CAREC
Central Asia Regional Economic Cooperation Program

22nd Transport Sector Coordinating Committee Meeting

16–17 June 2025 • Bishkek, Kyrgyz Republic

22-е заседание Координационного комитета по транспортному сектору

16–17 июня 2025 года • Бишкек, Кыргызская Республика

Session xx: Green Roads Toolkit

Michael Anyala
Senior Transport Specialist (Road Asset Management)
Transport Sector Office, Sectors Department 1

David Fay
Senior Transport Specialist
Transport Sector Office, Sectors Department 1

Why is the Green Roads Toolkit essential?

- **29 million km of roads in Asia and the Pacific region, with a forecast for 8 million km of new roads by 2030!**
- **0.4 Billion people in Asia lack adequate road access.**
- **$520 billion annual cost of transportation infrastructure**
- **36 Billion Tons of CO_2 emitted into the atmosphere annually, with the road sector contributing 18% of global CO_2 emissions!**

Enormous footprint of roads:

The unified MDB commitment to Paris align operations requires the move from regular roads to green roads

We need Best Green Road practices in:

- ✓ **Decarbonization**
- ✓ **Climate resilience/ adaptation**
- ✓ **Water and land management,**
- ✓ **Reducing pollution,**
- ✓ **Improving quality of life,**
- ✓ **Preserving biodiversity,**
- ✓ **Disaster preparedness,**
- ✓ **Sustainably sourcing materials,**
- ✓ **Fostering inclusive growth.**

What is the Green Roads toolkit?

- **A tool for maximizing benefits:** Focuses on making road projects better while reducing any harm.
- **A Collection of Best Practices:** Includes 150 different Green Roads practices that can be applied to road management, planning, design, construction, and asset management
- **Easy to Search:** Organized into nine green themes and can be filtered by different categories.
- **Includes additional helpful tools**: Comes with checklists and other tools, including assessment of enabling framework
- **Customizable Use:** Designed to support the creation of tailored road programs that promote sustainability

GREEN ROADS TOOLKIT

Download the Green Roads Toolkit

SCAN ME

Green Roads toolkit: Generating overview of relevant best practices

ADB META IRF

Project Level Application

Step 1: Select Green Road Theme(s) and project characteristics **(Note: Clear all checkboxes in both Step 1 and 2 before making selections)**

1 CO2	2 Res	3 W&L	4 Pol	5 QoL	6 Bio	7 Dis	8 Mat	9 Inc	10 Con	11 Saf	12 Aff
☐	☑	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Geography and Climate	Mountainous	Flat	Arid	Tropical	Pacific Islands
	☑	☐	☐	☐	☐
Standard of road	Low-Volume/rural	Paved highways	Expressed highways		Urban roads
	☐	☑	☐		☐
Road project stage	Planning	Design	Construction/Implementation		Maintenance
	☐	☐	☐		☐
Degree of impact	Incremental	Progressive	Transformative		
	☐	☐	☐		

Step 2:
Select Enabling factor(s) aligning with the current conditions or policies

☐ Improved Design Standards	☐ Public Awareness and Education
☐ Modified Tendering Procedures	☐ Collaborative Partnerships
☑ Policy Development	☐ Roadmaps for Green Roads
☐ Environmental Standards	☑ Supply systems: available Resources and Materials
☐ Regulatory Frameworks	☐ Application of New Technologies
☐ Improved Planning Systems	☑ Connection with other programs

Green Road Practices found 48

Green Road Theme	Intervention Area	No.	Pracitce Name	1 CO2	2 Res	3 W&L	4 Pol	5 QoL	6 Bio	7 Dis	8 Mat	9 Inc	10 Con	11 Saf	12 Aff
				GR objectives served: ● Core contributions ○ Secondary contributions											
1. Decarbonization	1.4. Vegetative measures to sequester CO2	1.4.1	Roadside tree planting for sequestering CO2	●	○	○	○	○	○			○		○	
2. Climate Resilience	2.1. Resilient routing/ avoiding vulnerable areas	2.1.1	Moving roads out of channel migration zones		●	○									
2. Climate Resilience	2.1. Resilient routing/ avoiding vulnerable areas	2.1.2	Avoid unstable and wet areas		●	○				○					
2. Climate Resilience	2.2. Climate resilient road drainage design	2.2.1	Preventing stream diversion at road-stream crossings		●		○			○				○	
2. Climate Resilience	2.2. Climate resilient road drainage design	2.2.2	Avoid using multiple small culverts		●										
2. Climate Resilience	2.2. Climate resilient road drainage design	2.2.3	Climate resilient culvert design		●	○				○					
2. Climate Resilience	2.2. Climate resilient road drainage design	2.2.4	Road surface drainage to prevent water concentration		●		○			○	○				
2. Climate Resilience	2.3. Increased Stabilization of road sides	2.3.1	Complete ground cover in disturbed areas		●	○									

Enabling factors: Improved Design Standards; Modified Tendering Procedures; policy Development; Environmental Standards; Regulatory Frameworks; Improved Planning Systems; Public Awareness and Education; Collaborative partnerships; Roadmaps for Green Roads; Supply systems: available Resources and Materials; Application of New Technologies; Connection with other programs

1. Decarbonization

- ✓ **Road sector is responsible for 18 % of global CO2 emissions (IEA, 2021).**
- ✓ **Emissions in each phase of the road cycle (material production and transport, construction, use, maintenance and end-of-life)**

Key intervention areas:

1.1. Material production and transportation

1.2. Design of roads and road appliances

1.3. Road construction

1.4. Road Transport Management

1.5. Vegetative measures to sequester CO2

2. Climate Resilience

- ✓ **Climate-related damage to road infrastructure costs countries between 1-3% of their GDP annually (World Bank)**
- ✓ **Making infrastructure more climate-resilient can add about 3 percent to the upfront costs but has benefit-cost ratios of about 4:1 (Global Commission on Adaptation)**

Key intervention areas:

2.1. Climate-resilient road drainage design

2.2. Increased Stabilization of roadsides

2.3. Resilient routing/ avoiding vulnerable areas

2.4. Resilient road maintenance

2.5. Enhance Climate Resilience of roads and bridges

2.6. Enhance climate resilience of roads in permafrost regions

2.7. Nature-based Solutions for enhanced climate resilience of roads

2.8. Landscape Management

3. Water and Land Management

- ✓ **Water is responsible for 80% of road damage to unpaved roads and 30% of damage to paved roads**
- ✓ **It is estimated that 20% of the global land surface is within one kilometre of road**
- ✓ **Roads have a major impact on local hydrology – often with negative consequences – this can be turned around into beneficial water management using the road infrastructure**

Key intervention areas:

3.1. Water harvesting and run-off storage
3.2. Agricultural Water management
3.3. Groundwater management
3.4. Reduced waterlogging and protecting natural channels
3.5. Preventing landslides
3.6. Erosion and Gully control
3.7. Avoiding sand dune movement
3.8. Green routing

4. Reducing Pollution

- ✓ **Usually, a land strip up to 60-100 meters from the road is significantly affected by road pollution, either from runoff or deposited road dust.**
- ✓ **The health consequences of exposure to these contaminants can be severe**

Key intervention areas:

4.1. Consider road construction materials

4.2. Source control: Minimize pollutants from vehicles and road material

4.3. Road maintenance

4.4. Prioritize road drainage

4.5. Proper use of de-icing agents/ traction agents

4.6. Capture and remove pollutants

5. Quality of Life

- ✓ Large negative impacts from roads to people's quality of life, via dust, noise, temperature and aesthetics. This can be reduced and turned around.
- ✓ Tree planting is found to be associated with significant reductions in non-accidental and cardiovascular mortality (Donovan et al., 2022)
- ✓ Use of temperature control technologies such as the use of Thermosyphon can help to minimize permafrost thawing and heat island impact of road pavements
- ✓ Closely aligned to all other Green Roads themes.

Key intervention areas:

5.1. Dust control

5.2. Beautification and public health

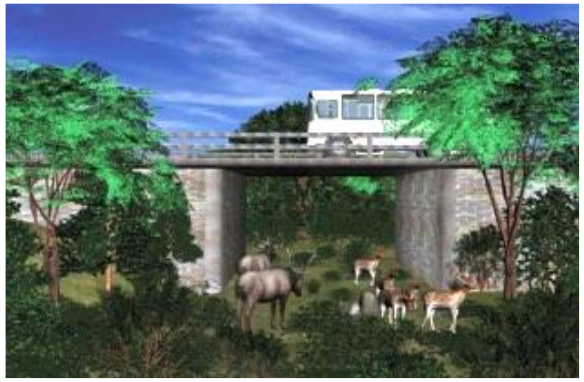
5.3. Noise control

5.4. Temperature control

5.5. Traffic Safety

6. Preserving Biodiversity

- ✓ **Roads significantly influence biodiversity, impacting both ecosystems and habitats, as well as populations of invertebrates (such as insects and soil biota) and vertebrates (including protected species).**
- ✓ **To address the biodiversity crisis, it is critical to ensure roads no longer harm biodiversity but instead preserve it and that habitats stay connected**



Key intervention areas:

6.1. Protect and harness invertebrate biodiversity

6.2. Protect and harness vertebrate biodiversity

6.3. Protect aquatic systems

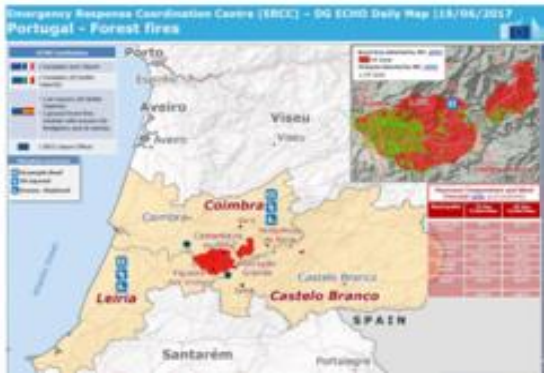
6.4. Improve roadside flora

6.5. Protect improved roadside flora

6.6. Use of Digital tools for biodiversity preservation

7. Disaster Preparedness

- ✓ **Disasters triggered by natural hazards and escalating climate change impacts pose a huge threat to economic and social development worldwide in Asia and the Pacific.**
- ✓ **Roads play an important role in disaster risk reduction as well as in disaster response (such as flood and fire management).**



Key intervention areas:

7.1. Flood mitigation by road network (compartmentalization)

7.2. Flood resilience of the road network

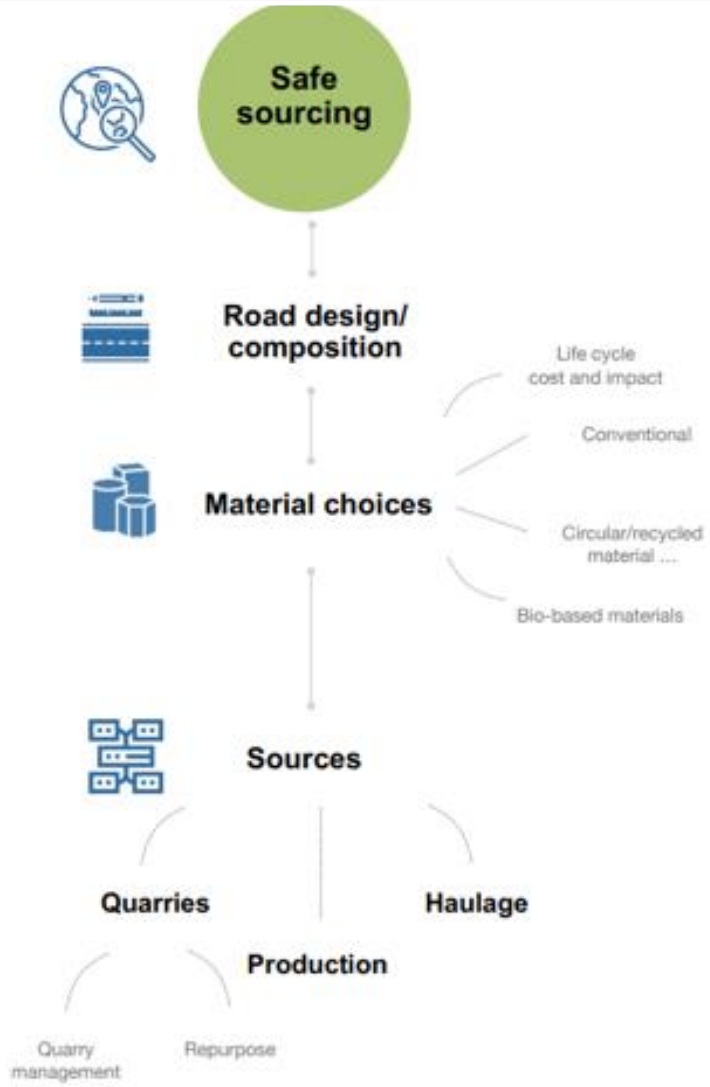
7.3. Road network capacity to deal with emergencies

7.4. Evacuation and access plans

7.5. Fire prevention

8. Sustainable Materials Sourcing and Construction Practices

- ✓ 30-40% of construction material **globally is used in linear infrastructure.**
- ✓ **Asia and the Pacific are increasingly large consumers of road construction materials, for instance, consuming** 46 million tons of asphalt a year, an increase of 64% in 10 years. – far ahead of global growth (17%)
- ✓ **Some of the raw materials are in short supply (sand, gravel) either locally or globally**
- ✓ **In many cases, the production process is demanding in terms of (environmental) costs, or haulage is demanding regarding carbon emissions. This is an area where balanced trade-offs are required**



Key intervention areas:

8.1. Design

8.2. Material choice

8.3 Sourcing

8.4. Operation and Maintenance – tailored to Small Islands material options

9. Fostering Inclusive Growth

- ✓ **Roads wire economies – yet still over 400 million of Asia's population lacks basic road access**
- ✓ **Road construction and maintenance is a large public expenditure ticket – high scope for inclusive growth and jump-start fledgling economies**
- ✓ **In many countries, road construction is also included in social safety net programs**
- ✓ **Road construction can be used to build entrepreneurial capacity and – through local sourcing - to enlarge the money circulating in local economies**

Key intervention areas:

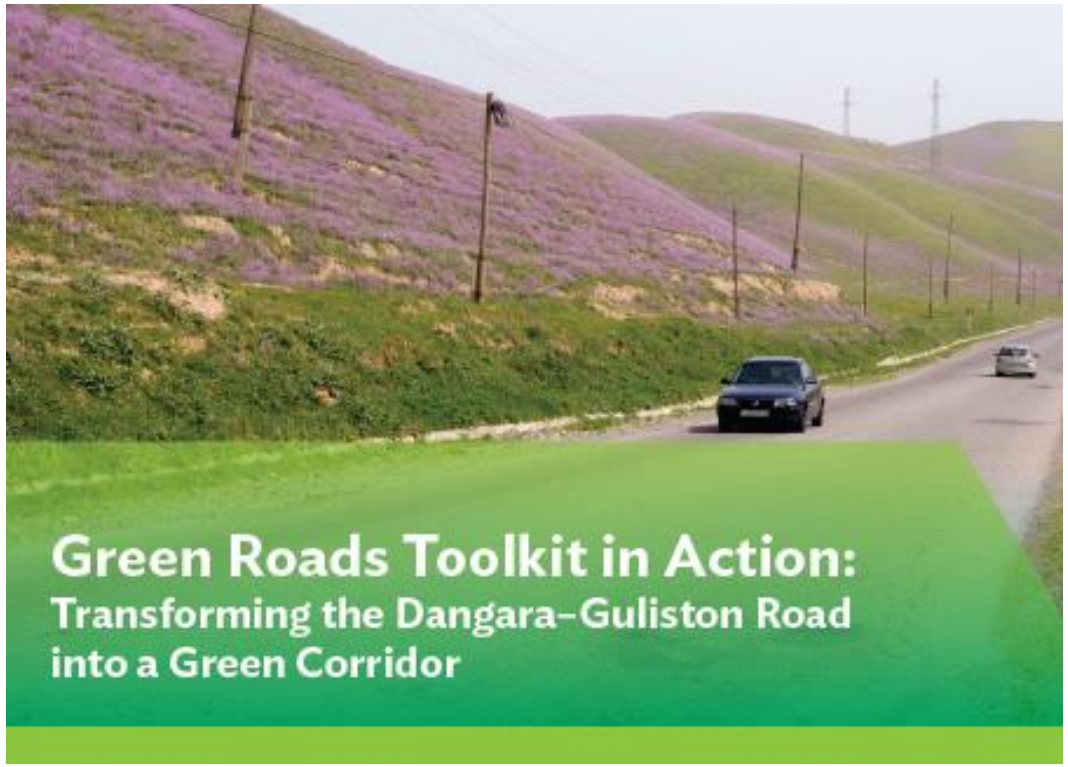
- **9.1. Local sourcing**
- **9.2. Employment generation and local capacity building**
- **9.3. Promoting (safe) roadside businesses**
- **9.4. Ensuring last mile access**
- **9.5. Gender and indigenous population special inclusion**

How to use the Toolkit in road projects?

1 – Toolkit's Application in Tajikistan

Recommendations:

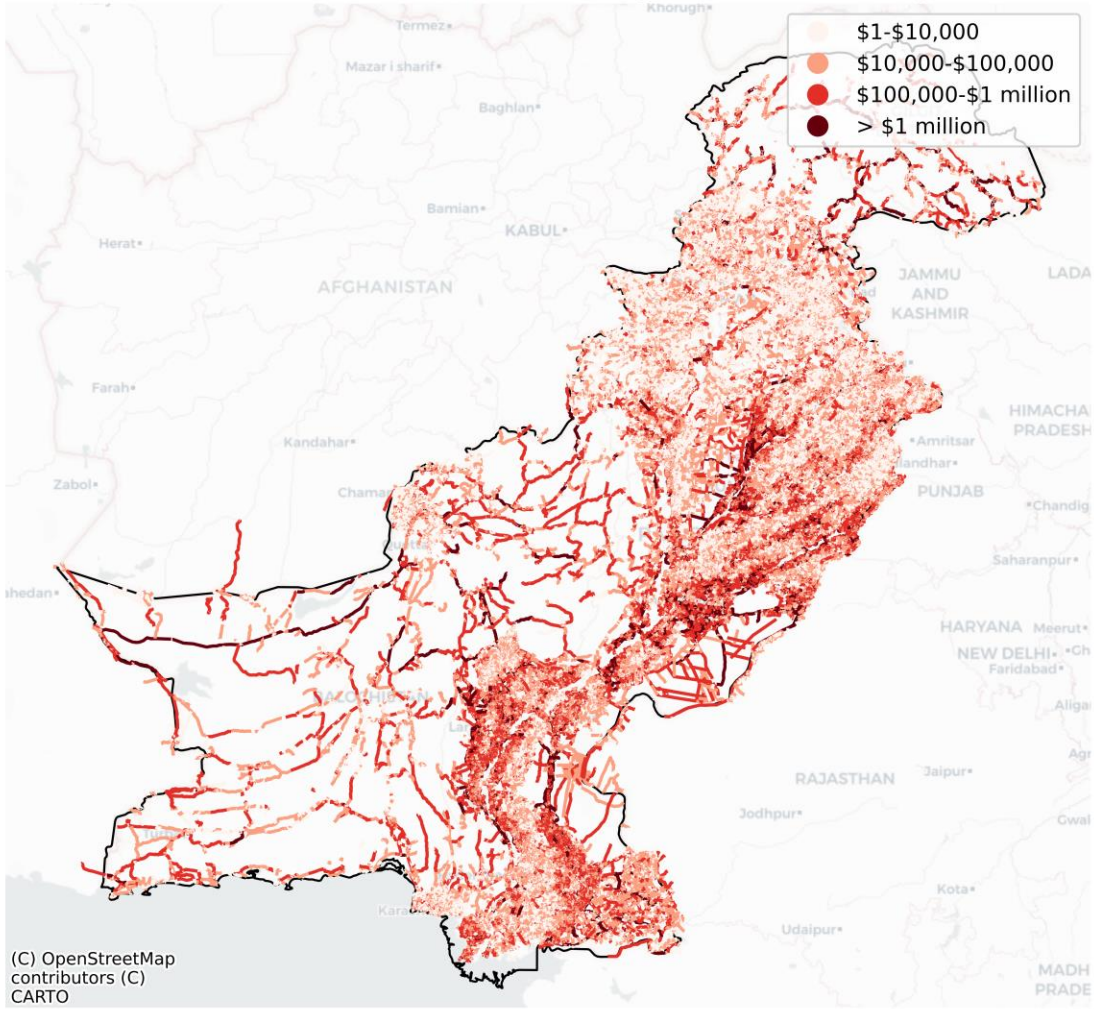
- **Decarbonization Initiatives:** Reuse existing materials, implement energy-efficient lighting, and develop international climate financing application for a re-forestation project along the national road corridors
- **Climate Resilience Measures:** bio-engineering and improved drainage systems to enhance the road's ability to withstand climate-related impacts
- **Water Management Improvements**: mudflow control and exploration of water harvesting/reuse options to optimize resource management
- **Pollution Control and Biodiversity Protection:** Safe decommissioning of petrol stations and introduction of underpasses to facilitate cattle and wildlife movements



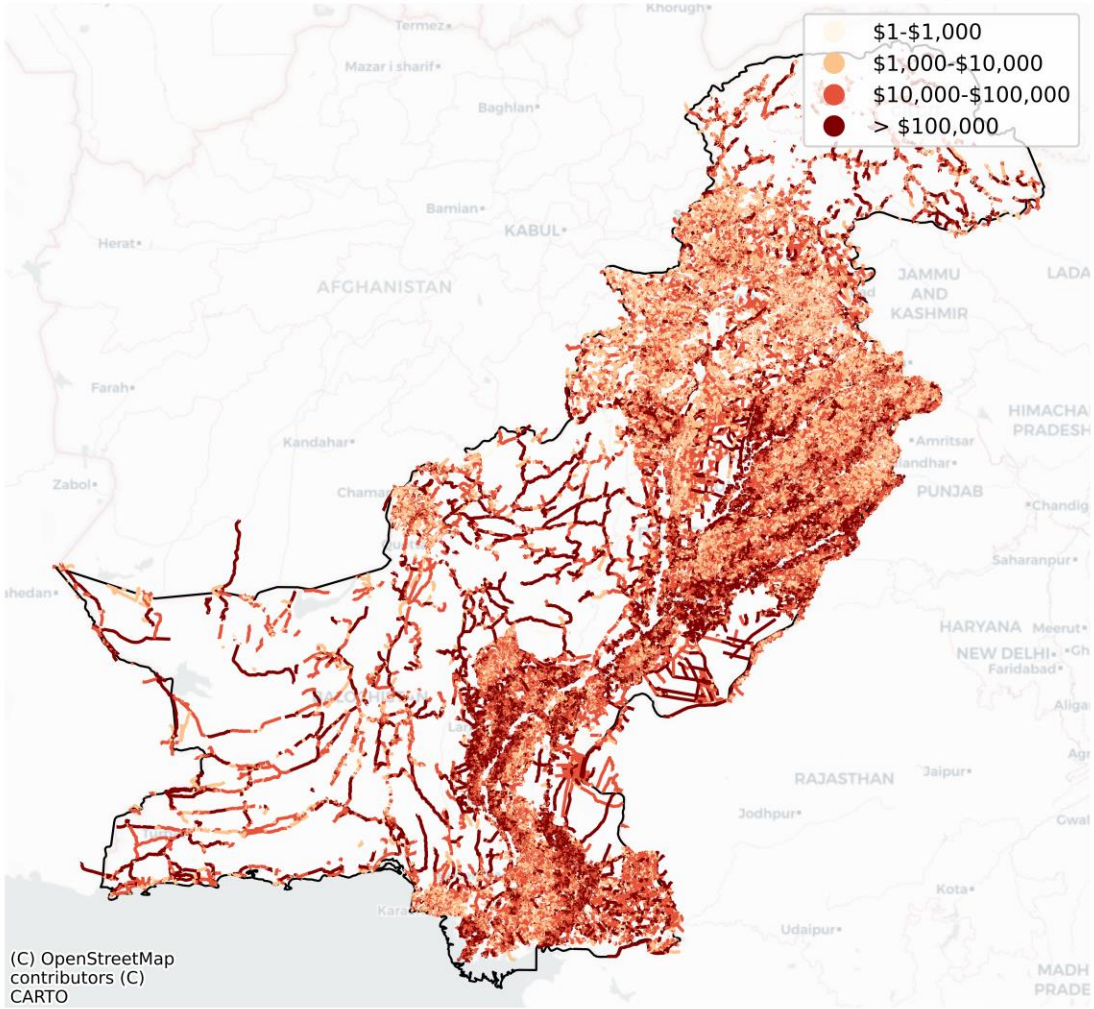
2 – Pakistan Transport Risk & Resilience

River flood damage in Pakistan (~35% of roads affected)

Pakistan 1/100 total damage river flooding

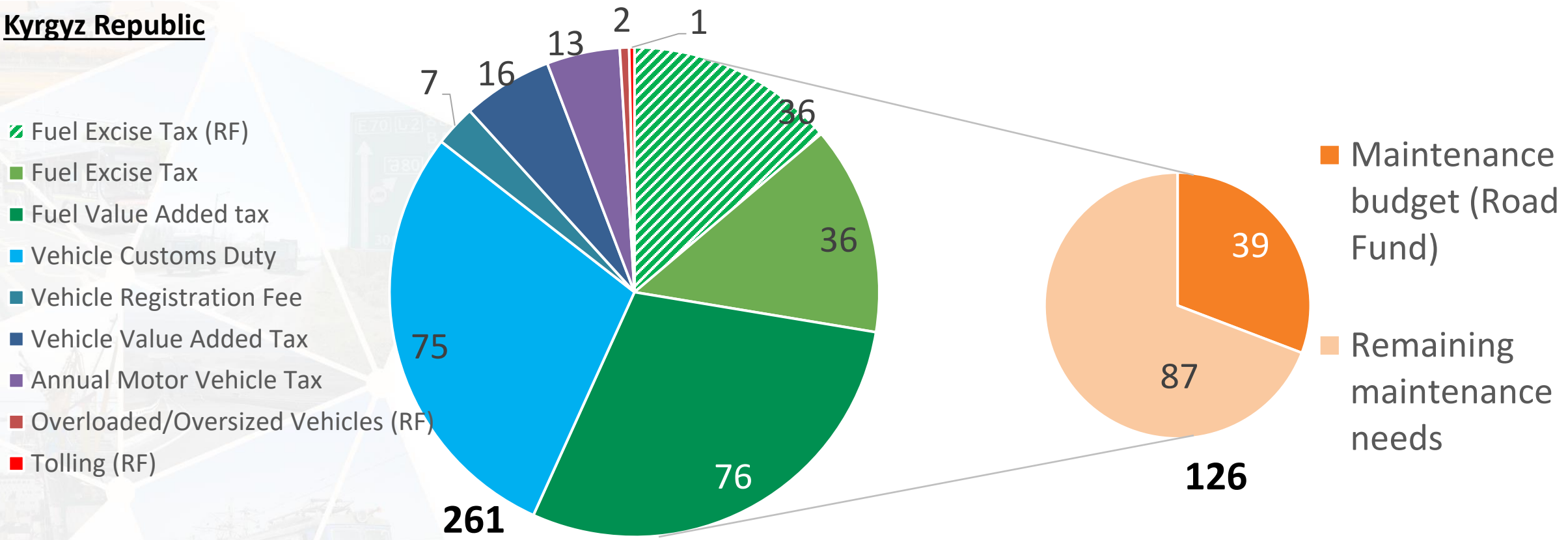


Pakistan 1/100 damage per km river flooding



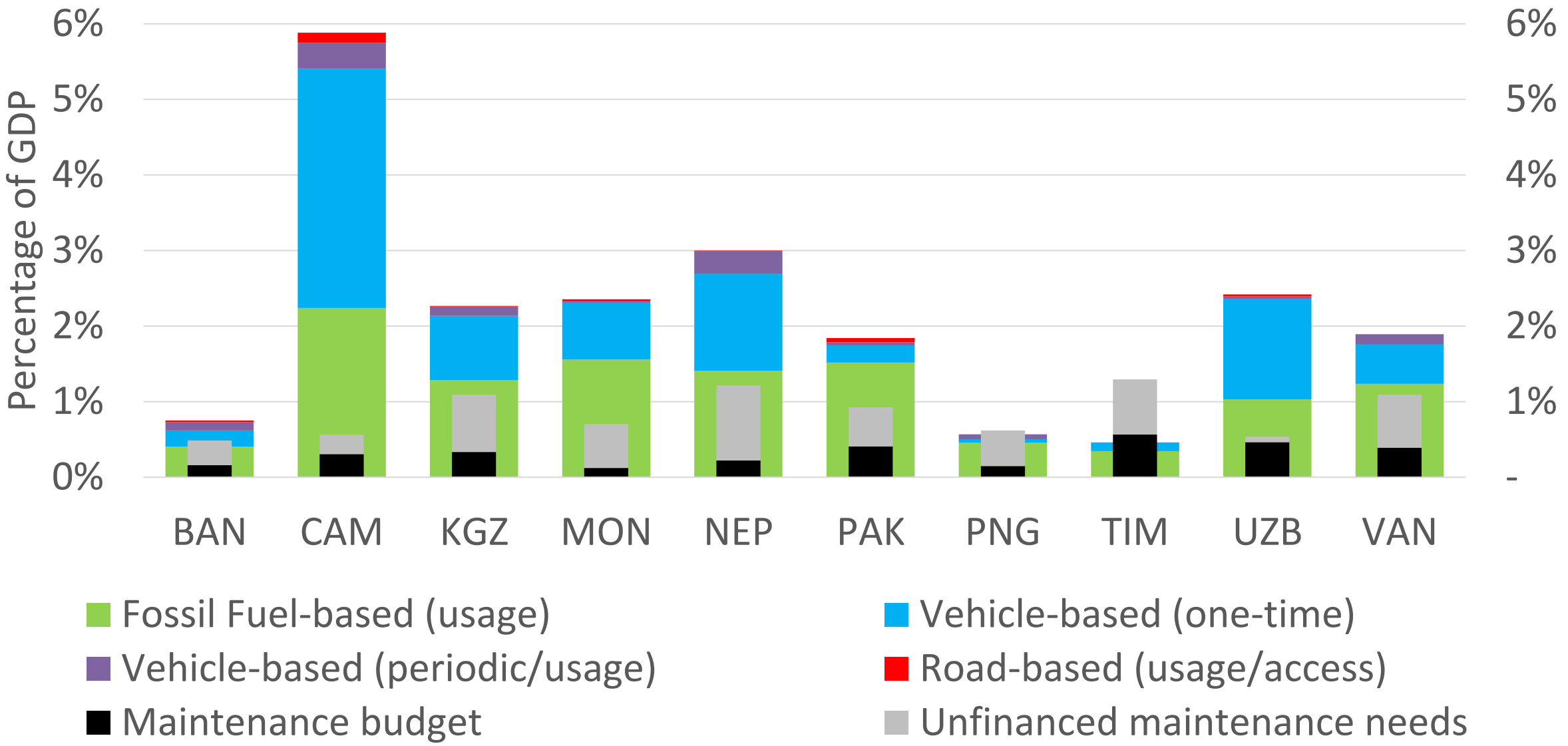
3 – Road User Revenues, Needs & Budget

Kyrgyz Republic



Revenue (WITH Fuel Tax)	$261 Million
Revenues (WITHOUT Fuel Tax)	$113 Million

3 – Road User Revenues, Needs & Budget



Next Steps

- Green Roads Maturity Assessment
  - Tajikistan as a pilot
  - Scale up maturity assessments to other CAREC DMCs
- Scaling up Green Roads investments and initiatives
- Upgrading the Toolkit to web-based platform

Thank you

dfay@adb.org