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#006

Framework for the implementation of Road Asset Management System

Framework for the implementation of RAMS

It is estimated that within 10 years, over 30% of the road assets value in developing countries will be lost due to lack of routine and periodic maintenance. The deficit of adequate road maintenance causes the rapid deterioration of road assets, which have to be re-built long before the end of their design life, leading to assets being lost and requiring new major Capex investment projects.

To put an end to this situation, an integrated and holistic approach to road management is required in order to adequately align funding, management systems, and the implementation of procedures. For that, the stakeholders in the road sector of every country both on the private and public side have in the Road Asset Management System (RAMS) a powerful tool to define and achieve an optimal level of road conservation while minimizing the overall costs to society. The development and implementation of a sound and reliable RAMS is one of the key factors in any road sector reform that aims to provide efficiencies for the long term.

RAMS can be understood as a systematic management for maintaining, upgrading and operating road assets, combining engineering principles with sound business practice and economic rationale. It includes specific digital and analysis tools to facilitate a more organised and flexible decision-making process.

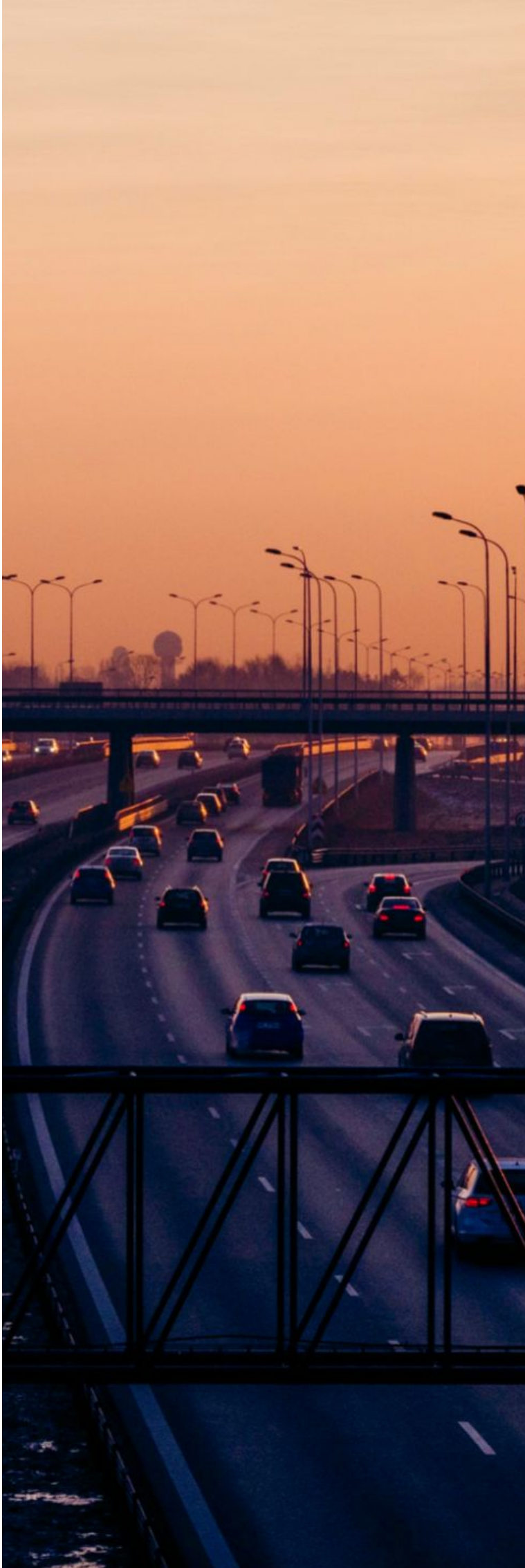
The benefits of implanting a RAMS ranges between the better allocation of resources and the reduction of social costs, but what is more important to highlight is that these benefits have an impact across all stakeholders involved in the road sector.

- **Public sector decision makers:** RAMS confers assurance of efficient allocations of funds, improves assets performance, gives information about the actual performance which support funding needs, and allows to argue precisely the consequences of a reduction of available funds or levels of service (LoS).

- **Road Authorities and Funds:** RAMS reduces construction and maintenance costs, assures best use of available budget, provides a solid basis for prioritizing and allocating funds, justifies capital spending, provides a more accurate and up-to-date information of the assets and enables more accurate and justified forecasts.

- **Road users:** benefits from better condition assets, improved LoS, reduction of user cost in terms of travel time, vehicle operation, increase of safety and reduction of environmental impacts.

In this context and being aware of its benefits, the aim of this article is to highlight some insights on the requirements and challenges when implementing a RAMS. It is intended to provide a management tool that could help understanding the process of planning and execution of such a system.



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The four-step guideline for RAMS implementation

Within ALG, we understand a four-step framework for the implementation of a RAMS, to achieve an efficient design and operation of this management tool.

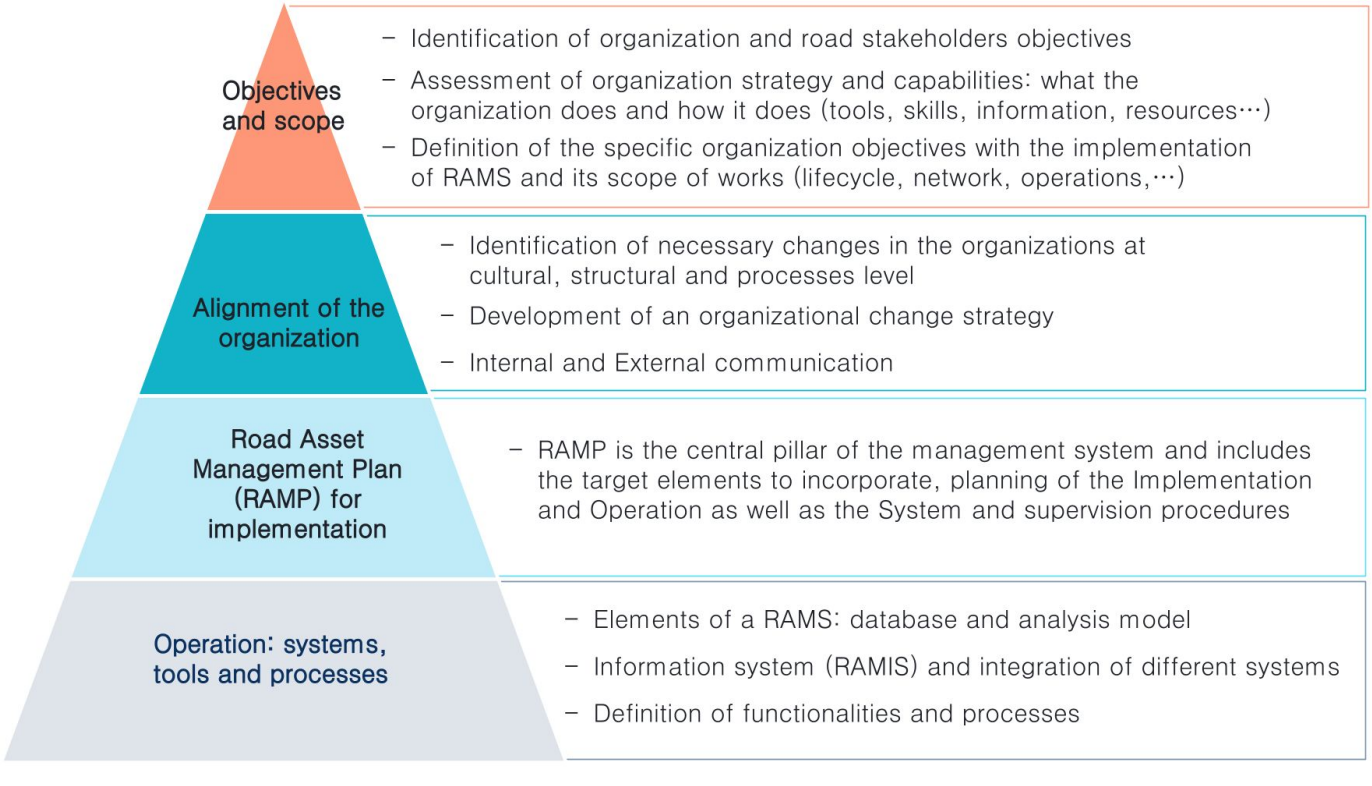


Figure 1. RAMS implementation guidelines

Objectives, scope and gaps

The starting point for RAMS implementation is to specify clearly and objectively its strategic objectives and their scope, so that it is better understood the overall goals of the RAMS.

Firstly, it is necessary to undertake an internal analysis of the organization's strategy and capacities in order to determine its deficiencies and gaps.

The objectives and scope of the RAMS may include the definition of the target road network, the levels of service required, the tools and resources available, the stakeholders involved and its current and future capacities, etc.

Alignment of the organization

Once the organization goals are defined, it is necessary to identify the organizational requirements needed at the cultural, structural and processes levels.

For that, it is important to establish an internal structure in the RAMS owner (usually the Road Agency) framed around a supervisory committee composed of senior managers from different areas which ensure the correct integration of the different elements of the RAMS. In addition to that, top management shall be identified to support and boost the project as well as a capable staff with the right formation and understanding of the RAMS.

Figure 2. Illustrative example of RAMS Organization Structure

In order to ensure the success of the RAMS implementation process, it is also indispensable for the organization to elaborate a communication strategy on two different levels: Internal (within the Road Agency and organizations responsible for the implementation of the RAMS) and External (within public institutions and other Ministries related and other sector stakeholders such as citizens, road and logistics sector companies, etc.).

Road Asset Management Plan (RAMP)

Asset management plans play a key role in connecting the Road Agency's corporate strategic direction with the RAMS implementation by ensuring that the Road Agency can accomplish its mission in the most cost-effective manner.

The main purpose of the RAMP is the definition of functions, processes and systems that will be included in the RAMS: data collection, treatment and subsequent storage in a digital and structured database, software acquisition, internal policies, rules (laws, technical standards, operating methodologies), the experience of all the Road Agency staff involved, etc. In this context, it is recommended to incorporate, define and develop the following:

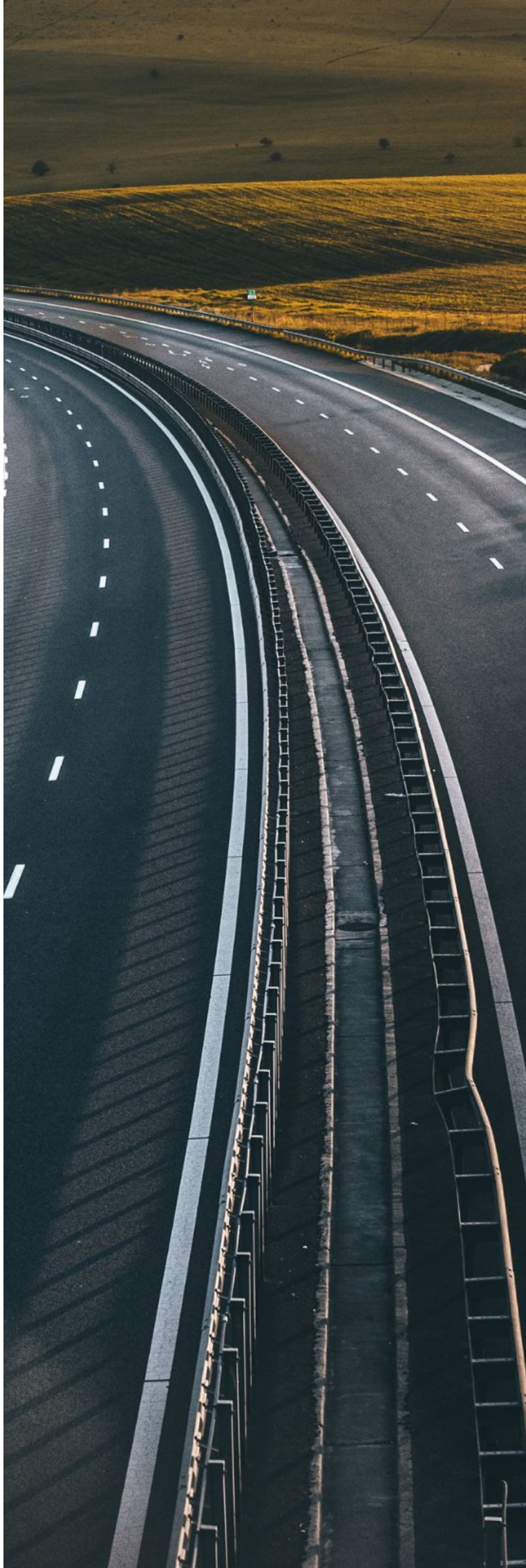
- **Target levels of service**: define the criteria for measuring and monitoring agency performance in line with customer expectation, corporate goals and legislative requirements.
- **Demand studies:** knowledge of the traffic evolution including the understanding of demand drivers, potential risks, demand forecast, etc.
- **Lifecycle management plan:** define the cycle asset characteristics evaluation, O&M programs, major maintenance/rehabilitation/upgrading plans, disposal plans, etc.
- **Monitoring plan:** define tools for the continuous monitoring and improvement of the Road Agency activity in terms of the data collected accuracy and confidence level.
- **Funding**: Annual budgets for data collection, asset operation and maintenance to be secured.
- **Continuous training:** development program for internal staff as well as contractors formation with the aim of improving the performance of the whole national road sector.
- **Annual Reports/Business Plans**: define periodic analysis and reports to be published focused on 'Asset Value' and other Key Performance Indicators (KPI's) obtained from the RAMS.
- **Continuous Quality Improvement:** implementation of a program with the aim of ensuring that all systems in the RAMS are updated and evolve with the technology and road network needs.

Operation: systems, tools and processes

Once all the previous considerations are set, the RAMS itself can be built up. RAMS is constituted by two main elements which allow the system to provide improved decision-support functionalities:

- The **database**: including a georeferenced digital inventory with all the relevant data for network characterization and other required input for asset management purposes. Its operation should be driven by the following aspects:
    - Only key data required for and used in decision-making should be collected and stored in the RAMS: road inventory, asset condition, traffic data, etc.
    - Use an appropriate level of accuracy (it is key to have a sufficient budget for monitoring).
    - Processes must ensure the reliability of data and the correct format.

In fact, the database has to be constantly updated through the collection of new data by means of a structured and ordered periodic process. In order to optimize the use of data and the resources assigned to the asset condition monitoring.

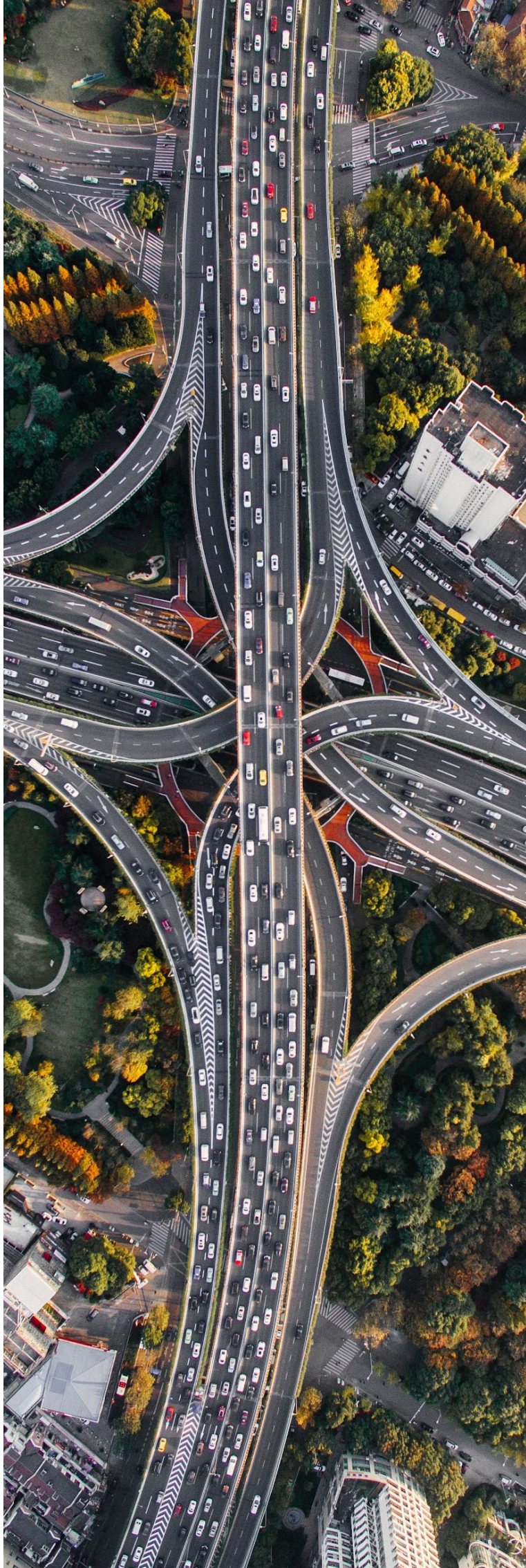


- The **analysis model**, able to process information in the database and generate optimized road maintenance programs according to the received inputs.

The analysis deals with the prioritization of a defined list of candidate road projects under budget constraints, specified for discrete road sections and in a one-year or multi-year work program. In other words, the purpose of this analysis model is to identify maintenance needs and systematically evaluate the functional and economic results of alternatives with respect to a “do nothing” scenario to prioritize among them.

The analysis model can therefore produce the following key outputs for analysis:

- Road deterioration forecast
- Demand forecast
- Maintenance effect and costs
- Road User benefits
- Economic indicators (NPV, IRR)
- Road maintenance plan (routine and periodic)



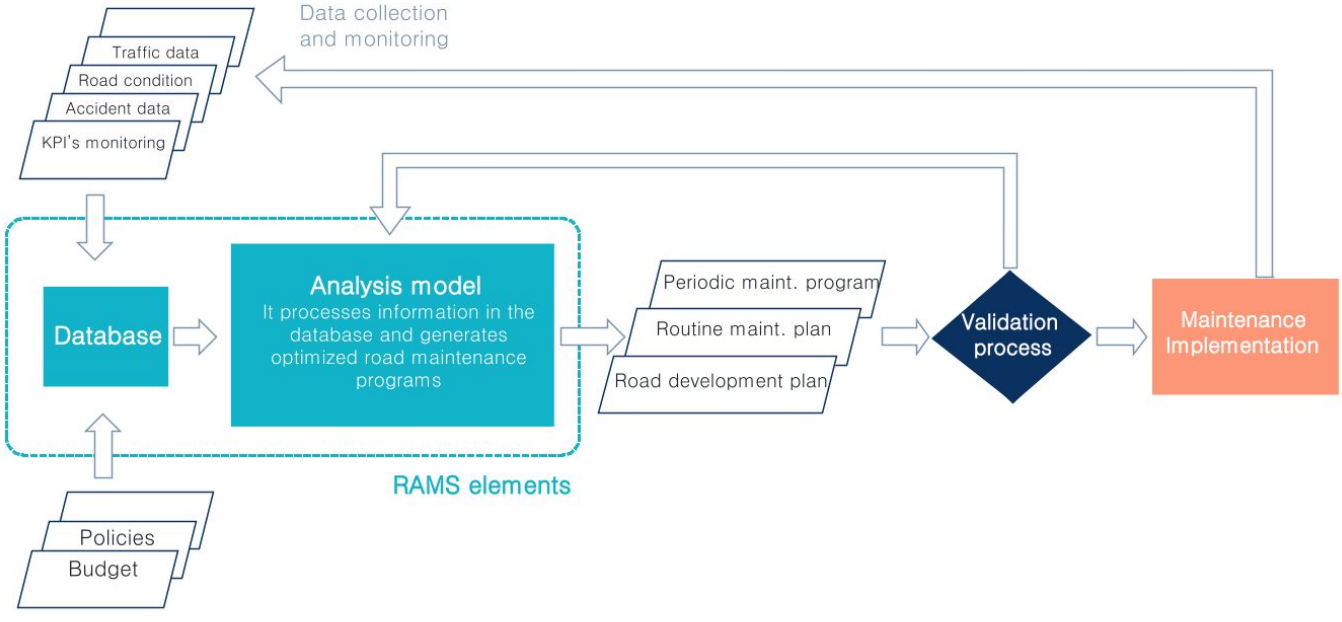


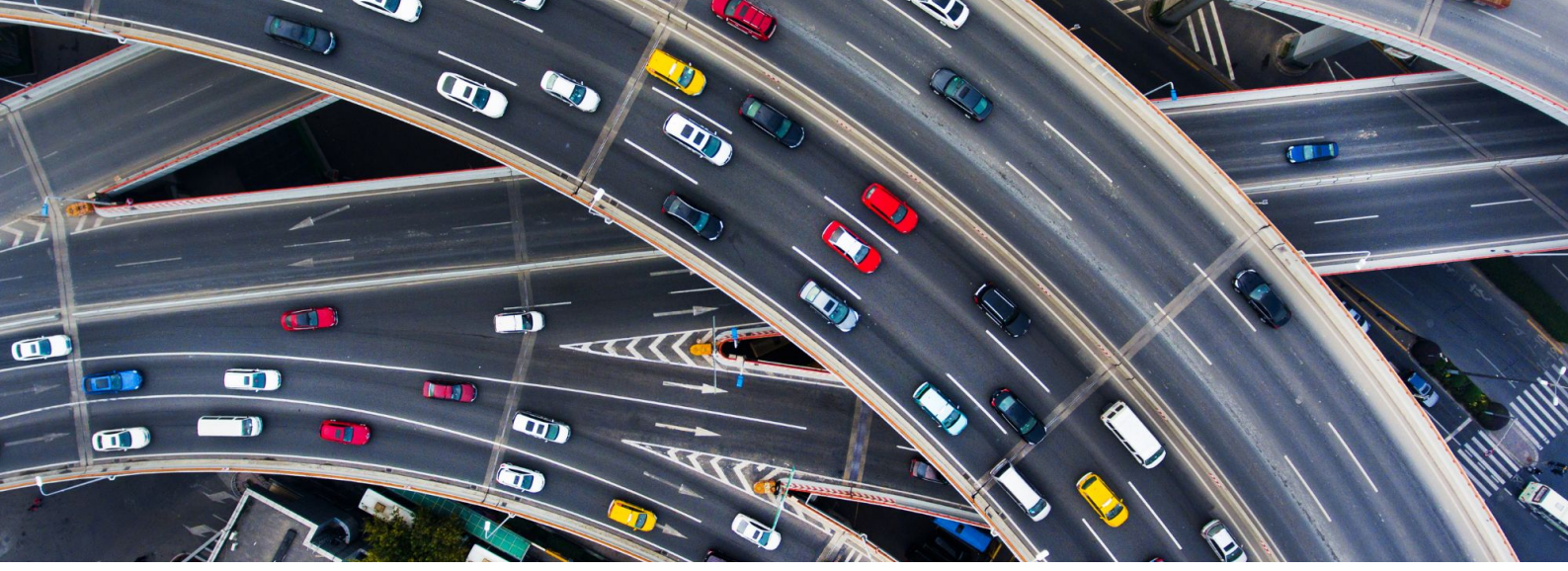
Figure 3. Road maintenance process with RAMS

With the knowledge of the current and actual road condition and economic impact obtained from the Analysis Model (outputs), the Road Agency can define a cost-effective maintenance strategy including critical short-term intervention programs and long-term periodic plans.

The steps to be followed during this planning process would include:

- Introduction of road network information, maintenance costs, management policies, prioritization criteria and budget constrain into the management software/model.
- Execute the model several times considering different funding scenarios and prioritization criteria in order to obtain a variety of results that allow a more robust decision-making process.
- Define long-term strategies and short-term intervention programs after analysing the proposed options obtained with the RAMS.

Therefore, the resulting maintenance strategy from a RAMS is not linear but cyclic as it needs to be updated constantly with new information, oversighting and monitoring the works carried out is the final step to close the RAMS cycle and introducing this new information to the database. The processes use all resources to prioritize and maximise the use of funding to align the road technical needs with the demand and the available budget.



Key takeaway

RAMS is more than just a software or a database, is a complex system focused on managing road assets in a rational and cost-effective way. It involves the implementation of new approaches of preventive maintenance by means of digital tools to support monitoring, planning and decision making based on the current asset condition and the forecast of infrastructure needs in the future.

The implantation of a RAMS allows the alignment of resources available with the road asset maintenance and operation requirements. This advantage provides benefits to all stakeholders involved, from the public sector (decision makers, road authorities, etc.) to the users or the private sector players (contractors).

RAMS is the best practice in terms of optimizing the use of funds, specially for countries with scarce funds for road maintenance. In this context, the implementation of RAMS in these countries becomes essential and must be carried out in a structured manner so the capacities of the road sector are aligned with the RAMS functionalities.

Implementing a RAMS is a constant process evolving with the maturity of the road agencies involved in its operation. For this reason, it is important to define an implementation plan including not only the IT tools, processes (data gathering, maintenance planning, etc.) and human and technical resources needed but also an improvement strategy focused on gradually enhancing the system to meet future challenges.

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