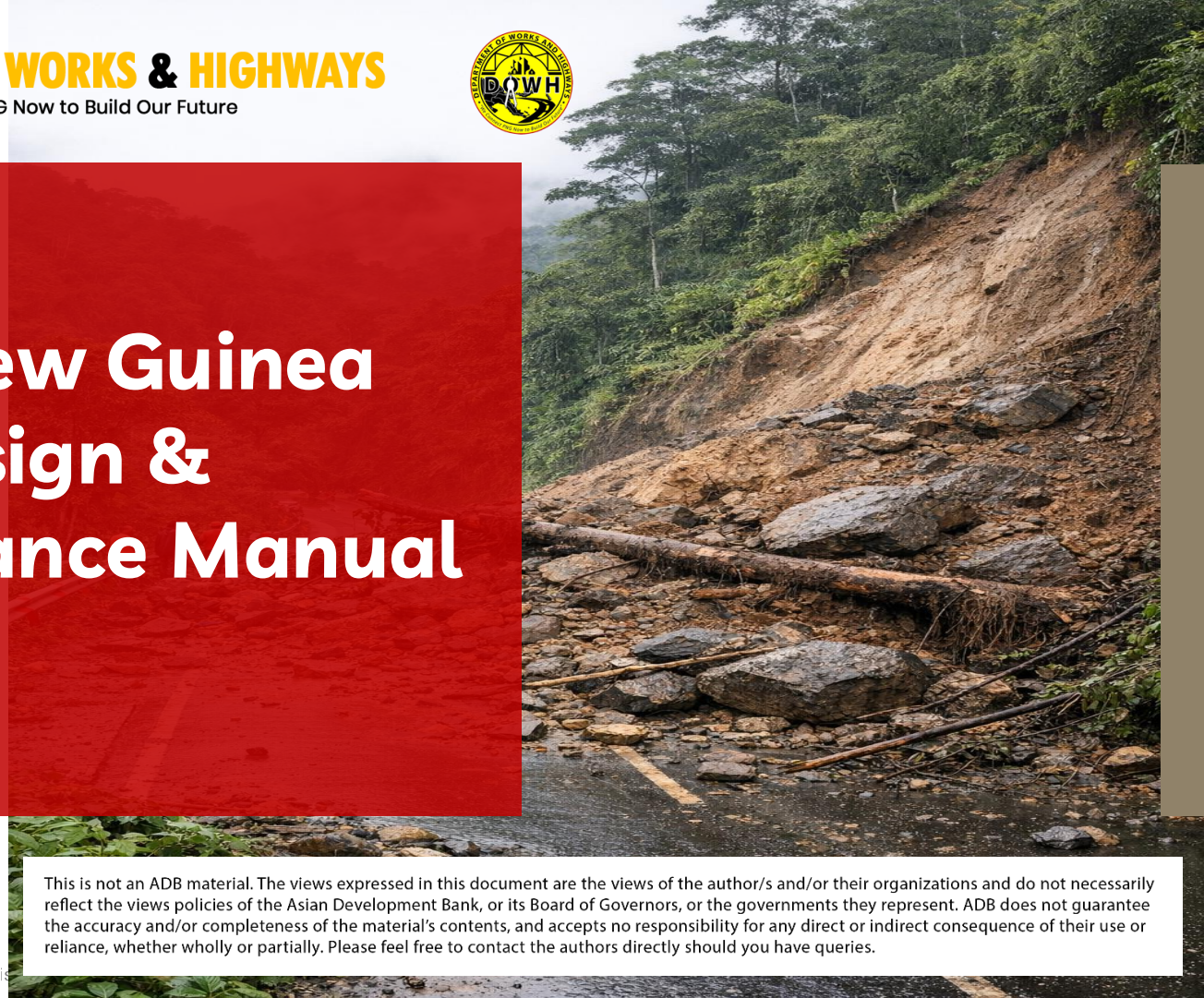
DEPARTMENT OF WORKS & HIGHWAYS

We Connect PNG Now to Build Our Future

Papua New Guinea Road Design & Maintenance Manual

Dr Theunis Henning and
Dr Ian Greenwood

ADB Green Roads Webinar
23rd April 2026



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Agenda

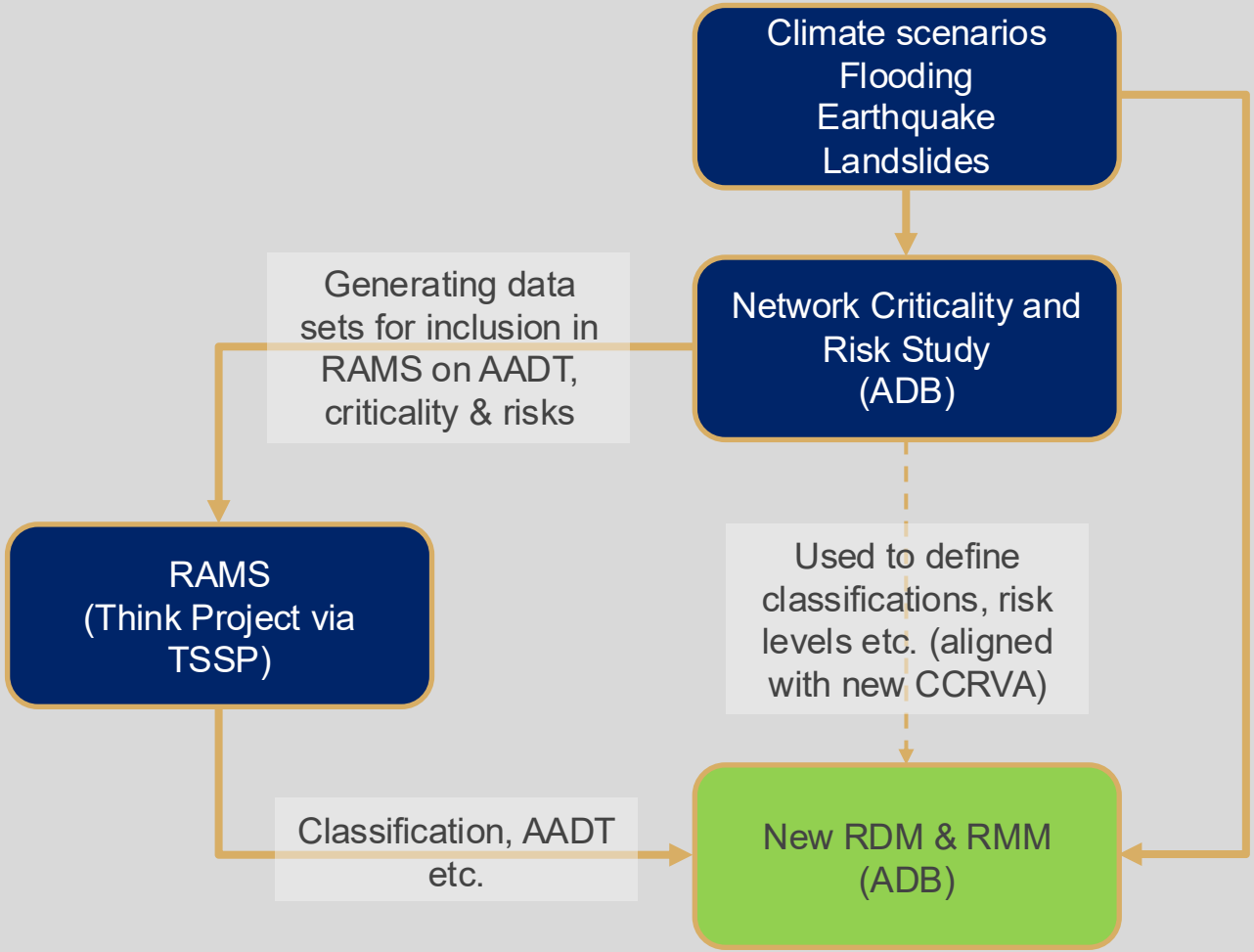
1. **Overview of related initiatives (Ian)**
2. **Road Design Manual (Theuns)**
3. **Road Maintenance Manual (Ian)**
4. **Q&A**

01

Overview of Related Initiatives

Many Players Improving PNG Capabilities

- Australia DFaT – TSSP3
  - Climate Change Risk & Vulnerability Assessment Framework (CCRVA) (2025)
  - Many other related initiatives, including condition assessments and web-based AMIS
- ADB
  - RAM Roadmap
  - Bridge asset management
  - Network level multi-hazard resilience modelling (Elco and Travis webinar)
- World Bank
  - OPBRC contracts
- JICA
  - Capacity development
- …
- GoPNG
  - ConnectPNG, Reclassification of road network, Road Act, Road Fund, …



IMF Country Report No. 25/336 For PNG

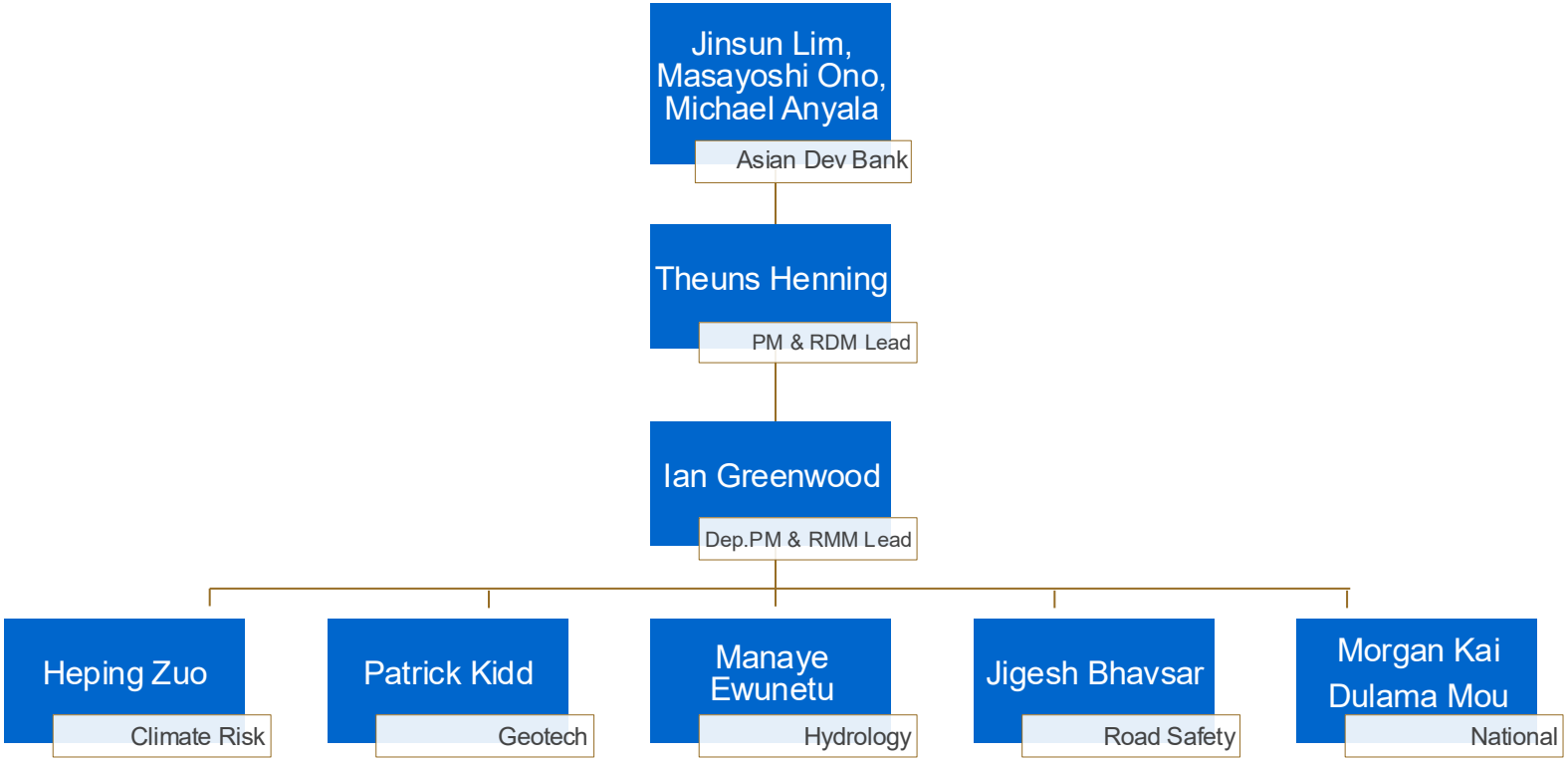
33. *Continued efforts are needed to integrate climate considerations in infrastructure governance practices and improve the climate resilience of infrastructure (MEFP 36).*

Building on the CPIMA recommendations, and with further support from the upcoming PIMA in early 2026, the authorities remain committed to developing public investment management regulations incorporating climate considerations throughout the capital project cycle (RM5 for March 2026).

Given the criticality of routine and capital maintenance of infrastructure assets for an effective adaptation strategy, and with support from the WB and the ADB, the authorities are on track to pilot the incorporation of climate considerations in maintenance standards and costing applied to national roads (RM6 for March 2026).

By limiting the adverse economic impact of climate-related shocks, these reforms would contribute to lower external financing and facilitate a rapid recovery of growth and net exports.

Our Team



02

Road Design Manual

Source: DOWH PNG

Overview of Structure

INTRODUCTION AND DESIGN PROCESS

Context, Design Process, Classification and Criticality

CLIMATE AND DISASTERS ADAPTATION FOR ROAD DESIGN

PNG Climate and Disaster Risk, Risk Assessment Process, Adapting Design

Geometric Design

Design Inputs, Alignments, Intersections, Road Safety

Drainage

Sustainable Drainage, Run-off and Flow path, Crossings & Pavement

Earthworks and Slope Stability

Slope and Geotechnical Inspections, Slope Stability Design

Pavement Design and Lifecycle Management

Materials and Pavement Design, Lifecycle Management

PART A: INTRODUCTION AND DESIGN PROCESS – Decision Making

- **Design Process**

- **The Manual promotes an integrated design approach across investment drivers.**

- Strategic development
  - New road construction (Construction of new roads, extension, and realignment)
  - Systemic level of major upgrades

- Technical improvements
  - Road renewal (resurfacing and rehabilitation)
  - Road safety improvement

- Resilience improvement
  - Pro-active resilience improvements for obvious at-risk areas
  - Damage caused by climate and geophysical hazards
  - Disruptions caused by climate and geophysical hazards

PART A: INTRODUCTION AND DESIGN PROCESS – Road Classification

- Classification approach now includes criticality
- Functional road classification is key to many road classification is key to many design key to many design standards and, in some cases, road classification is key to many design standards and,in some cases, policy on speed and access policy

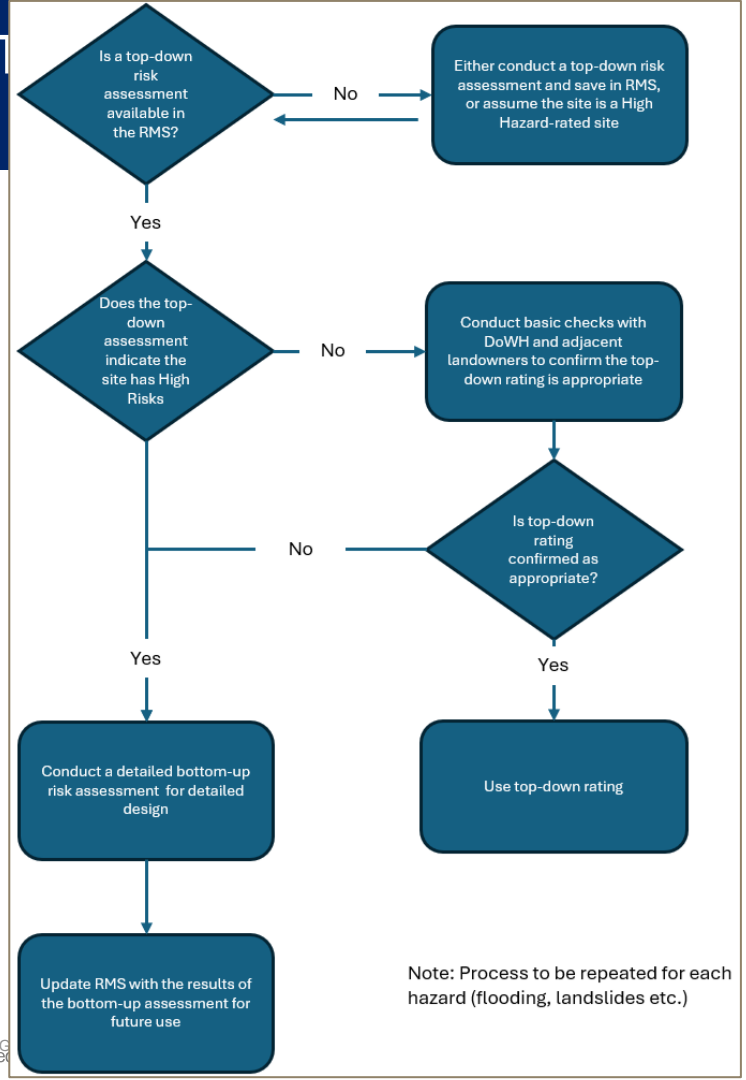
Classification	Approach/Criteria	How the Classification is Used
Functional Classification	Road hierarchical and functional use classification	To determine the road design standards and the ongoing Level of Service
Resilience Classification	Risk exposure to the respective individual hazards (i.e. – likelihood and how it could be damaged)	To know the specific requirements and allowances in the design and maintenance of the road. (For example, if erosion is of concern, more emphasis is taken on drainage design and maintenance)
	Criticality for the road to be closed or at a reduced Level of Service (i.e. what are the wider consequences for reduced access)	To guide the investment priority into a road link and reduce road network vulnerability

PART B: CLIMATE AND DISASTERS ADAPT FOR ROAD DESIGN - Risk Assessments

- Part B contains details on risk assessment at two levels.

Considerations

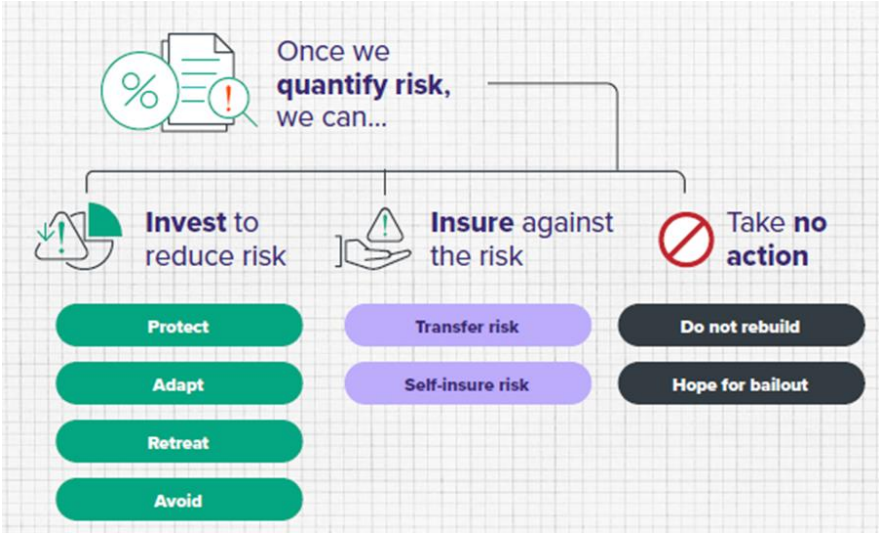
- Main purpose for the design
- Is there enough information for the design?
- Integrated approach with 'other' factors e.g. road safety



PART B: CLIMATE AND DISASTERS ADAPTATION FOR ROAD DESIGN - Adaptation Design

Intervention Points

- **New road design** – avoid risk, adaptive design
- **High-risk & Criticality road** Pre Event– protect, adapt, retreat
- **Medium risk/criticality** pre-event – adapt, protect
- **Post Event:**
  - Response –restore access, make it safe
  - Recover – see as a new design (Not built as I was)

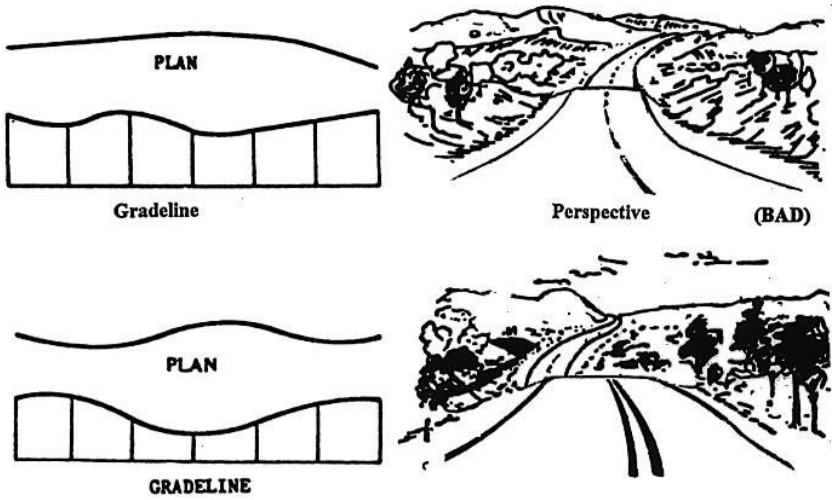


Source NZ Infrastructure Commission

PART C: GEOMETRIC AND SAFETY DESIGN REQUIREMENTS

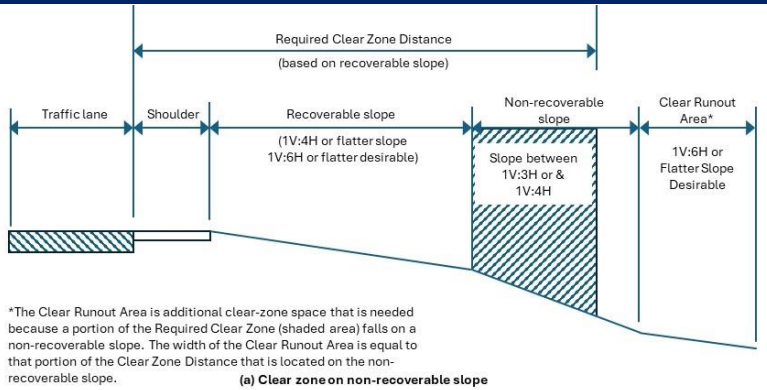
Part C is predominantly a safety-informed geometric design

- Alignment
- Intersections
- Pedestrian facilities
- Traffic signs and marking



PART C: GEOMETRIC AND SAFETY DESIGN REQUIREMENTS - Safety management

- ‘forgiving roads’
- Manual provides details on road safety audits and star rating e.g. iRAP
- Having a manual is one part of ensuring safety; there are other institutional supports needed also (e.g. law enforcement)



*The Clear Runout Area is additional clear-zone space that is needed because a portion of the Required Clear Zone (shaded area) falls on a non-recoverable slope. The width of the Clear Runout Area is equal to that portion of the Clear Zone Distance that is located on the non-recoverable slope.

(a) Clear zone on non-recoverable slope

PART D: DRAINAGE DESIGN

- Higher peak discharges and increase in short-duration extreme rainfall
- RDM addresses climate change impacts through **climate uplift factors** related to planning horizon & risk category (10-50% increase)
- Design Storm event reflects the risks on the road

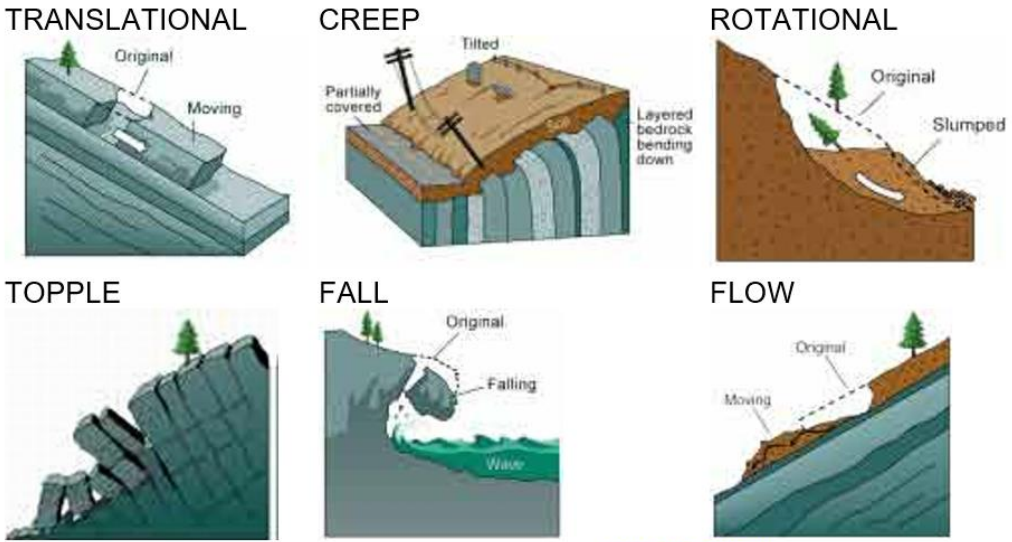
Table 1: Road Drainage Hazard Category Levels and Descriptions

Climate Risk Level	Design Storm (ARI / AEP)	Typical Road Type / Feature	Indicative Design Life
Low	2–5 year ARI	Local access roads, unpaved roads	10–20 years
Moderate	10–20 year ARI	District or provincial roads	20–30 years
High	50–100 year ARI	National roads, bridges	40–50 years
Extreme	200-year ARI or greater	Critical highways, emergency routes	50–100 years

PART E: EARTHWORKS AND SLOPE STABILITY

- What investigations should be undertaken?
  - Now clarified the linkage to the stage of project development (concept, preliminary, detailed design)
- Slope stability and design

Figure 3: Common Types of Landslides



Source: Government of Australia, Geoscience Australia. www.ga.gov.au.

PART F: PAVEMENT DESIGN AND LIFECYCLE MANAGEMENT

PART F is largely based on AUSTROADS Pavement Design, but it focuses more on making the right design choices

- Choosing the right options for Traffic Loading
- Choosing the right technology for a climate perspective
  - Appropriate surface options
  - Choices on pavement materials

Table 1-6: Pavement Materials Stabilisation Agents Application

Based on (Gray, 2016)

Particle Size	MORE THAN 25% PASSING 0.425 mm			LESS THAN 25% PASSING 0.425 mm		
Plasticity Index	PI ≤10	10<PI<20	PI ≥10	PI ≤6 WPI≤60	PI ≤10	PI >10
Cement and Cementitious Blends*						
Lime						
Bitumen						
Bitumen /Cement Blends						
Granular						
Polymers						
Miscellaneous Chemicals**						

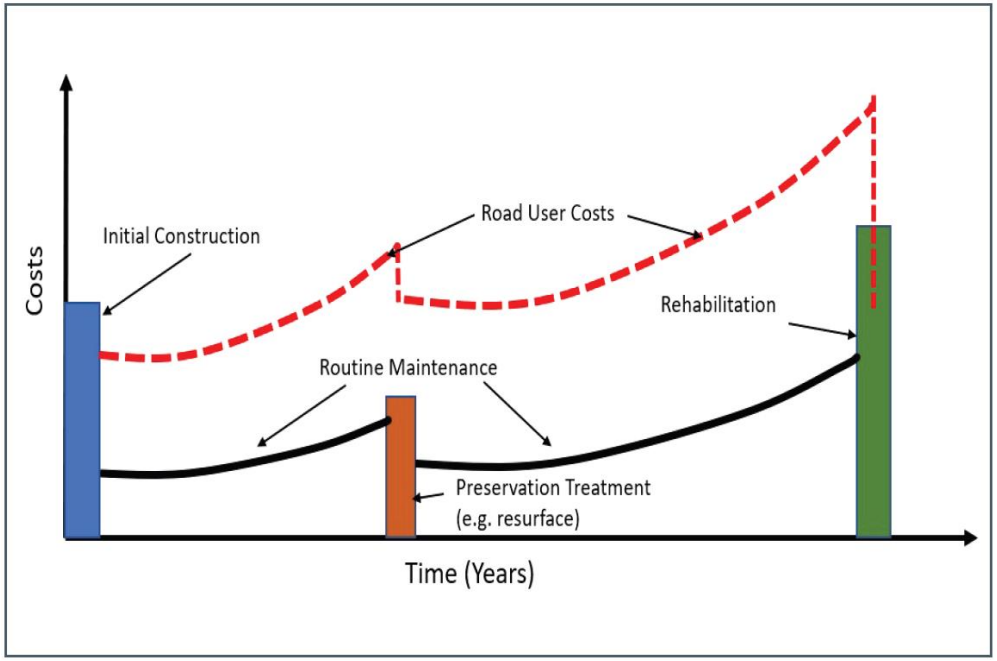
Key

Suitable	Less suitable/not advised	Not suitable/Appropriate

PART F: PAVEMENT DESIGN AND LIFECYCLE MANAGEMENT

Sustainability considerations are vital for design option selection

- Practicalities
  - Can this road be maintained?
- Long-term Economics
  - Minimum Whole of life costs
- Carbon reduction
  - Reducing construction and traffic carbon emissions
- Community development
  - Allowance for job creation
  - Resilience for community benefits



03

Road Maintenance Manual

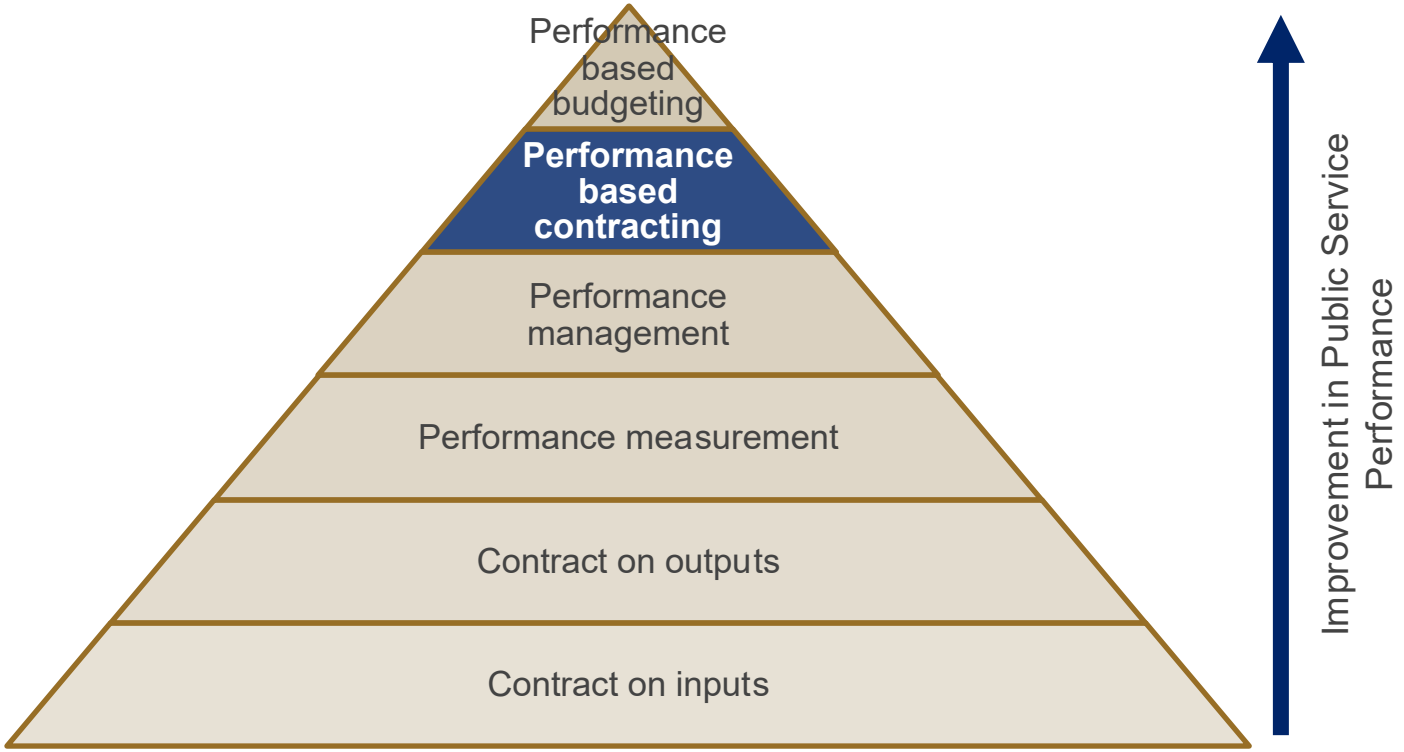
Current Maintenance Practices

- Current manual focusses on how to do repairs and with what materials – but not when to intervene or how many defects there can be
- PNG have undertaken various PBCs under projects funded by MDBs or donor partners
- But funding for routine maintenance is significantly below need for the current network size

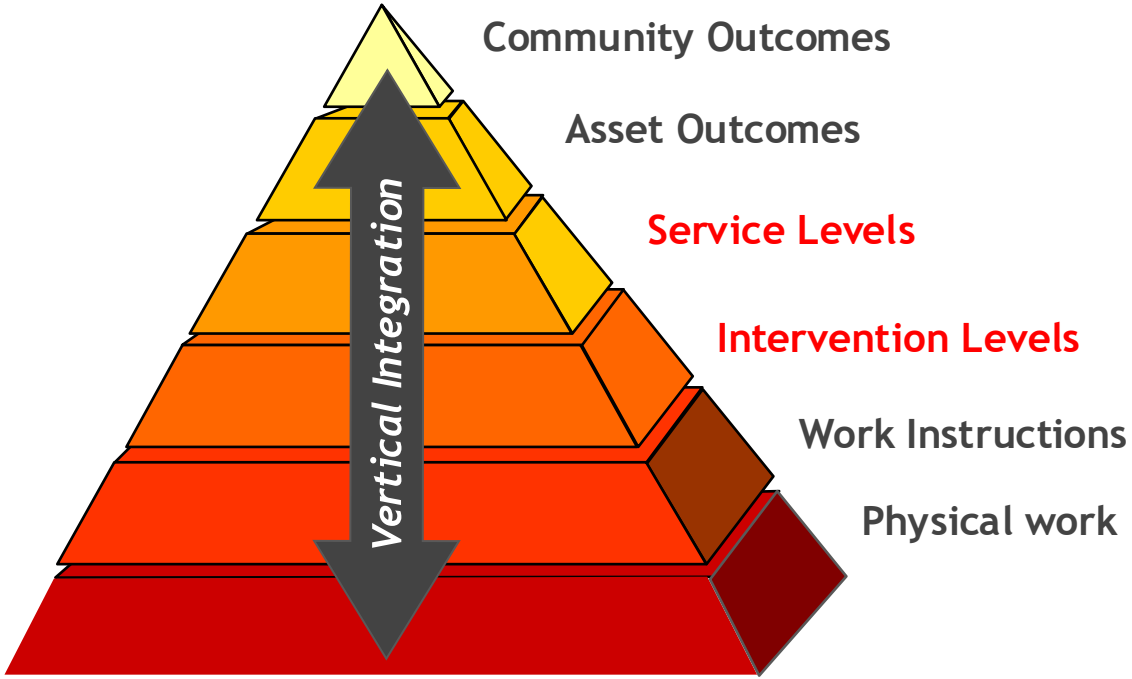
Form of New Maintenance Manual

- Not revoking the existing manuals on how to do repairs
- Focus is on what level of defect is acceptable for different risk categories
- Which ideally aligns to a ‘performance based specification’ type manual

Why Performance Based Approach



Asset Management Pyramid



Overview of Structure

- Assumes road has been classified as per the RDM
- Largely aligned with the World Bank OPBRC approach
- Simplified where possible
  - Keeping the focus on what is important within PNG context

Major Climate-Resilient Mtce Features

- Inspection frequency of roads linked to the criticality rating of the road
- Maintenance standards vary based on the resilience or criticality rating of a road
- Requirement to have pre-planned detour routes for all high criticality roads

Inspection Frequency

Table 2: Self-Control Unit Inspection Frequency

Criticality Rating	Frequency of Inspections[a]
Low	Once per month
Medium	Every 2 weeks
High	Every week

[a] The contractor will need to conduct additional patrols of the network as they deem appropriate to enable them to identify and rectify defects and remain in compliance with the performance standards at all times. Personnel assigned to these patrols are at the complete discretion of the contractor.

Maintenance Standards Vary

- Maintenance standards vary based on the criticality rating of a road section, not its hierarchy

Table 13: Drainage Performance Measures

Criteria	Performance Measure	Flooding Resilience Classification		
		Low	Medium	High
Earth side drains	Number of blockages of more than 10% of cross-sectional area per km of road (sum total of both sides of the road)	10	5	1
	Number of blockages of more than 30% of cross-sectional area per km of road (sum total of both sides of the road)	0	0	0
Concrete lined side drains	Number of blockages of more than 10% of cross-sectional area per km of road (sum total of both sides of the road)	5	2	1
	Number of blockages of more than 30% of cross-sectional area per km	0	0	0

Practical Guidance on Application

- As with the RDM, needs wider consultation with the PNG road sector

- Service levels need to be pilot tested to see if they deliver the right outcomes
  - OPBRC or PBMC contract

Practical Guidance on Application

- Are the inspection requirements feasible and achievable?
  - Does the human resource capacity exist and if not how to develop it?

- For use within a PBMC or in an OPBRC style contract
  - Also need all the supporting documentation to be in place
  - And incorporate climate- and disaster-resilient maintenance as a "business as usual" action of domestic maintenance industry

Maintenance Challenge in PNG Is Not Just Technical

- Questions we are still working on include:
  - How do we get the private sector to invest in maintenance capacity?
    - What are the impediments to creating a strong maintenance industry in PNG?
  - What is a reasonable timeline to target a competent maintenance industry with good capacity, and what are the steps to be taken to get there?

Savings on Maintenance is Never a Saving!!

04

Summary

Source: DOWH PNG

Key Points

- Drafts of new road design and maintenance manuals have been produced for PNG
  - These incorporate key principles of climate and geophysical hazard resilience as a foundational concept
  - They were developed to align with numerous other initiatives occurring in PNG
- These will be further elaborated and developed in close communication with PNG and should be piloted to ensure workability of the manuals
- Will require a capacity building phase for all parties – DoWH, consultants and contractors.

THANKS

Does anyone have any questions?

Dr Theuns Henning
Dr Ian Greenwood

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