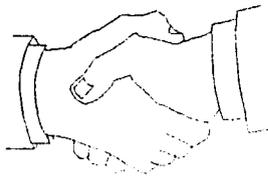


PH-18-1000

ROAD RESOURCES MANAGEMENT PROJECT
Contract No.(391-0480-C-00-2454-00)



STUDY REPORT
ON
REVISED ECONOMIC APPRAISAL

FOR

DISTRICT ROAD REHABILITATION & UPGRADATION PROGRAMME
IN SINDH

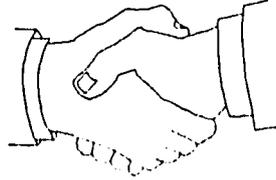
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REF. NO. ACE/RRM/3909

DATE : 10-12-1992

USAID Mission to Pakistan
Project Officer,
Karachi.

Attention: Mr. Hasan Masood, Project Officer RRM

Subject: Road Resources Management Project
Contract No. (391-0480-C-00-2454-00)

REVISED ECONOMIC APPRAISAL REPORT

Dear Mr. Masood,

We are pleased to submit two copies of the revised Economic Appraisal Report for the above referenced project.

Should you need any further clarification of contents of this report we would be pleased to assist you in this regard.

Very truly yours,

Project Manager
RRM - Project

Enclosed: As stated.

Branches : LAHORE-ISLAMABAD-IRAN-MALAYSIA-INDONESIA-SAUDI ARABIA-NIGERIA-LIBYA

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INTRODUCTION

ECONOMIC APPRAISAL MODEL
FOR
DISTRICT ROAD REHABILITATION AND UPGRADATION
PROGRAMME IN SINDH

1.0 INTRODUCTION

1.1 Background to the Project

The Road Resources Management (RRM) Project is designed to achieve a sustainable road system attained through management and financial reforms which will improve transport facilities of rural areas. An improved network will stimulate a rapid economic & social growth in the region and enhance the living standards of the rural population in Sindh Province. For this purpose, in addition to the rehabilitation of existing roads, a selected number of brick paved and Katcha roads will also be upgraded under this project, so as to provide a model to District Councils (DCs) of improved standards for future construction.

The purpose of this study is to revise the existing model developed earlier, and set forth an updated and generalized approach for the economic analysis of rehabilitation/upgradation of rural road projects, which includes:

- Updating the vehicle operating costs (VOCs) for road rehabilitation upgradation programme, and preparing a simple users friendly model for economic analysis in case of rehabilitation/upgradation of road projects, so that it could be used by the District Council Engineers.

- And standardization of the procedures for economic analysis, thus segregating the roads selected by each district for rehabilitation and or upgradation according to their economic viability and prioritizing the economically feasible roads for final rehabilitation/ upgradation programme.

1.2 Introduction to Economic Appraisal:

The construction and improvement of roads are of basic importance to national development and economic growth in developing countries.

The Road Resources Management Project is financed by the United States Agency for International Development and is implemented in the province of Sindh. The most important aspect of the RRM project involves rehabilitation of existing district paved roads, in addition to this a limited number of selected brick paved and katcha roads will also be upgraded to paved standards. The project requires that funding for each road be evaluated on the basis of economic returns which will be obtained by the proposed activity. For a road project to be feasible for rehabilitation and or upgradation it must have quantifiable benefits greater than the cost incurred for the construction of that project, or the internal rate of return of project should exceed the established discount rate of 12%, which is generally assumed in all transportation projects by governmental agencies in Pakistan like NHA, C&W and in the Planning Commission, Govt. of Pakistan.

ECONOMIC ASSESSMENT APPROACH

2.0 ECONOMIC ASSESSMENT APPROACH:

The economic analysis contains three elements viz costs, benefits and a comparison of the cost and benefit. These elements with reference to road rehabilitation or upgradation are discussed as follows.

2.1 Cost:

The costs would include the cost of initial rehabilitation or upgradation, annual maintenance cost and periodic rehabilitation cost such as resurfacing of a bituminous paved road.

2.1.1 Initial Rehabilitation/Upgradation Cost

This is the initial cost of physical construction to provide the required rehabilitation or upgradation of a road, the life of which is assumed to be 12 years under normal circumstances.

2.1.2 Routine Maintenance Cost

This is the cost incurred every year to maintain the road in an as built condition.

2.1.3 Periodic Resurfacing Cost

This cost occurs once during the life of project and it is assumed that after the end of 6th year a bituminous paved road needs to be resurfaced by providing a Double Bituminous Surface Treatment.

2.2 Benefit

Direct benefits of the improvements of a road are virtually always measured in terms of reduced costs, essentially

the reduced vehicle operating costs. There are many other indirect benefits resulting from road improvements, especially, when the upgradation from brick paved or katcha road to bituminous paved level takes place. These benefits normally occurs in the agriculture and economic sectors of the rural environment. However, it is difficult to establish generalized procedures to determine the monetary worth of these benefits. Some of these benefits include increased agricultural production, land use and values, reclaiming blighted areas and improvement in public services etc.

The following economic benefits that are resulting from the road improvements i.e. rehabilitation/upgradation have been considered for this economic appraisal:

a) For Rehabilitation case.

Reduced vehicle operating costs to traffic using the facility due to the implementation of the project.

b) For Upgradation case.

Reduced vehicle operating costs to the traffic due to the upgradation of brick paved or of katcha road and net agricultural value added due to the project.

2.2.1 Reduced Vehicle Operating Costs (VOC's):

The benefits due to the saving in the VOC's is the difference of vehicle operating costs between with and without the project during its life.

VOC is a function of various key parameters relating to the type of road surface and its physical conditions determined from road roughness, the physical

consumption of fuel, lubricating oil, spare parts, tyres, & crew cost, depreciation cost of vehicles and the cost of capital etc.

In this study Economic VOC's prepared by the National Highways Board in 1984 have been updated for the year 1992, taking into consideration the average annual escalation. The current VOC's determined as such are close to the figures given in the NTRC report on 'vehicle operating costs' published in August, 1991.

In order to calculate VOC's for various road surface conditions determined by level of roughness, use has been made of the results of Farm to Market (FMR) Road Project, Final report, by Louis Berger International Inc., published in August, 1985. In that study aggregate VOC equations were used to relate total operating costs to road roughness for various vehicle types and road categories. VOC indices for different values of roughness ranging from paved to unpaved or Katcha road were derived as related to the index of 100 for bituminous paved road surface in good condition. These indices are as follows;

TABLE 1.0
SUMMARY OF
VEHICLE OPERATING COST INDICES

ROUGHNESS VALUES (mm / km)	SURFACE TYPE AND CONDITION	VOC INDEX

BITUMINOUS PAVED ROAD		
2310	Good condition (condition - 5)	100
3300	Fair condition (condition-4)	108
5940	Bad Condition (condition-3)	131
7920	Poor condition (condition-2)	153
9900	Very poor (condition-1)	176
BRICK PAVED ROAD		
5280	Brick Paved, in good condition i.e.(condition - 4)	125
7260	In fair condition, i.e.(condition-3)	145
9240	In poor condition i.e. (condition-2)	168
11880	In a very poor con- dition i.e. (condi- tion-1)	204
KATCHA UNPAVED ROAD		
7420	Good Condition i.e.(condition-3)	152
11220	Poor condition i.e.(condition-2)	194
14520	Very poor condition i.e. (condition-1)	249

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Benefit of rehabilitation or upgrading is calculated as the difference of VOC "with out project" i.e. the existing condition and the VOC "with project" i.e. when the road is rehabilitated or upgraded to bituminous paved level. The VOC varies with the VOC Index.

Summary and detailed VOC's and benefit analysis is given in Appendix-I

2.2.2 Net Agriculture Value added (AVA)

The conventional methodology for the appraisal of road projects stresses the quantification of road user (VOC) savings. In those areas where normal traffic is not very significant and economic activity (in rural areas chiefly comprised of agriculture related activity) is low, one has to consider the mechanism through which road user savings are translated into improved output and incomes i.e. the developmental aspects of road investment.

In a rural economy, the important changes, which it is hoped the road project will bring about, are mostly at the agriculture level. It is important to enhance physical agriculture related conditions i.e. (cost, prices and quantities) which are related to agricultural production and inputs, that includes crops area breakdown, yield and production, local consumption and exportable surplus etc. These projection and estimates are very difficult to workout in a short span of time. It is also difficult to estimate net AVA benefits imputed to rural road projects. Therefore, as to simplify the whole aspect of agricultural benefits gained due to implementation of project, a generalized

approach to develop as far as possible simple "rules of thumb" for the computation of agricultural value added is adopted in the analysis.

Estimate of AVA is based on the available data and knowledge, on provincial and at district levels. The methodology adopted in the case is to work out an average net AVA per sq.Km of the road influence area (RIA), keeping in view the cropping patterns and the nature of RIA. This value is then projected from the base year, on the basis of an average agricultural growth rate for the Districts.

AV. per sq.Km derived comes out to be averagely Rs.5,000/sq.Km/year for 19 districts road projects in the FMR report for the year 1985 which was then escalated at a rate of 6.5% per annum comes to about Rs.8000/sq.Km/year. The average agricultural growth rate was worked out for the same and the value comes to about 3% per annum.

The RIA of a rural road is defined as the area served, impacted or modified by a road after an improvement in its immediate geographic environs. In quantifying the benefits (other than the conventional road user savings) for a rural road project, a critical input is an estimate of the area influenced by the road project.

The area of influence can be easily calculated from the maps. The method used is to identify from maps area upto 3 Km on either side of road, and in a radius of 3 Km from the end of road, but less than 2 Km from the main (metalled) road from which the proposed road branches, were excluded, since they are already being served by the metalled road.

There are two other methods adopted in the World Bank staff working paper No.241 titled as "The Economic Analysis of Rural Road Project, based on economic efficiency and on social services. These two methods are cumbersome to adopt as a detailed input data is required in both the cases and are generally adopted for new construction or for road extension project.

The first methodology describe above which is based on the cropping pattern and RIA has been adopted in the FMR report and is recommended for use on RRM Project in Sindh in view of its simplicity.

2.3 Comparison of Costs and Benefits:

After estimating the costs and benefits of the project, they have to be compared in a rational manner. Comparison, however requires that all elements of cost & benefit be on a common basis. This requires that all monetary units be referenced to the same year, and that the costs and benefits being compared represent essentially the same span of time i.e. the project life period. When this is done and all future costs and benefits are discounted to an equivalent present worth, they can be directly compared and a measure of profitability can be calculated for the purpose of priority determination among the proposed road projects.

Several measures are commonly used to represent the comparison of benefits and costs of a project; Any one of the two measures namely, the Net Present Value (NPV) and the benefit to cost (B/C) ratio, can be immediately determined. NPV is the difference of benefits and costs, and if the value is positive, the project is considered worthwhile. The B/C ratio

consists of the same two figures expressed as a ratio, and if the value is greater than one, the project is viable. A third index, which is often more suitable for priority ranking purposes, is the internal rate of return (IRR). The IRR is the interest rate, or discount rate, at which all future benefits exactly equal costs. This is analogous to the interest rate earned when money is deposited in a bank. If the IRR exceeds the established discount rate, i.e. the opportunity cost of capital, the project is termed as economically viable.

ECONOMIC ANALYSIS

3.0 ECONOMIC ANALYSIS

Basic data required for economic appraisal includes:

- Type of Road
- Length and Conditions of various sections of road
- Average daily Traffic

Analysis will be done of:

- Rehabilitation Cost
- Upgradation Cost
- Maintenance Cost

Steps that are being followed in the economic appraisal are given below:

3.1 Length and condition of Road

With reference to the type of the road and the length of the road to be rehabilitated the first step is to input the lengths of road according to their respective conditions as determined by the road condition survey and inventories.

3.2 Design categories for (Rehabilitation/Upgradation)

The pavement design of the road is based on the number of commercial vehicles traversing through that road. Based on that four categories have been established for the economic analysis.

Design

Category	1	0- 15	Vehicles.
"	2	15- 45	"
"	3	45-150	"
"	4	150- and above	vehicles.

3.3 Average Daily Traffic & Traffic Growth Rates

The traffic counts by vehicles classes have been averaged from ACE's, District Council's and M/s CCSC second traffic counts (STC) conducted during the current year in the month of July through September, and STC in 1989 respectively. Also comparative analysis have been made in order to determine the average annual traffic growth rate. A growth rate of 12% per annum for the project life has been adopted based on the results of the earlier study.

3.4 Cost Estimates

The cost estimates for the improvement i.e. rehabilitation and/or upgradation from brick paved or from katcha road have been worked out separately, attached as Annexure II-A, II-B and II-C with this report. The following key items are considered other than minor items;

- i. Aggregate base course and leveling course.
- ii. Double bituminous surface treatment.
- iii. Earth work for embankment and shoulders.

Also estimates of routine and periodic maintenance economic cost are prepared for each alternate. For the economic analysis purpose the financial cost of these items are converted to the economic costs and a factor of 0.65 has been assumed.

3.5 Estimated Benefits:

The economic benefits for the total life of project, accruing due to the implementation of road project is estimated and projected at a growth rate of 12% per

annum for vehicle operating cost component, and generally a growth rate of 3% for agricultural value added for different districts in case of upgradation.

3.6 Working of Economic Analysis for Rehab./Upgradation:

Samples, showing the economic analysis working for the rehabilitation case for road No. SH-22M (Shadadpur road to Soomer Faqir Hingoro, District Sanghar) included in 1992-93 programme is attached as Annexure III and working sheet are also attached. For upgradation of brick paved road to bituminous paved Road i.e. Wazirabad Begari Road to Wazirabad (District Shikarpur) is also attached with this report as ANNEXURE III . As the analysis procedure for the upgradation of brick paved and katcha roads are similar, therefore, katcha road example has not been given here.

RESULTS AND RECOMMENDATION

4.0 RESULTS

As can be inferred from the proposed Economic evaluation results in the list of proposed roads of district councils in Sindh Province for FY 1992-93 programme. There are quite a few roads that exhibit a B/C ratio of less than one and an IRR of less than 12%, these indicates that the initial decision to rehab./upgrade the road is not justified on economic basis. It is quite difficult to state whether or not other social and unquantifiable benefits are weighted enough for the proposed road construction. The road projects are listed in descending order of B/C ratios and IRR values, District wise, this would be the most efficient order of choosing the investment projects if a budgetary constrain does exist. Therefore, an alternative ranking should be adopted for constructions of road projects subject to the availability of funds.

Summary of economic evaluation results of the list of proposed roads for rehab./upgradation programme of FY 1992-93 is attached as Appendix-II.

4.1 Recommendations and Conclusions of the Study

1. Programme Monitoring and Evaluation:

It is recommended that all District Councils are directed to perform a background survey on at least one third of the road projects to be included in the RRMP programme, then perform subsequent surveys annually on these road projects, following the completion of works. This will help evaluating the impact of road improvement and monitor changes. This could be done with the help of technical assistance team who can establish guidelines for the survey and synthesize the

survey results in maintaining an up-to-date record. This in will provide all necessary information on economic gains to identify engineering requirements. This is also to record subjective change in the road influence area. Furthermore, it is desirable that the monitoring system also concentrate on documenting the following:

- i. Road condition and maintenance needs.
- ii. Population in RIA.
- iii. Cultivated area, crop patterns, yield.
- iv. Traffic mix, counts and trip purposes.

2. Preliminary Screening and Selection of Rural Roads:

In planning rural road programme governmental agencies are often faced with a large number of construction proposals, this situation is aggravated where local participation is envisaged in the planning and implementation stages. Therefore, it becomes necessary to devise a rational system of screening the proposed road projects, the use of such a screening technique would ensure the formulation of a road programme that would serve the best interest of community.

3. More Realistic Approach for estimating AVA Benefits:

In case of upgradation of proposed roads a more detailed study is required to get near to an accurate result in the quantification of agricultural benefits.

4. Need of Sufficient List of Qualified Road Projects.

All district should timely submit a list of their proposed projects for evaluation, and to make sure that there are sufficient number of road projects

included in that proposed list. This will probably avoid unnecessary delay in economic evaluation and final selection of projects.

APPENDIX-1

APPENDIX-1

For Paved Road (PR)

TABLE-1.1 (A)

VEHICLE OPERATION COST FOR BITUMINOUS PAVED ROAD
IN GOOD CONDITION

(MOTOR CYCLE)

ITEM	UNIT	UNIT PRICE UPDATED, AGU.92	PHYSICAL UNIT	TOTAL COST (Rs)
FUEL	LITER	8.15	40.60	330.89
ENGINE OIL	LITER	20.74	0.58	12.03
TYRE WEAR	TYRE	350.00	0.26	91.00
DEPRECIATION	% VEH.COST	18,000.00	0.50	90.00
INTEREST	% VEH.COST	20,160.00	0.4050	81.65
MAINTENANCE				
LABOUR	HOURS	17.00	5.00	85.00
PARTS	% VEH.COST	18,000.00	0.30	54.00
ITEM COST	KM	0.40	1,000.00	400.00
TOTAL				1,144.57
UNIT VEHICLE OPERATING COST/KM = Rs.				1.14

*Calculations are based on the average speed of 56 km/Hour.

(D-12 ECONOMIC.WK1 TAS/MS)

(PR)

TABLE-1.1 (B)

VEHICLE OPERATION COST FOR BITUMINOUS PAVED ROAD
IN GOOD CONDITION

(CAR)

ITEM	UNIT	UNIT PRICE UPDATED, AGU. 92	PHYSICAL UNIT	TOTAL COST (Rs)
FUEL	LITER	8.15	113.598	925.82
ENGINE OIL	LITER	20.74	1.44	29.87
TYRE WEAR	TYRE	876.00	0.1285	112.57
DEPRECIATION	% VEH.COST	86,888.88	0.50	434.44
INTEREST	% VEH.COST	93,495.10	0.4450	416.05
MAINTENANCE				
LABOUR	HOURS	19.98	4.99	99.70
PARTS	% VEH.COST	86,888.88	0.2764	240.16
ITEM COST	KM	0.62	1,000.00	620.00
TOTAL				2,878.61
UNIT VEHICLE OPERATING COST/KM = Rs.			2.87	=====

(D-12 ECONOMIC.WK1 TAS/MS)

(PR)

TABLE-1.1 (C)

VEHICLE OPERATION COST FOR BITUMINOUS PAVED ROAD
IN GOOD CONDITION

(MINI BUS)

ITEM	UNIT	UNIT PRICE UPDATED, AGU.92	PHYSICAL UNIT	TOTAL COST (Rs)
FUEL	LITER	4.07	156.956	638.81
ENGINE OIL	LITER	20.74	2.16	44.80
TYRE WEAR	TYRE	1,346.15	0.1514	203.81
DEPRECIATION	% VEH.COST	213,507.00	0.20	427.01
INTEREST	% VEH.COST	223,567.53	0.1204	269.18
MAINTENANCE				
LABOUR	HOURS	20.58	19.47	400.69
PARTS	% VEH.COST	213,507.00	0.2835	605.29
ITEM COST	KM	0.59	1,000.00	590.00
TOTAL				3,179.59
UNIT VEHICLE OPERATING COST/KM = Rs.				3.17

(D-12 ECONOMIC.WK1 TAS/MS)

TABLE-1.1 (D)

(PR)

VEHICLE OPERATION COST FOR BITUMINOUS PAVED ROAD
IN GOOD CONDITION

(TRUCKS AND TRACTOR/TROLLEY)

ITEM	UNIT	UNIT PRICE UPDATED, AGU.92	PHYSICAL UNIT	TOTAL COST (Rs)
FUEL	LITER	4.07	367.368	1,495.19
ENGINE OIL	LITER	20.74	5.08	105.36
TYRE WEAR	TYRE	3,100.00	0.1461	452.91
DEPRECIATION	% VEH.COST	325,400.00	0.11	357.94
INTEREST	% VEH.COST	364,550.00	0.07366	268.53
MAINTENANCE				
LABOUR	HOURS	21.27	24.09	512.39
PARTS	% VEH.COST	325,400.00	0.2745	893.22
ITEM COST	KM	0.21	1,000.00	210.00
TOTAL				4,295.54
UNIT VEHICLE OPERATING COST/KM = Rs.				4.29

(D-12 ECONOMIC.WK1 TAS/MS)

(PR)

TABLE-1.1 (E)

VEHICLE OPERATION COST FOR BITUMINOUS PAVED ROAD
IN GOOD CONDITION

(BUS)

ITEM	UNIT	UNIT PRICE UPDATED, AGU.92	PHYSICAL UNIT	TOTAL COST (Rs)
FUEL	LITER	4.07	318.300	1,295.48
ENGINE OIL	LITER	20.74	5.08	105.36
TYRE WEAR	TYRE	2,900.50	0.1459	423.18
DEPRECIATION	% VEH.COST	330,000.00	0.17	561.00
INTEREST	% VEH.COST	367,600.00	0.0994	365.39
MAINTENANCE				
LABOUR	HOURS	21.27	24.14	513.46
PARTS	% VEH.COST	330,000.00	0.2660	877.80
ITEM COST	KM	0.75	1,000.00	750.00
TOTAL				4,891.68
UNIT VEHICLE OPERATING COST/KM = Rs.			4.89	=====

(D-12 ECONOMIC.WK1 TAS/MS)

TABLE 1.2

SUMMARY OF ECONOMIC VEHICLE OPERATING COSTS
ON PAVED ROAD IN GOOD CONDITION

VEHICLE CLASSES	VOC's (Rs./KM)				
Motor Cycle	1.145				
Cars (Including pickup and wagons)	2.87				
Mini Bus	3.17				
Trucks	4.29				
Tractor/Trolley	4.29				
Buses	4.89				
VOC's in Rs. per km for Different states of road conditions.					
	Cond.5	Cond.4	Cond.3	Cond.2	Cond.1
Motor Cycle	1.14	1.23	1.49	1.74	2.00
Cars	2.87	3.10	3.76	4.39	5.05
Ford Mini Bus	3.17	3.42	4.15	4.85	5.58
Trucks/Tractors and Trolley	4.29	4.63	5.62	6.56	7.55
Bus	4.89	5.28	6.40	7.48	8.60

VOC benefits for rehabilitation of paved road on account of savings in the cost in Rs/Km for different states of road conditions is as follows:

	Cond.1	Cond.2	Cond.3
Motor Cycle	0.86	0.60	0.35
Cars	2.18	1.52	0.89
Ford Mini Buses	2.41	1.68	0.98
Trucks/Tractor/Trolley	3.26	2.27	1.33
Bus	3.71	2.59	1.51

* VOC benefits for condition 4 and condition 5 which are maintainable conditions are considered to be negligible.

** VOC Benefit for each vehicle type for different conditions is the difference of VOC for the existing condition to the VOC of paved road in good condition i.e. condition 5.

For Brick Paved Road (B.P)

TABLE 1.3

SUMMARY OF ECONOMIC VEHICLE OPERATING COSTS
FOR UPGRADATION OF BRICK PAVED ROADS

VEHICLE CLASSES	VOC's (BRICK PAVED) (IN Rs/KM)
Motor Cycle	1.43
Cars (Including pickup and wagons)	3.58
Mini Bus	3.96
Trucks & Tractor/Trolley	5.36
Buses	6.11

Following are the VOC's in Rs. per km for Different states of road conditions in case of upgradation of Brick Paved Road.

Vehicle Classes	VOC for Pavd Rd.	VOC's in Rs/Km for (B.P.)			
		Cond.4	Cond.3	Cond.2	Cond.1
Motor Cycle	1.14	1.43	1.66	1.92	2.33
Cars	2.87	3.58	4.16	4.82	5.85
Ford Mini Buses	3.17	3.96	4.59	5.32	6.46
Trucks & Tractor /Trolley	4.29	5.36	6.22	7.20	8.75
Buses	4.89	6.11	7.09	8.21	9.97

Therefore, VOC Benefits in Rs./Km for different states of condition for upgradation of Brick Paved Road are as under:

	Cond.1	Cond.2	Cond.3
Motor Cycle	1.19	0.78	0.52
Cars	2.98	1.95	1.29
Ford Mini Buses	3.29	2.15	1.42
Trucks & Tractor /Trolley	4.46	2.91	1.93
Buses	5.08	3.32	2.20

* VOC benefits for condtion 4 which is a maintainable condition is considered to be insignificant.

TABLE 1.4

SUMMARY OF ECONOMIC VEHICLE OPERATING COSTS
FOR UPGRADATION OF KATCHA ROAD

VEHICLE CLASSES	VOC's (IN Rs/KM)
Motor Cycle	1.74
Cars (Including Pickup and Wagons)	4.36
Mini Bus	4.82
Trucks & Tractor/Trolley	6.52
Buses	7.43

VOC's in Rs. per km for Different states of road conditions in case of upgradation of Katcha Road are as under:

Vehicle Classes	VOC for Pavd Rd	VOC's in Rs/Km for (K.R)		
		Cond.3	Cond.2	Cond.1
Motor Cycle	1.14	1.74	2.22	2.85
Cars	2.87	4.36	5.56	7.14
Ford Mini Buses	3.17	4.82	6.15	7.89
Trucks & Tractor /Trolley	4.29	6.52	8.32	10.68
Buses	4.89	7.43	9.48	12.17

VOC Benefits in Rs./Km for average states of condition has been adopted in the economic analysis for upgradation of Katcha Road.

VOC Benefits for
avg. of Conditions 1, 2 & 3

Motor Cycle	1.13
Cars	2.81
Ford Mini Buses	3.11
Trucks & Tractor/ Trolley	4.21
Buses	4.80

* Assuming that there are negligible No. of Katcha roads operating in condition 4 which are under the jurisdictions of District Councils.

** The above VOC's benefit values are utilized in the computation of annual benefits for upgradation of katcha road.

ANNEXURE-II

ANNEXURE-II(A)

Updated Economic Rehabilitation Costs per kilometer
(On the basis of 16 projects).

Capital Rehabilitation Costs of roads in;

Design Category	cond.1 (Rs)	cond.2 (Rs)
1	360,281	327,560
2	472,443	439,722
3	530,743	498,022

Periodic resurfacing cost of road

in Rs/km (Financial Costs) = 70,320 (Avg. cost of DBST) +
29,529 (Cost of tack coat) =
Rs.99,849 Say Rs. 100,000/=

For economic cost of a factor of 0.65 is assumed.
Economic Cost of Resurfacing = Rs.100,000 x 0.65
= Rs. 65,000/=

Economic Routine Maintenance Cost of road (Maintenable
Condition)

in condition 5 = Rs. 598/- km
in condition 4 = Rs. 5,390/- km
in condition 3 = Rs.28,747/- km

ANNEXURE-II(B)

Updated Economic Upgradation Cost per Kilometer Brick Paved

Financial Costs

ITEM	QUANTITY	RATE	UNIT	AMOUNT
1. Earthwork for (Embankment & Shoulders)	32,000 CFT @ Rs. 2279/- P. %		CFT	72,928
2. Sub-Base (4" Thick)	12,993 CFT @ Rs. 1717/- P. %		CFT	223,090
3. Base Cours (6" Thick)	19,686 CFT @ Rs. 1717/- P. %		CFT	338,009
4. 1st. Coat (DBST)	39,372 SFT @ Rs. 272/- P. %		SFT	338,009
5. 2nd. Coat (DBST)	39,372 SFT @ Rs. 183/- P. %		SFT	72,051
				Rs. 813,170
- For condition (2 & 3) cost/km Add 5%				Rs. 853,829
- For condition (1) 3" extra stone in 50%				
	$\frac{3280}{2} \times 12 \times 0.25 = 4920$ CFT @ 1717 per % CFT.			Rs. 84,476
				Rs. 938,305
Economic cost/km for condition 2 & 3				<u>Rs. 554,988</u>
Economic cost/km for condition 1				<u>Rs. 609,898</u>

* For brick paved roads we assume that condition 4 and 5 does not exist.

** A factor of 0.65 is used for the conversion of financial cost to economic cost.

ANNEXURE-11(C)

Updated Average Economic Upgradation Cost per Kilometer of Condition 1 and 2 for Katcha Road.

ITEM	QUANTITY	RATE	UNIT	AMOUNT
1. Earthfill for Rd side	69,395 CFT @ Rs. 1130/-	P. %	CFT	78,416
1a. Selected Barrow Earth	69,032 CFT @ Rs. 2279/-	P. %	CFT	157,324
2. Selected Fill Material	45,934 CFT @ Rs. 520/-	P. %	CFT	238,857
3. Sub-Base (4" Thick)	12,993 CFT @ Rs. 1717/-	P. %	CFT	223,090
4. Base Cours (6" Thick)	19,686 CFT @ Rs. 1717/-	P. %	CFT	338,009
5. D.B.S.T. (1st Coat)	39,372 SFT @ Rs. 272/-	P. %	SFT	107,092
6. D.B.S.T. (2nd Coat)	39,372 SFT @ Rs. 183/-	P. %	SFT	72,051
Average Financial Cost/Km for cond.1&2.			TOTAL	Rs. 1,214,839
Average Economic Cost/Km for condition 1 & 2.			Rs.	789,645

* For Katcha road only condition 1 and 2 are considered in the existing roads.

** A factor of 0.65 for the conversion of Financial cost to economic cost is assumed.

ANNEXURE-III

ANNEXURE-III

Basic Data Sheet for Rehabilitation Example 1

DISTRICT SANGHAR

Example-1

Road No. SH-22M (Shadadpur road to village Soomer Faqir Hingoro - District Sanghar) - Paved.

Data for Economic Analysis

Total Length of Road to be rehabilitated is 9.00 km, with condition as follows:

Length of Road in Condition 1 =	0.45 km
Length of Road in Condition 2 =	3.60 km
Length of Road in Condition 3 =	4.95 km

TOTAL:	9.00 Km

Design Category : 3

Vehicle Type	Avg. Daily Traffic (ADT)	(14 hours count b/w 6.00 am to 8.00 pm)
M/Cycles	147	
Cars	88	
Mini Buses	-	
Trucks	52)	Total number of commercial vehicles = 116
Tractors/Trolley	64)	
Buses	8	
Other (LCV)*	51	

TOTAL:	410	

* LCV: Light commercial vehicle which includes Datsun, Mazda and Suzuki Pickups and Jeeps.

Referring to Table 1.2 , VOC benefits in Rs./Km for 3 different states of rehabilitation condition are as follows:

	Cond.1	Cond.2	Cond.3
Motor Cycle	0.86	0.60	0.35
Cars	2.18	1.52	0.89
Ford Mini Buses	2.41	1.68	0.98
Trucks & Tractor/ Trolley	3.26	2.27	1.33
Buses	3.71	2.59	1.51

VOC BENEFITS FROM VEHICLES OPERATING IN CONDITION 1

VEHICLES CATEGORIES	DAILY TRAFFIC		VOC FACTOR	VOC BENEFIT PER KM/DAY
Motor Cycle	147	x	0.86	= 126.42
Cars	88	x	2.18	= 191.84
Buses	8	x	3.71	= 29.68
Trucks & Tractor/ Trolley	(64+52) = 116	x	3.26	= 378.16
Others (LCV)	51	x	2.18 *	= 111.18
Total VOC benefits for condition 1.				= Rs. 837.28 per km/day

VOC BENEFITS FROM VEHICLES OPERATING IN CONDITION 2

VEHICLES CATEGORIES	DAILY TRAFFIC		VOC FACTOR	VOC BENEFIT PER KM/DAY
Motor Cycle	147	x	0.60	= 88.20
Cars	88	x	1.52	= 133.76
Buses	8	x	2.59	= 20.72
Trucks & Tractor/ Trolley	(64+52) = 116	x	2.27	= 263.32
Others (LCV)	51	x	1.52 *	= 77.52
Total VOC benefits for condition 2.				= Rs. 583.52 per km/day

VOC BENEFITS FROM VEHICLES OPERATING IN CONDITION 3

VEHICLES CATEGORIES	DAILY TRAFFIC		VOC FACTOR	VOC BENEFIT PER KM/DAY
Motor Cycle	147	x	0.35	= 51.45
Cars	88	x	0.89	= 78.32
Buses	8	x	1.51	= 12.08
Trucks & Tractor/ Trolley	(64+52) = 116	x	1.33	= 154.28
Others (LCV)	51	x	0.89 *	= 45.39
Total VOC benefits for condition 3.				= Rs. 341.52 per km/day

* Assuming that the VOC benefits of LCV's are equivalent to that of VOC benefits obtained from Cars.

VOC benefit in Rs. per km per day for condition 1 = Rs.837.28
 VOC benefit in Rs. per km per day for condition 2 = Rs.583.52
 VOC benefit in Rs. per km per day for condition 3 = Rs.341.52

VOC benefit per year for condition 1 = $837.28 \times 0.45 \times 365 = 137,523/\text{YR}$
 VOC benefit per year for condition 2 = $583.52 \times 3.60 \times 365 = 766,745/\text{YR}$
 VOC benefit per year for condition 3 = $341.52 \times 4.95 \times 365 = 617,042/\text{YR}$

Total Annual VOC benefits Rs. = 1,521,310

Rehabilitation Cost for Condition-1 (Category 3) = $530,744 \times 0.45 = 238,834.8$ **
 Rehabilitation Cost for Condition-2 (Category 3) = $498,022 \times 3.6 = 1,792,879.2$ **
 Total Rehab.Cost Rs. 2,031,714.0

Maintenance Cost for Condition-3 = $28,747 \times 4.95 = \text{Rs.}142,297.65$

Periodic resurfacing cost at the end of 6th year. = $65,000 \times 9 = \text{Rs.}585,000.00$

Routene maintenance cost
 @ year 1st. = 0
 @ year 2nd. = $598 \times 9 = \text{Rs.} 5382/\text{Yr.}$
 @ year 3rd. = $598 \times 9 = \text{Rs.} 5382/\text{Yr.}$
 @ yera 4th. = $5390 \times 9 = \text{Rs.} 48510/\text{Yr.}$
 @ year 5th. = $5390 \times 9 = \text{Rs.} 48510/\text{Yr.}$
 @ year 6th. = $28747 \times 9 = \text{Rs.}258723/\text{Yr.}$

** For economic rehabilitation cost per km refer to Annexure-II-A.

Notes:

- Traffic growth rate compounded @ 12% per annum.
- Traffic growth during the 1st. year is taken as half of the rest years traffic.
- Assuming that the new road will oprate @ condition-5 during the 2nd and 3rd years after construction and in 8th and 9th years after resurfacing.
- Assuming that condition 4 prevails during 4th and 5th years and during 10th and 11th years of rehabilitation. At 6th and 12th year the road is assumed to be in condition-3.

(D-12 EC-APRSL P-31 TAS/MS)

ECONOMIC ANALYSIS FOR THE REHABILITATION OF PAVED ROAD
OF FISCAL YEAR 1992-93 PROGRAMME.

EXAMPLE-I

09-Dec-92

TOTAL LENGTH 9.00 KM
CONDITION 3 4.95 REHAB. LENGTH 9.00 KM
CONDITION 2 3.60 MAINT. LENGTH 4.95 KM
CONDITION 1 0.45 DESIGN CAT.3

ROAD NO. : SA-SH-22M (DISTRICT SANGHAR)
ASSUMING TRAFFIC GROWTH RATE AS 12% .ROAD NAME: SHADADPUR ROAD TO SOOMER FAQIR HINGORO

YEARS	COST			PRESENT WORTH @ 12%			BENEFITS	
	REHAB. & PERIODIC COST	MANTANINCE COST	TOTAL 2+3	REHAB. & PERIODIC COST	MANTANINCE COST	TOTAL 8+9	V.O.C BENEFITS @12%	P.W OF VOC @ 12%
	1	2	3	4	5	6	7	8
1	2,031,714	142,298	2,174,012	1,814,030	127,051	1,941,082	760,655	679,157
2		5,382	5,382		4,290	4,290	1,521,311	1,212,780
3		5,382	5,382		3,831	3,831	1,703,868	1,212,780
4		48,510	48,510		30,829	30,829	1,908,332	1,212,780
5		48,510	48,510		27,526	27,526	2,137,332	1,212,780
6		48,510	48,510		24,577	24,577	2,393,812	1,212,780
7	585,000	0	585,000	264,624	0	264,624	2,681,069	1,212,780
8		5,382	5,382		2,174	2,174	3,002,798	1,212,780
9		5,382	5,382		1,941	1,941	3,363,133	1,212,780
10		48,510	48,510		15,619	15,619	3,766,709	1,212,780
11		48,510	48,510		13,945	13,945	4,218,715	1,212,780
12		48,510	48,510		12,451	12,451	4,724,960	1,212,780
	2,616,714	454,886	3,071,600	2,078,655	264,235	2,342,889	32,182,696	14,019,733

RESULTS OF ECONOMIC ANALYSIS

DESCRIPTION	@ DISCOUNT
	12%
a. Total Nominal Benefits	32,182,696
b. Present value of V.O.C Benefits	14,019,733
c. Present value of rehab., periodic & routine maintenance contn.	2,342,889
d. Net Economic return (b-c)	11,676,843
e. Economic Internal Rate of Return (%)	118.30
f. Benefit/Cost Ratio (b/c)	5.98

(D-13 SA-SH-22M.WK1 TA/MS)

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ANNEXURE-111

Basic Data Sheet for Upgradation Example 2

DISTRICT SHIKARPUR

Example-2

Road Name: (Begari Road To Wazirabad
District Shikarpur) Brick Paved

Data for Economic Analysis

Total Length of Road to be upgraded is 0.33 km, with condition as follows:

Length of Road in Condition 1 = 0.33 km

Design Category : 2

Vehicle Type	Avg. Daily Traffic (ADT)	(14 hours count b/w 6.00 am to 8.00 pm)
M/Cycles	35	
Cars	00	
Mini Buses	00	
Trucks	02}	Total number of commercial vehicles = 22
Tractors/Trolley	20}	
Buses	5	
Other (LCV)*	22	

TOTAL:	84	

* LCV: Light commercial vehicle which includes Datsun, Mazda and Suzuki Pickups and Jeeps.

Referring to table 1.3 , VOC benefits in Rs./Km for 3 different states of upgradation of brick paved are as follows:

	Cond.1	Cond.2	Cond.3
Motor Cycle	1.19	0.78	0.52
Cars	2.98	1.95	1.29
Ford Mini Buses	3.29	2.15	1.42
Trucks & Tractor/ Trolley	4.46	2.91	1.93
Buses	5.03	3.32	2.20

VOC BENEFITS FROM VEHICLES OPERATING IN CONDITION 1

VEHICLES CATAGORIES	DAILY TRAFFIC		VOC FACTOR	VOC BENEFIT PER KM/DAY
Motor Cycle	35	x	1.19	= 41.65
Cars	00	x	2.98	= 00.00
Buses	5	x	5.08	= 25.40
Trucks & Tractor/ (02+20) Trolley	= 22	x	4.46	= 98.12
Others (LCV)	22	x	2.98 *	= 65.56
Total VOC benefits for condition 1.				= Rs. 230.73 per km/day

VOC BENEFITS FROM VEHICLES OPERATING IN CONDITION 2

VEHICLES CATEGORIES	DAILY TRAFFIC		VOC FACTOR	VOC BENEFIT PER KM/DAY
Motor Cycle	35	x	0.78	= 27.30
Cars	00	x	1.95	= 00.00
Buses	5	x	3.32	= 16.60
Trucks & Tractor/ (02+20) Trolley	= 22	x	2.91	= 64.02
Others (LCV)	22	x	1.95 *	= 42.90
Total VOC benefits for condition 2.				= Rs. 000.00 per km/day

VOC BENEFITS FROM VEHICLES OPERATING IN CONDITION 3

VEHICLES CATAGORIES	DAILY TRAFFIC		VOC FACTOR	VOC BENEFIT PER KM/DAY
Motor Cycle	35	x	0.51	= 17.85
Cars	00	x	1.29	= 00.00
Buses	5	x	2.20	= 11.00
Trucks & Tractor/ (02+20)				
Trolley	= 22	x	1.93	= 42.46
Others (LCV)	22	x	1.29 *	= 28.38
Total VOC benefits for condition 3.				= Rs. 000.00 per km/day

* Assuming that the VOC benefits of LCV's are equivalent to that of VOC benefits obtained from Cars.

VOC benefit in Rs. per km per day for condtion 1 = Rs.230.73
 VOC benefit in Rs. per km per day for condtion 2 = Rs.000.00
 VOC benefit in Rs. per km per day for condtion 3 = Rs.000.00

VOC benefit per year for condition 1 = $230.73 \times 0.33 \times 365 = 27,791.42/\text{YR}$

Total Annual VOC benefits Rs.= 27,791.42

Upgradation Cost for Condition-1
 (Category 2) ** = $609,898 \times 0.33 = \text{Rs. } 201,266.34$

Periodic resurfacing cost at the
 end of 6th year. = $65,000 \times 0.33 = \text{Rs. } 21,450.00$

Routene maintenancè cost

¢ year 1st.	=	0
¢ year 2nd.	=	$598 \times 0.33 = \text{Rs. } 197/\text{Yr.}$
¢ year 3rd.	=	$598 \times 0.33 = \text{Rs. } 197/\text{Yr.}$
¢ year 4th.	=	$5390 \times 0.33 = \text{Rs. } 1779/\text{Yr.}$
¢ year 5th.	=	$5390 \times 0.33 = \text{Rs. } 1779/\text{Yr.}$
¢ year 6th.	=	$28747 \times 0.33 = \text{Rs. } 9487/\text{Yr.}$

AVA Benefits:

Road Influence Area (RIA) = 0.66 sq.km.
 Agriculture Value Added (AVA) = Rs.8000/sq.km./yr.
 (Refer to Page No.8 of the Report).
 AVA Benefits = $0.66 \times 8000 = \text{Rs. } 5280/\text{yr.}$

(D-12 EC-APRSL P-34 TAS/MS)

** For economic upgradation cost per km refer to Annexure-11-B.

Notes:

- Traffic growth rate compounded @ 12% per annum.
- Traffic growth during the 1st. year is taken as half of the rest years traffic.
- Agriculture growth rate is assumed as 3% per annum.
- Assuming that the new road will operate @ condition-5 during the 2nd and 3rd years after upgradation and in 8th and 9th years after resurfacing.
- Assuming that condition 4 prevails during 4th and 5th years and during 10th and 11th years of upgradation. At 6th and 12th year the road is assumed to be in condition-3.

ECONOMIC ANALYSIS FOR THE UPGRADATION OF BRICK TO BITUMINOUS PAVED ROAD
FOR THE FISCAL YEAR 1992-93 PROGRAMME.

EXAMPLE - II

09-Dec-92

TOTAL: LENGTH 0.33 KM
UPGRADE LENGTH 0.33 KM
CONDITION 1 0.33 KM
CONDITION 2 0.00 KM
CONDITION 3 0.00 KM

ROAD NO. : SH-BEGAR (DISTRICT SHIKARPUR)
ROAD NAME: BEGARI ROAD TO WAZIRABAD

YEARS	PROJECT COSTS			P.W OF ALL COSTS			BENEFITS			
	UPGRADE & PERIODIC COST	MANTANINCE COST	TOTAL 2+3	UPGRADE & PERIODIC COST	MANTANINCE COST	TOTAL 5+6	V.O.C BENEFITS	AVA BENEFITS	PRESENT WORTH OF AVA	PRESENT WORTH OF VOCs
1	2	3	4	5	6	7	8	9	10	11
1	201,266	0	201,266	179,702	0	179,702	13,896	2,640	2,357	12,407
2		197	197		157	157	27,791	5,280	4,209	22,155
3		197	197		140	140	31,126	5,438	3,871	22,155
4		1,779	1,779		1,130	1,130	34,862	5,602	3,560	22,155
5		1,779	1,779		1,009	1,009	39,045	5,770	3,274	22,155
6		1,779	1,779		901	901	43,730	5,943	3,011	22,155
7	21,450	0	21,450	9,703	0	9,703	48,978	6,121	2,769	22,155
8		197	197		80	80	54,855	6,305	2,546	22,155
9		197	197		71	71	61,438	6,494	2,342	22,155
10		1,779	1,779		573	573	68,811	6,689	2,154	22,155
11		1,779	1,779		511	511	77,068	6,889	1,980	22,155
12		1,779	1,779		457	457	86,316	7,096	1,821	22,155
	222,716	11,462	234,178	189,405	5,030	194,435	587,916	70,265	33,894	256,114

RESULTS OF ECONOMIC ANALYSIS

Discount rate 12%
Traffic Growth rate 12%
Agric. growth rate 3%

DESCRIPTION	DISCOUNT
	12%
a. Total Nominal Benefits	587,916
b. Present value of V.O.C Benefits	290,008
c. Present value of rehab., periodic & routine maintenance cost	194,435
d. Net Economic return (b-c)	95,573
e. Economic Internal Rate of Return (%)	21.75
f. Benefit/Cost Ratio (b/c)	1.49

APPENDIX-II

Following is the status of proposed roads for each districts and recommendations for selecting new qualified road projects for the fiscal year 1992-93 rehabilitation/upgradation programme.

(D-12 EC-APRSAL.P-17 TAS/MS)

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ROAD RESOURCES MANAGEMENT PROJECT (RRMP)

APPENDIX-II

DISTRICT ROAD REHABILITATION AND UPGRADATION PROGRAM
FY 1992-93

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SUMMARY OF ECONOMIC ANALYSIS RESULTS AND PROPOSED RANKING SCHEDULE

SR. NO.	R O A D S	PROPOSED LENGTH	ACTUAL LENGTH	ELIGIBLE	ECONOMIC	BENEFIT	IRR VALUE IN	CONSULTANT'S	R E M A R K S
		GIVEN BY DCs IN (KM)	SURVEYED BY ACE	LENGTH FOR REHAB./UPG	EVALUATION RESULT	COST RATIO	PERCENTAGE (%)	PRIORITY RANKING	
A	DISTRICT BADIN:								
1	BA-M5 HAJI SAWAN BUS STOP TO SAMJI KABAR VILLAGE. (PHASE-III)	14.00	10.65	10.65	FEASIBLE	1.55	23.73	1	3.35 km has been reha- bilitated under RRMP
B	DISTRICT DADU:								
1	DK-KI-07 INDUS HIGHWAY TO AMRI	3.00	0.60	0.60	N.A.	-	-	-	Road Taken up by Highway Dept.
2	DK-KI-06 INDUS HIGHWAY TO GARWARI	3.00	7.30	7.25	FEASIBLE	1.74	25.96	4	5.80 km is katcha road & 1.5 km is bit. paved
3	DA-KA-04 DADU TO WADHIO PANHWAR VIA PIRGUNI	4.00	4.00	3.45	FEASIBLE	3.40	65.08	1	
4	DA-KI-02 INDUS HIGHWAY TO MANJHAND	1.60	1.10	0.80	FEASIBLE	2.20	41.15	2	
5	DA-DA-06 METALLED ROAD VILLAGE RUSTAMANI TO GOLIMAR	3.20	2.00	2.00	FEASIBLE	1.18	17.63	5	
6	DA-DA-03 DADU TO DARRO ROAD	4.80	4.60	2.60	FEASIBLE	1.99	38.76	3	
7	DA-KI-04 INDUS HIGHWAY TO LAKHA	1.60	0.85	0.85	FEASIBLE	1.12	15.71	6	
8	DA-SS-02 METALLED ROAD JHANGARA TO NAING SHARIEF	4.80	-	-	UNDERWAY	-	-	-	Road is currently under flood, survey is not possible
9	DA-MR-02 MEHAR TO GHARRI VILLAGE	4.80	4.40	4.40	FEASIBLE	1.01	12.25	7	
	TOTAL:	30.80	24.85	21.95					

SR. NO.	R O A D S	PROPOSED LENGTH GIVEN BY DCs IN (KM)	ACTUAL LENGTH SURVEYED BY ACE	ELIGIBLE LENGTH FOR REHAB./UPG	ECONOMIC EVALUATION RESULT	BENEFIT COST RATIO	IRR VALUE IN PERCENTAGE (%)	CONSULTANT'S PRIORITY RANKING	R E M A R K S
C	DISTRICT HYDERABAD:								
1	HY-HL-30 DEPAR TO TAYAE DAHRI VIA ZAIR PIR	2.00	2.00	2.00	FEASIBLE	1.10	14.78	7	
2	HY-HY-21 LINED CHANNEL TO VILLAGE NOOR KHAN CHANG	2.10	2.00	1.55	FEASIBLE	6.02	144.24	1	
3	HY-HL-15 WAHAB SHAH STATION TO FAQIR HINGORO	3.00	3.00	1.10	FEASIBLE	1.26	18.66	4	
4	HY-HL-8 SAEEDABAD BAKHAR JAMALI ROAD TO AGRO RAHU	3.20	1.90	1.90	INFEASIBLE	0.52	(1.78)	-	
5	HY-HL-22 NATIONAL HIGHWAY TO FAQIR NOOHATHIANI	1.80	1.80	1.80	FEASIBLE	1.21	16.50	5	
6	HY-HY-14 HYDERABAD HALA N.H.WAY TO DARYA BAIG MUGHAL	2.50	2.50	2.50	FEASIBLE	3.21	53.07	2	
7	HY-TA-1 KAMARO RAILWAY STATION TO KAMARO SHARIF	1.60	5.00	0.00	N.A.	-	-	-	Not eligible for rehab. generally in cond.4
8	HY-TA-12 KHESANA MORI TO VILLAGE NASARPUR TAJPUR	8.59	8.50	8.50	FEASIBLE	1.56	23.17	3	
9	HY-HY-15 LINED CHANNEL TO ARAB SHORO	2.50	2.55	2.55	FEASIBLE	1.13	15.02	6	
	TOTAL:	27.29	29.25	20.00					

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SR. NO.	R O A D S	PROPOSED LENGTH GIVEN BY DCs IN (KM)	ACTUAL LENGTH SURVEYED BY ACE	ELIGIBLE LENGTH FOR REHAB./UPG	ECONOMIC EVALUATION RESULT	BENEFIT COST RATIO	IRR VALUE IN PERCENTAGE (%)	CONSULTANT'S PRIORITY RANKING	R E M A R K S
D	DISTRICT JACOBABAD:								
1	JA-KM-02 VILLAGE BADANI TO GANDHER (TALUKA KASHMORE)	1.40	1.45	1.45	FEASIBLE	1.48	21.89	1	District are advised to identify more roads.
2	JA-TL-04 THUL JACOBABAD ROAD TO VILLAGE SIKANDERABAD (KATCHA ROAD)	1.00	1.00	1.00	INFEASIBLE	0.60	2.28	-	
3	- BRICK PAVED ROAD FROM JCD. G.KHAIRO ROAD TO VILLAGE HAJI FAKHURDDIN KHAN KHOSO TALUKA JACOBABAD.	0.60	0.60	0.60	INFEASIBLE	0.37	(6.39)	-	
4	JA-GH-01 MOHAMMADPUR TO LARKANA ROAD AT GHULAM SHAH	5.10	5.10	4.50	INFEASIBLE	0.81	2.66	-	
	TOTAL:	8.10	8.15	1.45					Brick paved surface proposed by Consultant (Road recently proposed by DC Jacobabad.
E	DISTRICT KARACHI:								
1	KA-WT-02 DUMLOTTEE TO MEMON GOTH	1.50	1.50	1.50	FEASIBLE	3.33	55.60	3	
2	KA-ET-29 ICE FACTORY TO PUMP STATION TO BALOCH GOTH (IBRAHIM HYDERI)	1.75	2.00	1.75	FEASIBLE	4.53	78.14	1	
3	KA-ET-40 MEMON GOTH TO JAM GOTH VIA MULLAH ESSA GOTH	0.70	0.70	0.70	FEASIBLE	2.28	36.28	5	
4	KA-WT-08 MANGHOPIR TO BALOCH GOTH	1.15	1.15	1.15	FEASIBLE	2.99	50.18	4	
5	- JAMKHANDO TO PEER SARHANDI	1.50	1.50	1.50	FEASIBLE	3.69	60.79	2	
	TOTAL:	6.60	6.85	6.60					

Sr. No.	R O A D S	PROPOSED LENGTH GIVEN BY DCs IN (KM)	ACTUAL LENGTH SURVEYED BY ACE	ELIGIBLE LENGTH FOR REHAB./UPG	ECONOMIC EVALUATION RESULT	BENEFIT COST RATIO	IRR VALUE IN PERCENTAGE (%)	CONSULTANT'S PRIORITY RANKING	R E M A R K S
F	DISTRICT KHAIRPUR:								
	TALUKA KHAIRPUR								
1	KH-KH-02 NATIONAL HIGHWAY TO WARIJO GOTH	0.70	1.50	1.40	FEASIBLE	2.86	48.87	1	
2	- NATIONAL HIGHWAY TO MISRI KHAN VILLAGE	0.30	0.25	0.25	FEASIBLE	1.88	28.86	2	
	TALUKA KOTDIJI								
3	KH-KD-02 NATIONAL HIGHWAY TO MUHBAT SHAKH	0.30	-	-	-	-	-	-	Not yet identified by District Council
4	KE-KD-05 NATIONAL HIGHWAY TO DEH SOHU	0.22	0.22	0.22	FEASIBLE	1.16	15.52	9	
	TALUKA KINGRI								
5	- AHMEDPUR ROAD TO GHUNIA VILLAGE (BRICK PAVEMENT)	0.70	0.70	0.70	INFEASIBLE	0.40	(5.50)	-	
6	- JEH: BHATYON ROAD TO KHAWAND DINO DHAREJO VILLAGE (BRICK PAVEMENT)	-	-	0.00	N.A.	-	-	-	Road taken up by Highway Department
7	- SADERJI BHATYON ROAD TO BODLI MAHSEK (BRICK PAVEMENT)	0.70	0.70	0.70	FEASIBLE	1.26	17.47	8	
8	- KINGRI MACHYON ROAD TO DATT MOHAMMAD ABRO (BRICK PAVEMENT)	0.82	0.82	0.82	FEASIBLE	1.41	20.34	3	
9	- ULRA BUND TO FAIHULLAH GHUMRO (BRICK PAVEMENT)	0.45	0.45	0.45	INFEASIBLE	0.49	(1.92)	-	
10	- NOORPUR ROAD TO SAHAR LARIK VILLAGE (BRICK PAVEMENT)	0.30	0.30	0.30	INFEASIBLE	0.44	(3.84)	-	
	TALUKA FAIZ GASJ								
11	- HUSSAIN PATO TO KHUDA BUY CHEENA VILLAGE (BRICK PAVEMENT)	-	-	-	-	-	-	-	Not yet identified by District Council

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SR. NO.	R O A D S	PROPOSED LENGTH GIVEN BY DCs IN (KM)	ACTUAL LENGTH SURVEYED BY ACE	ELIGIBLE LENGTH FOR REHAB./UPG	ECONOMIC EVALUATION RESULT	BENEFIT COST RATIO	IRR VALUE IN PERCENTAGE (%)	CONSULTANT'S PRIORITY RANKING	R E M A R K S
TALUKA GAMBAT									
12	- HINGORJA SAGYOON NAU GOTH ROAD TO DARGAH WADHO WADHAN (BRICK PAVEMENT)	0.70	0.70	0.70	FEASIBLE	1.27	17.61	7	
13	- NAU GOTH ROAD TO VILLAGE NAU GOTH (BRICK PAVEMENT)	0.50	0.50	0.40	FEASIBLE	1.34	18.95	5	
14	- NAU GOTH ROAD TO WADEKO ISMAIL SAHITO (BRICK PAVEMENT)	0.60	0.60	0.60	FEASIBLE	1.36	19.50	4	
15	- SETHARJA BALA ROAD TO HINGORJA MINOR	0.60	0.60	0.60	FEASIBLE	1.28	17.78	6	
TOTAL:		6.89	7.34	5.69					
DISTRICT LARKANA:									
1	LA-2 BARRANI TO MUD BAHU	3.20	3.20	3.20	FEASIBLE	1.62	25.40	1	
2	- KAMBER ROAD TO LASHARI VILLAGE	1.00	0.76	0.76	FEASIBLE	1.33	19.45	2	
3	- RATODERO NAUDERO ROAD TO JAHAN KHAN JARWAR	1.00	0.65	0.15	INFEASIBLE	0.52	(0.44)	-	
4	- LARKANA SUKKUR ROAD TO LINK BABERNERA	0.50	0.17	0.17	INFEASIBLE	0.04	-	-	
5	- KAMBER SHAHDADROT ROAD TO GHULAM ALI MAGSI	1.00	0.53	0.52	INFEASIBLE	0.71	4.17	-	
6	- KATCHI PUL SOOFI MOHAMMAD BUX KHAN KHOSO.	1.00	0.60	0.60	INFEASIBLE	0.66	3.40	-	
7	- SHADADKOT RAILWAY CROSSING TO GHULAM NABI ADMANI	1.00	0.55	0.55	N.A.	-	-	-	Road in condition 4, therefore not eligible for rehab.
8	- GARELLO TO UMER BHAYO	1.25	1.97	1.97	FEASIBLE	1.08	13.94	3	
TOTAL:		9.95	8.43	6.48					

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SR. NO.	R O A D S	PROPOSED LENGTH GIVEN BY DCs IN (KM)	ACTUAL LENGTH SURVEYED BY ACE	ELIGIBLE LENGTH FOR REHAB./UPG	ECONOMIC EVALUATION RESULT	BENEFIT COST RATIO	IRR VALUE IN PERCENTAGE (%)	CONSULTANT'S PRIORITY RANKING	R E M A R K S
H	DISTRICT NAUSHERO FEROZ:								
1	NF-K-13K KOTRI KABIR TO MEHRABPUR	7.10	6.97	6.97	FEASIBLE	3.76	61.71	1	
2	NA-24 KOTRI KABIR TO KHANWAN	8.30	8.50	8.50	FEASIBLE	2.15	51.24	2	
	TOTAL:	15.40	15.47	15.47					
I	DISTRICT NAWABSHAH:								
1	NA-20 KAZI AHMED TO BUCHARI VIA KK OIL MILL	14.40	5.12	5.12	FEASIBLE	2.57	41.69	1	
2	NA-SA-18 SAKKAND MEHRABPUR TO VILLAGE MUD	3.00	3.00	3.00	FEASIBLE	1.87	31.05	2	Road has been identified after DCC meeting
	TOTAL:	17.40	8.12	8.12					
J	DISTRICT SANGHAR:								
1	SA-SH-24M SANGHAR SHAHDADPUR ROAD TO KHAIRO KALOJ BRIDGE TALUKA SHAHDADPUR	6.60	2.00	2.00	FEASIBLE	2.83	45.91	2	
2	SA-3M TANDO MITHA KHAN ROAD TO VILLAGE BAKAR TALUKA SANGHAR	5.00	5.90	5.90	FEASIBLE	1.54	23.36	3	
3	SA-2 SANGHAR KHIPRO ROAD TO VILLAGE HUSAIN BUA RAJAR TALUKA KHIPRO	0.80	0.80	0.80	FEASIBLE	1.19	16.20	6	
4	SH-22M SHAHDADPUR ROAD TO LUNDO VIA SOOMAR FAQIR HINGORO TALUKA SHAHDADPUR	8.00	9.00	9.00	FEASIBLE	5.64	118.08	1	
5	SA-5M SANGHAR KHIPRO ROAD TO VILLAGE TALIB JUNEJO TALUKA SANGHAR	0.60	0.60	0.60	FEASIBLE	1.43	20.97	4	
6	SA-10 PERUMAL TANDO MITHA KHAN ROAD TO VILLAGE CHIMENDAS TALUKA SANGHAR.	6.00	6.00	6.00	FEASIBLE	1.19	16.69	5	
	TOTAL:	27.00	24.30	24.30					

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SR. NO.	R O A D S	PROPOSED LENGTH GIVEN BY DCs IN (KM)	ACTUAL LENGTH SURVEYED BY PACE	ELIGIBLE LENGTH FOR REHAB./UPG	ECONOMIC EVALUATION RESULT	BENEFIT COST RATIO	IRR VALUE IN PERCENTAGE (%)	CONSULTANT'S PRIORITY RANKING	R E M A R K S	
K	DISTRICT SHIKARPUR:									
1	- ARBAB SHOP TO HYDERI MASJID (BRICK PAVED)	0.30	0.28	0.29	INFEASIBLE	0.42	(4.58)	-	District are advised to identify more roads.	
2	- WAZIRABAD BEGARI RD TO WAZIRABAD (BRICK PAVED)	0.33	0.33	0.33	FEASIBLE	1.22	16.65	1		
3	- WAZIRABAD TO UNAR GOTH	1.80	1.80	1.80	INFEASIBLE	0.29	(12.27)	-		
4	SH-GT-01 RATODERO SHERANPUR ROAD TO SATRANPUR	0.80	1.15	1.15	INFEASIBLE	0.71	3.90	-		
5	SH-LK-02 CHAK BAGERJI ROAD TO VILLAGE TAMACHANI	1.00	0.92	0.92	FEASIBLE	1.14	15.68	3		Newly proposed by DC Shikarpur dated 13-9-92;
6	SH-LK-08 SUKKUR SHIKARPUR ROAD TO MUNGRANI	0.60	0.56	0.56	INFEASIBLE	0.93	10.37	-		
7	SH-LK-09 SUKKUR SHIKARPUR ROAD TO DODO GOTH	0.60	0.60	0.595	FEASIBLE	1.13	14.99	4		-do-
8	SH-69 SHIKARPUR TO BOJANAPAR-JANO	0.40	0.79	0.785	FEASIBLE	1.21	16.62	2		-do-
	TOTAL:	5.83	6.43	2.63						
L	DISTRICT SUKKUR:									
1	SU-GT-03 NATIONAL HIGHWAY TO GHOTKI ADILPUR ROAD VIA QADIRIA FACTORY (BRICK PAVED)	2.20	2.20	1.30	FEASIBLE	3.05	122.69	1		
2	- BERIRI KHANPUR ROAD TO JIWANGARH VIA PIR BUX PITAFI (B.R.)	9.00	13.00	13.00	FEASIBLE	1.04	12.98	5		
3	- SADAR GARH TO TAMSQHI VILLAGE (B.P.)	7.30	7.30	3.30	INFEASIBLE	0.34	(8.05)	-		
4	- WAHI GHOTO SARDAR GARH ROAD TO JIWANGARH.(B.P.)	8.50	12.00	12.00	INFEASIBLE	0.57	0.72	-		
5	- BILHNI TO SHAHPUR (B.P.)	1.50	5.50	5.50	FEASIBLE	1.05	13.15	3		
6	- THIKRATHO TO GHATTI(B.P.)	4.00	4.00	4.00	INFEASIBLE	0.53	(0.61)	-		

SR. NO.	ROADS	PROPOSED LENGTH GIVEN BY DCS IN (KM)	ACTUAL LENGTH SURVEYED BY ACE	ELIGIBLE LENGTH FOR REHAB./UPG	ECONOMIC EVALUATION RESULT	BENEFIT COST RATIO	IRR VALUE IN PERCENTAGE (%)	CONSULTANT'S PRIORITY RANKING	REMARKS
7	- KHANPUR THIKRATHO ROAD TO SHAHPUR JIWANGARH ROAD VIA ABDUL SATTAR QUNJABI ALLAH DITO MUHTAM. (B.P.)	4.00	4.00	4.00	FEASIBLE	1.04	12.99	4	
8	- SHAHPUR JIWANGARH ROAD TO VILLAGE KATAN WARO (BRICK PAVED)	3.50	4.05	4.05	INFEASIBLE	0.73	5.54	-	
9	- QAZIJI LANDHI TO SARDARGHAR	4.00	4.00	4.00	FEASIBLE	1.91	29.37	2	Recently proposed by DC
	TOTAL:	44.00	56.05	27.80					
M	DISTRICT THAKPARKAR:								
1	THR-17 TANDO JAN MOHAMMAD TO KHUDAD ROAD	0.70	0.70	0.70	FEASIBLE	1.06	13.27	6	
2	THR-3 SETELLITE TOWN TO MIR SHER M. VILLAGE	0.60	0.65	0.65	FEASIBLE	2.19	34.75	5	
3	THR-10 SINDHRI ROAD TO HAJI BISHAN BROHI	3.30	3.35	3.35	FEASIBLE	2.33	38.84	4	
4	THR-18 TANDO GHULAM ALI TO DEH 164	0.70	0.90	0.90	FEASIBLE	3.18	51.44	3	
5	THR-16 UMERRKOT RD TO ANWAR PALI	1.00	1.25	1.25	INFEASIBLE	0.77	5.86	-	
6	THR-12 MFS JHLURI ROAD TO MIR KHALID LONDIHI	0.70	0.75	0.75	FEASIBLE	1.01	12.35	7	
7	THR-S-52 UMERRKOT ROAD TO SHADI-PLI	-	5.00	5.00	FEASIBLE	6.09	114.72	2	
8	THR-MP-21 MIRPURKHAS TO PATAYUN (PHASE-III)		4.00	4.00	FEASIBLE	8.87	281.89	1	About 4.70 km was being rehabilitated under KRM
	TOTAL:	7.00	12.60	11.35					
N	DISTRICT THATTA:								
	NIL	-	-	-	N.A.	-	-	-	

- * No. of Feasible roads = 59 Nos.
 * No. of Infeasible roads = 20 Nos.
 * No. of roads under way = 1 Nos.

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