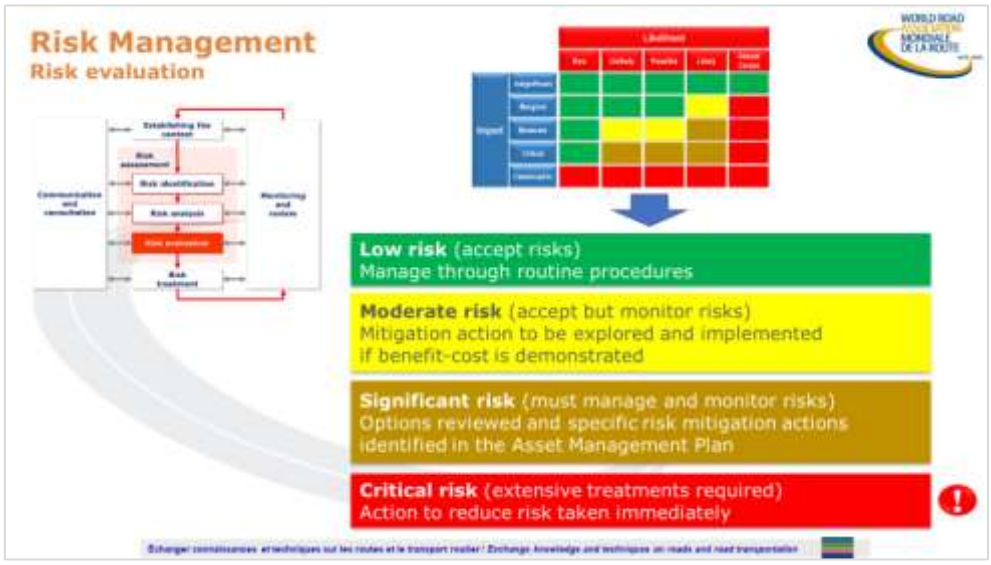
Control of the work that has been performed
- Corrective maintenance (CM) and Preventive maintenance (PM)

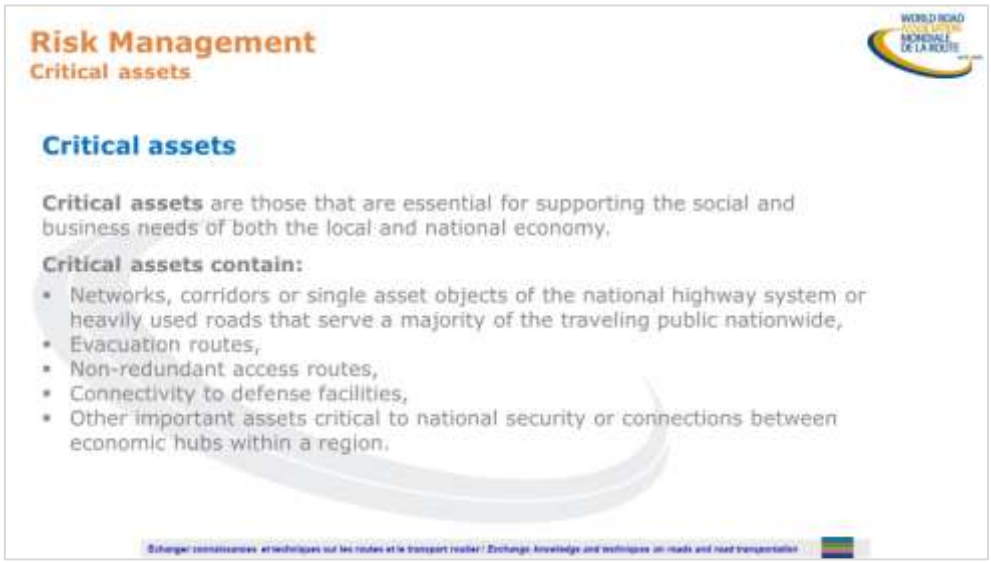
Create a basis for analysis and follow-up

Condition indices

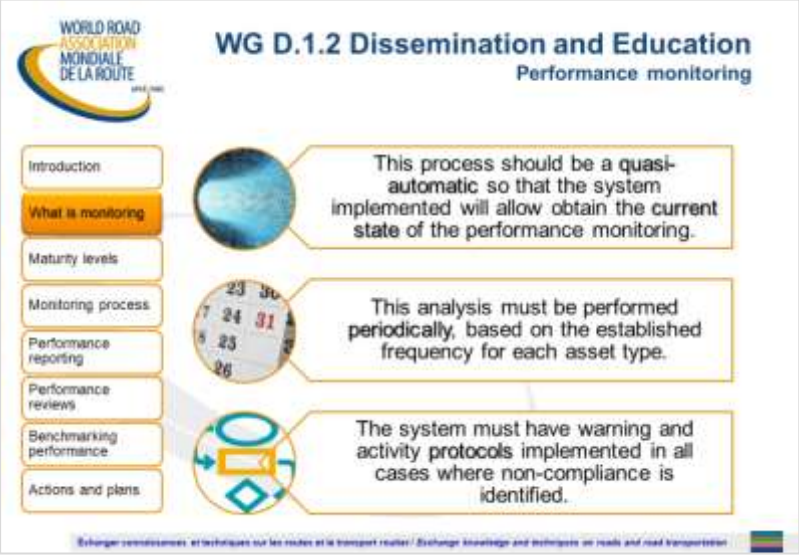
The following slides provide an exemple of a condition indicator for pavements over the lifespan of a road

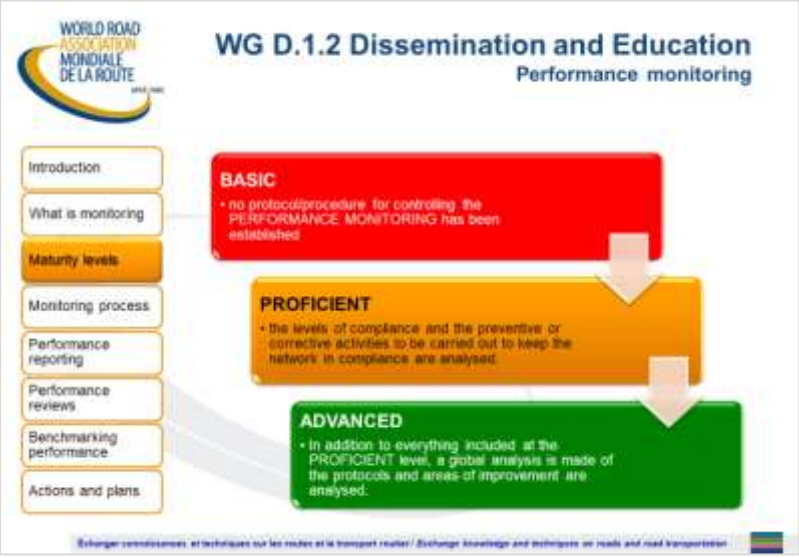
RISK MANAGEMENT

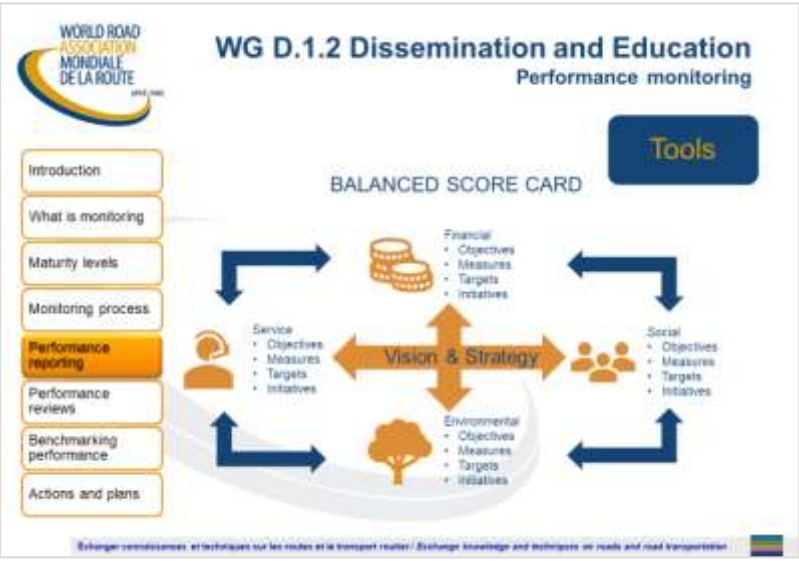




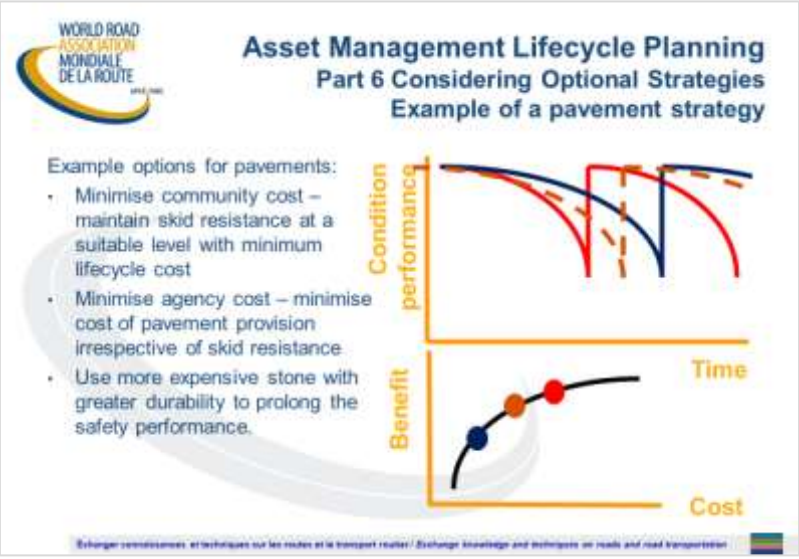
PERFORMANCE AND MONITORING







LIFE-CYCLE PLANNING



APPENDIX 4

Additional documents to dissemination and education

EXPERTS' INFORMATION

Specialist information

General information

Name:
Surname:
E-mail:
Company:
Level:
Degree certificate:

Languages: ☐Spanish ☐ English ☐ French

Member ID:

Contact details

Business number:
Mobile:
Fax:

Business Address

Primary address:
State/Region:
Country:

City:
ZIP/Postal code:

Fields of Knowledge

Asset Management

Survey Condition: ☐Structural ☐Functional ☐Other

Signaling ☐

Pavements ☐

Defense works ☐

Bridges ☐

Other assets ☐

Road network			
Highways	☐	National Highways	☐
Regional Highways	☐	Secondary Highways	☐
Unpaved Roads	☐		

Traffic			
Traffic counting Stations	☐	Traffic evolution	☐
Levels of service	☐	Origin and destination studies	☐

Other complementary			
Financial Literacy	☐	Environmental Issues	☐
Road Safety	☐	Pavement Maintenance System	☐
Integrated Maintenance Services	☐	Winter Road Maintenance	☐

QUESTIONNAIRE FOR EDUCATIONAL OFFERS TO BE FILLED IN BY EXPERTS BEFORE PUBLISHING INTO THE DISSEMINATION AND EDUCATION SECTION

QUESTIONNAIRE FOR EDUCATIONAL CONTENT ACCORDING TO PIARC ASSET MANAGEMENT MANUAL

Training institution:		
Training title:		
Director of training:		
Director's contact details:		
Training education level:		1st for Msc Degree or Specialization course, 2nd for University Subject, 3rd for University/Institution Seminar, 4th for University/Institution Workshop
Training duration:		
ECTS credits, if any:		

Main aspects of Asset Management (according to PIARC's Asset Management Manual) are shown below. Please check if they are included in your Training offer.

A. MANAGEMENT

A.1. Asset management implementation

Establishment of goals and objectives in line with the vision and the expectations of the different stakeholders, the self-assessment and gap analysis, and, of course, necessary steps for an improvement of the current situation.

Yes ☐ No ☐

Comments

A.2. Implementation

Includes topics related to adapting the structure of a road organization to unleash the potential of asset management, and support the organization in achieving its objectives.

Yes ☐ No ☐

Comments

A.3. Strategy

This chapter focuses on the explaining what is an asset management strategy, the reasons for a road organization having one; which objectives this strategy should comply, and what aspects should be covered.

Yes ☐ No ☐

Comments

A.4. Performance management

This chapter sets out the process(es) and/or procedure(s) for providing a systematic approach to measure progress in the implementation of asset management and setting levels of service and performance targets to enable auditing and monitoring the strategic objectives.

Yes ☐ No ☐

Comments

B. DATA AND MODELING

B.1. Inventory and condition

The data collection activities should be designed to support asset management decision processes at different levels and include a rational evaluation of what data should be collected to cost-effectively support the asset management decision.

Yes ☐ No ☐

Comments

B.2. Performance monitoring

This chapter should include the process and procedure of monitoring and reviewing the performance of asset management and the performance and/or condition of assets.

Yes ☐ No ☐

Comments

B.3. Risk

This chapter should give an overview how different risks can be incorporated into asset management, including an overview about the definition of risk in the context of asset management.

Yes ☐ No ☐

Comments

B.4. Lifecycle planning

This chapter focuses on modelling, planning, investment, resource allocations and procedures for generating a holistic lifecycle plan.

Yes ☐ No ☐

Comments

C. PLANNING

C.1. Asset management plan

This chapter focuses on the reasons why an organization should have a plan, explaining its benefits, the type of questions that should be considered; and the concerns that an AMP should demonstrate in its implementation.

Yes ☐ No ☐

Comments

C.2. Financial plan

This chapter explain in detail what is a financial plan, why it is necessary to develop it, and how to develop it.

Yes ☐ No ☐

Comments

C.3. Asset valuation

The valuation of road infrastructure assets is a business reporting requirement for many transportation organizations and an important component for the financial management of roads.

Yes ☐ No ☐

Comments

C.4. Programming (resource allocation)

Besides explaining the basics and motivation of works programming and the maturity levels associated with it, this chapter presents a detailed description of the works programming process.

Yes ☐ No ☐

Comments

D. APPLICATIONS

D.1. Asset management tools

This chapter explains the benefits of an organization having implemented such a software into daily practice. It focuses as well on making the case on an AMT and provide information on the AMT structure.

Yes ☐ No ☐

Comments

QUESTIONNAIRE FOR EDUCATIONAL CONTENT ACCORDING TO PIARC ASSET MANAGEMENT MANUAL

D.2. Communication

Relevant information associated with asset management should be actively communicated through engagement with internal staff and external stakeholders in setting requirements, making decisions, and reporting performance. It is important to discuss and develop a strategy for how this information is communicated.

Yes ☐ No ☐

Comments

Any additional comments?

Date, signature and Stamp

QUESTIONNAIRE FOR TECHNICAL DOCUMENTS TO BE FILLED IN BY EXPERTS BEFORE PUBLISHING INTO THE DISSEMINATION AND EDUCATION SECTION

QUESTIONNAIRE FOR REVIEW OF TECHNICAL DOCUMENTS

Document title:	
Author of the document:	
Document version:	
Date of receipt of the document:	
Reviewer:	
Review date:	

1. Are the objectives for which the document was written clear?
   Yes ☐
   No ☐ Comments
2. Are these objectives met?
   Yes ☐
   No ☐ Comments
3. Does the document have a correct structure?
   Yes ☐
   No ☐ Comments
4. Is defined the profile of the target reader?
   Yes ☐
   No ☐ Comments
5. Are defined the minimum requirements that the target reader has to have?
   Yes ☐
   No ☐ Comments
6. Does the document require further editing, whether for spelling, grammar, idiomatic, writing or formatting reasons?
   Yes ☐ Comments
   No ☐
7. Are all the main aspects/processes detailed?
   Yes ☐
   No ☐ Comments
8. Does the document need any additional image/graph to clarify some aspect?
   Yes ☐ Comments
   No ☐
9. Do the images/ graphs of the document have sufficient quality/definition?
   Yes ☐
   No ☐ Comments

10. Does the document need additional bibliography/references?

Yes ☐ Comments

No ☐

11. Does the bibliography/references have the correct format?

Yes ☐

No ☐ Comments

12. Is the document ready to be published?

Yes ☐

No ☐ Comments

13. Any additional comments?

LETTERS TO POTENTIAL STAKEHOLDERS (EXAMPLES)

[Name of the Director of the Master]
[Master title]
[Name of the University]

[Location], [date].

Dear [Title] [Surname of the Director of the Master],

I am writing to you on behalf of the World Road Association (PIARC), founded in 1909, which brings together 121 government road administrations and comprises individual members, companies, institutions and organizations in over 140 countries.

Through this document, and as a result of the agreements established by the technical committees comprised of experts designating member countries to work on issues identified in the Strategic Plan, and that among the works of the Working Group (WG2) responsible for the "dissemination of knowledge" is developing a knowledge portal on Road Heritage Management in which they intend to collect all kinds of educational references for training in this area, though subjects or courses specific, and even seminars or training courses in other institutions.

As a first goal, a portal of knowledge related to the management of the heritage road (https://road-asset.piarc.org/en) is developed through our website, which aims to collect all kinds of educational references for the training in the described area.

We believe it would be of great interest if your educational offer would be added to this tool so that any professional or student can benefit through this project of a new research infrastructure providing information on the content and educational offer that can be accessed at your university in terms of Road Heritage Management.

For this purpose, a template has been prepared that will allow you to describe profiles of master and post-graduate courses within the framework of Asset Management. This template is attached to the present document so that it can be completed and returned to PIARC (via e-mail), and subsequently be published in the web of knowledge.

It is possible that this request may reach you in other ways, for which we apologize. In such a case, it is sufficient to send a single completed template with educational offers.

Thank you in advance for your cooperation and interest.

Yours cordially,

[Name]

[Name of the University's Dean]
Dean of [Name of the University]

[Location], [date].

Dear [Title] [Surname of the University's Dean],

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As a first goal, a portal of knowledge related to the management of the heritage road (https://road-asset.piarc.org/en) is developed through our website, which aims to collect all kinds of educational references for the training in the described area.

As an active and dynamic University, you have given emphasis to practices enhancing the circulation of resources and research values. Therefore, it may be of great interest that your educational offer is added to this tool so that any professional or student can benefit through this international project of a new research infrastructure providing information about the contents and educational opportunities which can be accessed at the university in terms of the management of world heritage road.

For this purpose, a template has been prepared that will allow you to describe profiles of master and post-graduate courses within the framework of Asset Management. This template is attached to the present document so that it can be completed and returned to PIARC (via e-mail xxx), and subsequently be published in the web of knowledge.

It is possible that this request may reach you in other ways, for which we apologize. In such a case, it is sufficient to send a single completed template with educational offers.

Thank you in advance for your cooperation and interest.

Yours cordially,

[Name]

[Name of the Education Minister/State Secretary/General Manager of Universities]
[Position, i.e. Education Minister/State Secretary/General Manager of Universities]

[Location], [date].

Dear [Title] [Surname of the Education Minister/State Secretary/General Manager of Universities],

I am writing to you on behalf of the World Road Association (PIARC), founded in 1909, which brings together 121 government road administrations and comprises individual members, companies, institutions and organizations of over 140 countries.

Through this document, and as a result of the agreements established by the technical committees comprised of experts designating member countries to work on issues identified in the Strategic Plan, and that among the works of the Working Group (WG2) responsible for the "dissemination of Knowledge" is developing a knowledge portal on Road Heritage Management in which they intend to collect all kinds of educational references for training in this area, though subjects or courses specific, and even seminars or training courses in other institutions.

As a first goal, a portal of knowledge related to the management of the heritage road (https://road-asset.piarc.org/en) is developed through our website, which aims to collect all kinds of educational references for the training in the described area.

As it befits the competence in the field of education and the institutional relationships between higher education and public administrations, entities as well as foreign and national organizations, we want to make you a part of our project. Any professional or student would benefit through this international project of a new research infrastructure providing information about the contents and educational opportunities which can be accessed at universities in the Madrid region in terms of the management of the heritage road.

For this purpose, a template has been prepared that will allow you to describe profiles of master and post-graduate courses within the framework of Asset Management. Hereby I would like to ask you to request their completion by the corresponding official ways so that universities and educational institutions of the community of Madrid describe their educational offer and return the completed template to PIARC (via e-mail xxx) that will subsequently be published in the web of knowledge.

Thank you in advance for your cooperation and interest.

Yours cordially,

[Name]

World Road Association (PIARC)

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