

Performance-Based Routine Maintenance of Rural Roads by Maintenance Groups

Manual for Maintenance Groups

Asian Development Bank



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Note:

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Foreword

Traditionally, rural road maintenance in Dehong Prefecture, Yunnan Province, People's Republic of China is carried out through voluntary contributions from communities along the road during 1 or 2 days each year, complemented by provincial and local maintenance subsidies for the purchase of materials. In practice, the burden tends to fall disproportionately on women and the poor; and due to limited labor inputs and a lack of skills training, maintenance quality is suboptimal and roads continue to deteriorate.

Through a small-scale technical assistance pilot project linked to the Yunnan Integrated Road Network Development Project and the preceding Gender and Development Cooperation Fund pilot demonstration project, the Asian Development Bank (ADB) reached an agreement with the Yunnan Provincial Department of Transport and Dehong Prefecture Communications Bureau to allow a more flexible use of provincial maintenance subsidies, making it possible to finance the remuneration of maintenance groups that work year-round to keep the roads open and slow down deterioration. As well as resulting in improved road conditions, this provides a rare opportunity for off-farm employment in rural areas especially for women and ethnic minority groups.

The small-scale technical assistance pilot project achieved the following:

- 250 kilometers of rural roads were successfully maintained by women's road maintenance groups, resulting in continued access throughout the rainy season and leading to improved road conditions, benefiting transport services and facilitating access to markets, schools, and health facilities.
- 129 women, mainly from ethnic minority groups, were provided with technical and management training and employed in rural road maintenance, with a total of over 11,500 person-days of employment created. The flexible and part-time nature of the performance-based payment system enabled the maintenance group members to easily combine this work with other household and farm responsibilities.
- With an average investment of CNY2,470 per kilometer, the piloted approach is in line with existing funding levels for routine maintenance of township and village roads (from provincial subsidies and local allocations). More than 80% of this investment is in the form of wages,

and the remainder is spent on insurance, tools, safety equipment, and materials.

- Average daily wages under the project reached CNY44 per day, providing the maintenance group members with a little less than CNY4,000 per person per year on average. The wages obtained from the maintenance work have provided a major boost to household incomes, raising these beyond the official poverty line of CNY1,196 per capita and providing the women with greater decision-making power in their households.
- Under the project, a regulation was prepared regarding the implementation of routine maintenance of rural roads by maintenance groups. This was issued by the Dehong Prefecture Communications Bureau to regulate the use of the approach under the Yunnan Integrated Road Network Development Project. It is expected to be followed by a province-wide regulation to be issued by the Yunnan Provincial Department of Transport.

This approach to road maintenance by maintenance groups has potential for wider replication in the People's Republic of China and other developing countries. This manual and the complementary guide for communications bureaus provide a way to share the approach and methods used.



Tyrrell Duncan

Director, concurrently Practice Leader (Transport)

Transport and Communications Division, East Asia Department

Preface

The physical condition of roads is critical to any transport network. However, unless roads are adequately maintained, they inevitably deteriorate, leading to higher road user costs and longer travel times. Routine maintenance is often delayed due to various factors, such as lack of funds or insufficient technical knowledge. When simple routine maintenance is postponed for long periods, there is often a need for more extensive rehabilitation, which is much more costly.

The purpose of this manual is to assist maintenance groups in Yunnan Province, People's Republic of China, in organizing and carrying out the routine maintenance of unpaved rural roads.

The manual is the outcome of the small-scale technical assistance (SSTA) pilot project linked to the Yunnan Integrated Road Network Development Project. The SSTA pilot project built on the experience of a previous pilot project on Community-Based Routine Road Maintenance by Women's Groups, which was financed by the ADB Gender and Development Cooperation Fund. The SSTA sought to improve the approach developed under the first pilot project by introducing performance-based payments with the aim of reducing the resources required for supervision and inspection. It also aimed to improve the financial sustainability of the approach by reducing the investments required and promoting policy changes regarding the use of road maintenance funding.

This manual guides the maintenance groups at the operational level in the use of appropriate tools and techniques in their work. It teaches the maintenance group members technical and managerial skills for routine maintenance of rural roads, based on the experience gained from the two pilot projects carried out in Dehong Prefecture, Yunnan Province. The manual will serve as a basis for the replication of performance-based routine maintenance by maintenance groups under the Yunnan Integrated Road Network Development Project on 650 kilometers of rural roads over a 4-year period.

Robert Wihtol
Director General
East Asia Department

Acknowledgments

This manual was developed as part of a small-scale technical assistance (SSTA) pilot project for the Yunnan Integrated Road Network Development Project funded by ADB. The SSTA pilot project was carried out in Dehong Prefecture, Yunnan Province, People's Republic of China. This manual is largely based on a manual developed under a previous pilot project funded by a grant from ADB's multidonor Gender and Development Cooperation Fund: *Community-based routine maintenance of roads by women's groups: Manual for maintenance groups*.

The task manager for the SSTA pilot project was Xiaohong Yang, lead transport specialist, Transport and Communications Division, East Asia Department. Overall guidance and support was provided by Tyrrell Duncan, director, Transport and Communications Division, East Asia Department, concurrently practice leader (Transport).

The contributions of the following people to this manual are acknowledged with gratitude: Serge Cartier van Dissel, international road maintenance specialist, for preparing the main text and structure; Dajiang Sun, national gender development expert, for the Chinese translation of the text; and Kasthamandap Art Studio for the drawings rendered.

The authors are also grateful to the Yunnan Provincial Department of Transport: Yang Yan, deputy director general; Xu Shaoneng, director, Planning Division; Zhan Xiaolin, deputy director, Planning Division; and Xu Caijian, director, International Financial Institution IFI-financed Project Office. The Dehong Prefecture Communications Bureau and Dehong Prefecture Traffic Bureau provided valuable guidance and institutional support: Yan Xintong, director; Jin Chu, director of Maintenance Division; and Yi Tiansong, deputy director of Maintenance Division.

Abbreviations

- ADB – Asian Development Bank
SSTA – small-scale technical assistance

Currency Unit (as of 1 September 2012)

Currency unit	–	yuan (CNY)
CNY1.00	=	\$0.16
\$1.00	=	CNY6.33



Photo credit: Xiaohong Yang

Members of Laxin maintenance group



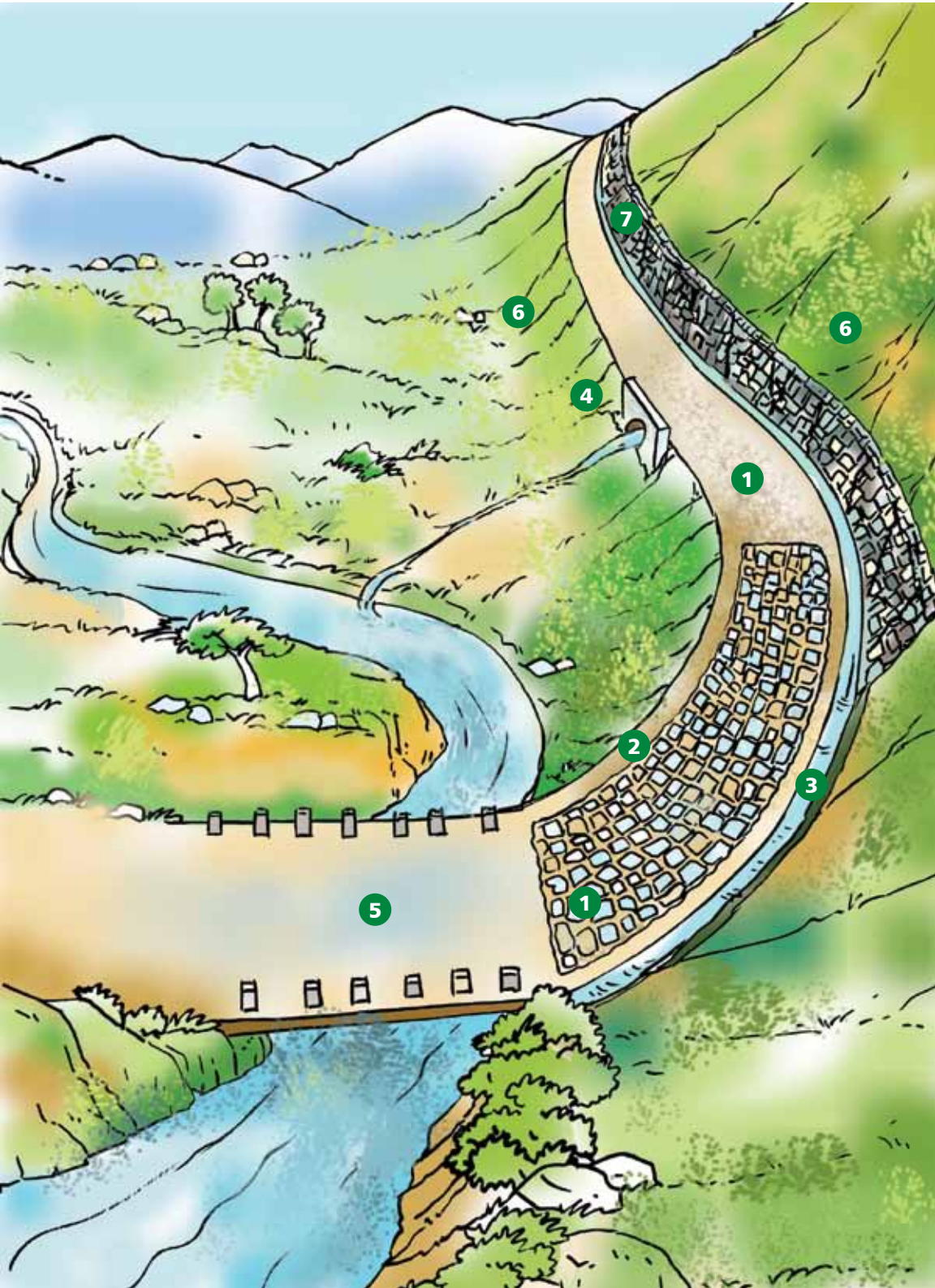
Photo credit: Serge Cartier van Dissel

Yunmao group removing a landslide

Road Elements

A road is made up of different parts or elements. Apart from the road surface, which people drive or walk over, many other elements support the road and protect it from damage. The most important road elements are described below and are shown in the picture on the opposite page.

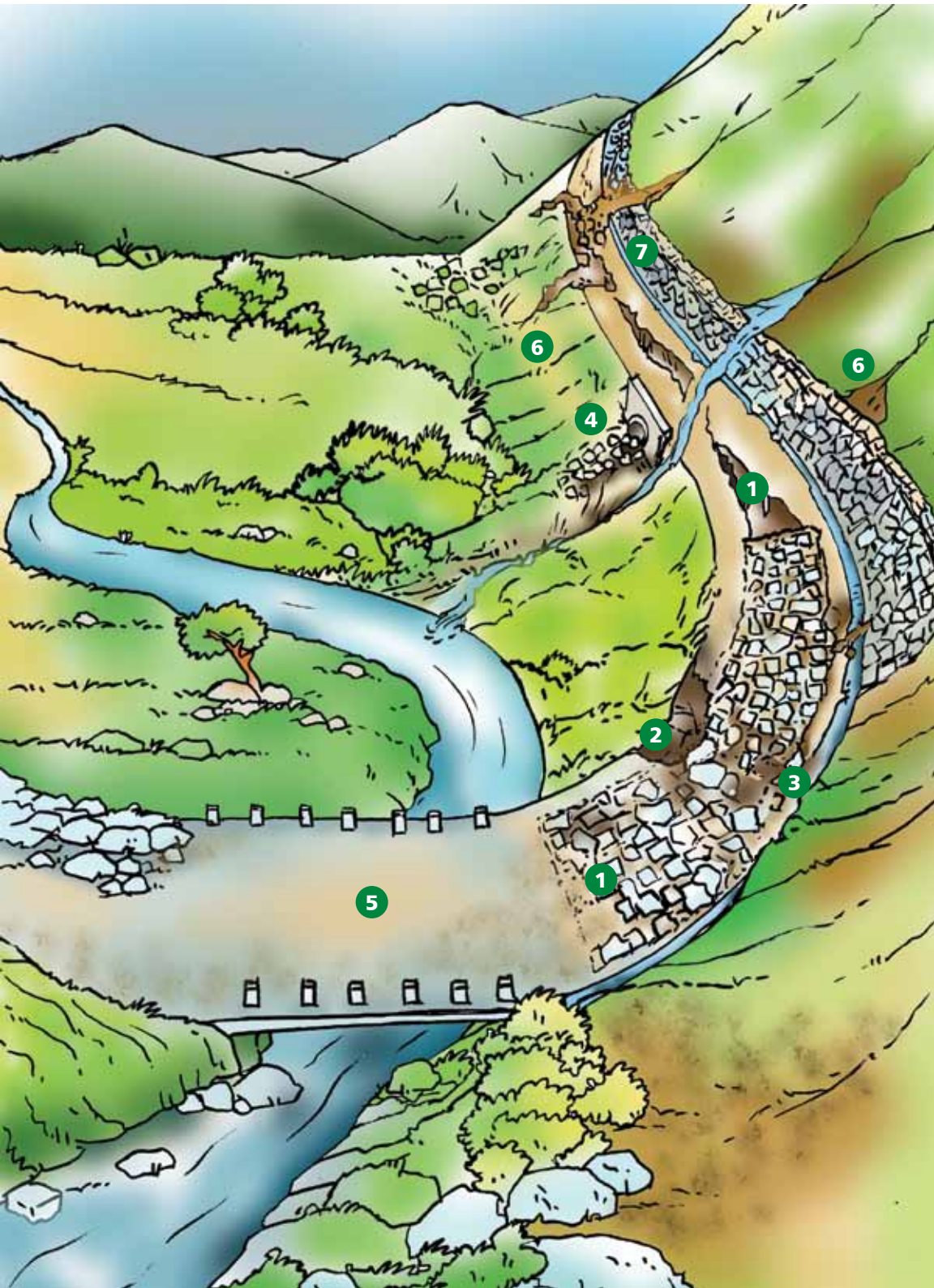
1. **Road surface.** The main element of the road, the road surface supports the traffic driving on it. For unpaved roads, the surface can be made of earth, gravel, or stone pavement.
2. **Road shoulder.** The road shoulder gives additional support to the road surface, especially in the case of stone pavement, separating the road surface from side drains and slopes.
3. **Side drain.** Side drains guide water along the side of a road and safely away from it, so the water does not flow over the road surface where it may cause damage. Side drains form the most basic protection for the road.
4. **Culvert.** A culvert allows water to cross safely under the road through a pipe, so water does not flow over the road surface where it may cause damage. It is the most common type of water crossing.
5. **Bridge.** A bridge is used where the amount of water crossing under the road is too much for a culvert and a bigger opening is needed.
6. **Slope.** Where a road crosses a mountainous area, it is necessary to cut into the mountains. This results in cut-slopes uphill from a road and fill-slopes downhill from a road. These must be stable to avoid damage to and blockage of the road.
7. **Retaining wall.** Where slopes are not sufficiently strong, a retaining wall can be used to stabilize them. A retaining wall can be made of loose, piled stones; cemented stones; or stones in a wire cage (also known as a gabion).



Road Deterioration

Over time, different road elements cease to work properly or are damaged by water, traffic, and vegetation. This causes deterioration of the road. When this becomes very severe, the road can become impassable. The most typical types of deterioration are described below and are shown in the picture on the opposite page.

1. **Road surface.** Road surfaces can be damaged by water flowing over them, causing erosion and muddy areas. Traffic also causes damage, especially if there is water on the road, resulting in ruts and potholes. If such damage is severe, the road becomes impassable.
2. **Road shoulder.** Road shoulders can also be damaged by water and traffic, leading to decreased support for the road surface and possibly its collapse. In the case of stone-paved roads, damaged road shoulders can cause the stones to become loose.
3. **Side drain.** Side drains can become silted up or blocked by landslides or vegetation. Where this happens, water no longer flows through the side drains but flows over the road, causing damage.
4. **Culvert.** Culverts can become blocked by sediment and vegetation, causing water to flow over the road surface instead, leading to damage.
5. **Bridge.** Bridges can also become blocked with vegetation and material left behind by water. Where this is severe, water can no longer flow under the bridge, so it flows over it or over the road, causing damage.
6. **Slope.** Slopes can collapse, especially where water flows over them and there is no wall or vegetation to stabilize them. This causes landslides, which may block the road and side drains. The flow of water can also cause cuts in the road shoulder, which can undermine the road.
7. **Retaining wall.** Retaining walls can become damaged and even collapse. This will limit the support that they give to the slopes and shoulders, resulting in landslides or road collapse.



Road Maintenance

Road maintenance ensures that all of the different road elements work properly, any existing damage to these elements is repaired, and further damage is prevented. Routine maintenance consists of three types of activities, which are carried out by maintenance groups throughout the year: clearing road elements, repairing road elements, and creating protection measures.

Clearing Road Elements

The first type of maintenance activity is aimed at cleaning and clearing the different road elements to ensure that they function properly and to avoid damage occurring.

1. **Clearing landslides.** Any landslides or other obstacles blocking the road surface, road shoulder, or side drains are removed.
2. **Clearing side drains.** Any earth, stones, vegetation, garbage, or other material in side drains are removed, and the drains are restored to their proper shape so water can flow through them easily.
3. **Clearing culverts.** Any earth, stones, vegetation, garbage, or other material inside culverts or at their inlets and outlets are removed so water can flow through them easily.
4. **Clearing bridges.** Any earth, rocks, branches, vegetation, garbage, or other material under or near bridges are removed so water can flow easily underneath them.
5. **Clearing vegetation.** Any vegetation that hinders visibility, traffic, or the flow of water away from the road and through the drainage system, or that is damaging the road elements, is removed.

Repairing Road Elements

The second type of maintenance activities is aimed at repairing minor damage that has occurred to the road, bringing the different road elements back into good condition.

6. **Repairing unpaved roads.** Any ruts, rills, and potholes in the road surface of earthen or gravel roads are repaired by filling in the deformations, ensuring that protection measures are in place to avoid further damage (see also activities 11, 12, and 13).

7. **Repairing stone pavement.** Any loose or missing stones are replaced, and the road shoulder is filled to avoid stones becoming loose again, ensuring that protection measures are in place to avoid further damage (see also activities 11, 12, and 13).
8. **Repairing road shoulders.** Any cuts or depressions in road shoulders are filled up and compacted, ensuring that protection measures are in place to avoid recurrence of the damage (see also activities 11, 13, 14, and 15).
9. **Repairing drainage systems.** Any erosion and other damage to side drains, culverts, and bridges is repaired, ensuring that protection measures are in place to avoid further damage.
10. **Repairing retaining walls.** Any loose or missing stones in retaining walls are replaced, using cement or gabion wiring where needed, and weep holes are cleared.

Creating Protection Measures

The third type of maintenance activity aims to create additional road protection measures where these are insufficient, further protecting the road from damage. Often, this is done in combination with repairs, to ensure that the damage does not happen again.

11. **Creating side drains.** Where water flowing along a road is causing damage to the road surface or shoulder, side drains are constructed to guide the water safely away from the road.
12. **Creating water bars.** Where water is flowing through ruts and rills in a road, water bars are constructed across the road to guide the water away from the road surface as a temporary measure until road surface repairs can be carried out.
13. **Creating paved crossings.** Where water flowing across a road is causing damage to the road surface or shoulder, stone-paved splashes are constructed to protect the road surface from damage.
14. **Creating retaining walls.** Where a slope is very unstable or is severely eroded by water resulting in cuts or landslides, dry-stone retaining walls are constructed to stabilize the slope.
15. **Planting vegetation.** Where a slope is mildly unstable or lightly eroded by water, vegetation is planted to protect the soil.

All of these maintenance activities are carried out by maintenance groups at different times of year. Each activity is explained in more detail in this manual. Roads should be checked regularly for damage and to determine the activities to be carried out, and any significant damage must be reported to the county communications bureau. In case of significant damage, additional emergency maintenance activities may be required for specific cases, such as when a river is cutting away the road (also known as a “washout”). In such cases the maintenance groups may be required to assist the county communications bureau in carrying out repairs.

Tools and Safety Equipment

Tools

To carry out the different maintenance activities, the maintenance groups use the tools listed below and shown in the picture on the opposite page. The tools are provided by the county communications bureau. Tools should be of good quality and available in sufficient numbers to ensure that all maintenance group members can work properly. No single tool is appropriate for every job, so the proper tools should be used to get the work done easily and correctly (for instance, a pickaxe is better for loosening hard soil than a hoe, and a wheelbarrow is better for transporting materials over medium distances than a basket).

- **Pickaxe**—to loosen hard or stony material
- **Hoe**—to loosen or excavate soft material
- **Shovel**—to excavate and throw soft or loosened material
- **Rake**—to spread out loose material
- **Bush knife**—to cut vegetation
- **Earth rammer**—to compact material in a small area
- **Watering can**—to spread water before soil compaction
- **Basket**—to transport material over a short distance
- **Wheelbarrow**—to transport material over a medium distance
- **Tractor and trailer**—to transport material over a longer distance (alternatively, use can be made of a pickup or a truck, which can be hired)

Safety Equipment

Safety equipment serves to ensure the safety and health of maintenance workers and should be used at all times. It is provided by the county communications bureau.

- **Safety vests** ensure that drivers can clearly see the maintenance workers so accidents are avoided. These should be worn by all maintenance workers at all times.
- **Safety cones** warn drivers that people are working on the road so accidents are avoided. These should be placed at a distance of 100 meters on each side of the working area.



Pickaxe



Hoe



Shovel



Rake



Bush knife



Earth rammer



Watering can



Basket



Wheelbarrow



Tractor and trailer



First-aid kit



Safety vest



Safety cone

- **First-aid kits** are used to treat any injuries and avoid infection. Injuries should be washed with soap and water, treated with antiseptic cream, and covered with plasters or bandages. In case of more serious injuries, a doctor should be consulted.
- **Warning signs** are positioned to adequately warn drivers of ongoing maintenance or dangerous situations so accidents are avoided. These should be used for maintenance work or damage to the road that lasts more than 1 day, and should be placed at a distance of 250 meters on each side of the working area.

Materials

The county communications bureau provides the materials to be used in the maintenance activities (such as gravel, stones, or cement). Otherwise, a suitable source near the road is indicated, and maintenance groups transport these materials to the site using their transport allowance.



Photo credit: Serge Cartier van Dissel

Hexinchang group repairing the road surface



Photo credit: Serge Cartier van Dissel

Xiangguantang group cutting vegetation and clearing culvert

Performance Indicators

The maintenance group is paid to carry out the routine maintenance of the road. In performance-based maintenance this payment is not linked to the number of days worked or the amount of work carried out, but to the condition of the road. A fixed monthly payment is agreed between the maintenance group and the county communications bureau, as indicated in the contract.

If the road is in good condition as a result of the routine maintenance carried out by the maintenance group, then the full monthly payment is made. If some parts of the road are not in good condition, then a penalty is applied and a deduction is made to the monthly payment. The maintenance group has to ensure that the road is in good condition at all times; and it is responsible for deciding what to do, when, where, and how to do it.



Photo credit: Serge Cartier van Dissel

Road shoulder in poor condition



Photo credit: Serge Cartier van Dissel

Road shoulder in good condition

Performance Indicators

The condition of the road is evaluated using performance indicators. These specify the allowable defects for each road element. If the defects to the different road elements are less than stated in the performance indicators, then the road is considered to be in good condition. If the defects to certain road elements are more than stated in the performance indicators, then the road is not considered to be in good condition and a deduction is made from the monthly payment. The performance indicators are as follows:

1. **Road surface.** In gravel or earthen surfaces there are no potholes larger than 30 centimeters and no ruts or rills deeper than 5 centimeters, and water does not flow over or remain on the road. Repairs to gravel surfaces have been made using suitable gravel material. In stone-paved surfaces there are no loose stones, and newly formed holes are filled with new or recovered stones.
2. **Road shoulder.** There are no depressions or cuts larger than 30 centimeters in diameter, the road shoulder is not more than 3 centimeters below the road surface (stone-paved roads) and there are no banks on the road shoulder.
3. **Side drains.** Less than one-quarter of the cross section at any point in the side drain is blocked, the side drain is at least 20 cm below the road surface, water can flow freely through the side drain, and there is no scouring of the side drain.
4. **Culverts.** Less than one-quarter of the culvert height at any point in the culvert is blocked, the inlet and outlet are clear, water can flow freely through the culvert, and there is no erosion at the inlet or outlet.
5. **Bridges.** Less than one-tenth of the cross section of the bridge is blocked, the areas 5 meters on either side of the bridge are clear of obstructions, water can flow freely under the bridge, and there is no erosion of the bridge structure.
6. **Vegetation.** Vegetation within 1 meter of the road is less than 30 centimeters high (except trees), vegetation protruding over the road is at least 2.50 meters above the road surface, and the flow of water away from the road is not restricted. Vegetation on slopes is not removed, only cut short.
7. **Landslides.** There are no small landslides (less than 3 cubic meters) or other obstacles on the road surface, road shoulder, or side drains. In the case of large landslides (more than 3 cubic meters), these have been reported to the communications bureau. Vehicles are able to pass at all times and water does not flow over the road surface.
8. **Retaining walls.** There are no loose stones in the retaining walls, and weep holes are clear.

Inspections and Payments

Inspections

At the end of each month, the road is inspected by the county communications bureau and an inspection form is filled in (see opposite page). During this inspection, the condition of the different road elements is compared to the performance indicators. If the defects to certain road elements are more than defined in the performance indicators, this is noted on the inspection form for the road section concerned.

The total number of days worked by the maintenance group members and any additional workers is also recorded on the inspection form. For this purpose, the sum of the person-days worked as recorded in the monthly report is used. The number of person-days worked has no influence on the payment and is only used for monitoring purposes. This information is necessary for the payment to be approved.

Deductions

If the condition of the road is found to comply with the performance indicators in all sections of the road, the full monthly payment is approved for the entire road length. If the defects to some road elements are more than allowed according to the performance indicators, this is indicated on the inspection form and a deduction is applied to the monthly payment.

The size of the deduction for a specific road element (E) is calculated by multiplying the monthly payment per kilometer (B) by the number of deficient kilometers for that road element (C) and by the deduction rate for that road element (D). The total deduction for the month concerned (F) is calculated by adding up the deductions for the different road elements (E). The approved monthly payment is calculated by multiplying the monthly payment per kilometer (B) by the number of kilometers (A) and subtracting the total deduction for the month concerned (F).

Monthly Payments

The approved monthly payments are made by check or bank transfer immediately after the inspection has been carried out, and in the amount indicated on the inspection form. Once the money has been collected from the bank, it is distributed among the group members and additional workers.

Inspection Form																			
General Information																			
Road name and length (A)	Guangxi road – 11.50 km										Monthly payment per km (B)	CNY250/km							
Inspection period (month)	June										Date of inspection	31 June 2012							
Name of inspector	Zhou Wen										Group leader's name	Li Ying							
Inspection Results (mark if deficient)																			
Kilometer segment	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Total km deficient (C)	Deduction rate (D)	Deduction (E = B × C × D)	Problems to be corrected
Segment length	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.50				
Road element	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Road surface	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Road shoulder	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Side drains	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Culverts	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bridges	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Vegetation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Landslides	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Retaining walls	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Conclusion																			
Deduction (F = Sum of E)	CNY109.40										The total deduction and resulting payment are mentioned here.								
Approved monthly payment (A × B – F)	CNY1,903.10																		
Total person-days spent	Group members: 45										Additional workers: 0								
Signature inspector	Zhou Wen																		
Signature group leader	Li Ying																		
	The number of person-days worked is written here.																		

Source: ADB Consultant.



Photo credit: Serge Cartier van Dissel

Provision of materials by communications bureau



Photo credit: Serge Cartier van Dissel

Hexinchang group creating a side drain

Group Management

Maintenance groups are formed by local people living near the road to be maintained. The group members who receive technical and managerial training are contracted and paid by the county communications bureau to carry out routine road maintenance.

Group Leader and Treasurer

Each maintenance group elects a group leader and a treasurer to carry out its management. These individuals are responsible for the management of the maintenance group, although certain tasks may be delegated to other group members.

The **group leader** is responsible for the overall management of the group, planning and organizing the maintenance activities, and making sure that the road is in good condition at all times. He or she is responsible for distributing the work to different group members and additional workers, and filling in the monthly report.

The **group treasurer** is responsible for managing the money of the maintenance group. He or she is responsible for monitoring all incomes and expenditure of the maintenance group. It is recommended that this is done in a cash book similar to the one shown on the opposite page. The cashbook should show the incomes on one side and the expenditures on the other; and indicate for each the date, a description of the type of income or expenditure, the amount, and the number of the receipt. Copies of the receipts should be kept with the cashbook.

Cashbook											
General Information											
Name of group or subgroup			Guangxi Road Maintenance Group								
Month			June 2012								
Balance from previous month			CNY100								
Income						Expenditure					
Date	Description	Amount	Receipt number	Date	Description	Amount	Receipt number				
01-6	Transport/sandbags	280.00	Bank receipt	07-6	Transport of stones	200.00	June-1				
30-6	Monthly payment	1,903.10	Bank receipt	09-6	Purchase sandbags	7,710.00	June-2				
				30-6	Salary payments	1,890.00	June statement				
								All money spent is noted down here.			
								All money received is noted down here.			
								The total money received during the month is noted here.			
								The total money remaining at the end of the month is written here and is used in the cashbook for the next month.			
								The total money spent during the month is noted here.			
Total		CNY2,183.10		Total		CNY2,170.00					
Balance at end of month			CNY113.10								
Conclusion											

Source: ADB Consultant.

Work Planning and Organization

Work Planning and Organization

The maintenance group is responsible for planning and organizing the maintenance activities required to keep the road in good condition. This means that the road needs to be checked regularly to see if there is any damage and to determine what needs to be done. The group leader is responsible for setting up a weekly work plan, indicating the activities to be carried out during the week.

The types of activity to be carried out will depend on the season. The figure on the opposite page shows which activities are important in different parts of the year. Just before and during the rainy season the focus will be on the drainage system, while just after the rainy season and during the dry season the focus will be more on repairs. Actual activities will of course depend on the defects identified during the regular survey of the road, and the selection of maintenance activities to be included in the weekly work plan will be aimed at avoiding (further) damage and repairing defects that exceed the allowances defined in the performance indicators. The amount of work to be carried out will also vary according to the season. Generally, there will be more work during the rainy season than during the dry season in order to avoid damage from flowing water and to control the vegetation.

The group has to make sure that the work plan is completed by the end of the week and that the maintenance activities indeed result in a good road condition that complies with the performance indicators. It may be necessary to adjust the work plan if sudden damage to the road is encountered. At the time of the inspection, all road elements should be in good condition and all defects should be within the allowances defined in the performance indicators. Furthermore, the road should be passable at all times.

During implementation, the maintenance group members should work together in such a way that the work can be completed as quickly and easily as possible. For certain activities, group members can carry out complementary tasks. For example, for creating side drains, one person loosens the soil, another person excavates the soil and fills a wheelbarrow, and a third person transports the soil away in the wheelbarrow. For other activities, group members may carry out similar tasks in parallel (such as cutting vegetation) or they may carry out different activities. By working together, the work can be completed quickly and easily.

Activity	Month	Seasonal Priority of Activities											
		J	F	M	A	M	J	J	A	S	O	N	D
1. Clearing landslides						■	■	■	■	■	■		
2. Clearing side drains		■	■	■	■	■	■	■	■	■	■	■	■
3. Clearing culverts		■	■	■	■	■	■	■	■	■	■	■	■
4. Clearing bridges		■	■	■	■	■	■	■	■	■	■	■	■
5. Clearing vegetation		■	■	■	■	■	■	■	■	■	■	■	■
6. Repairing unpaved roads		■	■	■	■	■	■	■	■	■	■	■	■
7. Repairing stone pavement		■	■	■	■	■	■	■	■	■	■	■	■
8. Repairing the road shoulder		■	■	■	■	■	■	■	■	■	■	■	■
9. Repairing the drainage system		■	■	■	■	■	■	■	■	■	■	■	■
10. Repairing retaining walls		■	■	■	■	■	■	■	■	■	■	■	■
11. Creating side drains		■	■	■	■	■	■	■	■	■	■	■	■
12. Creating water bars		■	■	■	■	■	■	■	■	■	■	■	■
13. Creating paved crossings		■	■	■	■	■	■	■	■	■	■	■	■
14. Creating retaining walls		■	■	■	■	■	■	■	■	■	■	■	■
15. Planting vegetation		■	■	■	■	■	■	■	■	■	■	■	■

Rainy Season
 Dry Season
 High Priority
 Low Priority

Source: ADB Consultant.

Reporting

Monthly Report

Maintenance groups need to fill in a monthly report each month. This is an internal document for the maintenance group that records the number of days worked by each group member and any additional workers that were hired by the group. A sample monthly report is shown on the opposite page.

For each day, "X" or "O" is entered beside the name of each person to show whether they have worked for a full day (X) or a half day (O). At the end of the month, the person-days are added up for each person and for the group as a whole. The total number of person-days worked by the group members and by any additional workers is included in the inspection form for monitoring purposes (the number of person-days worked has no influence on the monthly payment). The data on the number of person-days worked also allows the monthly payment to be easily distributed among the workers according to the number of days worked by each person.

Payments

Once the monthly payment has been calculated and approved, the payment for each worker should be noted in the monthly report based on the number of days worked by each person. The payment for each worker can be calculated by dividing the total monthly payment by the total number of person-days worked, and multiplying the resulting figure by the number of person-days worked by each person. To simplify this task, the total salary payment should be an amount that is easily divisible by the number of person-days worked (the remainder of the approved monthly payment can be paid at a later date or used for group activities). The monthly report should be signed by each person upon receipt of payment as proof that payment has been made.

Monthly Report General Information																																				
Reporting period (month)	June																																			
Road name and length	Guangxi road, 11.5 km																																			
Road section: Start and end	Guangxi township to Shangxi village																																			
Group leader's name	Li Ying																																			
Actual Person-Days																																				
Name of group member or additional worker	Date																															Total	Payment			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31					
Li Ying			X	O	X			X		O						X	O	O	X																7.0	294.00
Liu Cheng			X	O	X			X		O						X	O	O	X					O	O										8.0	336.00
Yang Ju			X	O	X			X		O						X	O	O	X					O	O										8.0	336.00
Ma Lin			X	O	X			X		O						X	O	O	X					O	O										8.0	336.00
Hu Fang			X	O			X		O							X	O	O	X					O	O										7.0	294.00
Wang Luli			X	O	X			X		O						X	O	O					O	O										7.0	294.00	
Conclusion																																				
Total workdays by group members	45																																			
Total workdays by additional workers	0																																			
Total approved payment	CNY1,903.10																																			
Total salary payments	CNY1,890.00																																			
Please indicate workdays as follows:	<input checked="" type="checkbox"/> Full-day work <input type="checkbox"/> Half-day work																																			

General information on the group is written here.

The days worked by each person are indicated here.

The total number of days worked by each person is written here.

Additional workers and the number of days that they worked can be written here.

The payment to each worker is written here and signed upon receipt of the payment.

The total days worked by group members and additional workers are indicated here.

After the inspection the approved monthly payment is written here.

The amount to be paid in salaries is written here.

Source: ADB Consultant.



Photo credit: Kan Lei

Jingpo women maintenance workers



Photo credit: Kan Lei

Dai minority women's group clearing and cutting vegetation

Activity 1

Clearing Landslides

What: Remove any landslides and other obstacles from the road surface, road shoulder, or side drains, and transport the removed material to a suitable location.

Why: Clearing of landslides avoids traffic being hindered by the blockage of the road and ensures that water can flow away from the road and through the side drains so that the road is not damaged.

When: Undertake this activity whenever landslides or other obstacles are encountered—mainly during the rainy season. Small obstacles should be removed immediately. Landslides should be reported to the county communications bureau and removed upon its approval. Landslides larger than 3 cubic meters (m³) are generally removed by the county communications bureau.

Tools:



Safety Equipment:



Materials: No additional materials are needed.

Transport: If a suitable location for the removed material is not available next to the road, wheelbarrows should be used to transport the removed material farther away to an appropriate location. The removed material can sometimes be used for repairs to the road surface or road shoulder.



1. We always use safety equipment to avoid accidents.

2. We remove the landslide debris, and deposit the removed material in a safe place.

3. We also remove any rocks or other obstacles that we find on the road or in the side drains.

4. We make sure that the road, road shoulder, and side drains are totally clear.

Activity 2

Clearing Side Drains

What: Remove any earth, stones, vegetation, garbage, or other material from the side drains, and return the side drains to their proper shape. Transport any removed material to a suitable location.

Why: Clearing of side drains ensures that water can flow safely and easily through them and away from the road, so that the road is not damaged by water flowing over it.

When: The side drains must be kept clear during the entire rainy period, which means that they should be cleared just before the rainy season starts and again during the rainy season if necessary.

Tools:



Safety Equipment:



Materials: No additional materials are needed.

Transport: If a suitable location for placing the removed material is not available next to the road, wheelbarrows should be used to transport it farther away to an appropriate location. The removed material can sometimes be used for repairs to the road surface or road shoulder, but vegetation should be removed first.



1. We always use safety equipment to avoid accidents.

2. We remove all of the material from the side drains.

3. We deposit the removed material and garbage in a suitable place, making sure that the side drains are clear and that water can flow freely.

Activity 3

Clearing Culverts

What: Remove any earth, stones, vegetation, garbage, or other material from inside the culverts and from their inlets and outlets, and transport the removed material to an appropriate location.

Why: Clearing of culverts ensures that water can flow safely and easily through them under the road, instead of over the road where it may cause damage.

When: Culverts must be kept clear during the entire rainy period, which means that they should be cleared just before the rainy season starts and again during the rainy season if necessary.

Tools:



Safety Equipment:



Materials: No additional materials are needed.

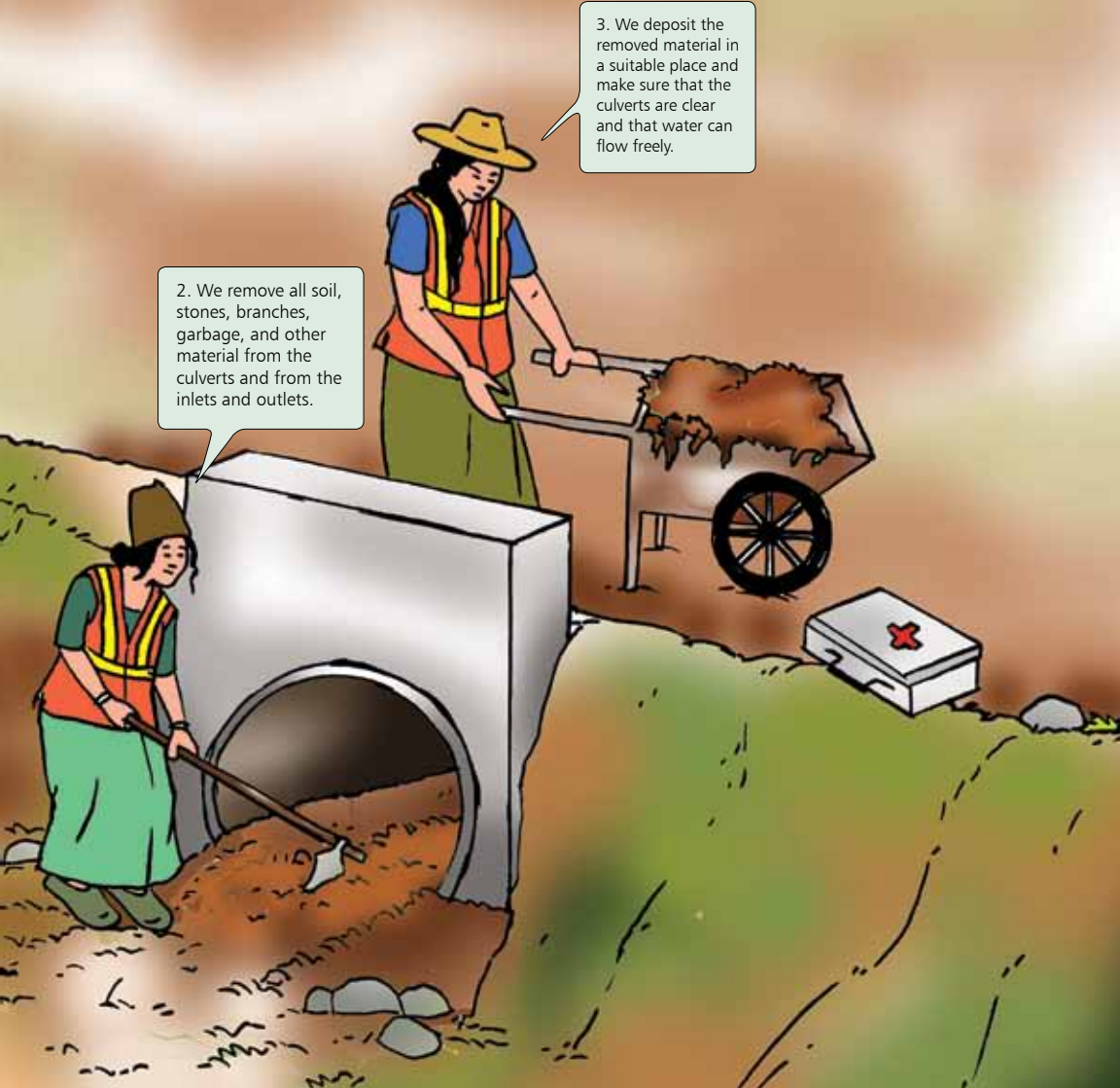
Transport: If a suitable location for placing the removed material is not available next to the road, wheelbarrows should be used to transport it farther away to an appropriate location.



1. We always use safety equipment to avoid accidents.

3. We deposit the removed material in a suitable place and make sure that the culverts are clear and that water can flow freely.

2. We remove all soil, stones, branches, garbage, and other material from the culverts and from the inlets and outlets.



Activity 4

Clearing Bridges

What: Remove any earth, rocks, branches, vegetation, garbage, or other material that is under or near the bridge, and transport the removed material to a suitable location.

Why: Clearing under and around bridges ensures that water can flow safely and easily under them, without causing damage to the pillars of the bridges or flowing over or around the bridges and causing damage to the road.

When: Bridges must be kept clear during the entire rainy period when water levels are higher, which means that they should be cleared just before the rainy season starts and again during the rainy season if necessary. Clearing during the dry period may be necessary if water levels are high or if the bridge is severely blocked.



Materials: No additional materials are needed.

Transport: If a suitable location for placing the removed material is not available next to the road, wheelbarrows should be used to transport it farther away to an appropriate location.



1. We always use safety equipment to avoid accidents.

2. We remove the soil, rocks, branches, garbage, and other material from beneath the bridge.

3. We deposit the removed material in a suitable location, making sure the area beneath the bridge is clear and that water can flow freely.

Activity 5

Clearing Vegetation

What: Remove any vegetation that hinders visibility, traffic, or flow of water away from the road and through the drainage system, or that is damaging the road elements. Transport the removed material to a suitable location.

Why: Clearing of vegetation ensures that water can flow safely away from the road and through side drains and culverts, where it does not cause damage; traffic can easily pass; accidents are avoided by providing good visibility; and road structures are not damaged by plant roots.

When: Generally, vegetation is cleared as part of the clearing of the drainage system before the rainy season, and should be repeated later in the rainy season when the vegetation has grown significantly. It may be repeated at any time during the year when considered necessary.

Tools: 

Safety Equipment: 

Materials: No additional materials are needed.

Transport: If a suitable location for placing the removed material is not available next to the road, wheelbarrows should be used to transport it farther away to an appropriate location.



1. We always use safety equipment to avoid accidents.

3. We remove the cut vegetation to a suitable location.

2. We cut all of the vegetation that hinders visibility, traffic, or runoff water, or that is damaging the road in any way.

4. We make sure traffic can pass easily and that water can flow freely off the road.



Activity 6

Repairing Unpaved Roads

What: Repair any ruts, rills, and potholes in the surface of earthen or gravel roads by filling in the deformations and compacting them, ensuring that road protection measures (such as side drains, water bars, and stone-paved crossings) are in place to avoid recurrence of the damage (*see also activities 11, 12, and 13*).

Why: Repairing unpaved roads ensures that traffic can easily pass and water can flow off the road so that further damage is avoided.

When: To repair the road surface effectively, repairs must be done during periods when it does not rain heavily. However, the soil must still be moist so that it is easier to excavate and compact (otherwise extra water needs to be added). Therefore, it is recommended to carry out this activity at or immediately after the end of the rainy season. It may be useful to carry out some urgent repairs before the rainy season to avoid water staying on the road or flowing over it and causing more serious damage.

Tools:



Safety Equipment:



Materials: For gravel roads, gravel is required to do the repairs. Earth should not be used on gravel roads, except as a base layer. For earthen roads, soil excavated from beside the road or from the side drains can be used; but vegetation must be removed first. Do not excavate soil from the slope next to the road as this will make the slope unstable and cause landslides.

Transport: The gravel is transported to the road by the county communications bureau and placed in heaps along the road. Alternatively, a suitable location near the road for obtaining the gravel is identified. For the transport of the gravel along the road, wheelbarrows can be used. For longer distances, a tractor and trailer (or truck) can be hired by the maintenance group with their transport allowance.



2. Where water flows over the road, we first create side drains or stone-paved crossings to guide the water away.

1. We always use safety equipment to avoid accidents.

3. We can use the excavated material to fix the potholes, rills, and ruts in the road, adding gravel on top if needed.

4. We make sure that we compact the material well.

5. If necessary, we add water to the material to make it easier to compact.

6. We make sure there are no more large potholes or deep ruts and rills, and that water does not remain on the road.

Activity 7

Repairing Stone Pavement

What: Replace any loose or missing stones in the stone pavement, fixing them in place with sand on all sides; fill the road shoulder to the same level as the pavement to avoid stones becoming loose again; and ensure that road protection measures such as side drains are in place to avoid recurrence of the damage (*see also activity 11*).

Why: Repairing stone pavement ensures that the stones remain fixed together and that the road base is not damaged by water, so the stone pavement remains strong and traffic can pass easily.

When: Repairs to the stone pavement and the filling of the shoulders are generally done during the dry season. Whenever loose stones are encountered; however, these should be fixed in place again as soon as possible to avoid further damage.

Tools:



Safety Equipment:



Materials: If loosened stones have been lost, additional stones are needed. Earth excavated from beside the road or from the side drains can be used for filling the shoulders, but vegetation must be removed first.

Transport: The stones are transported to the road by the county communications bureau, or a suitable local location for obtaining the stones is identified. For the transport of the stones along the road, wheelbarrows can be used. For longer distances, a tractor and trailer (or truck) can be hired by the maintenance group with their transport allowance.



1. We always use safety equipment to avoid accidents.

2. We replace any missing or loose stones, adding sand to fix them in place.

3. Where the shoulder is damaged by traffic or water, we fix it by adding material, replacing any missing or loose stones.

4. We make sure there are no more loose stones and that the road shoulder is the same height as the stone pavement.

Activity 8

Repairing the Road Shoulder

What: Repair any cuts or depressions in the road shoulder by filling and compacting them. Ensure that protection measures like side drains, retaining walls, vegetation, or stone paved crossings are in place to avoid recurrence of the damage (see also activities 11, 13, 14, and 15).

Why: Repairing the road shoulder ensures it provides sufficient support to the road so that the road is not undermined and traffic is unhindered.

When: Undertake this activity toward the end or after the rainy season. In severe cases, however, it may be necessary to carry out repairs during the rainy season, but this should preferably be done when it is not raining and the soil is not too wet.

Tools:

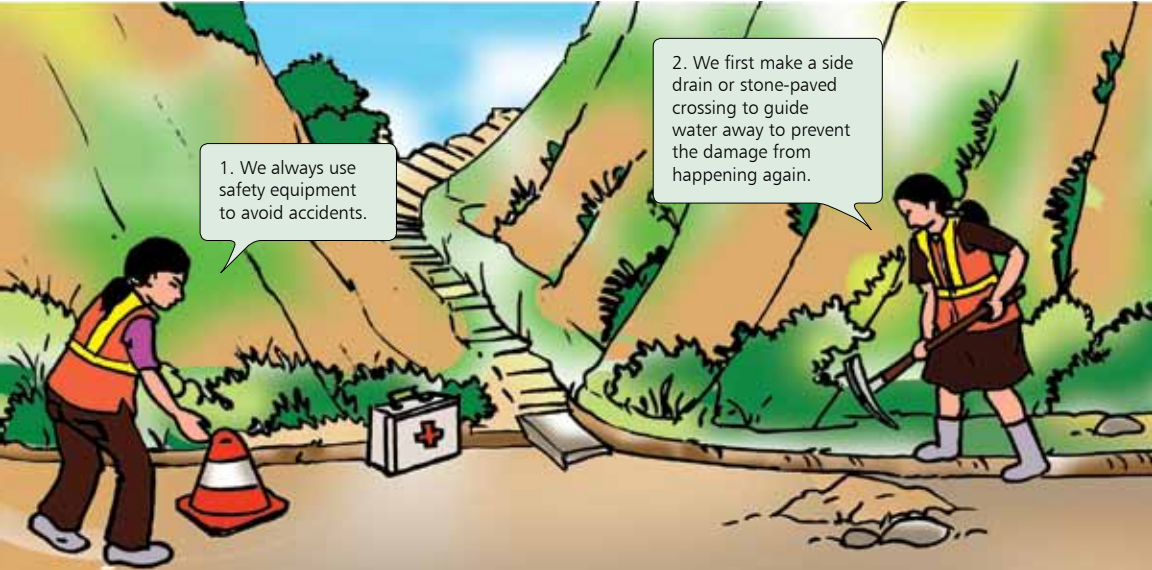


Safety Equipment:



Materials: For gravel roads, gravel is required to do the repairs. Earth should not be used on gravel roads, except as a base layer. For earthen roads, soil excavated from beside the road or from the side drains can be used, but vegetation must be removed first. Do not excavate soil from the slope next to the road as this will make the slope unstable and cause landslides. Additional stones and plants may be required for the road protection measures (see activities 14 and 15).

Transport: The gravel is transported to the road by the county communications bureau and placed in heaps along the road. Alternatively, a suitable location near the road for obtaining the gravel is identified. For the transport of gravel or earth along the road as well as for the transport of plants and stones, wheelbarrows can be used. For longer distances, a tractor and trailer (or truck) can be hired by the maintenance group with their transport allowance.



1. We always use safety equipment to avoid accidents.

2. We first make a side drain or stone-paved crossing to guide water away to prevent the damage from happening again.



3. Where the cut is very large, we build a retaining wall to protect the road.

4. For small cuts, we simply fill them and compact the material, planting vegetation to protect the slope.

Activity 9

Repairing the Drainage System

What: Repair any erosion and other damage to side drains, culverts, and bridges, ensuring road protection measures are in place to avoid recurrence of the damage.

Why: Repairing the drainage system avoids damage to the drains, which undermines the road or causes water to flow over the road surface or road shoulder.

When: Repairs to the drainage system are best carried out in the dry season as part of preparations for the rainy season.

Tools:

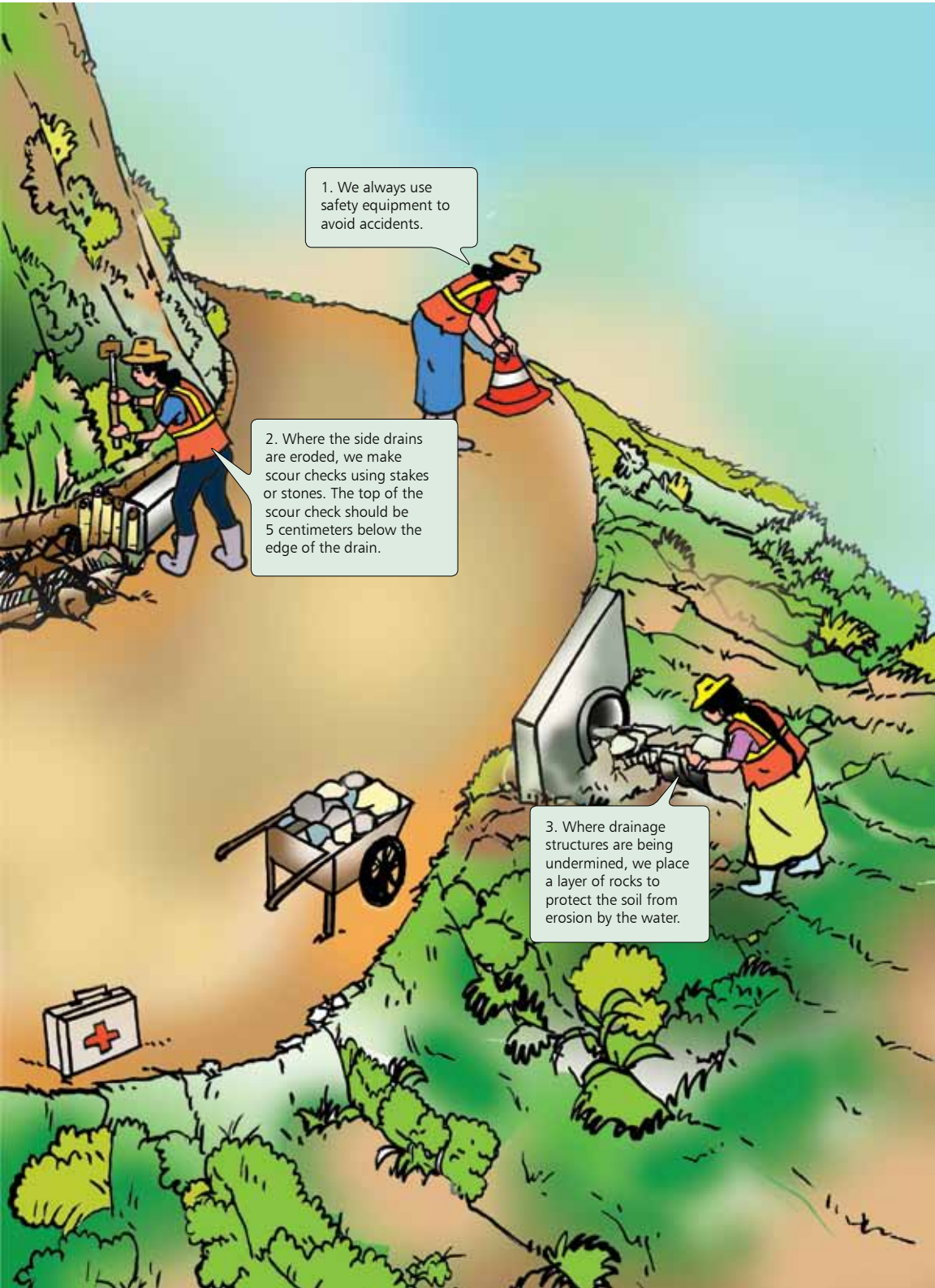


Safety Equipment:



Materials: Stones and stakes for creating scour checks and for laying a protection bed to stop the erosion of the drainage structures can generally be obtained locally.

Transport: For the transport of the stones and stakes along the road, wheelbarrows can be used. For longer distances or large quantities, a tractor and trailer (or truck) can be hired by the maintenance group with their transport allowance.



1. We always use safety equipment to avoid accidents.

2. Where the side drains are eroded, we make scour checks using stakes or stones. The top of the scour check should be 5 centimeters below the edge of the drain.

3. Where drainage structures are being undermined, we place a layer of rocks to protect the soil from erosion by the water.

Activity 10

Repairing Retaining Walls

What: Repair any loose or missing stones in retaining walls, using cement or gabion wiring to fix them in place where needed, and clear weep holes.

Why: Repairing retaining walls prevents their collapse so that they continue to protect the slopes and shoulders of the road.

When: Undertake this activity whenever damage to the retaining walls is encountered. Generally, these repairs are carried out in the dry season.

Tools:



Safety Equipment:



Materials: Stones can generally be obtained along the road. Cement and wiring is provided by the county communications bureau where required.

Transport: The transport of stones, as well as cement and wiring along the road, can be done using a wheelbarrow. For larger distances or quantities, a tractor and trailer (or truck) can be hired with the transport allowance of the maintenance group.



1. For gabion walls, we replace the missing stones.

2. And we repair the gabion cage using new wire.



1. In stone masonry walls, we replace the loosened stones, using cement if necessary.

2. And we clear the weep holes to allow the water behind the wall to flow out.

Activity 11

Creating Side Drains

What: Where water flowing along the road is causing damage to the road surface or shoulder, construct side drains to guide the water safely away from the road. Transport the excavated material to a suitable location.

Why: Creating side drains prevents water from flowing over the road and causing damage to the road surface.

When: Undertake this activity before and during the rainy season, when it becomes clear that side drains are required to avoid water flowing over the road where it will cause damage.

Tools:



Safety Equipment:



Materials: No additional materials are needed.

Transport: If a suitable location for placing the removed material is not available next to the road, wheelbarrows should be used to transport it farther away to an appropriate location. The removed material can sometimes be used for repairs to the road surface or road shoulder; this should not contain any vegetation.



1. We always use safety equipment to avoid accidents.

2. To avoid water flowing over the road, we excavate a side drain along the upper side of the road, starting from the outlet and working our way up the road.

3. We deposit the removed material in a suitable location.

Activity 12

Creating Water Bars

What: Where water is flowing through ruts and rills in the road, construct water bars diagonally at regular intervals across the road to guide the water away from the road surface as a temporary measure until road surface repairs can be carried out and side drains can be excavated.

Why: Creating water bars prevents water from flowing over the road for longer distances and causing more severe damage due to larger water volumes.

When: Undertake this activity during the rainy season, when it becomes evident that water cannot flow off the road and instead flows down the road through rills and ruts, and the ruts and rills cannot be repaired immediately.

Tools:



Safety Equipment:



Materials: No additional materials are needed.

Transport: The excavated material from the ditch is used to create a bank on the downhill side; therefore, the material does not need to be transported.



1. We always use safety equipment to avoid accidents.

2. Where water flows down the road, we create temporary water bars to guide the water off the road.

3. We excavate a diagonal ditch across the road and use the material to create a bank on the downhill side.

Activity 13

Creating Paved Crossings

What: Where water flowing across the road is causing damage to the road surface or shoulder, construct stone-paved splashes to protect the road surface from damage.

Why: Creating paved crossings prevents water flowing over the road from damaging the road surface or causing muddy areas that make it difficult for traffic to pass.

When: Undertake this activity during the rainy season when it becomes clear that water is flowing over the road (and cannot be redirected) and is causing damage to the road or creating muddy areas that are difficult to pass.

Tools:




Safety Equipment:




Materials: Stones can generally be obtained from alongside or near the road.


Transport: The transport of stones along the road can be done using a wheelbarrow. For larger distances or quantities, a tractor and trailer (or truck) can be hired with the transport allowance of the maintenance group.



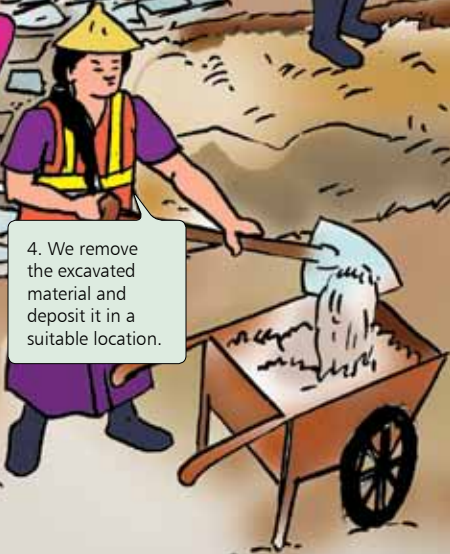
1. We always use safety equipment to avoid accidents.



2. We excavate a wide ditch in the lowest part of the road where the water crosses.



3. We pave the ditch with stones to avoid erosion and muddy areas.



4. We remove the excavated material and deposit it in a suitable location.

Activity 14

Creating Retaining Walls

What: Where the slope is very unstable or is severely eroded by water resulting in cuts or landslides, construct dry-stone retaining walls to stabilize the slope.

Why: Creating retaining walls helps prevent landslides and cuts in the slopes and road shoulder.

When: This is generally carried out in the dry season, although it may be necessary to carry it out in the rainy season in case of severe cuts or repeated landslides.

Tools:



Safety Equipment:



Materials: Stones can generally be obtained from alongside or near the road.

Transport: The transport of stones along the road can be done using a wheelbarrow. For larger distances or quantities, a tractor and trailer (or truck) can be hired with the transport allowance of the maintenance group.



1. We always use safety equipment to avoid accidents.

2. In areas prone to landslides or cuts, we build retaining walls.

3. We excavate the damaged area, leaving a flat surface.

4. We build the wall by piling rocks on top of each other, making sure that the wall leans backwards slightly.

5. We fill the area behind the wall with earth and compact it.

Activity 15

Planting Vegetation

What: Where the slope is mildly unstable or is lightly eroded by water, plant vegetation to protect the soil.

Why: Planting of vegetation avoids more serious erosion of the slopes and road shoulders, which may result in landslides and cuts in the road shoulder.

When: It is best to do this at the beginning of and during the rainy season to ensure sufficient rainfall for the vegetation to take hold, and so it can protect the slopes during the rainy season.

Tools:



Safety Equipment:



Materials: Planting material can usually be obtained from alongside the road.

Transport: The transport of planting material along the road can be done using a wheelbarrow.



1. We always use safety equipment to avoid accidents.

2. We fill the deeper rills and gullies with soil.

3. We plant vegetation to protect the slope against damage.

Performance-Based Routine Maintenance of Rural Roads by Maintenance Groups Manual for Maintenance Groups

This manual is for maintenance groups responsible for the routine maintenance of rural roads. It details the different activities to be carried out by maintenance groups to keep the road in good condition by preventing damage and carrying out minor repairs. It lists performance indicators used to evaluate the condition of the roads. It also describes the internal management of the groups, and the planning and organization of the maintenance activities.

It was written as part of a small-scale technical assistance (SSTA) pilot project linked to the Yunnan Integrated Road Network Development Project of the Asian Development Bank (ADB). The SSTA pilot project aimed to build on the experiences gained from a previous pilot project by introducing performance-based payments to reduce the resources required for supervision and inspection. This pilot project also improved the financial sustainability of the approach by reducing the investments required and promoting policy changes regarding the use of road maintenance funding. In addition, it increased the capacity of the county communications bureaus in Dehong Prefecture to implement the approach, allowing it to be replicated under the Yunnan Integrated Road Network Development Project on 650 kilometers of rural roads over a 4-year period.

This manual is complemented by a guide for communications bureaus that was developed under the same SSTA pilot project.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two-thirds of the world's poor: 1.7 billion people who live on less than \$2 a day, with 828 million struggling on less than \$1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.

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