ROAD MAINTENANCE (C) 2025

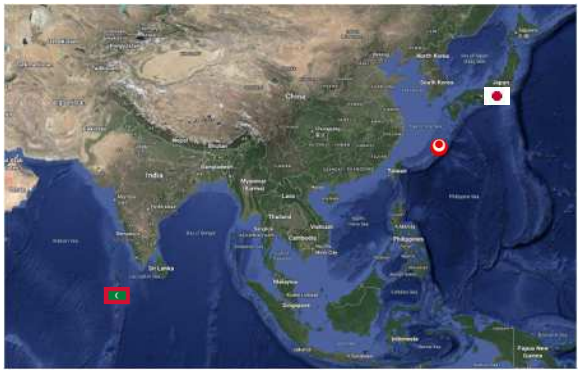
Summary Report & Action Plan

Aminath Hamna Mohamed
Engineer, Road Development Corporation Ltd. (RDC)
Republic of Maldives

Hi, everyone! I'm Hamna from Maldives.

Contents

- Current status and issues of road maintenance in Maldives
- Key learnings & areas of interest for future learning
- Application and implementation of what I've learnt from Okinawa, Japan



- Today, I'll briefly recap the current status and issues of road maintenance in Maldives.
- Then, I'll highlight the things I've learnt during this course and areas I'm interested in learning more about.
- Finally, I'd like to discuss how I intend to apply and implement things I've learnt from Okinawa, Japan.

Current Status & Issues of Road Maintenance in Maldives

- Reactive > Preventive 😞
- Small, limited budget for road maintenance 🥵 💸 Repair work is not long lasting ⏳
- Lacking technical capacity, materials, equipment and skilled workforce 🚫 👷 🛠️ 🚜 🥺
- No road asset management system, no road register, no road condition monitoring system, no periodic inspection system. Why? No data collection and no central database 😭

3

- The current status of Maldivian road maintenance is that it is reactive instead than preventive maintenance. There are a lot of reasons why it is so.
- Due to the limited budget, there is a significant delay in repair works.
- Such rush repair works are often not long-lasting repair and not of good quality. This is because there is a lack of technical capacity, materials, equipment and skilled workforce.
- Furthermore, Maldives lacks a road asset management system and lacks the manpower and equipment to monitor road conditions and carry our periodic inspections. However, Maldives currently does not have the data needed in one central database that has all the road details to implement a road asset management system.
- The inspection reports for inspections carried out due to road-related complaints from citizens are not kept in an organised manner in a centralised system, thus leaving no easily accessible road inspection history. These inspection reports are also not used to inform future maintenance and monitoring works.
- But the most significant reason for the current status of road maintenance in Maldives is due to not placing enough importance on road maintenance. This, I believe, is the root cause for the limited of technical capacity, budget and equipment for road maintenance.

Key Learnings & Areas of Interest for Future Learning

- How road management, construction and maintenance are organised within the administrative system in Japan and Okinawa
- Understand the contract and bidding systems in Japan and other countries for outsourcing maintenance works
- Use of management frameworks (PDCA & OODA) to improve road safety and maintenance
- Ways to reduce maintenance costs (partial trimming of vegetation, turning off streetlights in areas with less traffic)
- Importance of keeping maintenance measures in mind during the planning and design stage of infrastructure projects.

4

- Over the duration of this course, I've learnt a lot of things and found new methods and technologies I'm interested in learning more about.
- One of the most important things I've learnt about was how road management, construction and maintenance are organised within the administrative system in Japan and Okinawa. It was clear who was responsible for which roads maintenance and construction of new road projects.
- Understanding the contract and bidding systems, not only in Japan, but other participant's countries as well, further broadened my knowledge of outsourcing road maintenance works to the private sector.
- Another impactful framework, was the use of PDCA and OODA and how it is implemented to improve road safety and maintenance. Having a clear framework to ensure that the works being implemented are continually being checked to see the effectiveness and revised to improve, is something that ensures quality of works and ensures the safety and satisfaction of citizens.
- I also learnt that sometimes, you don't need innovative technology to reduce road maintenance but a simple questioning of the existing operations and wondering, what is the simplest thing that can be done to reduce cost without spending more money such partial trimming of vegetation and turning off lights in areas of light traffic at night.
- But the simplest solution for reducing the maintenance costs is to keep maintenance measures incorporated into the infrastructure itself during the

planning and design stage of infrastructure projects.

Key Learnings & Areas of Interest for Future Learning

- Road & bridge inspections and patrols
  - Types of inspections and patrols and their respective frequency/cycles
  - Key inspection points
  - Maintenance tasks for the roads and bridges
  - Methodologies and equipment used for inspections
- Inspection Reports – damage maps and organisation of photos
- Use of technologies to assist asset condition monitoring and schedule maintenance and allocate budget to prevent emergency repairs being needed
- Use of technologies such as drones to carry out inspections and surveys

5

- The topic I was most interested in and learnt the most about is the road and bridge inspections and patrols. I learnt the different types of inspections, patrols, the respective tools and equipments needed for each, and the frequency of these inspections and patrols. Not only do I know what are the maintenance tasks carried out during each, I also now know which are the areas that are most prone to damage and needs to be checked carefully.
- Building on this foundation, I found the Japanese inspection reports are extremely detailed and well structured. Notably the numbering and the organisation of the inspection photos. This has inspired me to update the existing inspection report template of my department.
- Aside from the inspection reports, I also learnt how technologies are being utilised to assist asset condition monitoring, even with a limited workforce. Through monitoring and predicting damage and fatigue of road assets, maintenance can be scheduled in such a way to be within the allocated budget by knowing which are road assets need to be repaired before it reaches the level of an emergency repair.
- Furthermore, with the use of drones for carrying out inspections and surveys, it ensures the workers safety by reducing the need to access hard to reach places that need to be inspected.

Key Learnings & Areas of Interest for Future Learning

- Different types of asphalt, coloured pavements and where they are used usually – cement milk, epoxy and resin binders, porous asphalt
- Asphalt pavement deterioration – different types of deterioration, how to identify them, causes, repair methods, classification of damage severity
- Pavement design – classification of roads, structural layers and materials
- Yuikuru – use of recycled construction waste as recycled construction materials and products

6

- Another thing I've learnt during the course is the many types of asphalt pavements. Back home, I've only heard about the traditional asphalt and porous asphalt. To discover and learn that there are coloured pavements, cement milk asphalt and the use of epoxy and resin binders has definitely changed how I see roads now. Now, I know there's a reason for the coloured asphalt on the roads and why intersections have a different look than the rest of the roads. Which makes walking on the road a lot more interesting now.
- The second know-how I wanted to gain from this course was how to identify the different types of road deterioration. I've learnt that though the damage on the surface may look alike, there can be several causes of the damage and how it informs the severity of the damage (for example if its' a surface damage or a structural damage), and the type of repair work that needs to be done.
- I also found the pavement design very useful as I learnt about the classification of roads, structural layer and materials of pavements.
- One very interesting area was Yuikuru. I've heard of plastic bottles being recycled. But never in my dreams, did I think asphalt and concrete waste can be recycled. Yuikuru challenged my current view on construction waste and it has fuelled my curiosity to know how much construction waste can be reduced through recycling and how much can theconstructions costs can be reduced for the road development projects back in Maldives.
- This is something I'd like to further learn about as Maldives imports all the raw

materials for asphalt pavements which does make road construction very costly.

Key Learnings & Areas of Interest for Future Learning

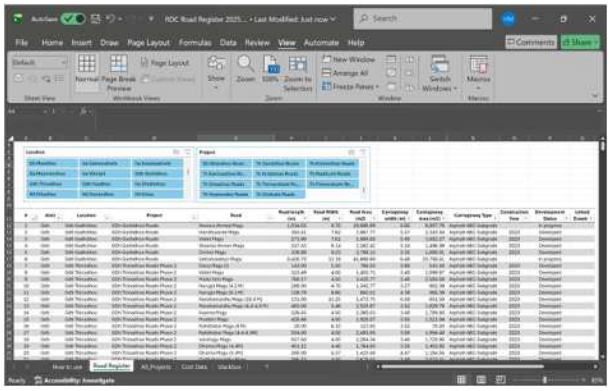
- Concrete and steel damages – how it is caused and how to prevent/reduce such damages
- Anti-corrosion of different key components, where corrosion commonly occurs, repair solutions and preventive treatments and methods
- Salt damage in concrete and steel – mitigation, prevention and repair techniques
- Maintenance rooms between the girders of the bridge for ease of access and reduce salt damage to the underside of bridge girders

7

- Another thing I've learnt was the damages to concrete and steel. How it is caused, what factors contribute to the quickening the rate of deterioration and how to prevent and reduce such damages.
- One key damage to both concrete and steel was corrosion. I learnt about where corrosion most commonly occurs, the different ways key components of roads and bridges are protected against corrosion, and repair solutions and methods for the corrosion damage that has already taken place.
- I've also learnt how salt damage can be a very silent killer for bridges as it is usually the underside of bridges that suffer most from the corrosion exacerbated by salt spray off. The use of boards between the girders to prevent salt from reaching the girder undersides was a particularly creative solution as it also allow for a maintenance hallway to be created between girders, allowing for easier accessibility for bridge maintenance.
- But most impressive one I found was the use of bolt caps. I was astonished to find that with use of bolt caps and protective painting, there was almost little to none damage to bolts! That is so impressive just how something small can prevent corrosion so well just by getting rid of the two things needed for the corrosion chemical reaction.

Action Plan – Short-term Goals

- Improve and update the current inspection report template
- Establish an inspections log and reporting system
- Create a road register database in Excel
- Conduct training to teach maintenance staff on how identify the type of asphalt pavement damages, causes and respective repair work
- Conducting feasibility study for
  - Use of coloured asphalt in Maldivian road construction projects
  - Porous asphalt in Maldivian road construction projects
  - Use of bolt caps on streetlight pole-footing connection
  - Use of protective painting on streetlights and road sign poles against salt damage and corrosion
  - Use of road asset condition monitoring equipment
- Identify manpower, fleet and equipment requirements to carry out periodic inspections



8

- But just knowing all these things isn't enough. So I made a list of things I would like to do and categorised them into short-term and mid to long term goals.
- <Read from the slide>

Action Plan – Mid to Long-term Goals

- Create a guideline for road maintenance, inspections and patrols
- Based on feasibility studies, incorporate technologies and materials in the new road construction projects
- Conduct capacity building programs for local government bodies for carrying out inspections and reporting
- Create road register in QGIS and connect inspections and maintenance to the road register

9

- These are the long term goals.
- <Read from slide>

ޝުކުރިއްޔާ

ありがとうございました

Thank you