



CAREC Institute

Road Asset Management (RAM) and RAM System

Virtual Workshop Proceedings Report

10-13 August 2020



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The CAREC Institute workshop proceedings report and policy brief series is a forum for stimulating discussion and eliciting feedback on ongoing and recently completed research and workshops undertaken by the CAREC Institute staff, consultants, or resource persons. The series deals with key economic and development issues, particularly those facing the CAREC region, as well as conceptual or analytical issues relating to program or policy design and implementation.

This proceedings report is one of the outputs of the virtual workshop on “Road Asset Management (RAM) and RAM System.” The CAREC Institute delivered the workshop during 10-13 August 2020. It aimed at raising the level of understanding about RAM within the CAREC region.

The report is drafted by Dr. Ian Greenwood, the CAREC Institute RAM Consultant. It is edited by Mr. Eisa Khan Ayoob Ayoobi, Chief of Capacity Building Division, the CAREC Institute, and Ms. Dildar Zakir, Capacity Building Specialist, the CAREC Institute. Rovshan Mahmudov and Gary Huang of the CAREC Institute have contributed to the report.

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Abbreviations

ADB	Asian Development Bank
CAREC	Central Asia Regional Economic Cooperation
CWTC	Transport and Communications Division, Central and West Asian Department, ADB
SASEC	South Asia Subregional Economic Cooperation
IIMM	International Infrastructure Management Manual
AMP	Asset Management Plan
HDM-4	Highway Development and Management version 4
IQL	Information Quality Level
PBC	Performance Based Contract
RAM	Road Asset Management
RAMIS	Road Asset Management Information System

Introduction

Roads are the lifeblood of economic and social development, mainly for landlocked CAREC countries who engage in transporting people and goods. While there has been significant investment in building the road infrastructure over many decades, investment in the management and maintenance of those roads has generally not kept pace.

Road Asset Management (RAM) is the process of managing the road assets – comprising of people, processes, data, and information management systems – to deliver the desired level of service at the lowest possible lifecycle cost. There is often a focus on the information system, data collection and decision support tools, however RAM is a much broader set of practices.

The Central Asia Regional Economic Cooperation (CAREC) Program has a keen interest in these issues as the program promotes economic cooperation in a geographically and economically diverse area with quite different levels of RAM implementation among member countries. Hence, the CAREC Institute, as the CAREC Program's knowledge arm, undertook a four-day (3 hours per day) online workshop to raise the understanding of what RAM is, and how the various components fit together.

Around 50 senior government officials and experts from across the CAREC region participated in the capacity building event. Presentations were made covering the full range of RAM activities, with extensive Q&A sessions. The workshop received very positive feedback from the participants, with follow-up actions planned to build on the strong foundation laid.

The workshop was based around two topics per day for over four days – with each day consisting of nominally three hours of training. Mr. Ayoobi was the overall chair of the workshop, introducing the sessions and moderators, encouraging discussions and active participation. Mr. Ayoobi was ably supported by the wider CAREC Institute Capacity Building Division team.

Welcoming and Opening Remarks

Dr. Iskandar Abdullaev, Deputy Director of the CAREC Institute, opened the workshop by reminding participants about the enormous cost to both build and maintain assets, and the need to maximize the benefits from the limited budgets available. He mentioned that focus on sustaining medium to long term service levels, minimizing road agency and road user costs is at the heart of RAM. He further referred to the CAREC 2030 Strategic Framework noting the establishment of competitive transport corridors for the efficient movement of people and goods, as part of the overall delivery of a safe and people friendly transport system.

Dr. Abdullaev then introduced **Mr. Dong-Soo Pyo**, Director of Transport and Communications Division, Central and West Asian Department (CWTC), ADB. Mr. Pyo reiterated that CAREC countries have invested billions of dollars in improving road assets, but the management and maintenance works are an ongoing challenge. He reaffirmed that improving RAM practices will ultimately reduce the long term cost of ownership and reminded participants that in recent years the ADB has supported RAM in various modes – guides, software, hardware, technical guidance – and that they are currently reviewing RAM practices in the region.

Dr. Abdullaev then introduced **Mr. Syed Shakeel Shah**, Director of the CAREC Institute. Mr. Shah noted the critical role that roads have in the overall economic development of a country, along with significant investments made in building and maintenance. Mr. Shah noted that countries require RAM to deliver sustainable road management, which is often more challenging than building roads. He further noted the need to ensure sufficient in-house capability to manage the assets that have been built, across the full range of asset management activities – from policies, to data collection, information management systems and the like. In reference to the CAREC corridors, Mr. Shah noted that they are critical for regional connectivity, and quoted from the CAREC 2030 Strategic Framework:

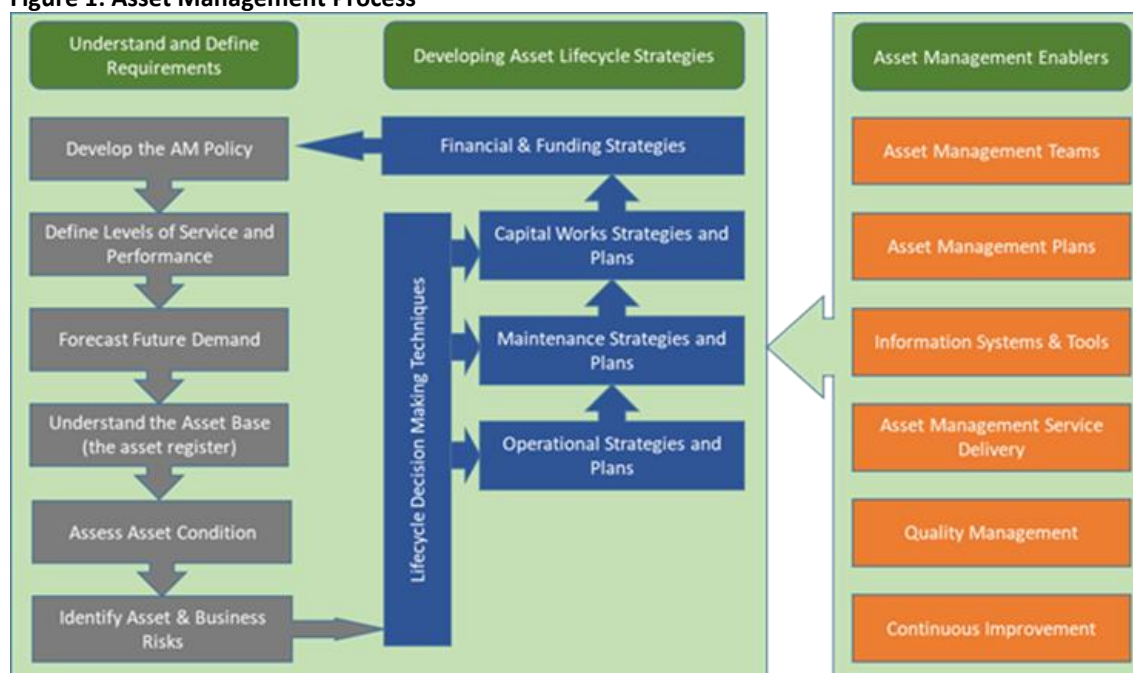
“CAREC 2030 will continue to assist in completing road corridor investments, paying more attention to sustainability of road infrastructure. There will be an increased focus on road safety and road asset management. Institutional and financial reforms in the road transport sector will help improve road maintenance practices and enhanced road asset life cycle.”

Session 1: Overview of Road Asset Management and Introduction to the Components of RAM

The session was organized around a set of presentations that illustrated the scope of RAM and the components that make up a complete RAM system. The session moderator was **Mr. Oleg Samukhin**, Senior Transport Specialist of CWTC, ADB.

The primary aim of the day was around establishing the broader context of what RAM actually is – getting the thinking beyond an information management system or routine maintenance and provide an overview of an entire RAM process. Central to the structure of the training modules, **Dr. Greenwood** presented the asset management process from the International Infrastructure Management Manual (IIMM) as per Figure 1.

Figure 1: Asset Management Process



Source: International Infrastructure Management Manual (IIMM), www.nams.org.nz

Some of the key messages that came out form session 1 presentations and discussions were:

- a) RAM is the all-encompassing procedures, systems, people and tools that are involved in the RAM process.
- b) RAM Information System (the database holding all the data) is not the same as RAM.
- c) RAM covers the operation and maintenance of existing assets, along with the investment in new assets – as these are all means of meeting the desired level of service.
- d) RAM is about enabling the trade-off between the cost of service and the level of service.
- e) Improving RAM ability (RAM competency or maturity) enables better leveraging of available funds to meet the desired level of service.
- f) Being good at RAM is not the same as having good assets.
- g) Many road authorities have traditionally operated as facility managers (find faults and fix them), rather than as asset managers (formal planned approach to management of the assets).
- h) A single RAM process can apply to all road hierarchies, but the level of effort placed on any of the steps in the process will naturally vary by hierarchy, geographic conditions, and similar constraints, etc.

- i) The timeline to achieve an acceptable level of competence in RAM. For a road authority, it will take approx. 5-10 years after commencement of the RAM journey, before it becomes business-as-usual practice. This means RAM is a marathon and not a sprint, and it will require sustained support in terms of staffing, funding, and technical expertise.

Dr. Greenwood then discussed the need for strong leadership if RAM is to be successfully adopted. This starts out with commitment to implement RAM through the RAM policy statement, which should be authorized by high ranking officials in the road authority – government minister, secretary of transport, chairman of the board or similar. Without strong leadership to deliver RAM, it is very hard to make progress.

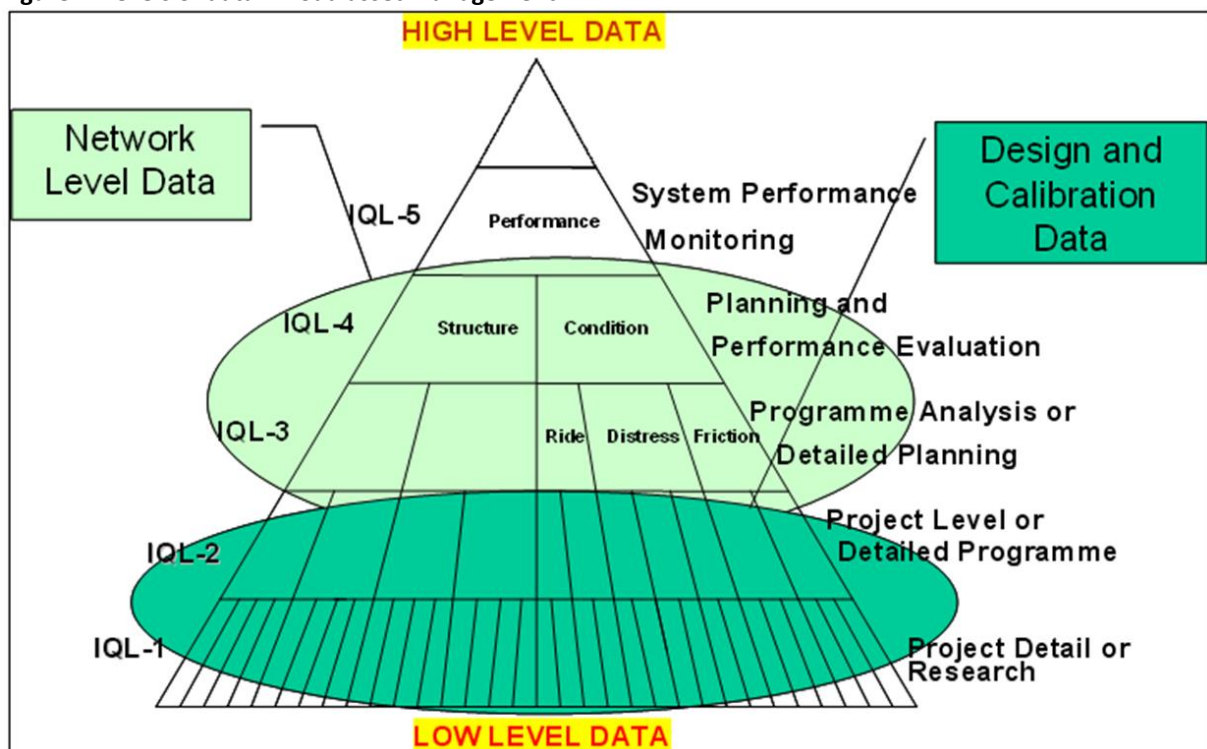
Finally, Dr. Greenwood emphasized the need to start out simple - make sure you have robust and sustainable RAM process in place, before adding complexity and cost to it. Question the need for additional data, and for complex decision support tools (HDM-4) or the like. It is far better to start simple and add complexity in 2-3 years than to start with complexity and not be able to sustain the data collection and associated effort of the RAM processes.

Session 2: Levels of Service and Data Collection

This session was organized around two topics on defining levels of service and data collection (inventory and condition data). The session moderator was **Mr. Thomas Herz**, Senior Transport Specialist of CWTC, ADB.

With regard to levels of service, **Dr. Greenwood** noted that while many road authorities start with technical service levels (e.g. average roughness of the road), ideally these should commence with the customer focused service levels (e.g. connecting communities with a safe and comfortable all weather roads). When implemented well, there should be alignment between the top-level customer facing service levels, and the day-to-day routine maintenance standards.

Figure 2: Levels of data in road asset management



Service level examples were presented from both the UK and New Zealand, illustrating the hierarchical nature of the measures and how the highest-level measures should use language accessible to the general public.

For data collection, the concept of Information Quality Level (IQL) was introduced. The IQL aligns with the notion of ensuring that data that is fit-for-purpose is available for use within the RAM processes. It is not necessary to have highly detailed information for every decision within RAM, and this should be thought through before commencing data collection processes.

Once the datasets have been collected, it is necessary to ensure that they are managed to retain accuracy. A key aspect of this is the collection of as-built data from work activities, and not just as-built drawings. Most RAMIS enable uploading of data updates based upon an Excel template or similar, and it is this information that is critical to ensuring the inventory data remains credible.

Session 3: Lifecycle Decision Making and Asset Valuation

This session was organized around two topics of lifecycle decision making and asset valuation which are the stages of the RAM process where the engineering and finance teams come together. The session moderator was **Dr. Michael Anyala**, Senior Road Asset Management Specialist at the Transport Sector Group, Sustainable Development and Climate Change Department, ADB.

With the focus on lifecycle decision making within RAM, the importance of analyzing sufficient time series data to understand the impacts of different investment options was explained. This is especially applicable when considering long-life options such as concrete pavements, bridges, tunnels or the like. Different approaches to decision making were introduced – from simple approaches that aim to minimize the road authorities’ direct costs, to including the road user costs, and multi-criteria-analysis approaches.

The benefits of operational strategies to mitigate the need for further investment in physical infrastructure were discussed. This relates to both preparing for emergency events, but also to maximizing the capacity of the assets through concepts such as ramp signal metering, peak hour shoulder running, etc. The recently published “Road Geohazard Risk Management Handbook” was noted as being particularly useful in that it follows an asset management approach to risk identification and management.

A key message from the lifecycle decision making session was that there is generally no greater economic benefit to a road authority than that of looking after what you have already built. Consequently, the highest priority should be given to fully funding routine maintenance and renewals, ahead of constructing new assets.

Dr. Greenwood then covered asset valuation, noting that understanding the value of the assets can provide for much better justification for investment in maintenance and renewal activities. While there are a number of approaches available, the depreciated replacement cost method is best suited for road assets. This approach provides a number of financial parameters that are directly of use in RAM, including:

- Replacement Cost = the cost to rebuild all assets in new condition today
- Depreciated Replacement Cost = the replacement cost, less depreciation to account for the wear and tear on the assets that has occurred
- Annual Depreciation = the amount of money the assets need investing in renewals to prevent loss in value

It was noted that countries which have strong RAM tend to also be those that have legislation surrounding the need to complete asset valuations. By recording the road assets in the financial ledger of the road authority, funding of maintenance and renewals is no longer considered a sunk cost, but rather an appropriate investment to retain asset value.

Session 4: Asset Management Plans, Teams & Tools, and Performance Based Contracts

This session was organized around the topics of lifecycle decision making and asset valuation. The session moderator was **Ms. Ritu Mishra**, Young Professional of CWTC, ADB.

Dr. Greenwood commenced by noting the importance of documenting the RAM practices, as this enables establishment of consistent processes – from which improvement actions can be identified and prioritized. This is often referred to as an Asset Management Manual, and reflects local processes, calendar of events, etc.

Subsequently, the Asset Management Plan (AMP) document was presented. The AMP is the outward facing document that covers all aspects of the RAM process, in language that a non-technical person can understand. It is in essence the business case for investment in the assets to deliver upon the agreed levels of service.

The need for an asset management team to deliver all RAM activities was then discussed. In general, while a small team (often less than five) is needed to ensure all RAM activities are occurring, it is important RAM is seen as something that involves everyone in the road authority. For instance, while the RAM team will likely administer the RAMIS – the primary users and updaters of data in the various modules are often dispersed across the road authority.

With regard to software tools – it is important to note that having software is not the same as doing RAM. While many asset management projects funded by the international community focus on IT systems (typically some form of database and HDM-4 as a decision support tool), this is but a very small subject of what makes up RAM. What is important is that the data that is held within RAMIS is used in all decisions and reporting, such that all personnel in the road authority are equally motivated to ensure that the information in the system is kept up to date. RAMIS should take the processes and practices as documented in the Asset Management Manual and automate these, it shouldn't create parallel processes and practices.

Tools such as HDM-4 were noted as being quite advanced and that they need both extensive data sets and expertise if they are to be used well. The use of much simpler decision support tools, implementing sound engineering-based decisions, is often easier to understand and sustain within a road authority in the early years of RAM implementation. The HDM-4 (or similar) can then be added in subsequent years as an improvement action.

The need for a well justified improvement plan, that builds on a RAM Maturity Assessment (also known as a competency assessment) was explained. For a road authority just commencing the RAM journey, it can be 5-10 years before a good level of RAM competency is achieved. In this regard, RAM should be considered as a marathon journey and not a sprint – it benefits from well documented processes, that can then be incrementally improved.

The final topic covered was that of contracting models, with a particular focus on Performance Based Contracts (PBCs). While good RAM can be delivered through any service delivery model (from in house force account, through to input, output and outcome based external contracts), the PBC model has

been found to best drive improvements in the understanding and application of RAM practices within the road authority.

Closing Remarks

Dr. Iskandar Abdullaev, Deputy Director of the CAREC Institute, delivered the closing remarks. He reiterated the importance of RAM to the management of roads and the associated economic and social benefits that the transport sector delivers to countries across the CAREC region. Dr. Abdullaev further thanked the participants for their active engagement in the workshop. Finally, he thanked Dr. Greenwood, all the moderators, the CAREC staff and the translators for making it a successful workshop.

Mr. Syed Shakeel Shah, Director of the CAREC Institute, thanked the participants for their active participation throughout the week, reiterated the sentiment of Dr. Abdullaev, and brought the workshop to a close.

Summary of Evaluation

Based on an online evaluation system through the CAREC Institute E-Learning Platform – open to all participants and E-Learning users, respondents were asked (based on a set of statements) to “indicate the extent to which” they agree the workshop has helped them in updating knowledge. They were also asked to propose content improvement for the workshop. Summary of respondents’ results are reflected in the snapshots below.

Figure 3: Workshop evaluation form screenshot

1. Please indicate the extent to which you agree with the following statements:

	Strongly Agree ↕	Agree ↕	Neutral ↕	Disagree ↕	Strongly Disagree ↕
The workshop was effective.	4 50%	4 50%			
It updated my knowledge and upgraded my skills.	1 13%	7 88%			
It further developed my understanding of regional cooperation.	2 25%	6 75%			
The content and discussions were relevant to regional cooperation.	2 25%	6 75%			
The knowledge and skills gained will help me to be more effective in my work.	4 50%	4 50%			

The evaluation forms also contained suggestions as follows:

- Present more CAREC-specific case studies
- Make time for more presentations and discussions

Follow-Up Discussions and Initiatives

On 31 August 2020, a workshop follow-up discussion was held between Dr. Iskandar Abdullaev, Dr. Michael Anyala, Mr. Eisa Khan Ayoob Ayoobi, Ms. Dildar Zakir, Dr. Ian Greenwood, and Mr. Moin Khan (an active workshop participant from Pakistan).

Dr. Abdullaev reminded on the importance of roads, and challenges to their management and maintenance across large parts of the CAREC region. He noted that the workshop feedback indicated that there was a good mix of examples and guidelines during the workshop, and that with lots of interaction it was clear that the workshop achieved its objectives.

He further noted that the region is very diverse – from good practices in some places, to other road authorities just starting out on the RAM journey. In many parts of the region, both infrastructure and institutional capacity, are poor. The ADB and other multilateral development partners are spending a lot of money on infrastructure and can focus on enhancement of RAM capacities in recipient countries to protect that earlier investment.

There is an urgent need to have more robust understanding where each country stands on their RAM journey, and from here identify improvement areas of action on a country basis.

Dr. Michael Anyala of the ADB echoed comments of Dr. Abdullaev. He noted that there are many definitions of RAM depending where people come from – from routine maintenance to AMIS. The workshop did a good job to reset baseline understanding of what RAM is, and all the components that go into it. Dr. Anyala felt that importance and benefits of RAM was well covered and understood. Going forward, he recommended incremental changes and improvements for each country rather than always focusing on regionwide improvements.

Dr. Anyala continued that there is a need to formally understand where each country is with RAM, and then develop a road map (improvement plan) for that country. This could then be used to communicate with donor countries for specific activities. The ADB South Asia Sub-regional Economic Cooperation (SASEC) region are proposing to do such an assessment for those countries, and he was sure that the ADB would be keen to support this across the CAREC region as well. He noted that the ADB are looking at different funding modalities that better encourage RAM within the road authorities, and finally he again thanked all for an excellent workshop.

Mr. Khan from Khyber Pakhtunkhwa (KPK) province in Pakistan was invited to the follow-up discussions owing to his active participation in the workshop. He thanked the CAREC Institute for the workshop and the excellent speaker - Dr. Greenwood. Mr. Khan is a Deputy Director General at Road Asset Management body of KPK Pakistan and is studying for Ph.D. with the focus on RAM. However, he shared being challenged with the lack of expertise within universities and technical institutions in the region. He felt it would be worthwhile ensuring that some graduate engineers are brought into the process to help build future capacity.

Dr. Greenwood thanked others for their kind feedback and support in making it a success. He noted that raising the understanding of the breadth of RAM is important – not just in the countries but in the donor organizations also. Like adding more tools into the toolbox of the project managers, such that they do not just see every country as an “AMIS+HDM-4” type project.

Dr. Greenwood then raised the maturity assessment process that has been proposed by the CAREC Institute to establish the baseline of RAM competency, from which a country-specific roadmap to going forward could be developed. Mr. Ayoobi then noted that a series of in-country workshops would accompany the next phase of actions, with these live streamed to other CAREC countries.

Dr. Abdullaev gave a quick summation of the session. He noted that using the maturity assessment would be of significant use in setting up future demand-based training – which is what the CAREC Institute aims to deliver. He reiterated the success that the workshop had in bringing in a lot of good participants.

While he saw RAM as a big topic, he emphasized that we must remember that each country has their own specific demands. Completing a RAM Maturity Assessment is a good next step as it can both create the RAM improvement plan and identify research areas. Completing the maturity assessment in conjunction with the ADB makes good sense.

Dr. Abdullaev noted that there is a need to bring the various in-country institutions involved in the road sector into the RAM process. Where and how can they be involved, and how to raise their expertise to best help the CAREC countries.

Appendices

List of Reading Materials and References

The following are key documents referenced during the workshop and they are recommended reading materials for further updating of knowledge and overall capacity building.

Component	Document	Reference
General Guidance	International Infrastructure Management Manual	http://www.nams.org.nz/manualsguidelines
General Guidance	ISO55000	https://webstore.ansi.org/Standards/ISO/ISO550005500155002Asset?gclid=EA1aIQobChMIso3p5aej6wIVj8EWBR1VJg7YEAAYAiAAEgLBX_D_BwE
General Guidance	AASHTO Transportation AM Guide	https://store.transportation.org/search?q=asset%20management&categoryCode=&index=storeitem&type=storeitem&pageNum=1&pageSize=10&sortBy=Relevance&itemType=All
General Guidance	Austrroads	https://austrroads.com.au/assets/asset-management/guide-to-asset-management
AM Policy	Tasmania AM Policy	https://www.transport.tas.gov.au/_data/assets/pdf_file/0004/114439/Road_Management_Infrastructure_Asset_Management_Policy.pdf
Risk Management	Road Geohazard Risk Management Handbook	https://www.gfdrr.org/en/road-geohazard-handbook
General Guidance and Tools	Institute of Asset Management (UK)	https://theiam.org/
Service Levels	NZ One Road Network Classification service levels	https://www.nzta.govt.nz/assets/Road-Efficiency-Group-2/docs/customer-levels-of-service.pdf
Service Levels	Highways England framework	https://www.gov.uk/government/publications/highways-englands-2017-to-2018-performance-monitoring-statements
Service Levels	Auckland Transport	https://at.govt.nz/media/1978838/asset-management-plan-summary-2018-2021.pdf
Asset Management Plan	Auckland Transport	https://at.govt.nz/media/1978838/asset-management-plan-summary-2018-2021.pdf
Asset Management Plan	NZ Transport Agency (State Highways)	https://www.nzta.govt.nz/roads-and-rail/management-and-maintenance/management-and-delivery-plans/state-highway-asset-management-plan/
Valuation	Guidelines	http://www.nams.org.nz/manualsguidelines
Climate Change	World Bank Guidelines	https://openknowledge.worldbank.org/bitstream/handle/10986/26505/114641-WP-ClimateAdaptationandAMSSFinal-PUBLIC.pdf?sequence=1&isAllowed=y
Performance Based Contracting	World Bank Guidelines	https://collaboration.worldbank.org/content/sites/collaboration-for-development/en/groups/road-asset-management-and-rural-accessibility/documents.entry.html/2017/02/13/list_of_publications-TXYD.html
Inventory and Condition Data	Information Quality Levels	http://documents1.worldbank.org/curated/en/431821468340248050/pdf/373670trn0300data0collection01PUBLIC1.pdf
Inventory and Condition Data	NZTA Data Standards	https://www.nzta.govt.nz/roads-and-rail/asset-management-data-standard/#:~:text=The%20Asset%20Management%20Data%20Standard,assets%20%E2%80%93%20our%20roads%2C%20highways%2C

Agenda



agement (RAM) a
10-13 August 2020



AGENDA

Day 1/Session 1	
10 August (Monday) 13:00 -16:35 (China Standard Time)	12:30–13:00
Connecting to Zoom Webinar	
This time is allocated for all Speakers, Moderators and Participants to connect to the workshop Zoom webinar in advance.	
13:00–13:15	Opening Remarks
<ul style="list-style-type: none"> • Mr. Dong-Soo PYO, Director, Transport and Communications Division, Central and West Asia Department (CWTC), Asian Development Bank (ADB) • Mr. Syed Shakeel Shah, Director, CAREC Institute 	
Moderator: Dr. Iskandar Abdullaev, Deputy Director, CAREC Institute	
13:15–13:30	Outlining the Objectives of the Workshop and Introduction to CAREC Institute E-learning Platform
Speaker: Eisa Khan Ayoob Ayoobi, Chief of Capacity Building Division, CAREC Institute	
13:30–16:30	1. Road Asset Management (RAM) – Introduction
2. Overview of Asset Management – How all the components fit together within a RAM framework, and high-level overview of the components	
Speaker: Dr. Ian Greenwood, Chartered Professional Engineer, and a Fellow of Engineers New Zealand	
Moderator: Mr. Oleg Samukhin, Senior Transport Specialist, CWTC, ADB	
16:30–16:35	Close of Session
Day 2/Session 2	
11 August (Tuesday) 13:00 -16:05 (China Standard Time)	12:30–13:00
Connecting to Zoom Webinar	
This time is allocated for all Speakers, Moderators and Participants to connect to the workshop Zoom webinar in advance.	
13:00–16:00	3. Defining Levels of Service & Performance – How to link from community-based measures through to technical measures
4. Inventory and Condition Data – What do you need, how to collect it	
Speaker: Dr. Ian Greenwood, Chartered Professional Engineer, and a Fellow of Engineers New Zealand	
Moderator: Mr. Thomas Herz, Senior Transport Specialist, CWTC, ADB	
16:00–16:05	Close of Session
Day 3/Session 3	
12 August (Wednesday) 13:00 -16:05 (China Standard Time)	

12:30–13:00	<p>Connecting to Zoom Webinar</p> <p>This time is allocated for all Speakers, Moderators and Participants to connect to the workshop Zoom webinar in advance.</p>
13:00–16:00	<p>5. Lifecycle Decision Making and Funding Strategies 6. Asset Valuation and The Link to RAM</p> <p>Speaker: Dr. Ian Greenwood, Chartered Professional Engineer, and a Fellow of Engineers New Zealand</p> <p>Moderator: Dr. Michael Anyala, Senior Road Asset Management Specialist at the Transport Sector Group, Sustainable Development and Climate Change Department, ADB</p>
16:00–16:05	Close of Session
Day 4/Session 4 13 August (Thursday) 13:00 -16:15 (China Standard Time)	
12:30–13:00	<p>Connecting to Zoom Webinar</p> <p>This time is allocated for all Speakers, Moderators and Participants to connect to the workshop Zoom webinar in advance.</p>
13:00–16:00	<p>7. Asset Management Plans, Teams and Tools 8. Contracting Models and Their Alignment with Good Asset Management – Focus on Performance-Based Contracts</p> <p>Speaker: Dr. Ian Greenwood, Chartered Professional Engineer, and a Fellow of Engineers New Zealand</p> <p>Moderator: Ms. Ritu Mishra, Young Professional, CWTC, ADB</p>
16:00–16:15	<p>Workshop Closing Remarks</p> <ul style="list-style-type: none"> • Dr. Iskandar Abdullaev, CAREC Institute Deputy Director

List of organizers from the CAREC Institute and ADB

CAREC Institute

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Mr. Thomas Herz, Senior Transport Specialist, CWTC, ADB

Dr. Michael Anyala, Senior Road Asset Management Specialist at the Transport Sector Group, Sustainable Development and Climate Change Department, ADB

Ms. Ritu Mishra, Young Professional, CWTC, ADB