

## MODULE 16

## RURAL ROAD MAINTENANCE COST ESTIMATE

### Objectives

After fulfilling Module 16, you will be able to:

- Understand the structure of cost estimating sheets and the steps to establish a cost estimate for rural road maintenance
- Establish cost estimate
- Self - Assessment.

### Requirement

The participants are required to have comprehended following modules:

- Module 1: "*Local Road Network*"
- Module 2: "*The Concepts of Rural Road Maintenance*"
- Module 4: "*Rural Road Defects and the Causes*"
- Module 11: "*Rural Road Maintenance Materials*"
- Module 12,13,14: "*Rural Road Maintenance Techniques*"

### Methodology

- The participants are introduced the structure of cost estimating sheets.
- The participants are introduced steps to set up a cost estimate
- The participants practise to set up a cost estimate for rural road maintenance by themselves.
- Self - Assessment

### Training Kit

- Rural Road Maintenance Handbook
- Module 16 "*Rural Road Maintenance Cost Estimate*"

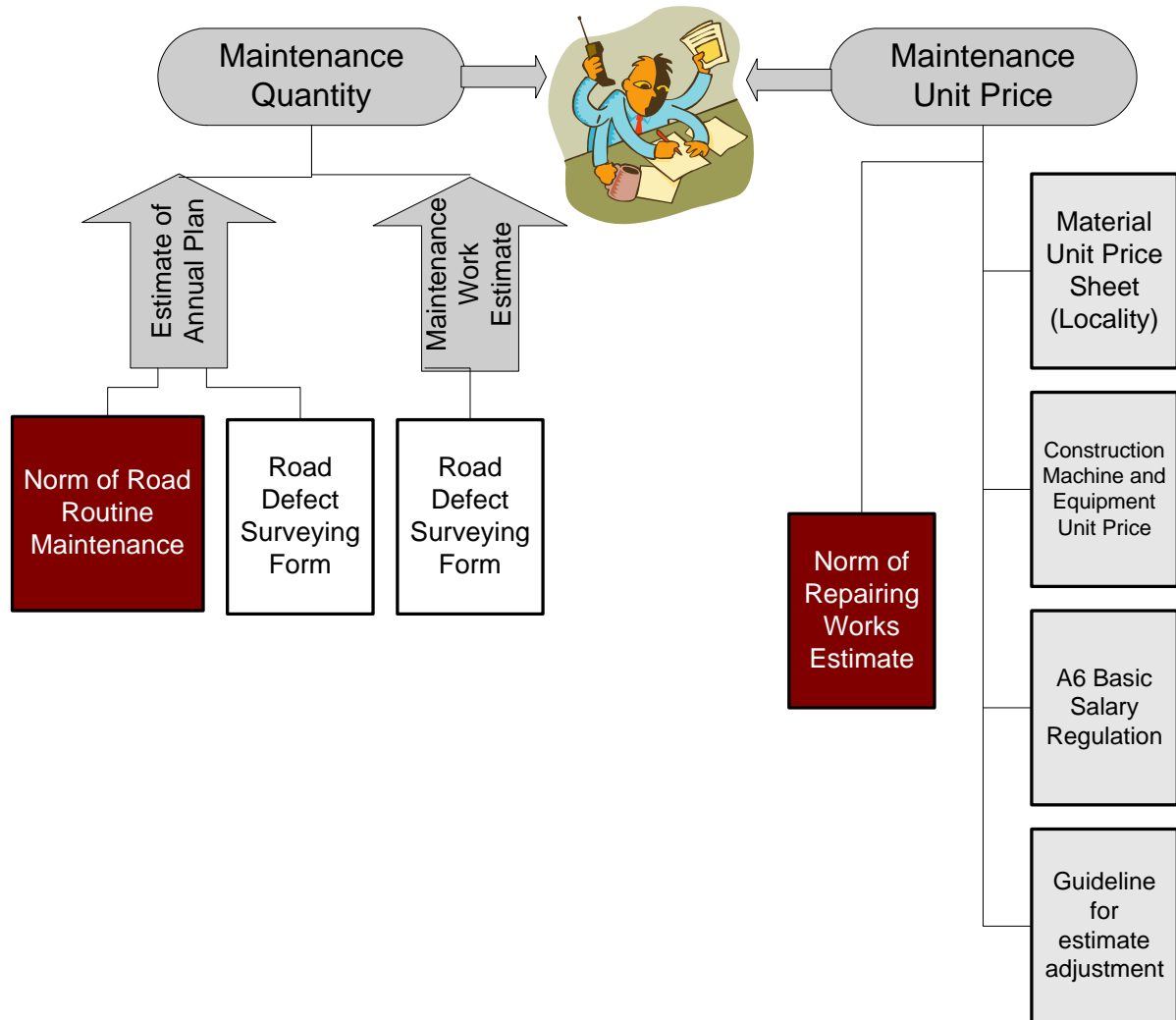
### Studying Activities

1. Familiarize with a rural road maintenance estimate - learn about the structure of cost estimate sheets of rural road maintenance and their relations.
2. Find out procedures and necessary data to generate a cost estimate of rural road maintenance
3. Make a cost estimate of road maintenance
4. Self - assessment

## 1. Familiarize with rural road maintenance estimate - learn about structure of cost estimate sheets and their relation

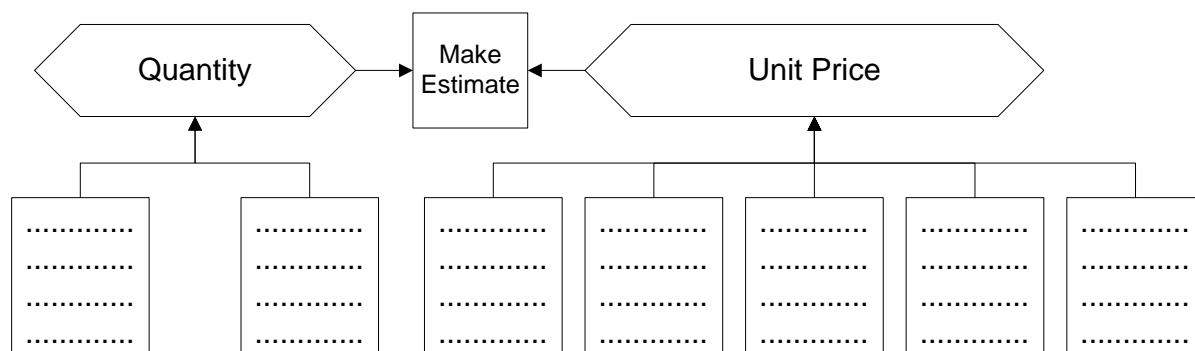


Look at the figure below to know the documents that are necessary for road maintenance estimating





Fill in the blanks of the following figure with names of documents (or regulations) used to prepare a rural road maintenance estimate in your local condition.



Look at example 1 of annual plan estimate for maintaining 1.6 km Commune bituminous road

*Table 1: (Taken from Module 15)*

**maintenance demand of 1.6 km bituminous road**

No.	Descriptions	Unit	Stipulated quantity	Road length	Maintenance demand
<b>A</b>	<b>Management works</b>				
1	Inspection, settlement of offences	Daywork			
<b>B</b>	<b>Traffic safety</b>				
2	Paint and repair guide posts and signs	Daywork	1	1.6	1.6
<b>C</b>	<b>Subgrade &amp; drainage</b>				0
3	Grass cutting	Daywork	3	1.6	4.8
4	Ditch cleaning in wet season	Daywork	2	1.6	3.2
5	Side drain clearing	m/daywork	500/16.67	1.6	800/26.67
6	Shoulder reshaping	m <sup>2</sup>	400/26.67	1.6	640/26.67
7	Drain excavating	m <sup>3</sup>	5/5	1.6	8/8
8	Embankment/ Shoulder replenishing	m <sup>3</sup>	5/2.5	1.6	8/4
9	Small landslide removal	m <sup>3</sup>	4/2	1.6	6.4/3.2
10	Clean tow section (if necessary)	Daywork	2	1.6	3.2
<b>D</b>	<b>Pavement</b>				
11	Pothole filling	m <sup>2</sup>	20	1.6	32
12	Corrugation grading	m <sup>2</sup>	60	1.6	96
13	Materials refilling	m <sup>3</sup>	2	1.6	3.2
<b>E</b>	<b>Soft spot repair</b>	m <sup>3</sup>			
14	Pavement watering	Daywork	1	1.6	1.6
15	Culvert & bridge (less than 10m span)		1	1.6	1.6

**Table 2: Unit Price Calculation Sheets of some road maintenance items**

Code	Descriptions	Unit	Quantity	Unit Price	Cost	Note	
XR.21.11 & XR.24.13	<b><u>Fill 15cm depth pothole by crushed stone and bitumen sealing</u></b>	sqm	1				
	<i>Material</i>				<b>34,844</b>		
	4x6 crushed stone	cu.m	0.138	85400	11,785		
	2 x 4 crushed stone	cu.m	0.0035	89000	312		
	1 x 2 crushed stone	cu.m	0.075	101000	7,575		
	Bitumen	kg	4.821	2450	11,811		
	Firewood	kg	3.86	600	2,316		
	Tripping or coarse sand	cu.m	0.0095	110000	1,045		
	<i>Labour</i>				<b>2,814</b>		
	Class 4/7	daywork	0.208	13529	2,814		
XR.33.41	<b><u>Crack sealing, bitumen ratio is 2.5kg/m<sup>2</sup></u></b>	sqm	1				
	<i>Materials</i>				<b>9,719</b>		
	1 x 2 crushed stone	cu.m	0.015	101000	1,515		
	0.015-1 chippings	cu.m	0.015	110000	1,650		
	Bitumen	kg	2.675	2450	6,554		
		<i>Labour</i>				<b>514</b>	
	Class 4/7	daywork	0.038	13529	514		
		<i>Construction Machine</i>				<b>1,358</b>	
	8.5 tons roller	daywork	0.003	252823	758		
	Bitumen heating tank	daywork	0.005	120000	600		
XR.45.30 & XR.24.13	<b><u>Soft spot/ Settlement Treatment</u></b>	cu.m	1				
	<i>Material</i>				<b>135,390</b>		
	0 - 4 crushed stone	cu.m	1.319	85400	112,643		
	1 x 2 crushed stone	cu.m	0.075	101000	7,575		
	Bitumen	kg	4.821	2450	11,811		
	Firewood	kg	3.86	600	2,316		
	Tripping or coarse sand	cu.m	0.0095	110000	1,045		
		<i>Labour</i>				<b>12,533</b>	
	Class 3.7/7	daywork	0.95	13193	12,533		

**\*Note:**

- The unit costs in calculation sheet above are made based on "Norm of Repairing Works Estimate "
- Materials unit price are depended on locality
- Labour unit cost conforms to A6 Basic Salary Regulation enforced conforming to Decree No. 26/CP dated 23/5/93 and adjusted conforming to the Circular Letter No. 03/2005/TT-BXD dated 4/3/2005
- Machine unit cost is conformed to 1998 Construction Machine Cost and adjusted conforming to Circular Letter No.03/2005/TT-BXD dated 4/3/2005

- *Estimate of 1.6 km bituminous road repair*

Estimation for repairing 1.6 km of road

ID	Description	Unit	Qty	Unit price			Amount		
				Material	Labor	Machinery	Material	Labor	Machinery
<b>A</b>	<b>Management works</b>								
1	Inspection, settlement of offences	daywork	3.2		10,000			32,000	
<b>B</b>	<b>Traffic safety</b>								
2	Paint and repair guide posts and signs	daywork	1.6		10,000			16,000	
<b>C</b>	<b>Sub-grade &amp; drainage</b>								
3	Grass cutting	daywork	4.8		10,000			48,000	
4	Ditch cleaning in wet season	daywork	3.2		10,000			32,000	
5	Side drain clearing	m	800		10,000			8,000,000	
6	Shoulder reshaping	sq.m	640		10,000			6,400,000	
7	Drain excavating	cu.m	8		10,000			80,000	
8	Embankment/ Shoulder replenishing	cu.m	8		10,000			80,000	
9	Small landslide removal	cu.m	6.4		10,000			64,000	
10	Clean tow section (if necessary)	daywork	3.2		10,000			32,000	
<b>D</b>	<b>Pavement</b>								
11	Pothole filling	sq.m	32	34,844	2,814		1,115,013	90,049	
12	Corrugation grading	sq.m	96	9,719	514	1,358	933,000	49,354	130,413
13	Materials refilling	cu.m	3.2	135,390	12,533		433,248	40,107	
<b>E</b>	<b>Soft spot repair</b>								
14	Pavement watering	daywork	1.6		10,000			16,000	
15	Culvert & bridge (less than 10m span)	daywork	1.6		10,000			16,000	
<b>Total</b>							<b>2,481,261</b>	<b>14,995,510</b>	<b>130,413</b>



## Sample 2: Crushed pavement estimating - the data is taken from Road Defect Surveying Form

### *Maintenance Demand Survey Form*

(Form 8a-1 that has been improved in comparison with the one in Rural Maintenance Handbook to suit to maintenance demand survey form) - Assumed surveying data

Table 8a - road defect quantity - site surveying results form								
Commune: An Son						Road : An Son - An Lac		
Road length: 2.2 km				Road Code: AS01R3.5/5D2.2		Date: 12 - 3 - 2005		
Pavement Type: Colluvial Gravel - Road/Pavement Width: 3.5m/5.0m						<b>Condition assessment</b>		<b>defects quantity</b>
Road Defects and Sphere of Influence						Value	Condition Assessment	
Location	K0 - K0+500	K0+ 500 - K1	K1 - K1+500	K1+500 2	K2 - K2+200			
Drain cleaning (m)	130	80	0	28	50	315	Bad	288 m
Drain excavation (m/m3)	20/6.4	0	0	0	15/4.8			11.2 m3
Clearing brush/grass(m2)	0	0	30	42	0	72	Bad	72 m2
<b>crushed stone pavement (cm)</b>								
Reshape & refilling (m3)	0	0	1.05	2.1	0	2.53 %	Fairly Good	3.15 m3
10 cm deep pothole (m2)	40	32	0	0	0			72 m2
12 cm deep pothole (m2)	0	0	55	65	0			120 m2
Soft spot (m2)/(m3)	3/1.9	0	0	0	0			1.9
<b>bridge, culvert and other structures</b>								

*Table 1: Road Defects and Maintenance Quantity*

No.	Items	Unit	Maintenance Quantity
<b>I</b>	<b>Road bed and Drainage</b>		
1	Brush/Grass Clearing	m2	72
2	Side Drain cleaning	m	288
3	Drain excavation	m3	11.2
<b>II</b>	<b>Pavement</b>		
4	10 cm deep pothole filling	m2	72
5	15 cm deep pothole filling	m2	120
6	Reshape and refilling surface	m3	3.15
7	Soft spot treatment	m3	1.9

Table 2: Maintenance Works unit price

Code.	Description	Unit	Quantity	Unit	Cost	Note
XR.65	<b><u>Drain cleaning</u></b>	m	1			
	<b>Labor</b>				454	
	class 3.5/7	daywork	0.035	12971	454	
BA.1733	<b><u>Side drain excavating</u></b>	m3	1			
	<b>Labor</b>				14,156	
	class 2.7/7	daywork	1.17	12099	14,156	
XR.66	<b><u>Vegetation clearing</u></b>	m2	1			
	Labor				285	
	class 3.5/7	daywork	0.022	12971	285	
XR.61.32	<b><u>Reshape, refill pavement using crushed stone</u></b>	m3	1			
	<i>Material</i>				112,728	
	Crushed stone 4x6	m3	1.32	85400	112,728	
	<i>Labor</i>				4,059	
	class 4/7	daywork	0.3	13529	4,059	
	<i>Construction Machine</i>				25,085	
	Hammer	daywork	0.5	50170	25,085	
XR.22.11	<b><u>10 cm deep pothole filling</u></b>	m2	1			
	<i>Material</i>				14,350	
	Crushed stone 4 x 6	m3	0.138	85400	11,785	
	Crushed stone 2x 4	m3	0.0035	89000	312	
	Crushed stone 1 x 2	m3	0.0035	101000	354	
	Tripping 0.015-1	m3	0.0159	110000	1,749	
	Natural gravel	m3	0.0043	35000	151	
	<i>Labor</i>				4,627	
	class 4/7	daywork	0.342	13529	4,627	
XR.22.14	<b><u>15 cm deep pothole filling</u></b>	m2	1			
	<i>Material</i>				20,662	
	Crushed stone 4 x 6	m3	0.207	85400	17,678	
	Crushed stone 2x 4	m3	0.0056	89000	498	
	Crushed stone 1 x 2	m3	0.0058	101000	586	
	Tripping 0.015-1	m3	0.0159	110000	1,749	
	Natural gravel	m3	0.0043	35000	151	
	<i>Labor</i>				5,357	
	class 4/7	daywork	0.396	13529	5,357	
XR.45.30	<b><u>Soft spot treatment</u></b>	m3	1			
	<i>Material</i>				117,391	
	Crushed stone 0 - 4cm	m3	1.319	89000	117,391	
	<i>Labor</i>				5,224	
	class 3.7/7	daywork	0.396	13193	5,224	
	<i>Construction Machine</i>				25,771	
	Water tanker, sprayer	ca	0.002	343052	686	
	Hand-held compactor	ca	0.5	50170	25,085	

**Table 3: Maintenance Estimate of 2.2 km crushed stone road - the quantity is assumed to take from surveying result.**

No	Items	Unit	Quantity	Unit Price			Cost		
				Material	Labor	Machine	Material	Labor	Machine
<b>I Road bed and Drainage</b>									
1	Brush/Grass Clearing	m2	72		454			32,687	
2	Side Drain cleaning	m	288		14,156			4,076,879	
3	Drain excavation	m3	11.2		285			3,196	
<b>II Pavement</b>									
4	10 cm deep pothole filling	m2	72	112,728	4,059	25,085	8,116,416	292,226	1,806,120
5	15 cm deep pothole filling	m2	120	14,350	4,627		1,721,964	555,230	
6	Reshape and refilling surface	m3	3.15	20,662	5,357		65,084	16,876	
7	Soft spot treatment	m3	1.9	117,391	5,224	25,771	223,043	9,926	48,965
<b>Total</b>							<b>10,126,507</b>	<b>4,987,021</b>	<b>1,855,085</b>

Direct Maintenance Cost

VL = 10,126,507 10,126,507

NC = 4,987,021 x 3.36 = 16,756,391

M = 1,855,085 x 1.4 = 2,597,119

T = VL + NC + M = 10126507+16,756,391+1855085 = 29,480,017

General Cost

C = 5.3 % x T = 29,480,017 x 5.3 % = 1,562,441

Maintenance Cost

Z = T + C = 29,480,017 + 1,562,441 = 31,042,457

Management Cost

K = 1% x Z = 31,042,457 x 1% = 310,425

Total Cost: Z + K 31,352,882

\*Note:

- The estimate above is calculated for maintenance works that is carried by Community Group or Length Person.
- If the maintenance works are carried by Contract with Professional Contractor, the total cost should be included payment of interest and VAT.
- Other maintenance works as big repair that survey & design works need be carried by professional contractors, surveying, designing and other cost should be included in the total cost conforming to State Regulations.



**Fill in following lines** with relations between data in the table above

1.....  
 .....  
 2.....  
 .....



3.....  
 .....



note

*Estimate of Annual Maintenance Plan is made with maintenance demand that conforms to Norms of Routine Maintenance. Maintenance Estimate of a road is made with maintenance demand that is defined by road defects surveying*

**2. Practice making estimate with maintenance demand defined by road defects surveying.**

*Fill maintenance quantity* in the table below using surveying data

No.	Items	Unit	Maintenance Quantity
.....	.....	.....	.....
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.....	.....	.....	.....
.....	.....	.....	.....
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.....	.....	.....	.....
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.....	.....	.....	.....

*Make unit price* of the maintenance items

Code	Description	Unit	Quantity	Unit Price	Cost	Note





1. Write names of documents that would be used to make road maintenance estimate in the following line

a. *Estimate of Annual Maintenance Plan*

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b. *Estimate of maintenance works for particular roads*

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Good	Not Good
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2. Fill steps to make road maintenance estimate in the lines below

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Good	Not good
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