



District Opportunity Report

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Demonstration Project
(GCDP)**
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Executive Summary

This District Opportunity Report presents the findings and preliminary recommendations from Task 1 of the Green Roads Design Advisory under the Green Corridor Demonstration Project (GCDDP), supported by the Asian Development Bank and the Government of Tajikistan. It explains the rationale for selecting focus districts and road segments, summarizes key findings from fieldwork and stakeholder consultations in Roghun and Vose districts, and identifies priority opportunities and suitable green road practices for demonstration and scaling.

Roghun District, with its mountainous terrain and the strategic role of the Roghun Hydropower Dam, faces high risks from erosion, landslides, and rapid infrastructure development that contribute to sedimentation in the reservoir. Roads are essential but highly vulnerable. Field assessments highlighted slope instability, inadequate drainage, limited vegetation cover, and risks to safety and connectivity. Using the ADB Green Roads Toolkit, the team identified targeted practices such as improved drainage, slope stabilization, and expanded roadside vegetation.

In Vose District, recurring issues affect both state and non-state roads, including slope erosion, landslides, poor drainage, and waste accumulation. Unpaved or poorly maintained road sections become difficult to use in wet conditions, affecting access and safety. Consultations emphasized the importance of roads for agricultural and economic development, the need for better maintenance and funding, and the benefits of roadside vegetation and improved water management.

Across both districts, shared challenges include erosion and landslide risks, insufficient vegetation and drainage systems, and limited maintenance capacity, all compounded by funding constraints and institutional gaps.

The report outlines actionable opportunities for each district, from quick-win measures to longer-term strategies for scaling up green road solutions. These cover technical improvements, institutional strengthening, and community engagement. The findings aim to guide national and district authorities in developing greener, more resilient road infrastructure and will inform the forthcoming National Guidance Note on Green Roads.

Annexes include the district selection database, field survey protocols, stakeholder lists, maps, photographs, and Green Roads Toolkit analysis results.

1. Introduction

Tajikistan's road network is a vital foundation for the nation's economic development, regional integration, and resilience in the face of climate and environmental risks. As the country seeks to modernize its infrastructure, there is an urgent need to embed sustainability and climate adaptation into road planning, design, and maintenance. The Green Corridor Demonstration Project (GCDP), implemented with support from the Asian Development Bank and the Government of Tajikistan, is at the forefront of this transition by introducing green road practices and institutional reforms that can serve as a model for the country and the wider region.

This District Opportunity Report documents the process and findings of Task 1 under the Green Roads Design Advisory. It details the methodology for selecting focus districts and road segments, ensuring that interventions are representative of Tajikistan's diverse landscapes and feasible. The report profiles the selected districts, and outlines the process for identifying priority road segments based on strategic importance, vulnerability to climate risks, connectivity, and potential for green interventions. The aim of the work in the focus districts is to have a deep dive into geographically different areas in Tajikistan, to inform the Guidance Notes to be developed as well as concept note for climate financing.

A comprehensive fact-finding exercise was conducted in Roghun and Vose Districts, combining systematic field surveys, photographic, video and GIS documentation, and in-depth stakeholder interviews. This integrated approach enabled a thorough assessment of both the physical condition of selected roads and the broader institutional and community context shaping road management and the potential for green infrastructure. The analysis is further strengthened by the application of the ADB Green Roads Toolkit, which provides a structured and tailored set of best practices for each road segment.

Building on this analysis, the report presents a set of actionable opportunities and recommendations - ranging from quick-win interventions to longer-term strategies for scaling up green road solutions. These recommendations address technical, institutional, and financial dimensions, with the aim of informing national policy, guiding future investments, and supporting the development of **National Guidance Notes on Green Roads**.

To facilitate ease of reading and sharing, the main report is kept concise, while a wealth of supporting information is provided in the annexes. Each annex contains rich documentation - including district databases, survey protocols, stakeholder interview notes, and results from applying the ADB Green Roads Toolkit to the surveyed roads, among other materials - with direct links for easy access. This approach keeps the report focused and accessible, while allowing readers to explore the annexes for valuable insights and detailed data that underpin the findings and recommendations.

2. District Selection Process

The identification of focus districts for the Green Roads Design Advisory was a foundational step to ensure that project interventions would be both representative of Tajikistan’s diverse landscapes and feasible for in-depth piloting. This chapter details the systematic, evidence-based, and participatory approach used to select the most suitable districts for demonstrating and scaling green road practices.

2.1. Methodology for District Selection

The selection process was designed to be transparent, data-driven, and inclusive, involving close collaboration with the Ministry of Transport and key national stakeholders. The methodology consisted of three main stages:

1. Database Development

A nationwide district-level database was developed, bringing together data from national statistics, sectoral reports, hazard maps, and stakeholder consultations. Where data gaps existed, expert judgment and qualitative proxies were used to ensure robust decision-making. For each district, 33 parameters were collected and organized into six main categories:

- **General Information:** Population (total, urban, rural), area, road network length and condition.
- **Geography:** Elevation, terrain type, natural hazard risk (floods, landslides, GLOFs), proximity to glaciers or GLOF-prone lakes.
- **Environment:** Soil erosion/land degradation, climate vulnerability index, forest cover, biodiversity hotspots, air and water quality.
- **Infrastructure & Accessibility:** Road density, access to schools, hospitals, markets, traffic volume, projected traffic growth, main assets.
- **Socio-Economic Factors:** Economic development index (strength and weakness), migration pressure, agricultural productivity, food security, employment data.
- **Governance & Project Readiness:** District capacity for implementation, road budgets, existing or planned investments, green infrastructure/adaptation programs.

The complete district database, including data sources, is presented in **Annex 1: District Selection Database**.

2. Multi-Criteria Analysis

A multi-criteria scoring system was applied, assigning each district a normalized priority score (from 1 = Low Priority to 5 = High Priority) for each parameter. The analysis focused on four core dimensions, each with its own set of weighted indicators:

- **Urgency of Environmental Management:** Biodiversity hotspots, water quality, presence of green infrastructure/adaptation programs, potential for roadside tree planting.

- Importance for Land Management and Disaster Risk Reduction (DRR): Hazard risk, soil erosion/land degradation, climate vulnerability.
- Inclusive Economic Growth and Poverty Reduction: Accessibility to services (schools, hospitals, markets), economic development index (weakness), migration pressure, food security.
- Accelerated Economic Development: Traffic volume, projected traffic growth, agricultural productivity, district capacity, existing/planned investments.

Districts were scored and ranked within each dimension, allowing for a fair and holistic comparison across the country.

3. Participatory Review and Final Selection

Preliminary scoring and rankings were presented in a joint workshop with the Ministry of Transport and other stakeholders. This transparent and participatory process ensured alignment with national priorities and fostered local ownership. The final selection considered:

- Representation of diverse geographical areas (at least one lowland and one mountain district)
- Strategic importance for green roads (environmental and economic impact)
- Opportunities for quick impact (imminent investments or planned upgrades)
- Readiness for project implementation and demonstration activities

2.2. Selected Districts

Based on this assessment, three districts were identified as strong candidates for the Green Roads Design Advisory:

1. Vose District

Rationale: Imminent investment in the Gulistan–Kulob motorway, part of an international corridor, offering a direct opportunity to integrate green road principles from the outset of a major infrastructure project.

2. Roghun District

Rationale: High economic importance due to the Roghun Hydropower Dam and Reservoir. The district faces sedimentation risks and rapid road development, making it a critical area for demonstrating green road solutions.

3. Kulob District

Rationale: Strategic location – adjacent to Vose District - along the planned Gulistan–Kulob motorway. Strong performance in both economic growth and environmental management, providing a solid basis for demonstration and scaling of green road practices.

Two districts - Vose and Roghun - were selected for field surveys and in-depth assessment. These districts provide immediate opportunities to apply and test green road practices, high readiness for stakeholder engagement, and conditions relevant to other road-climatic zones in Tajikistan.

All data and scoring matrices used in the selection process are documented in the *Final Report – Selecting the Focus Districts*, submitted to and circulated by the Ministry of Transport. This report is provided in **Annex 2: Report on Selecting Focus Districts for the Green Road Advisory Project**.

3. Profile of Selected District(s)

This chapter provides a detailed profile of each selected district, covering their geographic and climatic context, demographic and socio-economic characteristics, road network and infrastructure, environmental risks, and institutional landscape. These profiles establish the baseline for identifying green road opportunities and assessing the capacity for local implementation.

Roghun district

Roghun District is a rural, mountainous area located at 1,200 meters elevation in central Tajikistan, with a population of approximately 54,900. The district's rugged terrain, steep foothills and unstable geology (loess deposits, tectonics) make it highly susceptible to natural hazards, particularly landslides and flash floods. Soil erosion and land degradation are significant challenges, and the climate vulnerability index is rated as medium. The district's infrastructure includes a 274.5 km road network (80% paved), providing medium access to schools, hospitals, and markets. Forest cover is very low (2%), and Roghun is not a biodiversity hotspot. Agriculture is the main economic activity, but productivity and food security are only moderate. The most notable feature is the Roghun Hydropower Dam and Reservoir, Tajikistan's largest infrastructure project of vital economic importance. It faces major sedimentation risks exacerbated by road construction and poor land management. Implementing green road practices in Roghun is critical to reducing environmental risks, protecting strategic infrastructure, and ensuring long-term sustainability.

Vose District

Vose District is a densely populated, lowland area in southern Tajikistan, home to about 228,200 residents at an elevation of 600 meters. The terrain is flat and primarily agricultural, with the main environmental concerns being periodic flooding and irrigation-related hazards. The district's infrastructure is adequate, with a road network of 275.4 km (80% paved) and medium accessibility to essential services. Forest cover is low (2%), and the district is not a biodiversity hotspot. Agriculture dominates the local economy, with medium productivity and food security. The district has moderate development capacity and faces moderate migration pressure. Vose is strategically located along the planned Gulistan-Kulob motorway, a major international corridor, presenting a unique opportunity to integrate green road measures such as improved drainage, roadside forestry, and pollution control. While current investments in climate or green programs are limited, the district's upcoming infrastructure projects make it a strong candidate for piloting sustainable, climate-resilient road development.

Comparative Summary Table

Table 1: Comparative summary table of the two selected districts

Feature	Roghun District	Vose District
Population	54,900	228,200
Area (km ²)	1.2	0.8
Elevation (m)	1200	600
Terrain Type	Mountain foothills	Lowland
Main Hazards	Landslides, flash floods	Flood/water logging
Road Length (Total, km)	274.5	275.4
Road Length (Paved, km)	219.6	220.3
Road Length (Unpaved, km)	54.9	55.1
Road Condition	Sufficient	Sufficient
Forest Cover (%)	2	2
Biodiversity Hotspot	No	No
Climate Vulnerability Index	Medium	Medium
Soil Erosion/Degradation	High	Low
Air Quality Index	Medium	Medium
Water Quality Index	Moderate	Moderate
Accessibility (Services)	Medium	Medium
Key Assets	Agricultural land, grazing	Agricultural land
Economic Development Index	Medium	Medium
Migration Pressure	Moderate	Moderate
Agricultural Productivity	Medium	Medium
Food Security	Medium	Medium
District Capacity	Medium	Medium
Green/Climate Programs	Limited/None	Limited/None
Potential for Bio-engineering/ Tree Planting	High	Medium

While both Roghun and Vose are rural, agriculturally focused districts with similar infrastructure and service accessibility, their risk profiles differ significantly. Roghun's mountainous terrain exposes it to high levels of erosion and landslide risk - compounded by the strategic importance of the Roghun Dam - while Vose's lowland setting faces more manageable, but still significant, water management challenges in the shape of extensive waterlogging. Both districts currently lack substantial investment in environmental sustainability, but upcoming infrastructure projects and the urgent need for sediment control in Roghun present strong opportunities to pioneer green road solutions tailored to their unique contexts.

4. Selected Roads in Each District

Within each focus district, priority road segments were identified for the field surveys using criteria such as strategic importance, vulnerability to climate risks, connectivity, and potential for green interventions. The tables below summarize the selected road segments in Roghun and Vose districts.

Selected road in Roghun district

Table 2: Summary of selected roads in Roghun district.

Selected roads in the Roghun District			
No.	Names of roads	Length, km	Remarks
1	State Road Obigarm-Nurobod	76	Construction of the Obigarm–Nurabad highway began on June 1, 2021, was completed in 2024, and fully commissioned on August 26, 2025.
2	State Road to the city of Roghun	9.6	Construction of the Roghun Highway began on June 12, 2023, and was completed and fully commissioned on November 25, 2024.
Total State roads		85.6	
1	Non-state road to the village of Javoni	4.2	The existing road to the village of Javani was asphalted about 15 years ago.
2	Non-state road to the village of Dehqonobod	3.0	The existing road to the village of Dehqonobod was asphalted in August 2025.
3	Non-state road to the village of Sangi surkh	2.0	The existing road to Sangi Surkh village is a local road without asphalt pavement.
Total Non-state roads		9.2	

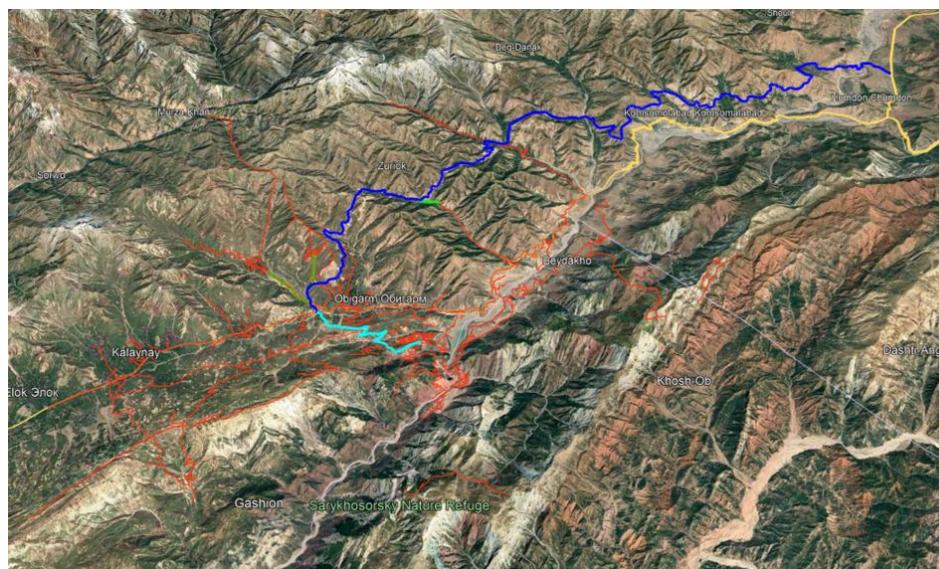


Figure 1: **Selected Roads in Roghun District.** All roads in Roghun district are shown in red. Among these, state roads are highlighted in dark and light blue, while non-state roads are highlighted in green.

Selected roads in Vose district

Table 3: Table 2: Summary of selected roads in Vose district.

Selected roads in the Vose District			
No.	Names of roads	Length, km	Remarks
1	State Road Guliston-Kulob	15.0	The construction of the Guliston–Kulob highway began in the 1960s–70s. The road was fully reconstructed in 2000. In 2023, it was asphalted up to the Khulbuk–Temurmalik–Kangurt highway for the visit of the President of Tajikistan.
2	State Road Hulbuk-Temurmalik-Kangurt	59.0	Reconstruction of the Khulbuk–Temurmalik–Kangurt highway started on November 1, 2021, was completed in 2023, and officially opened on October 20, 2023.
Total State roads		74.0	
1	Non-state road to the village of Oftobruya	2.5	During the reconstruction of the road, the existing road leading to the village was asphalted on a section about 45 meters long. The existing road to the village was asphalted during the Soviet era. In some places, the road surface is destroyed.
2	Non-state road to the village of Bahoriston	1.4	During the reconstruction of the road, the existing road leading to the village was asphalted on a section about 25 meters long. The main part of the village road was asphalted back in the days of the USSR, but in some places there is no pavement, and the road remains unpaved.
3	Non-state road to the village of Oftobruya (Chilcha street)	4.0	Of the total length of the road of 4.0 km in Soviet times, less than 2.0 km were asphalted.
4	Non-state road to the village of Yakkasada	1.7	The existing road to the village is asphalted in 2025.
Total Non-state roads		9.6	

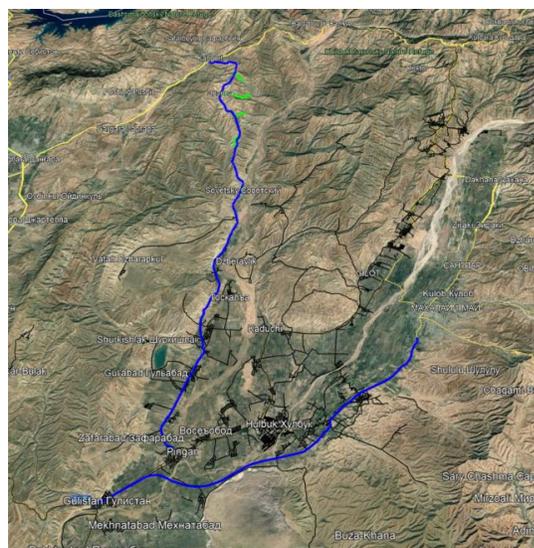


Figure 2: **Selected Roads in Vose District.** All roads in Vose district are shown in black. State roads are indicated in blue color and non-state roads are indicated in green color.

5. Fact-Finding on Selected Roads

5.1. Methodology for fact-finding

A comprehensive fact-finding exercise was conducted across selected roads in the focus districts to assess their current condition, institutional context, and opportunities for green road interventions. By integrating systematic field observations with structured stakeholder engagement, the survey aimed to identify priority needs, constraints, and opportunities for introducing innovative, environmentally sound practices in road development and maintenance. The methodology for this assessment is structured in two main sections:

i. **Transect Drive Road Survey**

The assessment began with a systematic transect drive along selected road segments in the focus districts. Prior to fieldwork, district road maps were prepared, and priority stretches identified. The transect drives were conducted using dash cameras and direct field observation, enabling teams to document the physical condition of the roads and their immediate environment. Data collection focused on key aspects such as road surface quality, the presence and condition of formal and informal crossings, drainage and maintenance issues, and the type and density of roadside vegetation. All observations, photographs, and video footage were catalogued for further analysis. Detailed procedures, survey forms, and data collection protocols for the transect drive are provided in **Annex 3: Detailed Guide for Focus District Road Surveys**.

ii. **Stakeholder Interviews and Institutional Assessment**

To complement the field survey, we carried out targeted interviews and institutional assessments with key stakeholders. These included the District Chairman, the Jamiot Chairman, and representatives from the local offices for roads, forestry, water, labour, and agriculture. The interviews focused on the main challenges and priorities for road development, the role of roads in the district economy, safety concerns, and the environmental and community impacts of roads.

Stakeholders were also asked to respond to a set of statements on green road opportunities, such as reducing carbon emissions through tree planting or electric vehicles, improving drainage and erosion control, and using roadside vegetation to reduce dust, heat, and noise. Further discussions with sectoral offices covered programming and financing, regulatory issues, coordination between agencies, and practical matters such as maintenance, communal work, and the use of local resources. Special attention was given to the institutional and financial conditions that support or limit the adoption of green road solutions. In addition, a detailed assessment with the forestry office was carried out to understand challenges and opportunities for roadside planting.

The full set of interview questions, statements, and methodological guidance is provided in **Annex 3: Detailed Guide for Focus District Road Surveys**.

5.2. Results of fact-finding

The results presented in this section synthesize the outcomes of the road surveys and stakeholder consultations conducted in the two focus districts. Drawing on the systematic transect drives, detailed site observations, and in-depth interviews with key stakeholders, the findings provide a nuanced understanding of both the physical road environment and the broader institutional context influencing road management and green road opportunities.

5.2.1. Roghun District

The following subsections present the detailed results for Roghun District, organized by road segment and issue type, followed by summaries of stakeholder input and institutional settings relevant to green road development.

Transect Drive Road Survey:

The state and non-state roads of Roghun District, which pass through steep and mountainous terrain, are highly susceptible to a range of natural and environmental risks. Across both the primary state highways (Obigarm–Nurobod and the road to the city of Roghun) and the smaller non-state access roads to villages (Javoni, Dehqonobod, Sangi Surkh), the most prevalent issues identified are extensive slope erosion, frequent landslides, and slope collapses - especially following heavy rainfall. Erosion at culvert outlets is a recurring problem, leading to instability of road embankments and the risk of the occurrence of snow slides or landslides. In several locations, deep ditches and slope washouts extend to the road edge, sometimes undermining structural supports such as fences and bridge abutments. The lack of sufficient vegetation cover further reduces slope stability, accelerating soil loss and increasing vulnerability to washouts. These hazards collectively threaten road safety, disrupt connectivity, and result in high maintenance needs, particularly during periods of adverse weather. They also add increased sedimentation which will reduce the lifetime of the Roghun reservoir.

Detailed tables with findings for each road are presented below. For each identified hotspot, the tables provide the issue title, a brief description, a photo, and GPS coordinates to document the location and nature of the problem.

Table 4: Main challenges observed during the transect drive along the State Road to Roghun.

State Road to the city of Roghun					
#	Distance from point zero	GPS Coordinates	Type of issue	Description and community remarks	Photo
0	0		N.A.	N.A.	N.A.

1	~ 1.1 km	38.70638 69.69480	Erosion of the slope at the outlet of the culvert	At the outlet of the reinforced concrete pipe, erosion of the slope is observed, which may lead to further avalanche formation and increased damage in the future.	
2	~ 1.6 km	38.70330 69.69847	Collapse-erosion process	Heavy rainfall caused erosion of the slope, resulting in the accumulation of a significant amount of debris. Rocks and soil may spill onto the roadside, posing a risk to traffic.	
3	~ 1.6 km	38.70329 69.69857	Erosion of the slope at the outlet of the culvert	At the outlet of the reinforced concrete pipe, erosion of the slope is observed, which may lead to further avalanche formation and increased damage in the future.	
4	~ 2.1 km	38.70346 69.70279	Landslides and erosion on slopes	Heavy rains caused landslides, which may subsequently lead to mudslides that could obstruct traffic and wash away the road in this section.	

5	~ 2.1 km	38.70268 69.70980	Erosion of the slope at the outlet of the culvert	At the outlet of the reinforced concrete pipe, erosion of the slope is observed, which may lead to further avalanche formation and increased damage in the future.	
6	~ 2.75 km	38.70260 69.71012	Landslide process	After heavy rainfall, landslides are observed on the slope.	
7	~ 7.3 km	38.69552 69.72632	Sliding and breaking off on slopes		
8	~ 7.3 km	38.69482 69.72597	Sliding and breaking off on slopes	On the right and left banks of the bridge, erosion and crumbling of the slope under the abutment can be observed - part of the soil has slid down towards the riverbed. During heavy rains and floods, the bridge may lose its support.	

9	~ 9.1 km	38.68908 69.74368	Slope washout and erosion	Deep ditches formed on the slope. The mudslide came right up to the edge of the road.	
10	~ 9.4 km	38.69010 69.74521	Landslide process	Heavy rains caused landslides, resulting in the accumulation of a significant amount of debris. Rocks and soil partially spilled onto the roadside, posing a risk to traffic.	
11	~ 9.6 km	38.69134 69.74675	Slope washout and erosion	Deep ditches formed on the slope. Mudslides reached the edge of the road. The presence/absence of minimal vegetation cover does not provide sufficient soil stabilization by the root system, which contributes to the progression of erosion and a decrease in slope stability.	
12	~ 9.7 km	38.69119 69.74656	Slope washout and erosion	Soil erosion and slope collapse occurred, resulting in part of the fence support base being washed away and left hanging in the air. Slope erosion can cause a reduction in the width of the roadside and destruction of the road section.	

13	~ 9.7 km	38.69110 69.74648	Slope washout and erosion	Deep ditches formed on the slope. Mudslides reached the edge of the road. The presence/absence of minimal vegetation cover does not provide sufficient soil stabilization by the root system, which contributes to the progression of erosion and a decrease in slope stability.	
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Table 5: Main challenges observed during the transect drive along the State Road Obigarm-Nurobod.

State Road Obigarm-Nurobod					
#	Distance from point zero	GPS Coordinates	Type of issue	Description and community remarks	Photo
0	0		N.A.	N.A.	N.A.
1	~ 2.9 km	38.73331 69.68884	Domestic animals on the roads	Livestock moves along the road and damages the roadside vegetation, creating obstacles and potential hazards for traffic.	
2	~ 10.0 km	38.76828 69.70103	Slope slippage and erosion	Heavy rains caused landslides, which may subsequently lead to mudslides that could obstruct traffic and wash away the road in this section.	

3	~ 20.4 km	38.80465 69.76610	Erosion of the slope at the outlet of the culvert	At the outlet of the reinforced concrete pipe, erosion of the slope is observed, which may lead to further avalanche formation and increased damage in the future, which could damage houses located at the bottom of the slope.	
4	~ 20.4 km	38.80469 69.76611	Slope slippage and erosion	After heavy rainfall, landslides are observed on the slope.	
5	~ 21.8 km	38.81642 69.76881	Construction waste on the roadside	After the renovation work, construction waste was dumped on the roadside.	
6	~ 26.6 km	38.83820 69.80431	Soil erosion and erosion on slopes	The slope has a very steep angle, which increases the likelihood of landslides. Traces of recent soil displacement, lack of vegetation and uneven surface are visible. Repeated rainfall may cause mudslides.	

7	~ 26.7 km	38.83806 69.80332	Construction waste on the roadside	There is rubbish on the slope that was left behind after renovation work.	
8	~ 27.7 km	38.84191 69.80271	Collapse-erosion process	Heavy rainfall caused erosion of the slope, resulting in the accumulation of a significant amount of debris. Rocks and soil may spill onto the roadside, posing a risk to traffic.	
9	~ 45.2 km	38.86889 69.91036	Flooding of the slope due to lack of drainage	Flooding is observed on the roadside. The absence of a drainage system may lead to flooding and destruction of the road surface.	
10	~ 49.1 km	38.88362 69.93484	Erosion of the slope at the outlet of the culvert	At the outlet of the reinforced concrete pipe, erosion of the slope is observed, which may lead to further avalanche formation and increased damage in the future.	

11	~ 51.9 km	38.88685 69.95055	Erosion of the slope at the outlet of the culvert	At the outlet of the reinforced concrete pipe, erosion of the slope is observed, which may lead to further avalanche formation and increased damage in the future.	
12	~ 52.6 km	38.88158 69.95650	Landslide process	Heavy rains caused landslides, which may subsequently lead to mudslides that could obstruct traffic and wash away the road in this section.	
13	~ 55.9 km	38.87856 69.97827	Landslide process	Heavy rains caused landslides, which may subsequently lead to mudslides that could obstruct traffic and wash away the road in this section.	
14	~ 62.014 km	38.89250 70.02573	Soil erosion and erosion on slopes	Deep ditches formed on the slope. Mudslides reached the edge of the road. The presence/absence of minimal vegetation cover does not provide sufficient soil stabilization by the root system, which contributes to the progression of erosion and a decrease in slope stability.	

15	~ 65.7 km	38.89703 70.05439	Slope washout and erosion	The slope has a very steep angle, which increases the likelihood of landslides. Traces of recent soil displacement, lack of vegetation and uneven surface are visible. Repeated rainfall may cause mudslides.	
16	~ 65.8 km	38.89742 70.05527	Slope slippage and erosion	Heavy rains caused landslides, which may subsequently lead to mudslides that could obstruct traffic and wash away the road in this section.	
17	~ 66.0 km	38.89949 70.05690	Slope slippage and erosion	After heavy rainfall, landslides are observed on the slope.	
18	~ 67.1 km	38.90535 70.05767	Slope slippage and erosion	After heavy rains, landslides formed on the slope, and there is a risk that subsequent mudflows could damage the gabion wall and lead to its partial or complete destruction.	

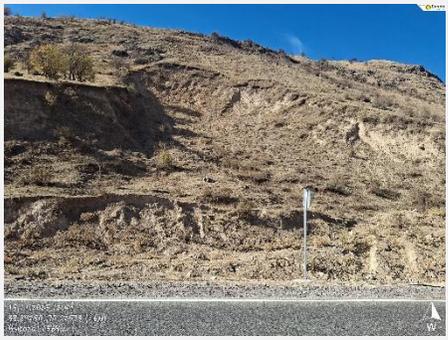
19	~ 71.8 km	38.91486 70.08239	Slope slippage and erosion	After heavy rainfall, landslides are observed on the slope.	
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Table 6: Main challenges observed during the transect drive along the Non-state road to the village of Dehqonobod.

Non-state road to the village of Dehqonobod					
#	Distance from point zero	GPS Coordinates	Type of issue	Description and community remarks	Photo
0	0		N.A.	N.A.	N.A.
1	~ 880 m	38.73631 69.68224	Cow on the road	The cow is on the right side of the road, which may obstruct traffic and damage green areas.	
2	~ 1.3 km	38.73983 69.68295	Tree on the roadside	The tree on the right-hand side of the road may obstruct traffic in the future.	

3	~ 2.8 km	38.75251 69.68363	Slope erosion	Due to heavy rains, the slopes have been washed away and the newly laid asphalt may be damaged. Local residents cannot walk along this roadside.	
4	~ 2.8 km	38.75260 69.68368	Landslide process	After heavy rainfall, landslides are observed on the slope.	
5	~ 2.9 km	38.75479 69.68350	Cow dung and large stones on the road	Cow dung on the road can damage new asphalt. Large stones have been thrown onto the roadside.	

Table 7: Main challenges observed during the transect drive along the non-state road to the village of Javoni.

Non-state road to the village of Javoni					
#	Distance from point zero	GPS Coordinates	Type of issue	Description and community remarks	Photo
0	0	38.72345 69.67536	N.A.	N.A.	N.A.

1	~ 0.9 km	38.72345 69.67536	Waterlogging due to lack of drainage	The flooding on the left side of the road is caused by a lack of proper drainage. This makes it difficult to drive on the road and, over time, leads to damage to the road surface.	
2	~ 1.0 km	38.72419 69.67397	The pond on the left side of the road	The pond is located on the left side of the road. During heavy rains, water from the pond flows onto the road, which may damage the road in the future and increase the load on the road.	
3	~ 1.1 km	38.72480 69.67315	Destruction of bridge support	The bridge supports have been damaged by severe landslides. Crossing the bridge is dangerous for road vehicles and there is a possibility that the bridge could collapse.	
4	~ 1.3 km	38.72599 69.67252	Sliding and slope failure	On the right side of the road, erosion and crumbling of the embankment can be observed. During heavy floods, the road may be destroyed.	
5	~ 1.8 km	38.72936 69.67016	Cows along the road	Domestic animals left unattended on the left side of the road make driving unsafe.	

6	~ 2.7 km	38.73198 69.66673	Slope washout and erosion	Deep ditches formed on the slope. Mudslides reached the edge of the road. The presence/absence of minimal vegetation cover does not provide sufficient soil stabilization by the root system, which contributes to the progression of erosion and a decrease in slope stability.	
7	~ 2.7 km	38.73182 69.66677	Unpaved section	Due to land issues, some sections of the road do not have asphalt pavement.	
8	~ 2.8 km	38.73135 69.66684	The trough is full due to a landslide.	On the right side of the road, there is a partial collapse of the embankment. Loose soil from the slope has slid towards the drainage channel and partially blocked it. The blocked channel will cause water to flow onto the road and damage the surface.	
9	~ 3.2 km	38.73370 69.66310	Domestic animals on the roads	Domestic animals are moving along the road, which may hinder traffic.	

10	~ 3.3 km	38.73421 69.66258	Litter on the roads	There is rubbish on the embankment on the left side of the road.	
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Table 8: Main challenges observed during the transect drive along the Non-state road to the village of Sangi Surkh.

Non-state road to the village of Sangi surkh					
#	Distance from point zero	GPS Coordinates	Type of issue	Description and community remarks	Photo
0	0		N.A.	N.A.	N.A.
1	~ 400 m	38.79362 69.75510	Erosion and erosion of the slope	On the left side of the road, there is a deep ditch on the slope. The absence of vegetation cover provides insufficient soil anchorage.	
2	~ 1.1 km	38.79324 69.76116	Landslide process	After intense precipitation, landslides occur on the slope. If this continues, the slope may collapse, blocking movement for local residents.	

3	~ 1.2 km	38.79360 69.76275	Dry ground, stone near the tree and deterioration of vegetation conditions	Due to dry soil conditions, trees cannot grow. The few trees that were planted are deteriorating without proper care. A large stone next to one tree is damaging it and preventing its development.	
4	~ 1.8 km	38.79327 69.76667	Slope erosion and erosion	Erosion and slope crumbling are visible on the left side of the road. Heavy rains may further damage the road.	
5	~ 1.9 km	38.79346 69.76719	Drake skidding and the absence of a reinforced concrete pipe	A mudflow destroyed the road. A reinforced concrete pipe for water drainage is missing in this section. The damaged area is filled with gravel.	
6	~ 2.0 km	38.79279 69.76748	Vertical slope and withered trees	The slope is vertical and the soil is compact, preventing water absorption. It is not possible to plant trees on such a slope. Several dried trees are visible at the top.	

7	~ 2.1 km	38.79220 69.76786	Vertical slope	The slope is vertical and the soil is too hard to absorb rainwater, making tree planting impossible.	
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Stakeholder Interviews and Institutional Assessment

During our stakeholder engagement in Roghun District, interviews were conducted with a wide range of local representatives, including directors of forestry agencies, heads of environmental protection and agriculture departments, deputy district chairmen responsible for road maintenance, jamoat (village community) heads, and local residents. The discussions took place in local government buildings, and where necessary, follow-up questions were clarified by phone. A complete list of participants and their roles can be found in the annex.

The primary economic activity in the district remains agriculture, although crop cultivation has declined in recent years while orchard acreage has increased. There has also been some growth in small manufacturing and service enterprises. Roads play a crucial role in supporting the local economy by facilitating the movement of goods and reducing costs. With the completion and filling of the Roghun Reservoir, existing roads will be inundated, and new roads will be constructed. In addition, access roads to the pillar of power transmission lines have been/ will be constructed. These developments are particularly significant as road infrastructure in the Roghun District plays a key role not only in supporting the local economy, but also in shaping environmental outcomes around the reservoir. According to our recent study that has also been shared earlier (see Annex 5: Green Roads Issues around Roghun Reservoir), road construction and relocation in the area is closely linked to concerns about sedimentation and landscape stability, especially given the fragile geology and steep slopes surrounding the reservoir. The report highlights that a substantial proportion of sedimentation in reservoir areas is attributed to roads, with estimates ranging from 15-40% of sediment loads being road related. This underscores the importance of careful planning and management of both state and non-state roads, as well as temporary access roads for construction and operations. The expansion of tourism and related infrastructure is also expected to increase the demand for new roads and improve connectivity in the district. For further background information on the relationship between road development, sedimentation, and landscape management in the Roghun Reservoir area, please refer to **Annex 4: Roghun District Green Road Issues**. Based on this report, we also produced an article for TheWaterChannel: "[Green roads and hydropower reservoirs – the necessary match](#)."

However, several issues were raised regarding road conditions and management. For example, some important roads are still under the control of the Roghun Hydroelectric Power Station or have not yet been

transferred to regional road agencies, which complicates maintenance and funding. Seasonal disruptions, particularly during the rainy season, can restrict transport and cause price increases for imported goods.

Stakeholders highlighted several key points and priorities:

- **Road Safety and Livestock:** Accidents are a concern, especially due to livestock wandering onto roads and falling debris. There is a need for improved safety measures such as warning signs, protective barriers, and safe passages for animals, including migrant livestock.



Figure 3: Road safety and livestock.

- **Environmental Management:** Flooding, landslides, and erosion are significant risks, especially in areas near rivers and streams. Maintaining clear drainage channels and planting moisture-loving vegetation were suggested as mitigation measures.



Figure 4: Environmental Management

- **Roadside Vegetation and Pollution:** There is scope to reduce carbon emissions and mitigate heat and dust by planting more trees and ornamental plants along roadsides. Pollution from vehicles is a growing concern, especially as traffic increases.



Figure 5: Roadside Vegetation and Pollution

- **Water Management:** Water scarcity in some areas could be alleviated by better use of road drainage and culverts for water storage and irrigation, including modern techniques such as drip and sprinkler systems.



Figure 6: Water Management

- **Employment and Local Business:** There is potential to boost local employment in road construction and maintenance, provided that funding and incentives are improved. Opportunities also exist for developing roadside businesses selling local farm products and handicrafts.
- **Labour Safety and Accessibility:** Stakeholders stressed the need for better worker safety, including protective gear, shelters, and transportation. Infrastructure for people with disabilities also requires enhancement.

Ownership of roadside tree plantations typically transfers to the environmental protection committee or forestry department after planting. Expansion of roadside vegetation is possible but faces bottlenecks such as shortages of seedlings, labor, and engineering solutions for irrigation and protection. There are no distinct plans for state versus non-state roads; most activities, such as tree planting, are part of broader general plans.

In summary, the overall goal is to address climate change, strengthen the green economy, and improve living standards by enhancing road infrastructure, safety, and the roadside environment. For more detailed responses and specific reflections from each stakeholder, please refer to **Annex 5: Stakeholders Interviews and Institutional Assessment**.

5.2.2. Vose District

The following subsections present the detailed results for Vose District, organized by road segment and issue type, followed by summaries of stakeholder input and institutional settings relevant to green road development.

Transect Drive Road Survey:

Across the six surveyed roads – State Road Guliston-Kullob, State Road Hulbuk–Temurmali–Kangurt, Non-state road to Oftobruya village, Non-state road to Bahoriston village, Non-state road to Oftobruya (Chilcha street), and Non-state road to Yakkasada village - several recurring issues were identified. The most prevalent problems include slope erosion and landslides, which were

observed on all roads. Steep or vertical slopes with minimal vegetation make these areas particularly vulnerable to erosion, scree, and landslide events, especially after heavy or prolonged rainfall. Roads such as the Hulbuk–TemurmaliK–Kangurt highway and Bahoriston village road exhibit extensive erosion at culvert inlets/outlets and along unprotected slopes, while the Oftobruya and Yakkasada roads also face significant erosion, often worsened by a lack of roadside ditches or root-stabilizing vegetation.

In addition to erosion and landslides, other widespread issues include the presence of construction debris and improper waste disposal, which are especially notable along the Oftobruya, Yakkasada, and Guliston–Kulob roads. Several roads, such as Bahoriston and Oftobruya (Chilcha street), have unpaved or poorly maintained segments that become muddy and difficult to use in wet conditions. The Guliston–Kulob road is particularly affected by poor drainage maintenance, with uncleared vegetation and garbage leading to water stagnation and reduced canal capacity. Comparatively, while all roads suffer from erosion and landslides, the state roads (Hulbuk–TemurmaliK–Kangurt and Guliston–Kulob) face additional challenges related to drainage infrastructure and larger-scale waste management, whereas the non-state roads are more impacted by localized issues such as loss of green spaces, fresh digging by residents, and practical difficulties with unpaved surfaces.

Detailed tables with findings for each road are presented below. For each identified hotspot, the tables provide the issue title, a brief description, a photo, and GPS coordinates to document the location and nature of the problem.

Table 9: Main issues observed during transect drive along the State Road Guliston-Kulob

State Road Guliston-Kulob					
#	Distance from point zero	GPS Coordinates	Type of issue	Description and community remarks	Photo
0	0		N.A.	N.A.	N.A.
1	~ 2.0 km	37.75159 69.51385	Improper maintenance of the drainage canal and territory	The channel bed has not been cleared of vegetation, as a result of which the water continues to stagnate, and the capacity of the canal is significantly reduced.	

2		37.7515769. 51377			
3	~ 5.2 km	37.76890 69.54347	Unused area suitable for landscaping	On the left side of the road, there is an area that can be used for planting trees and other vegetation in the future.	
4	~ 7.4 km	37.80902 69.68642	Improper maintenance of the drainage canal and territory (garbage + uncleared vegetation).	After cleaning the canal bed, all the collected garbage was thrown onto the edge of the roadway. In addition, the channel bed has not been cleared of vegetation, which is why the water continues to stagnate and the capacity of the canal deteriorates.	
5		37.80896 69.68635			
6	~ 10.9 km	37.83178 69.71307	Construction waste	Construction work was carried out on the territory, after which all the resulting construction waste was stored on the edge of the roadway. This worsens the condition of the surrounding area and violates landscaping standards.	

7	~ 13.6 km	37.84441 69.73943	Improper maintenance of the drainage canal and discarded household garbage on the slopes of the canal	There is household garbage on the slopes and the channel bed. In addition, the channel bed has not been cleared of overgrown vegetation, as a result of which the water stagnates, the normal flow is disrupted and the capacity of the canal decreases.	
8		37.84440 69.73941			
9	~ 15.4 km	37.85685 69.75347	Erosion and slide of the road slope, discarded garbage	On the left side of the road, erosion and crumbling of the slope is observed. In case of heavy precipitation, there is a risk of further destruction of the slope and possible damage to the roadway. In addition, there is discarded garbage on the roadside, which can increase the risk of environmental pollution.	
10	~ 16.6 km	37.86533 69.76091	Landslide process	After heavy rains, landslides formed, which in the future mudslides can impede traffic and wash away the road in this area.	
11	~ 16.9 km	37.86747 69.76139	Dried concrete on the roadside and the condition of vegetation	On the left side of the road, on the side of the road, there is dried concrete, which was probably thrown out by concrete mixers. This worsens the condition of vegetation in this area and disrupts the ecological improvement.	

12	~ 17.0 km	37.86837 69.76164	Erosion and erosion Slope	The surrounding area has a vertical slope, which increases the likelihood of scree. Traces of soil displacement, lack of vegetation and uneven surface are visible. With intense rains, mudflows are possible, which can damage trees.	
13	~ 17.1 km	37.86900 69.76176	Erosion and landslide of the road slope	On the right side of the road, there is a slide of the slope. There is a risk of further destruction of the slope and possible damage to the roadway. In addition, discarded concrete sleepers of the railway are observed on the roadside.	
14	~ 17.2 km	37.86965 69.76190	Landslide process	After heavy rains, landslides formed, which caused the accumulation of a significant amount of detrital material. Stones and soils have partially come to the side of the road, which poses a risk to the road.	
15	~ 17.2 km	37.87041 69.76208	Erosion and erosion of the slope	As a result of heavy rains, the slope is destroyed, which increases the risk of further scree and poses a threat to traffic on the road.	
16	~ 17.4 km	37.87192 69.76271	Landslide process and vertical slope	After intense precipitation, there are landslide processes on the slope. The adjacent territory has a vertical slope, rainwater can lead to the emergency formation of the slope.	

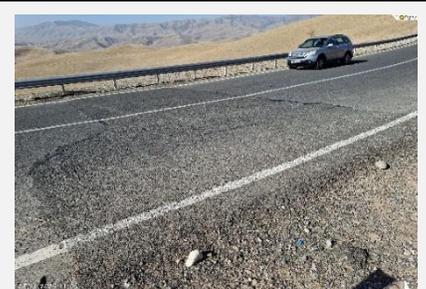
17	~ 17.5 km	37.87235 69.76289	Erosion and erosion Slope	Deep ditches formed on the slope. The presence/absence of a minimum vegetation cover does not provide sufficient soil fixation by the root system, which contributes to the progression of erosion and a decrease in slope stability.	
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Table 10: Main issues observed during transect drive along the State Road Hulbuk-Temurmalik-Kangurt

State Road Hulbuk-Temurmalik-Kangurt					
#	Distance from point zero	GPS Coordinates	Type of issue	Description and community remarka	Photo
0	0		N.A.	N.A.	N.A.
1	~ 17.9 km	37.92799 69.57144	Slope erosion at the inlet and outlet of the culvert	At the inlet and outlet of the culvert, erosion of the slope is observed, which may cause further damage in the future and increase in the volume of damage.	
2		37.92817 69.57139			

3	~ 28.2 km	38.01435 69.58496	Riverbed along the road is used for building materials	The riverbed is used as a quarry of building material, as a result of which there is a destruction of the road slope.	
4	~ 30.8 km	38.03662 69.58171	Erosion and erosion of the slope	Deep ditches formed on the slope. The presence/absence of a minimum vegetation cover does not provide sufficient soil fixation by the root system, which contributes to the progression of erosion and a decrease in slope stability.	
5	~ 31.7 km	38.04456 69.58551	Landslide process	After intense precipitation, landslide processes are observed on the slope. In case of their recurrence, the reinforced concrete channel can be filled with displaced soil masses and lose its capacity.	
6	~ 35.0 km	38.07083 69.57998	Landslide process and vertical slope	After heavy rainfall, landslides have been observed on the slope. The slope is nearly vertical, and the lack of vegetation increases the risk of further slope failure.	

7	~ 35.3 km	38.07298 69.57905	Erosion of the slope after water leaves the concrete ditch	After the water exits the concrete ditch, it erodes the slope, which can lead to further gully formation and eventually damage the ditch.	
8	~ 36.0 km	38.07839 69.57715	Erosion of the slope at the outlet of the culvert and destruction of the road	At the outlet of the culvert, slope erosion is evident, which may lead to further gully development and increased deformation over time. Due to the intense water flow, the roadway was previously damaged and later restored through re-asphalting.	
9		38.07831 69.57717			
10	~ 37.9 km	38.09616 69.57514	Slope Slide and Erosion	After intense precipitation, collapse and crumbling are observed on the slope.	
11	~ 39.1 km	38.10588 69.57630	Water erosion process	On the presented site, there is an intense water-erosion activity, manifested in the form of deep gullies, soil displacements and partial destruction of the slope. Signs of landslide processes and further destabilization of the slope surface are recorded.	

12		38.10663 69.57449			
13	~ 39.7 km	38.11063 69.57650	Landslide process	After heavy rains, landslides and filling of tank ditches formed, which in the future mudslides can impede traffic and wash away the road in this area.	
14	~ 53.2 km	38.22096 69.56450	Erosion of the slope at the outlet of the culvert and destruction of the road	As a result of the intense water flow, the roadway was destroyed and then restored by re-asphalting.	
15		38.22098 69.56450			
16	~ 55.0 km	38.2355869. 56104	Erosion and erosion Slope	Due to the lack of upland ditches, deep ditches have formed on the slope. The lack of a minimum vegetation cover does not provide sufficient soil consolidation by the root system, which contributes to the progression of erosion and a decrease in the stability of the slope.	

17	~ 55.6 km	38.2380669. 55522	Erosion and erosion of the slope	The surrounding area has a vertical slope, which increases the likelihood of scree. Traces of fresh displacement of the soil, lack of vegetation and uneven surface are visible.	
18	~ 58.1 km	38.2385669. 53079	Erosion and erosion Slope	Deep ditches formed on the slope. The presence/absence of a minimum vegetation cover does not provide sufficient soil fixation by the root system, which contributes to the progression of erosion and a decrease in slope stability.	
19	~ 58.3 km	38.23967 69.52897	Erosion and erosion Slope	The slope has an excessively steep slope, which increases the likelihood of scree. On the surface, you can see traces of fresh excavation made by local residents. With repeated precipitation, there is a risk of ravage formation and mudflows.	

Table 11: Main issues observed during transect drive along the Non-state road to the village of Oftobrya

Non-state road to the village of Oftobrya Temurmalik District					
#	Distance from point zero	GPS Coord-inates	Type of issue	Description and community remarka	Photo
0	0		N.A.	N.A.	N.A.
1	~ 400 m	38.1068669. 57392	Construction debris on the side of the road	After the reconstruction of the Khulbuk–Temurmalik–Kangurt highway, construction debris was deposited along the roadside leading to the village.	

2	~ 457 m	38.1072369. 57362	Landslide process	Following heavy rains, landslides have occurred, and future mudflows could block traffic and potentially wash out this section of the road.	
3	~ 1.1 km	38.11222 69.57262	Erosion and erosion Slope	The very limited vegetation cover offers insufficient root stabilization, accelerating erosion and reducing slope stability	
4	~ 1.15 km	38.11288 69.57287	Slope erosion	The damage on the slope continues to grow over time.	
5	~ 1.37 km	38.1146769. 57370	Erosion and erosion Slope	The slope is very steep, which increases the risk of stones and soil falling. Fresh digging by local residents can also be seen on the surface.	

6	~ 2.18 km	38.1213869. 57717	Destruction and death of green spaces due to unfavorable soil conditions	The soil is very dry, so trees do not grow well. Even the trees that were planted with effort slowly die without proper care. The steep slopes also cause the roots to be exposed, which makes them dry out faster.	
7	~ 2.32 km	38.1225869. 57763	Road damage due to precipitation/heavy rain	Heavy rains have also damaged the asphalt surface in several places along the road.	

Table 12: Main issues observed during transect drive along the Non-state road to the village of Bahoriston

Non-state road to the village of Bahoriston (Temurmalik District)					
#	Distance from point zero	GPS Coordinates	Type of issue	Description and community remarks	Photo
0	0		N.A.	N.A.	N.A.
1	~ 330 m	38.1511369. 57336	Erosion and erosion of the slope	Deep erosion channels have formed along the slope. Limited vegetation cover does not ensure sufficient root-based soil stabilization, contributing to continued erosion and reduced slope stability.	

2	~ 350 m	38.1511569. 57357	Landslide process	After heavy rain, soil movement and small landslides occur. In the future, mud or soil could block the road or even damage it.	
3	~ 443 m	38.15145 69.57448	Vertical slope	The slope is almost vertical, and water from rain causes small ravines to form. Planting trees is not possible because of the steepness.	
4	~ 545 m	38.1518969. 57555	Erosion and erosion Slope	The slope is very steep, which increases the risk of rock or soil falling. Fresh digging by local residents can be seen, which may also weaken the slope.	
5	~ 722m	38.1527769. 57719	Unpaved part of the road	This part of the road is unpaved. Local residents report that it becomes difficult to use, especially in autumn and spring when it is wet and muddy.	

6	~ 1.02 km	38.1541269. 58015	Erosion and erosion on slopes	The slope is steep and erosion continues because there is not enough vegetation to hold the soil in place.	
7	~ 1.18 km	38.1545269. 58186	Erosion and erosion of the slope	Deep erosion channels are forming. Because the slope has little vegetation, the soil is not stable and erosion keeps increasing.	

Table 13: Main issues observed during transect drive along the Non-state road to the village of Oftobruya (Chilcha street)

Non-state road to the village of Oftobruya (Chilcha street) Temurmalik District					
#	Distance from point zero	GPS Coordinates	Type of issue	Description and community remarks	Photo
0	0		N.A.	N.A.	N.A.
1	~ 454 m	38.1830469. 55459	Slope erosion and erosion	Deep erosion channels have formed on the slope. Because vegetation is very limited, the soil is not held in place and erosion continues to worsen.	
2	~ 1.22 km	38.1830869. 56207	Slope Landslide and Erosion	After heavy rains, landslides occur here. In the future, mudflows could block the road or wash it away.	

3	6~ 1.80 km	38.1813869.56818	Destruction and death of green spaces due to unfavorable soil conditions	Due to very dry soil and steep slopes, trees do not take root well and many die without proper care. Roots are exposed and dry out.	
4	~ 2.67 km	38.1793369.57750	Slope erosion and erosion	The slope continues to crumble. Heavy rainfall could further damage the slope and affect the road.	
5	~ 2.98 km	38.1799769.58065	Erosion and erosion Slope	The slope is extremely steep, increasing the risk of falling rocks. Fresh digging by residents is visible. With repeated rainfall, mudflows are likely.	
6	~ 3.14 km	38.1812669.58051	Slope erosion and erosion	Ongoing erosion is visible on the right side of the road. With heavy rains, damage could worsen.	
7	~ 4.01 km	38.1809669.58597	Erosion and erosion Slope	There is very little vegetation, so the soil is loose and continues to erode, reducing slope stability.	

Table 14: Main issues observed during transect drive along the Non-state road to the village of Yakkasada.

Non-state road to the village of Yakkasada Temurmalik District					
#	Distance from point zero	GPS Coordinates	Type of issue	Description and community remarks	Photo
0	0		N.A.	N.A.	N.A.
1	~ 190 m	38.2152169.56416	Vertical slope	The slope is vertical. Rainwater forms small ravines, and planting trees is not possible. The absence of a side ditch increases roadside damage.	
2	~ 274 m	38.2147069.56492	Absence of roadside ditches	There are no ditches along the road. Water from rainfall flows directly onto the road, causing damage.	
3	~ 275 m	38.2147069.56491	Large stones on the side of the road	Dry soil prevents trees from growing well. Trees that were planted struggle to survive, and nearby stones block their growth and damage them.	

4	~ 697 m	38.2117769. 56784	Erosion and erosion of the slope	A deep ditch has formed on the left side of the road. Minimal vegetation means the soil is not well anchored, increasing erosion.	
5	~ 1.28 km	38.2079769. 57232	Construction debris on the road	After repair work, construction waste was left on the road, making it difficult for villagers to move along it.	
6	~ 1.65 km	38.2051369. 57457	Roadside destruction	Deep ditches along the roadside are not reinforced. During rainfall, mudflows wash away the new asphalt.	

Stakeholder Interviews and Institutional Assessment

During our stakeholder engagement in Vose District, interviews were conducted with a broad range of local representatives, including heads of road maintenance and environmental protection departments, agricultural officials, deputy district chairmen, rural jamoat leaders, and local residents involved in roadside vegetation. Discussions were held in government buildings, with clarifications obtained by phone as needed. The assessment covered both roads under construction and those in operation, such as the Khulbuk-Temurmaliq-Kangurt and Gulistan-Kulyab sections. A complete list of participants and their roles can be found in the annex.

Stakeholders highlighted several key points and priorities:

- **Economic Role of Roads:** Agriculture remains the main economic activity in Vose District, with cotton farming and related agro-industries at the core. Roads are critical for regional development, facilitating market access domestically and internationally, reducing transport costs, and supporting both large- and small-scale enterprises.

- **Best Practices and Challenges:** The Khulbuk-Temurmalik-Kangurt road (first half) demonstrates best practices in green corridor development, including drip irrigation and fencing to protect vegetation from livestock. However, water scarcity in other sections limits the success of roadside planting. The Gulistan-Kulyab road also shows progress but faces challenges such as runoff, soil salinization, and the decline of roadside trees due to insufficient infrastructure and potable water.



Figure 7: Roadside Tree Planting in Vose district (1).

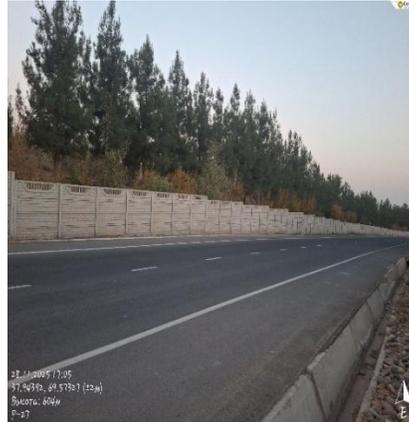


Figure 8: Roadside Tree Planting in Vose district (2).



Figure 9: Drip irrigation system used to water roadside agricultural activities.



Figure 10: Fencing along roads to protect vegetation from livestock.

- **Funding and Maintenance:** Insufficient funding is a major barrier - only about 1,000 somoni (\$100) per kilometer per year is allocated for road maintenance, which stakeholders consider inadequate for effective roadside management and green infrastructure.
- **Road Safety and Disruptions:** While there are no recorded “black spots,” accidents are mainly due to speeding, overloading, and adverse weather (fog, ice). Temporary road closures during the rainy season cause congestion, and noise is an issue in populated areas along the road.

- **Environmental and Climate Issues:** Persistent heat along the entire road corridor is a concern. Stakeholders believe that planting more trees and grass can help mitigate heat impacts and reduce carbon emissions. There is also potential to increase electric vehicle use if supporting infrastructure is developed.
- **Water Management:** Water scarcity is a challenge in several areas. Stakeholders recommend better use of water from road drainage and culverts, including artificial reservoirs and modern irrigation methods (e.g., drip irrigation, sprinklers), to support both agriculture and green corridors. Water logging is also an issue, related to intense and partly wasteful irrigation with a drainage system that is not maintained and hence does not remove water. The waterlogged situation affects the stability of the roads.



Figure 11: Due to water scarcity, drip irrigation is used to support agricultural activities along the roadside in Vose District.



Figure 12: The irrigation drain is overgrown and filled with silt due to poor removal of excess water. This has caused widespread waterlogging, which undermines the stability of nearby roads.

- **Vegetation and Pollution:** There is considerable scope to expand roadside vegetation, with attention to selecting species compatible with local agriculture. Pollution from vehicles (oil, exhaust) is a growing concern that needs to be addressed.
- **Planning and Policy:** There are no separate plans for state versus non-state roads; improvements are guided by broader national strategies - the National Development Strategy, Climate Change Adaptation Strategy, Green Economy Strategy, and Forestry Development Program - which collectively aim to plant up to 2 billion trees.

In summary, stakeholders in Vose District emphasized the importance of enhancing road infrastructure, safety, and green corridors to support economic growth, environmental sustainability, better water management and improved quality of life. Addressing funding gaps, water scarcity, and maintenance challenges, while leveraging best practices and national strategies, will be essential for future progress. For further details and the full list of participants, please refer to **Annex 5:**

Stakeholders Interviews and Institutional Assessment.

6. Selection of Suitable Green Road Practices

The ADB Green Roads Toolkit was systematically applied to each selected road segment to identify the most appropriate green road practices, taking into account the unique context and priorities of each district. This process ensures that recommended interventions are not only technically sound and evidence-based but also feasible and relevant to local needs. The prioritized practices identified through this process will serve as a foundation for the development of the National Guidance Note on Green Roads and for piloting in the focus districts.

What is the ADB Green Roads Toolkit?

The ADB Green Roads Toolkit is a comprehensive, user-friendly, Excel-based tool developed by the Asian Development Bank in collaboration with MetaMeta Research and the International Roads Federation. It is designed to help project teams identify, design, and implement sustainable road practices that are tailored to specific local contexts. The Toolkit compiles over 150 best practices for green road development, organized around nine key dimensions:

1. **Decarbonization:** Reducing emissions from both road transport and construction by promoting efficient designs, roadside tree planting, low-carbon materials, and support for electric vehicles.
2. **Climate Resilience:** Building roads that withstand floods, droughts, landslides, and changing weather, using resilient routing, drainage, and nature-based solutions.
3. **Water and Land Management:** Integrating roads with watershed management, water harvesting, and erosion control to turn potential liabilities into assets.
4. **Pollution Reduction:** Minimizing air, soil, and water pollution from vehicles and construction through better materials, drainage, and vegetation.
5. **Quality of Life:** Improving health, safety, and aesthetics for communities through dust and noise control, temperature management, and roadside greenery.
6. **Biodiversity Conservation:** Preventing habitat fragmentation and wildlife deaths, and supporting ecological connectivity through wildlife crossings and careful management.
7. **Disaster Preparedness:** Designing roads as lifelines for emergency response, evacuation, and recovery, especially in disaster-prone areas.
8. **Sustainable Materials Sourcing:** Promoting circular economy principles, using recycled and local materials, and reducing the environmental footprint of construction.
9. **Inclusive Growth:** Maximizing local economic benefits, creating jobs, supporting roadside businesses, and ensuring accessibility for all, including vulnerable groups.

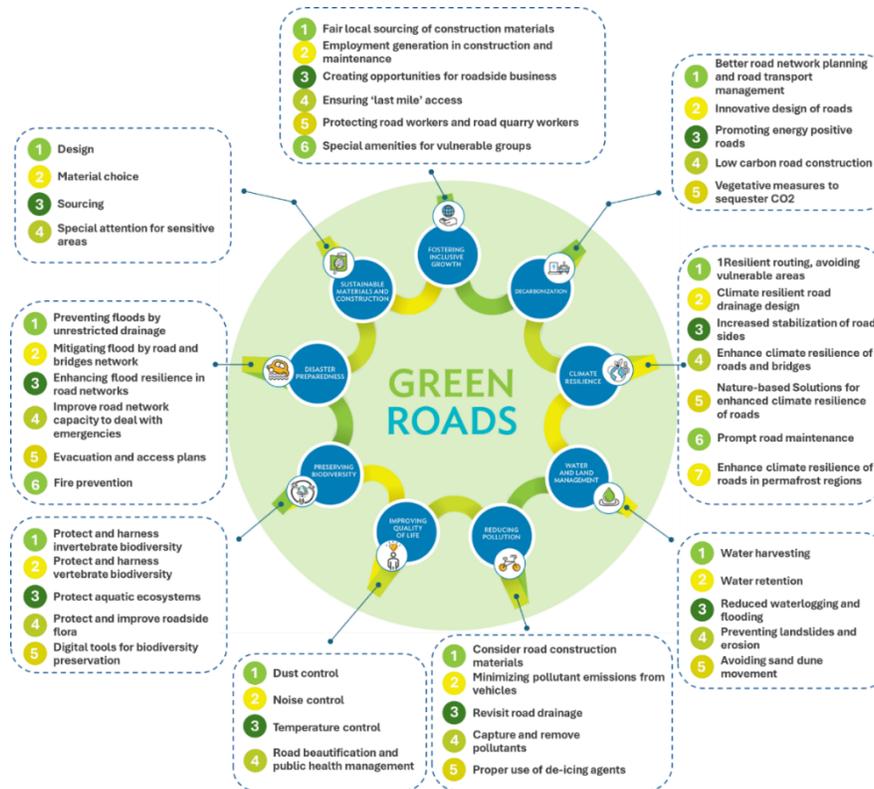


Figure 1: Green Roads Toolkit with the 9 Green Road Dimensions and the categories covered within these dimensions.

Why Use the Toolkit for Practice Identification?

The diversity of Tajikistan's geography, climate, and road network - ranging from high mountains to plains, and from main corridors to rural connectors - means that green road solutions must be highly context-specific. The Toolkit's systematic, evidence-based filtering process ensures that the recommended practices are actionable and feasible for the unique environmental, technical, and operational realities of each road segment. By leveraging the Toolkit, the project team can identify interventions with the greatest potential benefits for resilience, sustainability, and local development.

How is the Toolkit Used in This Assignment?

The Toolkit is applied in several key steps:

1. Selection of Relevant Dimensions:

For each road segment, the project team identifies which of the Toolkit's nine dimensions are most relevant, based on local conditions and project objectives. In the context of Tajikistan, dimensions such as Decarbonization, Climate Resilience, Water and Land Management, Biodiversity Conservation, and Inclusive Growth are particularly important. However, to ensure a comprehensive scan of opportunities, all nine dimensions are initially considered. The contribution of each recommended practice to these dimensions is then reviewed during prioritization.

2. Input of Project Characteristics:

The Toolkit requires input on key characteristics for each road segment, such as:

- Geographic setting (mountainous, flat, arid, tropical, pacific islands)
- Road Standard (low-volume road, paved highway, expressed highway, urban roads)
- Project stage (planning, design, construction/implementation, maintenance)

3. Toolkit Filtering and Output:

Based on these inputs, the Toolkit filters its database and generates a customized list of recommended green road practices for each segment. The initial output typically includes a long list of practices covering all relevant dimensions. The Toolkit outputs for each road segment are presented in **Annex 6: GR Toolkit results for each selected road, with a summary of results in the tables below.**

Table 15: Results of applying the Green Roads Toolkit in the surveyed roads in Rhogun district.

Roghun District GR Toolkit Results						
No.	Names of roads	Length, km	Toolkit Filters			Toolkit Output (No. of Practices)
			Geographic setting	Standard of Road	Project stage	
1	State Road Obigarm-Nurobod	76	mountainous	paved highway	maintenance	55 good practices covering all GR Toolkit dimensions (<i>same results for both roads since they have the same characteristics</i>)
2	State Road to the city of Roghun	9.6	mountainous	paved highway	maintenance	
3	Non-state road to the village of Javoni	4.2	mountainous	low-volume road	maintenance	56 good practices covering all GR Toolkit dimensions (<i>same results for both roads since they have the same characteristics</i>)
4	Non-state road to the village of Dehqonobod	3.0	mountainous	low-volume road	maintenance	
5	Non-state road to the village of Sangi surkh	2.0	mountainous	low-volume road	maintenance	

Table 16: Results of applying the Green Roads Toolkit in the surveyed roads in Vose district.

Roads in the Vose District						
No.	Names of roads	Length, km	Toolkit Filters			Toolkit Output (No. of Practices)
			Geographic setting	Standard of Road	Project stage	
1	State Road Guliston-Kulob	15.0	Flat; Arid	paved highway	construction/implementation	75 good practices covering all GR Toolkit dimensions
2	State Road Hulbuk-Temurmalik-Kangurt	59.0	Flat; Arid	paved highway	maintenance	46 good practices covering all GR Toolkit dimensions
3	Non-state road to the village of Oftobruya Temurmalik District	2.5	Flat; Arid	low-volume road	maintenance	46 good practices covering all GR Toolkit dimensions (<i>same results for both roads since</i>

4	Non-state road the village of Bahoriston	1.4	Flat; Arid	low-volume road	maintenance	they have the same characteristics)
5	Non-state road Oftobruya (Chilcha street)	4.0	Flat; Arid	low-volume road	maintenance	
6	Non-state road to the village of Yakkasada	1.7	Flat; Arid	low-volume road	maintenance	

Note: For roads with similar characteristics, the Toolkit typically generates similar lists of recommended practices.

4. Practice Assessment and Prioritization:

The initial long list of practices generated by the Toolkit is further assessed and prioritized.

Criteria include:

- Technical feasibility (can it be implemented given local conditions?)
- Financial viability (are resources available or accessible?)
- Institutional capacity (is there local know-how and support?)
- Policy alignment (does it fit with district and national strategies?)
- Expected impact (what are the anticipated environmental, social, and economic benefits?)
- Need for local adaptation (does the practice require modification for the Tajik context?)

5. Stakeholder Validation and Final Selection:

The green road practices and recommendations in the next chapter were developed using the ADB Green Roads Toolkit together with field data from road surveys, transect drives, and stakeholder interviews. This approach ensures the practices reflect local conditions and priorities for each road segment and district.

These practices will be reviewed in the upcoming stakeholder validation meeting with district authorities, technical experts, community representatives, and sectoral agencies. During the meeting, stakeholders will discuss and confirm the proposed practices to make sure they match local needs and practical realities.

7. Opportunities and Recommendations

This chapter presents a comprehensive set of opportunities and targeted recommendations for advancing green road practices in the selected districts of Tajikistan. The recommendations are based on an extensive process of field surveys, stakeholder interviews, and the application of the Green Roads Toolkit, ensuring that recommendations are both evidence-based and tailored to the local context. The chapter is structured to first address Roghun District, followed by recommendations for Vose District, reflecting the unique challenges and opportunities identified in each area.

Green road development is essential for Tajikistan’s mountainous districts, where road infrastructure is frequently threatened by erosion, landslides, flooding, and climate-related risks. Improving road sustainability not only protects investments in transport but also supports local economies, enhances safety, and contributes to national greening and climate resilience objectives. The recommendations provided here are designed to guide the Ministry of Transport as well as district authorities in implementing practical solutions that address both immediate problems and long-term development goals.

For each district, recommendations are organized at two levels:

- **Road-specific interventions:** These respond to the particular environmental, safety, and operational challenges observed on individual road segments, and are directly linked to issues such as erosion, drainage, slope stability, and safety risks.
- **District-wide strategies:** These address broader systemic needs, including vegetation management, water and soil conservation, pollution control, economic development, and institutional capacity building - measures that are essential for long-term sustainability and resilience of the road network.

Recommendations for Roghun District

Road-Specific Green Practices for Roghun District

Table 17: Overview of selected road-specific green practices for Roghun district.

Road Name & Type	Recommended Green Practices
<p>State Road Obigarm-Nurobod</p> <p><i>The State Road Obigarm-Nurobod, a paved highway traversing mountainous terrain, faces critical issues such as slope erosion, landslides, poor drainage, and minimal vegetation.</i></p>	<p>Decarbonization</p> <ul style="list-style-type: none"> • 1.1.5 Facilitate the use of fuel-efficient vehicles • 1.2.5 Use energy-efficient lighting along roads and in tunnels • 1.3.3 Use energy-friendly “Green Cement” in additional works • 1.4.1 Bio-engineering and roadside tree planting for carbon sequestration <p>Climate Resilience</p> <ul style="list-style-type: none"> • 2.1.1 Resilient routing / avoiding vulnerable areas • 2.2.1 Prevent stream diversion at road–stream crossings

<p>State Road to the City of Roghun</p> <p><i>This paved highway is affected by slope instability, debris flows, and structural risks to bridges</i></p>	<ul style="list-style-type: none"> • 2.2.2 Avoid using multiple small culverts • 2.2.4 Ensure proper road surface drainage to avoid water concentration • 2.3.1 Ensure complete ground cover in disturbed areas • 2.3.2 Use deep-rooted vegetation for slope stabilization • 2.3.3 Harden road embankments • 2.3.4 Prevent concentration of road surface water • 2.3.6 Stabilize unstable cut and fill slopes (incl bio-engineering) • 2.4.1 Apply best engineering practices for climate resilience • 2.4.2 Introduce climate adaptation measures for bridges • 2.4.3 Improve performance of asphalt pavements in high temperatures • 2.4.4 Conduct vulnerability assessments for infrastructure • 2.8.1 Implement risk-informed and routine road maintenance <p>Water & Land Management</p> <ul style="list-style-type: none"> • 3.1.1 Install floodwater spreaders along road surfaces • 3.1.2 Direct water to retention ponds/ditches at the roadside • 3.1.5 Use surface storage fed by road drainage (borrow pits, ponds, cisterns) • 3.1.6 Use roads as reservoir embankments • 3.2.1 Develop cascading irrigation systems fed from road drainage <p>Additional measures on safety, inclusion & biodiversity</p> <ul style="list-style-type: none"> • Install warning signs, truck parking areas, barriers against falling rocks/soil • Install livestock fencing, wildlife crossings, and accessible infrastructure for people with special needs • Support roadside business development and local employment • Ensure labor safety measures (protective gear, shelters, worker transport)
<p>Non-State Road to Javoni</p> <p><i>This low-volume road faces surface washouts, slope erosion, and community safety concerns</i></p>	<p>Decarbonization</p> <ul style="list-style-type: none"> • 1.1.5 Facilitate the use of fuel-efficient vehicles • 1.4.1 Bio-engineering and roadside tree planting for carbon sequestration <p>Climate Resilience</p> <ul style="list-style-type: none"> • 2.2.1 Prevent stream diversion at road–stream crossings • 2.2.4 Ensure proper road surface drainage to avoid water concentration • 2.3.1 Ensure complete ground cover in disturbed areas • 2.3.2 Use deep-rooted vegetation for slope stabilization • 2.3.3 Harden road embankments • 2.3.6 Stabilize unstable cut and fill slopes • 2.8.1 Implement risk-informed and routine road maintenance
<p>Non-State Road to Dehqonobod</p> <p><i>This road is threatened by slope erosion, landslides, gullies, and livestock access.</i></p>	<p>Water & Land Management</p> <ul style="list-style-type: none"> • 3.1.1 Install floodwater spreaders along road surfaces • 3.1.2 Direct water to retention ponds/ditches at the roadside • 3.1.5 Use surface storage fed by road drainage (borrow pits, ponds, cisterns) • 3.2.1 Develop cascading irrigation systems fed from road drainage <p>Additional measures on pollution reduction & biodiversity</p> <ul style="list-style-type: none"> • 4.1.2 Install livestock fencing and wildlife crossings • 4.2.1 Install warning signs, truck parking areas, barriers against falling rocks/soil • 5.2.1 Ensure labor safety measures (protective gear, shelters, worker transport) • 6.1.1 Monitor and protect wildlife migration corridors near roads
<p>Non-State Road to Sangi Surkh</p> <p><i>Surface erosion, unstable slopes, and poor drainage are the main concerns.</i></p>	<p>Additional measures on pollution reduction & biodiversity</p> <ul style="list-style-type: none"> • 4.1.2 Install livestock fencing and wildlife crossings • 4.2.1 Install warning signs, truck parking areas, barriers against falling rocks/soil • 5.2.1 Ensure labor safety measures (protective gear, shelters, worker transport) • 6.1.1 Monitor and protect wildlife migration corridors near roads

District-Wide Recommendations for Roghun District

To achieve a greener, safer, and more resilient road network in Roghun District, the following district-wide actions are recommended:

1. Expand and Maintain Roadside Vegetation

- Introduce bio-engineering systematically. Plant more trees and grasses along all roads, prioritizing native and drought-resistant species such as acacia, walnut, elm, and conifers. This will help prevent erosion, control dust, reduce heat, and enhance the appearance of the district.
- Transform cleared or disturbed roadside areas into green strips by leveling soil and planting appropriate vegetation.
- Monitor the survival of planted trees and replant as needed to ensure long-term success, aiming to improve the current survival rate above 62%.

2. Improve Water Management and Drainage

- Upgrade and maintain drainage channels and culverts to prevent flooding, landslides, and waterlogging, especially in areas near rivers and streams.
- Harvest and store rainwater and runoff from roads by constructing small reservoirs, ponds, or ditches along the roadsides.
- Use collected water for irrigation of roadside vegetation or for agricultural and livestock needs, especially in areas facing water scarcity. Consider installing drip or sprinkler irrigation systems for efficient water use.

3. Enhance Slope and Soil Stability

- Stabilize slopes and embankments using a combination of deep-rooted vegetation, bio-engineering measures, grass cover, and engineering measures such as retaining walls or terracing where necessary.
- Regularly inspect and repair areas prone to landslides, erosion, or washouts to keep roads safe and open year-round.

4. Strengthen Road Safety and Accessibility

- Install warning signs, barriers, and livestock fencing in hazardous areas to prevent accidents involving vehicles, animals, or falling rocks.
- Create safe crossings for livestock and wildlife, especially in areas with frequent animal movement or seasonal migrations.
- Improve road and sidewalk accessibility for people with disabilities by providing ramps, clear signage, and smooth surfaces.

5. Reduce Pollution and Support Clean Transport

- Promote the use of electric vehicles by supporting the installation of charging stations and offering incentives for their purchase.

- Control vehicle emissions and construction dust through regular roadside cleaning, enforcement of emissions standards, and increased planting of vegetation as a natural filter.

6. Support Local Economy and Employment

- Encourage the development of roadside businesses such as farm produce stands, local shops, and local cafes, by providing suitable locations and basic infrastructure.
- Prioritize hiring local residents for road construction and maintenance, offering training and fair wages to create more jobs and reduce out-migration.
- Improve labor safety by providing workers with protective equipment, safe transportation, and temporary shelters as needed.

7. Protect Biodiversity and Natural Habitats

- Monitor and protect wildlife migration corridors and sensitive habitats near roads, minimizing disturbances during construction and maintenance.
- Install animal crossings or underpasses where needed to allow safe animal movement and reduce accidents and roadkill.

8. Build Institutional Capacity and Coordination

- Strengthen cooperation between local government, forestry, environmental agencies, and communities to plan, implement, and maintain green road initiatives.
- Advocate for increased funding for road maintenance and greening activities, and ensure that green practices are included in district and state road programs.
- Conduct regular monitoring and evaluation of road conditions, vegetation health, and safety incidents to guide future improvements.

Institutional and Programmatic Actions for Roghun District

To ensure effective implementation of green road practices, the following institutional and programmatic actions are recommended:

- **Coordination:** Strengthen collaboration among local government, forestry, environmental agencies, and communities for integrated planning and implementation.
- **Funding & Planning:** Advocate for increased maintenance budgets and integrate green road practices into district and state programs to reduce long-term costs.
- **Capacity Building:** Train local staff and community members in green road maintenance, bioengineering, and roadside tree planting.
- **Monitoring & Evaluation:** Implement annual surveys of road conditions, vegetation survival, and safety incidents to inform adaptive management.

Recommendations for Vose District

Road-Specific Green Practices for Vose District

Table 18: Overview of selected road-specific green practices for Vose district.

Road Name & Type	Recommended Green Practices
<p>State Road Guliston–Kulob</p> <p><i>Main regional highway traversing flat, arid terrain, with recent reconstruction and ongoing drainage and slope stability issues.</i></p>	<p>Decarbonization</p> <ul style="list-style-type: none"> • 1.1.5 Facilitate the use of fuel-efficient vehicles • 1.2.5 Use of energy-efficient lighting along roads and in tunnels • 1.3.3 Using energy friendly “Green Cement” • 1.4.1 Bio-engineering and roadside tree planting for carbon sequestration <p>Climate Resilience</p> <ul style="list-style-type: none"> • 2.2.2 Avoid using multiple small culverts • 2.2.4 Road surface drainage to prevent water concentration • 2.3.1 Complete ground cover in disturbed areas • 2.3.2 Use deep-rooted vegetation for slope stabilization • 2.3.3 Harden road embankments • 2.3.4 Preventing road surface water concentration • 2.3.6 Stabilization of unstable cut and fill slopes • 2.4.1 Need for best engineering practices for climate resilience • 2.8.1 Risk-informed and routine road maintenance <p>Water & Land Management</p> <ul style="list-style-type: none"> • 3.1.1 Floodwater spreaders along road surfaces • 3.1.2 Directing water to retain ponds/ditches at the roadside • 3.1.5 Surface storage fed from road drainage (repurposed borrow pits, ponds and cisterns) • 3.2.1 Cascading irrigation fed from road drainage • Extra – Rethink irrigation and drainage management so as to create more stable foundations <p>Pollution & Waste Management</p> <ul style="list-style-type: none"> • 4.1.1 Install roadside waste collection points • 4.1.2 Conduct community awareness campaigns on waste disposal • 4.1.3 Enforce anti-dumping regulations and penalties • 4.2.1 Use sediment traps and silt fences at construction sites <p>Biodiversity & Green Spaces</p> <ul style="list-style-type: none"> • 5.1.1 Plant drought-resistant native trees and shrubs • 5.1.2 Establish green buffer strips along roadsides

	<p>Safety & Social Inclusion</p> <ul style="list-style-type: none"> 6.1.1 Install clear signage and road markings
<p>State Road Hulbuk–Temurmalik–Kangurt</p> <p><i>Key paved corridor crossing arid lowland areas, facing challenges from erosion, landslides, and riverbed exploitation.</i></p>	<p>Decarbonization</p> <ul style="list-style-type: none"> 1.4.1 Bio-engineering and roadside tree planting for carbon sequestration <p>Climate Resilience</p> <ul style="list-style-type: none"> 2.2.4 Road surface drainage to prevent water concentration 2.3.1 Complete ground cover in disturbed areas 2.3.2 Use deep-rooted vegetation for slope stabilization 2.3.3 Harden road embankments 2.3.6 Stabilization of unstable cut and fill slopes 2.8.1 Risk-informed and routine road maintenance <p>Water & Land Management</p> <ul style="list-style-type: none"> 3.1.1 Floodwater spreaders along road surfaces 3.1.2 Directing water to retain ponds/ditches at the roadside 3.2.1 Cascading irrigation fed from road drainage <p>Pollution & Waste</p> <ul style="list-style-type: none"> 4.1.1 Install roadside waste collection points 4.1.3 Enforce anti-dumping regulations and penalties <p>Biodiversity & Green Spaces</p> <ul style="list-style-type: none"> 5.1.1 Plant drought-resistant native trees and shrubs
	<p>Decarbonization</p> <ul style="list-style-type: none"> 1.4.1 Bio-engineering and roadside tree planting for carbon sequestration <p>Climate Resilience</p> <ul style="list-style-type: none"> 2.3.1 Complete ground cover in disturbed areas 2.3.2 Use deep-rooted vegetation for slope stabilization 2.3.3 Harden road embankments 2.3.6 Stabilization of unstable cut and fill slopes 2.8.1 Risk-informed and routine road maintenance <p>Water & Land Management</p> <ul style="list-style-type: none"> 3.1.2 Directing water to retain ponds/ditches at the roadside 3.2.1 Cascading irrigation fed from road drainage <p>Pollution & Waste</p> <ul style="list-style-type: none"> 4.1.1 Install roadside waste collection points 4.1.2 Conduct community awareness campaigns on waste disposal <p>Biodiversity & Green Spaces</p>

	<ul style="list-style-type: none"> 5.1.1 Plant drought-resistant native trees and shrubs
<p>Non-state road to Oftobruya village</p> <p><i>Village access road on flat, arid land, affected by debris, erosion, and loss of vegetation along recently reconstructed stretches.</i></p>	<p>Decarbonization</p> <ul style="list-style-type: none"> 1.4.1 Bio-engineering and roadside tree planting for carbon sequestration <p>Climate Resilience</p> <ul style="list-style-type: none"> 2.3.1 Complete ground cover in disturbed areas 2.3.2 Use deep-rooted vegetation for slope stabilization 2.3.3 Harden road embankments 2.3.6 Stabilization of unstable cut and fill slopes 2.8.1 Risk-informed and routine road maintenance <p>Water & Land Management</p> <ul style="list-style-type: none"> 3.1.2 Directing water to retain ponds/ditches at the roadside 3.2.1 Cascading irrigation fed from road drainage <p>Pollution & Waste</p> <ul style="list-style-type: none"> 4.1.1 Install roadside waste collection points 4.1.2 Conduct community awareness campaigns on waste disposal <p>Biodiversity & Green Spaces</p> <ul style="list-style-type: none"> 5.1.1 Plant drought-resistant native trees and shrubs
<p>Non-state road to Yakkasada village</p> <p><i>Paved rural road on flat, arid terrain, with significant erosion, lack of drainage, and construction debris issues.</i></p>	
<p>Non-state road to Oftobruya (Chilcha street)</p> <p><i>Low-volume village road in arid conditions, with steep slopes, deep erosion channels, and ongoing vegetation loss.</i></p>	
<p>Non-state road to Bahoriston village</p> <p><i>Low-volume, partially unpaved road in arid terrain, experiencing severe slope erosion and landslides, especially after rainfall.</i></p>	

District-Level Recommendations for Vose District

Building on the above road-specific interventions, the following district-wide strategies are recommended:

1. Scale Up Roadside Greening and Tree Planting

- Launch a district-wide program for bio-engineering and roadside tree planting (1.4.1), prioritizing drought-resistant native species suitable for the arid climate.
- Expand green buffer strips (5.1.2) and vegetative cover along both state and non-state roads, including transforming unused or disturbed roadside areas into green corridors.
- Integrate roadside greening with the national Forestry Development Program and Green Economy Strategy, contributing to the goal of planting up to 2 billion trees.

2. Strengthen Drainage, Erosion, and Slope Management



- Systematically upgrade and maintain drainage infrastructure, including regular cleaning of canals, culverts, and ditches to prevent blockages, water stagnation, and erosion (2.2.4, 3.1.2).
- Apply best engineering practices for climate resilience (2.4.1) and prioritize stabilization of slopes and embankments using both structural (2.3.3, 2.3.6) and nature-based solutions (2.3.2).
- Promote the use of ground cover (2.3.1) and cascading irrigation from road drainage (3.2.1) to support vegetation and reduce erosion risk, especially in areas prone to landslides and heavy rainfall.

3. Improve Waste Management and Pollution Control

- Install and maintain roadside waste collection points (4.1.1) at regular intervals along all main and rural roads.
- Conduct ongoing community awareness and enforcement campaigns (4.1.2, 4.1.3) to prevent illegal dumping and promote responsible waste disposal.
- Require the use of sediment traps and silt fences at construction and maintenance sites (4.2.1) to reduce pollution of water bodies and soils.

4. Enhance Water Harvesting and Efficient Use

- Develop small-scale water harvesting infrastructure, such as floodwater spreaders (3.1.1), retention ponds (3.1.2), and surface storage (3.1.5), especially in areas facing water scarcity.
- Use collected water for irrigation of roadside vegetation and, where feasible, for supporting local agriculture, as recommended by stakeholders.
- Encourage the adoption of modern irrigation techniques (e.g., drip irrigation) for roadside and community greening.

5. Strengthen Road Safety and Social Inclusion

- Expand the installation of warning signs, road markings, and pedestrian crossings (6.1.1) in accident-prone and populated areas.
- Improve accessibility for all road users, including people with disabilities, by ensuring clear signage and safe crossings.
- Address road safety risks related to livestock and wildlife by installing fencing or safe crossings where needed.

6. Build Institutional Capacity and Secure Funding

- Provide targeted training for district and jamaat-level road authorities and maintenance teams on green road practices, bioengineering, and drainage management.
- Foster inter-agency coordination among the road department, forestry, environment, and water management authorities for integrated planning and implementation.

- Advocate for increased funding for road maintenance and green infrastructure, leveraging national programs and potential donor support.

7. Monitor, Evaluate, and Scale Up Successful Practices

- Establish pilot demonstration sites for comprehensive green road interventions, with regular monitoring of vegetation survival, drainage function, and safety outcomes.
- Document lessons learned and share results with neighboring districts and national stakeholders to support wider replication.
- Integrate green road indicators into district infrastructure planning, budgeting, and performance monitoring frameworks.

8. Conclusion

The prioritized recommendations for green road interventions will be agreed with stakeholders during the district validation workshop scheduled for early January. Below are the main conclusions drawn from our fieldwork and analysis:

Roghun District:

Site visits confirmed widespread slope instability, landslides, and inadequate drainage along key road segments. Many slopes lack vegetation, and embankments are vulnerable to erosion, increasing risks to road safety and the Roghun reservoir.

We recommend:

- Immediate stabilization of critical slopes with deep-rooted vegetation and bioengineering.
- Upgrading and regular maintenance of drainage systems.
- Strengthening embankments and implementing routine, risk-informed maintenance.
- Expanding tree planting and ground cover to reduce sediment runoff.

Vose District:

The assessment found severe erosion and landslides, poor drainage maintenance, and significant waste accumulation on both state and non-state roads. Unpaved sections are frequently impassable during wet conditions, and green spaces are being lost.

We recommend:

- Systematic cleaning and repair of drainage canals and culverts.
- Improved waste management through regular collection points and awareness campaigns.
- Slope stabilization with vegetation and targeted water harvesting for irrigation.
- Upgrading unpaved roads and expanding green corridors along transport routes.

Final prioritization and adaptation of these recommendations will be completed in consultation with district authorities and stakeholders at the January workshop.

Annexes

Annexes provide supporting documentation, including the district selection database and scoring matrix, detailed field protocols and data, the list of stakeholders consulted, maps, photographs, and references.

Annex 1: District Selection Database



Tajikistan district
database_09_202509:

Annex 2: Report on Selecting Focus Districts for the Green Road Advisory Project



Report Final -
Selecting the focus di:

Annex 3: Detailed Guide for Focus District Road Surveys



Guide for Focus
District Survey.pdf

Annex 4: Roghun District Green Road Issues



Roghun District
Green Road Issues.pdf

Annex 5: Stakeholders Interviews and Institutional Assessment



Stakeholder
Interview Notes_Rogu



Stakeholder
Interview Notes_Vose

Annex 6: GR Toolkit results for each selected road

Roghun District – GR Toolkit Results						
No.	Road Name	Length (km)	Geographic Setting	Road Standard	Project Stage	Toolkit Output (No. of Practices)
1	State Road Obigarm–Nurobod	76.0	Mountainous	Paved highway	Maintenance	55 good practices (same results since both State roads have the same characteristics)  Rogun_State Road Obigarm-Nurobod an
2	State Road to the City of Roghun	9.6	Mountainous	Paved highway	Maintenance	
3	Non-state road to the village of Javoni	4.2	Mountainous	Low-volume road	Maintenance	56 good practices (same results since all Non-state roads have the same characteristics)  Rogun_Non-State Roads (56).pdf
4	Non-state road to the village of Dehqonobod	3.0	Mountainous	Low-volume road	Maintenance	
5	Non-state road to the village of Sangi Surkh	2.0	Mountainous	Low-volume road	Maintenance	

Vose District – GR Toolkit Results						
No.	Road Name	Length (km)	Geographic Setting	Road Standard	Project Stage	Toolkit Output (No. of Practices)
1	State Road Guliston–Kulob	15.0	Flat; Arid	Paved highway	Construction / Implementation	75 good practices  Vose_State Road Guliston-Kulob (75).pr
2	State Road Hulbuk–Temurmalik–Kangurt	59.0	Flat; Arid	Paved highway	Maintenance	46 good practices  Vose_State Road Hulbuk-Temurmalik-k
3	Non-state road to the village of Oftobruya	2.5	Flat; Arid	Low-volume road	Maintenance	47 good practices (same results since all non-state roads have the same characteristics)  Vose_Non-State Roads (47).pdf
4	Non-state road to the village of Bahoriston	1.4	Flat; Arid	Low-volume road	Maintenance	
5	Non-state road to the village of Oftobruya (Chilcha street)	4.0	Flat; Arid	Low-volume road	Maintenance	
6	Non-state road to the village of Yakkasada	1.7	Flat; Arid	Low-volume road	Maintenance	