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1979 Evaluation
BICOL SECONDARY AND FEEDER ROADS PROJECT

Project No. 492-0281

Camarines Sur Province
Philippines

GOP/BRBDFO-USAID

August 1979

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ABBREVIATIONS

AC	-	Asphalt Concrete
BMS	-	Bicol Multipurpose Survey
BRBDP	-	Bicol River Basin Development Program
BRBDPO	-	Bicol River Basin Development Program Office
EREP	-	Bicol Roads Evaluation Project
BSFRP	-	Bicol Secondary and Feeder Roads Project
DBST	-	Double Bituminous Surface Treatment
GOP	-	Government of the Philippines
IPC	-	Institute of Philippine Culture
MLGCD	-	Ministry of Local Government and Community Development
MPH	-	Ministry of Public Highways
PCC	-	Portland Cement Concrete
PD	-	Presidential Decree
PEC	-	Provincial Engineer's Office
PMO	-	Project Management Office of MPH
PP	-	Project Paper
SSRU	-	Social Survey Research Unit of IPC
TDD	-	Terminal Disbursement Date

Final Draft

A. Project Evaluation Summary^{1/}

Bicol Secondary and Feeder Roads (Project Number 492-0281)

Total estimated project cost: \$40,000,000

U. S. contribution: \$10,000,000

Period covered by evaluation: July 1978-July 1979

List of recommendations reached by joint evaluation team:	Responsible for action	Action date
1. MPH Planning and Operations Office arrange adequate fuel allocations to enable contractors to perform construction as scheduled.	MPH	ASAP
2. MPH Planning and Operations Office authorize and delegate to the Project Management Office (PMO) the responsibility to continue the Maintenance Management Training Program established by the GOP Contractor. Roy Jorgensen Associates, Inc. Coordinate with MLGCD and the provinces and cities for required inputs (budget, personnel).	MPH/MLGCD	10/79
3. Expedite distribution of IFB's for new road maintenance equipment.	MPH/PMO	11/79
4. Amend TDD from April 28, 1981 to April 28, 1982.	MPH/USAID	12/80
5. Provide a technical consultant to the extended Maintenance Management Training Program for at least one year (Bicol IRD).	USAID/OLRD	1/80
6. Provide consultancy to the ERBDFO Roads Evaluation activity (Bicol IRD).	USAID/OLRD	10/79
7. Reconduct Pre-Construction Survey to provide baseline transportation census and commodity marketing/distribution data for future project impact analysis.	ERBDFO/EREP	ASAP
8. The MPH and the concerned provinces and cities should plan and carry out a regular traffic count program on the project roads after their completion in cooperation with the ERBDFO.	MPH/MLGCD/ ERBDFO	As completed

^{1/} Follows format of USAID PES (AID Form 1330-15/3-78) and relates to Project Paper "logical framework design". Evaluation review meetings were held with concerned officials at the MPH/PMO in Naga City on 8/14 and at MPH Manila on 8/17/79 to present findings and recommendations and solicit comments on the draft reports. Washington team members responsible for analysis encourage additional comments and follow-up analysis.

1. SUMMARY

Though somewhat behind schedule and plagued by significant cost overruns, it appears that the project goal and purpose will be achieved. Because of excellent supervision, the construction work is of superior quality. Along with the increases in cost, benefits also increased and preliminary traffic counts on those roads near completion indicate that they will be economically feasible. The final contract will be finished in 1981. In total, the project is now 11% behind schedule, not including the initial one year delay discussed in the 1978 evaluation report. Barring surprises, no further delays are anticipated. As discussed below, the estimated total construction cost of the project as it will be completed in 1981 is more than triple the \$11,945 million estimated in the Project Paper. Local employment impact of the project has been disappointing, and is estimated at only 20% of the level projected in the PP. The construction contracts did not give emphasis to the employment of labor intensive methods for cost, timing, operating and management reasons.

Though a GOP Road Maintenance Training Program administered by Roy Jorgensen Associates, Inc. has been very successful, considerably more effort will be required to change current unsatisfactory maintenance attitudes and practices. The Bicol Roads Evaluation Project (BREP) set up to monitor and evaluate project impact is hampered in the execution of their vitally important role by lack of technical experience.

Review of the decision to upgrade road design standards from Double Bituminous Surface Treatment (DBST) to Portland Cement Concrete (PCC) reveals that the upgrading was not fully justified on technical or economic grounds.

2. EVALUATION METHODOLOGY

The evaluation was conducted in the Bicol Region from July 23 to August 16, 1979. The primary purpose of the evaluation was to document construction progress, assess the potential socio-economic impact of the project roads, review the analysis that led to the upgrading of design standards assess the effectiveness of the maintenance training program, identify problem areas, and propose remedial action. Participating were: members of the Project Management Office (PMO) under the Ministry of Public Highways, engineers of the Bicol River Basin Development Program Office (BRBDPO), the Roads Evaluation Program personnel of the BRBDPO, AID/W/ASIA/ED Civil Engineer, DOT/W Transportation Economist, and concerned USAID technical personnel. Visits were made to all 22 road contracts under construction. A representative of each contractor was interviewed. Accompanying the team on these interviews were one or two personnel from the A&E consultant firm responsible for the quality control on each particular contract. Traffic counts were taken on two of the almost completed roads and a survey was made of the project impact on local unemployment in construction activities.

3. EXTERNAL FACTORS

a. Upgrading of Design Standards

A review of the analysis performed by the A&E in justifying the change in design standards revealed that upgrading to Portland Cement Concrete (PCC) or Asphalt Concrete (AC) pavement could not be justified on economic or technical grounds. Given the relatively low traffic levels of less than 600 vehicles per day projected for the opening year, the Double Bituminous Surface Treatment (DBST) pavement for the project roads has a higher Net Present Value (NPV) of benefits over costs than the PCC and AC, unless a total absence of future maintenance is assumed. It is estimated that the additional construction cost due to upgrading exceeds ₱47 million (\$6.3 million) and that the upgrading had only a minor effect on benefits. This will be the subject of further GOP analysis.

b. Administrative Delays

The most important factor in the substantial delays in starting the actual construction work was the Presidential Decree specifying that all contracts in the Philippines exceeding a value of ₱2 million must be approved by a Presidential Review Committee. According to data collected by the evaluation team, the time consuming review in Manila caused an average delay of 5.3 months between the date of contract award to the notice to proceed, with a minimum of 2 months and a maximum of 10 months. The second most important delay was caused by the bid processing in the PMO. It took an average of 3.5 months between the time a contractor's bid was received and the time of contract award, with a minimum of 1 month and a maximum of 10 months.

As a consequence of these administrative delays, a minimum of almost 6 months of valuable dry-weather months per contract was lost. Actual losses are higher due to the unpredictable nature of the delays (the notice to proceed could arrive anywhere between 2 to 10 months after contract award), and contractors often were not ready to immediately commence work after receiving the notice to proceed due to other commitments. It is estimated that the total cost of delays amount to ₱24 million (\$3.2 million), or approximately ₱4 million (\$533,000) per dry month lost.^{1/}

c. Shortages of Fuel and Cement

Though numerous contractors claimed shortages of fuel and cement as an important reason for slippage, the evaluation team believes the slippage caused by these shortages was minor, especially when compared with the administrative delays discussed above.

d. Weather

The weather conditions during the evaluation period were normal and did not cause any significant cost overruns or slippage.

^{1/} See Mission reservation re this analysis, page 15.

4. INPUTS

a. Costs

Efforts are being made to keep construction below \$40 million, but the total construction cost of the project as it will be completed in 1981 is estimated at more than triple the \$12 million estimated in the Project Paper. Primary reasons for this large cost overrun were the underestimation of construction costs in the Project Paper, the higher than anticipated rate of inflation, and the upgrading of the road and pavement design standards by the Philippine Government. The average cost of the Double Bituminous Surface Treatment road, including the cost of the additional earthwork required to raise it to a sufficient height above the waterline, is now ₱636,650 (\$84,887) per km. The Asphalt Concrete road costs ₱912,741 (\$121,699) per km. and the Portland Cement road costs ₱1,249,256 (\$166,567) per km. In total, the upgrading of the pavements over the DBST type has imposed an additional cost of approximately ₱47.25 million (\$6.3 million) for the GOP.

b. Maintenance

Assuring adequate maintenance of the project roads will be a most difficult goal to achieve. In general, none of the existing roads in the project area show signs of preventive maintenance and very little of periodic maintenance. Current attitudes and practices are to rehabilitate road sections only after they have deteriorated to an almost impassable condition. The causes of this poor maintenance performance are complex and interrelated and are more fully discussed in the body of the main report. Though the Road Maintenance Training Program administered by Roy Jorgensen Associates, Inc. has been very successful in training 91 persons, or 25% more personnel than initially projected, considerably more effort will be required to change current maintenance attitudes and practices. The program is scheduled to terminate in December of this year, and it is recommended to extend the program for at least another year in order to provide continuity and increase the probability of field implementation of the training program.

5. FINDINGS ABOUT PROJECT OUTPUT

a. Schedule

The project is almost two years behind the original project paper schedule, but we do not foresee any further delays for the majority of the 25 contracts. One of the contracts will be completed this calendar year (the important San Isidro-Libmanan-Cabusao sub-project). Another 17 are now estimated for completion in 1980, and the balance will be finished in 1981. The primary reasons for the initial delay of almost one year (GOP fiscal year changeover, insufficient initial budgetary allocations, and lack of adequate staff levels for effective project management) have been discussed in the 1979 evaluation report. The additional year's slippage in schedule is mainly due to delays in staffing by the A&E design/supervision contractors and the slow pace of

processing and awarding construction contracts (an average of 9 months delay mostly in Manila). A minor part of the slippage can be attributed to fuel and cement shortages. In total, the project is now 11% behind schedule measured from the time of the first contract notice to proceed. This does not include the initial year delay discussed in the 1978 evaluation report.

b. Employment

The project impact on local employment is less than originally estimated. Due to the capital intensive approach taken by the contractors, the local employment is estimated at only about 20% of the 9000 manyears estimated in the Project Paper.

6. EVALUATION FINDINGS ABOUT THE PROJECT GOAL

The project goal is to "Bring about a self-sustaining rise in income levels of the rural poor in the Bicol River Basin and increase their perceived quality of life." This is similar to the broader ERBDP goal.

Since the project is not yet complete, insufficient information exists to fully assess project impact on the project goal. Additionally, the role of the project roads in increasing income levels is closely linked with the realization of complementary agricultural and rural industry growth in the project area. This will take time. However, preliminary traffic counts on two of the roads indicate that, though the roads are not yet completed, they are already used by substantial amounts of traffic and provide promise that the project goal will be achieved.

The current efforts by the ERBDPO to monitor achievement of the project goal and purpose are not sufficient. Unless corrected, this may impede the final evaluation after completion of the project. In addition, the office is not informed in a timely manner of lack of progress and problem areas. The Bicol Roads Evaluation Project (BREP) has been established to monitor and evaluate the implementation phase of road construction and the effectiveness with which maintenance capability is being upgraded. It is also to document socio-economic benefits accruing in the project influence areas. However, though a considerable amount of work has been accomplished and the unit is staffed by hardworking, dedicated, and well educated personnel, they are hampered in the execution of their vitally important role by lack of technical experience. Technical consultancy is recommended (Filipino-U.S.).

7. FINDINGS ABOUT PROJECT BENEFICIARIES

Though the project is still far from complete, there are indications that the rural poor in the zones of influence of the roads will receive significant benefits from the project. In the small barrio of Baliwag Viejo at the end of the partly completed and already useable Pili-Mataoroc secondary road, the 3-hour walk (no road connection existed before) has been reduced to a 15-minute tricycle or jeepney ride at a cost of P1.50 per passenger. A very substantial traffic of about

50 tricycles and 50 jeepneys per day has been generated on this road. Transport costs for shipping a sack of rice to the market place have dropped from ₱3 per sack (by animal and boat) to ₱1.50 per sack by vehicle. Also, on the almost completed San Isidro-Libmanan secondary road, the generated traffic in jeepneys and mini-buses has exceeded the original estimates and suggests a substantial increase in mobility of the low income category of the population. Confirmation of these favorable trends will, however, have to wait for completion of the post-project Panel and Traffic Surveys.

8. LESSONS LEARNED

- a. As stated in the narrative of the report, the original one year project implementation slippage was due in part to the GOP change in fiscal year, shortage of funds, and other budgeting problems during 1976. If USAID had provided for progress payments to the GOP to cover the cost of funding A&E contracts, a minimum of 6-8 months may have been saved in the preparation of final designs. Thus, the entire bidding process would have been advanced, construction started, etc. Cash flow is now even more critical.
- b. If the GOP bid evaluation procedures are to remain as presently administered, a 6-8 months processing time has to be built into future construction implementation schedules.
- c. The project highlights the importance of determining design standards based on both economic and technical considerations and the need for including a broad spectrum of alternatives in the evaluation.
- d. Assuring adequate maintenance of the road system is a most difficult goal to achieve. Maintenance training is an effective means of correcting poor maintenance performance, but the effort must be sustained over a substantial time period to change maintenance attitudes and practices.

9. UNPLANNED EFFECTS

None.

B. Status of Construction Contracts

Table A.1 presents an overview of the status of all 25 contracts let on the Bicol Roads Project. Presented in the Table are the length of road section and pavement type; length of bridges; name of contractor and contract amount; the dates of bid received, contract award, contract start, and date of scheduled and estimated completion; percentage completion as of July 1979; number of total employees per contract and percentage of employees that are locally hired; and summaries of the slippage.

1. Contract Starts

Notice to proceed has been granted in all but 3 contracts, and two of those are expected to be received during the month of August, the third by December.

Findings:

The reason these contracts were the last to be bid/negotiated is due simply to the normal processing delays.

2. Costs

The total contract amount of ~~7258.2~~ \$34.4 million exceeds the original Project Paper estimate of \$11.9 million (PP Annex C, Table 18, Items 1-3) by about \$22.5 million.

Findings:

The total construction cost estimate found in the PP was based upon a small sample of late 1974 unit cost prices furnished by Ministry of Public Highways (MPH) and Provincial Engineering Office (PEO) with a 10% inflation factor for each of four years. The average of the unit cost prices eventually bid is double the original estimates (See Appendix 6). The total cost of contracts awarded to date is \$34.4 million. Additional overruns, due to price escalation clauses, etc., of 15% (\$5.2 million), will result in a total cost more than triple the original estimate. Other notable cost increases are Right-of-Ways \$350,000 vs. \$219,000; Supervision \$2,472,000 vs. \$1,216,000 and A&E Detailed Design \$1,057,000 vs. \$608,000 estimated.

Fortunately, traffic also appears to have been underestimated, as has the increase in vehicle operating cost. Thus, as discussed elsewhere in this report, the increase in construction cost appears to have been offset by even larger increases in benefits, and the net effect is that the Project is still economically feasible provided the roads are maintained.

The major factors for this cost overrun are:

- a. The original estimate was extremely low. For example, the most expensive secondary road was estimated at only \$44,000/km which in late 1974 had to be a bare minimum at best, even assuming a fair subgrade to start with. The low estimate is especially curious since the first "energy crunch" with its major price increases had already passed. In addition, drainage structures can easily cost \$40,000 per km in 1979.

Furthermore, the average cost of simple gravel feeder roads currently under construction under the Project amounts to \$43,192/km which is only \$1000/km less than the most expensive road estimated in the PP. Some of the roads in the PP were estimated as low as \$11,000 per km.

- b. Inflation in construction cost has been averaging close to 18% per year, not 10%.
- c. The design of all the roads including the "Feeder" have been upgraded by the GOP. For example, there are now 67 km of Portland Cement Concrete Surface roads that originally were Double Bituminous Surface Treatment (DBST). Moreover, the upgrading of the pavement design standards would account for \$6.3 million of the \$22.5 million increase. All bridges on secondary roads have been constructed 2 lanes wide.

Wider travel ways and more drainage structures than originally specified have also increased the cost. As stated in the 1978 evaluation, the bulk of the subprojects are located in lowland areas which flood frequently and concrete pavements withstand flooding somewhat better than other pavements (see Table 1). In addition, considerably less maintenance is required for concrete pavements, which would partially relieve the burden on provincial and city engineering offices for maintenance. Second, finished subgrade elevations were significantly raised from existing ground levels to prevent flooding and washouts, particularly of feeder roads; hence, substantially more earthwork is involved than originally envisioned. Given the soil quality in the Bicol Region, the A&E deemed it the most appropriate strategy to follow to achieve a reliable network of all-weather feeder and secondary roads.

It should be noted that all cost overruns have been borne by the GOP. However, unless these overruns create offsetting incremental benefits, the project goal of achieving a self-sustaining rise in income levels of the rural poor in the Bicol Region may come at the expense of reduced income levels of rural poor in other regions in the Philippines. Cost overruns, even if borne by the host government, should therefore not be taken lightly. Section D of this paper analyses the extent to which the upgrading and cost increases were economically justified. This is done in part to guide future project design.

The average cost per kilometer of the various road types categorized by pavement type are presented at the bottom of Annex A. It should be noted that bid prices being submitted to the MPH as of July for similar types of road construction have been averaging 27% above these listed in Annex A.

3. Completion Dates

The A&E estimated completion date for the latest project is October 31, 1981. This is 23 months later than estimated in PP (Annex H denotes Nov. 79).

Findings:

As stated in the 1978 evaluation summary, the primary reason for the initial project delay of almost one year --- GOP fiscal year changeover, insufficient initial budgetary allocations, and lack of adequate staff levels for effective project management --- have been rectified and pose no further impediments to project implementation. This coupled with the 9-month average time taken to process a construction contract accounts for almost all the slippage (see B-5). It also explains the slippage of the December 31, 1978 date for all contracts to have been awarded as stated in the 1978 evaluation report. The latter is far in excess of normal contracting practices. Three months should be sufficient. The approval process should be simplified. This has been brought to the attention of all the government offices involved.

It should be noted that the bulk of the contracts (18) will be completed by the end of the 1980 calendar year.

4. Overall Schedule Slippage

The weighted overall project completion is 32% vs. the scheduled 41%. Thus, the slippage as of July 1, 1979 is almost 10%. This slippage does not take into account the initial project delay of one year discussed above.

Findings:

During the interview of contractors at their respective job sites, (only two of whom were on schedule) a variety of reasons were offered when confronted with the question as to why they were behind schedule. Foremost was the shortage of diesel fuel, especially during the months of March and April 1979, which they claimed caused them equipment downtime. All indicated they now have to pay higher than market prices on a cash basis in order to get enough supply to keep fully operational. The possibility of improvement of fuel allocations for contractors was discussed with an Assistant Minister of Public Highways in Manila. He assured us that this was very high on the priority list of problem

areas that the new Minister of Public Highways was attempting to resolve and in fact a solution was expected shortly.

Numerous contractors noted their late start after receiving notice to proceed. This was caused by the many months delay in receiving said notice (8.8 months average) after submitting their bids, which in turn had forced them to find "other work" in order to stay in business. Oftentimes after the notice to proceed was finally received, portions of that "other work" had to be completed before certain pieces of equipment could be mobilized for the firm's Bicol contract.

As noted in the last column of Table "A", this often resulted in the loss of valuable dry weather months. The first six months of the calendar year are known as the dry weather months and July through December is the rainy season. However, rain was not continuous in July and August in previous years and some work was accomplished. However, the months of June and July in 1979 have had considerable rain, and the contractors stated this as their biggest reason for major production slippage during those 2 months.

There was also a shortage of cement for about two months which apparently lasted until the price of cement had almost doubled from 14 Pesos to 27 Pesos per 40-kilo bag. The shortage temporarily affected those contractors whose prime effort was bridge construction and/or drainage structures.

Only minor right-of-way problems were mentioned and these were not causing the contractors any delays.

Most of the contractors have applied for time extensions on their contracts for all or a combination of the reasons stated above. A few extensions have been granted and many more are presently under study by the consultant engineering firms.

5. Schedule Slippage Due to Administrative Reasons

The average elapsed time between Time of Bid and Contract Award was 3.5 months. During this period, all papers were being processed in the Bicol. The average elapsed months from Contract Award to Notice to Proceed (Construction Start minus ten days) was 5.3. During that interim, all paper work was being processed in Manila. This totals to 8.8 months average processing time per contract. An average of 5.9 months of the dry season was lost per contract. But this is a minimum estimate. Due to the considerable uncertainty as to when the notice to proceed could be expected (anywhere between 2 to 10 months after contract award) contractors were not prepared to immediately commence their BSFRP Commitment after finally receiving their notice to proceed.

6. Employment

The project paper was highly optimistic in their estimates of the local employment impact of the project. It obviously saw this as a

labor intensive project. However, all but 2 of the 25 contractors are Manila based, most with ample heavy construction equipment. When interviewed by the evaluation team, they acknowledged they did not consider these contracts to be labor intensive. And, though considered by the GOP, labor intensive methods for this Project were rejected as impractical for reasons of cost, time, and management.

It would be fair to say that the 1550 employees noted for the month of June will be the "peak." Factoring in the rainy seasons, 1000 employees per month average is a conservative estimate of average employment through 1980. Employment was considerably less for 1978 and will be less for 1981. Thus, the 4-year average would run closer to 700 employees than the 2500 projected in the PP. This relates to a total of 2800 vis 7500 (3 years) as estimated in the PP. Again, it would be fair to assume that the average local hire will be close to two-thirds of the total. Thus, the total man years of local employment would be 1867, or about 21% of the 9000 man years estimated in the PP.

7. A&E Consultants

The Bicol Secondary and Feeder Roads Project was broken down into a series of subprojects. These in turn were placed into four groupings by geographical area. Four separate contracts were negotiated with different architect/engineering companies whose responsibilities included the design of roads and bridges within their group. The four firms were slow in mobilizing sufficient personnel to man the survey and design teams required to complete road drawings and contract bid documents in a timely manner. Once those hurdles were overcome, the four firms have performed well.

Located at the field office of each firm is a small soils laboratory which handles all but the compression testing of concrete cylinders. There are ample records to back up the fact that all materials used in the roadways and concrete have been tested and approved prior to use. Density tests are taken at regular intervals in the road base courses.

Some aggregate materials, some cement as well as some base and surface courses already placed have been rejected. The contractors had to remove the rejected materials be they bulk or placed and furnish new or redo as the case may be. In summary, there is strong evidence that the quality control throughout the project is good and effective.

8. BRBDPO and USAID Monitoring

The quality of the construction work is of high quality. The evaluation team considers this is due in great part to the active monitoring of contractors and A&E firms by PMO, BRBDPO and USAID. Unannounced inspection trips have been most effective.

9. Late Contract Completion Penalty Clause

All construction contracts have a "late completion penalty clause" which states that from 500 up to a maximum of 2000 Pesos per day may be assessed against a contractor's final payment for each day that he failed to complete his contract by the date specified.

Investigation into the past history of the MPH in regard to this matter indicates that contractors are seldom penalized. A way to get around it is more often the norm. This defeats the purpose of having the clause in the contract which is to get the work completed on time.

The status of completion of the Bicol contracts is not good. Of the 22 contractors presently working, only six are marginally on schedule, the other 20 ranging from 3% to 40% behind schedule. (Source is from the ERBDP end of June monthly report). Many of the contractors have applied for time extensions for a variety of reasons, but the A&E consultant and PMO stated that only a portion of those extensions will be approved; most of the contractors cannot complete their work on schedule.

Therefore, the penalty clause should be invoked in applicable cases. This would put "teeth" into adherence to contract terms. This of course assumes project administration does not delay processing of invoices for contractors who do adhere to the terms and schedules. Hopefully, this would lead to more efficient contractor mobilization and performance.

Table A.2 Maintenance and Construction Characteristics of Various Road Types in the Bicol Region

3

Pavement Type	Ease of Construction		Ease of Maintenance	Typhoon Flooding Resistance
	Quality Control	specialized equipment requirement		
Gravel	Easy	None	All should be well within Provincial maintenance capability if applied in a timely manner.	requires major rehabilitation and road may be closed for a month.
Single Bituminous Surface Treatment (SBST)	Fairly easy	minor		requires local rehabilitation and road may be closed for a few days.
Double Bituminous Surface Treatment (DBST)	" "	minor		"
Bituminous Concrete (AC)	Difficult	major ¹		requires minor rehabilitation usually without road closure.
Cement Concrete (CC, PCC)	Moderately difficult	major ²		"

¹ Bituminous spreader, Hot Mix Plant, Paving Machine, Tandem Riller, Secondary Crusher.

² Large cement mixer or mixing Truck, Paving Machine, Secondary Crusher.

³ Assumes that drainage ditches and structures have been properly maintained.

C. Maintenance Program

1. Introduction

The Project Paper emphasizes the importance of ensuring that the local road system will be maintained on a regular and continuing basis after completion of the project. Without this assurance, the project roads would deteriorate in less than 10 years and the AID investment of \$10 million loan would be lost, and equally important, the additional ₱225 million direct outlay by the GOP.

Our observations indicate that the roads (local and national) in general show no signs of preventive maintenance and very little of periodic maintenance. Rehabilitation takes place when the road has deteriorated to an almost impassable condition. Most of the maintenance equipment is either down for lack of parts or beyond repair. With the exception of the PEO's shop in Albay and Iriga City, the management of the repair facilities leaves a lot to be desired. Obtaining spare parts per government procedure is a frustrating and time-consuming endeavor.

The causes of poor maintenance performance have been complex and interrelated. First of all, the provincial governments have erroneously viewed maintenance efforts as low priority and easily postponable so that budget allocations destined for maintenance are often shifted to other needs. Secondly, difficulties in recruiting, training and retaining qualified and motivated personnel at both the managerial and vocational levels severely hamper maintenance operations. Thirdly, maintenance operations are small scale and widely scattered, and are inherently difficult to manage; maintenance is more a managerial than an engineering problem. Finally, inadequate domestic financing mechanisms; uneven supply of spare parts, fuel and materials; and delayed replacement of equipment frequently undermine the efficiency of maintenance operations.

2. PEO Physical Plants

- a. The new Camarines Sur Provincial Engineers (PEO) offices are proceeding at an extremely slow pace. The PEO is optimistic that they will be complete by next spring. The present equipment repair facility is cluttered with assorted "down" equipment. Many pieces will soon be offered for public sale. The spare parts room is very small but will be expanded when existing offices are vacated. An inordinate lack of management is evident.
- b. The PEO shops at Albay are a positive example of a well managed, orderly and properly organized facility. The new office facilities are nearing completion and the entire plant should be functional within a few months.

- c. Naga City has fair facilities with additional office space yet to be completed. They rent all needed equipment from the Ministry of Highways Area Motorpool so they do not yet have the parts and repair problems of the PED's.
- d. Iriga City has new facilities under construction. They have good management and appear to have adequate know-how.

3. Maintenance Equipment

Each of the four above-named facilities recently received from the Ministry of Highways the following new equipment: 2 dump trucks, 1 grader and a "Mighty-Mite" that are to be used only for the maintenance of barangay roads. All of their other equipment, with few exceptions, obtained via PDAP/Excess Property. Though most excess property has had a short but sometimes useful life, most feedback on its use was not positive. A minimum of 50% is already beyond economical repair (if parts could be found) in less than 3 years of use. A proposed USAID Order "AID-Financed Rehabilitated Excess Property," specifies the condition of AID-financed equipment after rehabilitation. If operationalized, such procedures may correct this situation. It shall be given careful consideration. With the exception of Naga City, who rents equipment, they stated a need for additional equipment and prefer new to excess. All are looking forward to the arrival of equipment (3 million dollars) being purchased under this project, (see Table B.1 for listing) the status of which is as follows:

The IFB's should go out by November, with bid openings scheduled for December and purchase contract awarded in February 1980. Shipping time, processing through customs, servicing and delivering to cities/provinces would make realistic operational date no earlier than 1 July 1980. The package is also programmed to purchase approximately \$250,000 of spare parts. In addition, it is suggested each bidder should include a maintenance program to support the parts and maintenance for five years. Three equipment manufacturers in the Philippines indicated they are prepared to do this if required.

4. Maintenance Funding

The present Equivalent Maintenance Kilometer (EMK) is ₱11,344 per kilometer and is expected to increase to ₱13,300 next year. Although all local government engineers allowed they could use more money, the consensus seemed to be that they could manage within those rates. All stated that they received their maximum allowable as their respective provinces always put up the required matching funds. The cities, which receive 100% from the National Government, and the provinces stated that they receive their funds quarterly and mostly on time, though occasional delays in the allotment seriously affects the supply of spare parts.

5. Purchasing of Spare Parts

If the PED's et. al. adhere to the government legal procedures for purchasing spare parts, the absolute minimum to obtain any part (be it large or small) is 6 weeks. If funds are in short supply, this easily stretches into several months (see Table B.3 for the complicated procedure required to obtain spares). Some equipment at Camarines Sur has been down for a year.

The Albay PED and the City Engineer of Iriga have managed to work out an arrangement whereby cash advances will be made for cost of part. Personnel rides the bus round trip to Manila to purchase the parts in one or two days and equipment downtime is often limited to less than one week. Although not strictly in accordance with regulations, it does have the sanction of the various government officials concerned. Therefore, one could conclude that there is a possibility that in some distant future, the legal procedures will be amended to provide a more efficient spare parts procurement system.

6. Maintenance Equipment Being Used for New Construction

Presently, the PED's are engaged in numerous new construction projects which often ties up their equipment for months. The PED's should consider phasing out of new road construction except on a contract basis, and should utilize all their equipment resources for maintenance of all provincial roads. The new equipment package cited in section C above stipulates that it may be used only for road maintenance, though this might be difficult to enforce.

Furthermore, it is recommended that the maintenance of all national roads in the cities should be by the Ministry of Public Highways (MPH), and city streets and roads should be maintained by city engineering offices. This could greatly simplify the management of the city road maintenance systems.

7. Maintenance Training

a. Introduction: The Road Maintenance Training Program is being implemented by Roy Jorgensen Associates, Inc. under the Bicol Roads Project. The 18-month GOP contract began June 5, 1978 will be completed December 15, 1979. It has been extremely successful in having trained 91 persons, or 25% more personnel, than initially projected. Some of those trained have already gone back to their provinces and have run a training class for others without consultant supervision.

b. Objectives and Course Outline

The main objective of this effort is to increase the road maintenance capabilities of provinces and cities within the

Bicol River Basin Program area. The mechanism to achieve the main objective is a management system to control the use of available human and physical maintenance resources. The management system must be implemented by training maintenance managers, and assisting them in the use of the system. A team of trainers is being instructed to enable them to train others in order to achieve continuity of the program after the consultant's departure in late 1979. Training materials and a management system have been developed to fit provincial and city organizations.

Training materials have been developed to assist Filipino local government personnel in the training of maintenance managers. The material is used in nine workshops. The format consists of instructional guides with transparency projection plus workbook case problems. Work methods, such as how to permanently repair a pothole, are also incorporated into the training. (See Table B.2.) These courses are slide-tape, audio visual presentation prepared by the Manpower Development Service of the MPH, and these types of courses have been very successfully used in other developing countries.

The proposed management system emphasizes control of resources rather than peso expenditures. The system is similar to the one now in use by the MPH, some provinces, and cities and emphasized by PDAP.

The project test area is the provinces of Camarines Sur and Albay; and the Cities of Naga and Iriga. At a later time, the training team will train personnel in the provinces of Sorsogon and Camarines Norte; and the city of Legazpi without consultant assistance.

The classification of trainees and approximate numbers of each follows:

<u>Test Area</u>	<u>Engineer Managers</u>	<u>Foremen</u>	<u>Capataces</u>
Camarines Sur	9	12	25
Albay	1	3	18
Iriga	1	2	3
Naga	0	2	4
	<u>11</u>	<u>24</u>	<u>50</u>

Outside the Test Area, Estimated:

Sorsogon	2	4	16
Camarines Norte	3	5	20
Legazpi	2	3	10
	<u>7</u>	<u>12</u>	<u>46</u>

The maximum number of persons per workshop is restricted to 20. The trainees are combined into two groups; engineers managers and foremen, and foremen and capataces. Thus, the nine workshops are being presented to five groups of managers in the test area and will be presented to five in the remaining Basin area. Funding arrangements graining outside the test area have not been made. The Project Manager and the MPH Region V Director have been requested to resolve the matter.

The training workshops include:

<u>Course Title</u>	<u>Duration</u>	<u>Trainee Classification</u>
1. Maintenance by Objectives (Planning and Programming)	3 days	Engr. Managers & Foremen
2. Orientation to Maintenance Management	2 days	Foremen and Capataces
3. Workload Balancing & Staffing	2 days	Engr. Managers & Foremen
4. Staffing & Work Methods*	2½ days	Foremen & Capataces
5. Scheduling	2 days	Foremen & Capataces
6. Work Reporting	1 day	Foremen & Capataces
7. Performance Evaluations	2 days	Engr. Managers & Foremen
8. Putting it together	1 day	Engr. Managers & Foremen
9. Making it work	<u>1 day</u> 17½ days	Foremen & Capataces

3 for Engineers and Foremen
8½ for Foremen and Capataces

c. Total Projected Personnel to be Trained Through Nov. 1979

<u>Classification</u>	<u>Province and City</u>				<u>Total</u>
	<u>Iriga</u>	<u>Naga</u>	<u>Camarines Sur</u>	<u>Albay</u>	
Engineer Managers	1	1	10	2	14
Foremen	3	2	10	6	21
Capataces	<u>3</u>	<u>3</u>	<u>22</u>	<u>13</u>	<u>26</u>
Total	7	6	52	26	91

d. Problems

There is no assurance that the trained maintenance managers will use the system even when they recognize the advantages. They may have trouble in printing the forms required although they will be furnished enough to begin next years work. Some do not have duplicating facilities and probably will rely upon the FMO-MPH to do their printing. Cost is always a factor, but with FMO-MPH help they can manage it.

Resistance to change: All forms, concepts, and subsystems have been reviewed and approved by a technical panel made up of those who will use the system. A steering committee has been used on occasion to review total concepts and voiced no objection. The actual use of the system, once the consultant has phased out in December of 1979 is hopeful but, unless strongly supported by higher government levels, is not guaranteed. PDAP/MLOCD can play an active and supporting role.

e. Continuation of Training Program

The FEO's City Engineers and an Assistant Minister of Public Highways were queried, not only as to their thoughts on the success of the training program to date but also as to the possibility of its continuity when the consultant departs in December. They were unanimous about its merits to date and desired that the program should be continued for several more years. All were willing to assume a proportionate part of the funding. They would prefer to have the classes held locally rather than in Naga. The Assistant Minister of Public Highways indicated he would delegate the responsibility for the continuation of the training program to the Director of the FMO in Naga.

If funding is available, it would be very beneficial to have the existing consultancy extended for at least another year. This would enhance the probability of field implementation of the training program. Institutional organization and funding will be critical indicators of recognition of the crucial importance of continuity in maintenance training efforts.

Table B.1

IFB Equipment List

<u>Equipment</u>	<u>Cam. Sur</u>	<u>Albay</u>	<u>Naga</u>	<u>Iriga</u>	<u>Total Units</u>	<u>Cost \$ Unit (000)</u>	<u>Total Cost (000)</u>
Motor Grader	3	3	1	1	8	65	520
Road Roller Stl.	3	2	1	1	7	35	245
Road Roller Pneum.	2	1	1		4	25	100
Truck Dump 4m ³	12	10	6	4	32	28	896
Small Trailer	1	1			2	20	40
Truck-Pick up	3	3	1	1	8	13	104
Dozer D.4 class	1		1	1	3	50	150
Loader 1 3/4 c.v.	1	1	1	1	4	50	200
Backhoe Loader	2	2	1	1	6	45	270
Conc. Mixer 2 bg.	2	2	1	1	6	9	54
Air Compressor 125 cfm.	2	1	1	1	5	11	55
Water Pump, 3"	4	2	2	1	9	2	18
Truck, Water	2	2	1	1	6	28	168
R.C. Kettle (100 gal)	4	2	1	1	8	6	48
Vib. Compact	4	2	2	1	9	4	36
Transportation for Personnel-Jeep	1	1	1	1	4	9	<u>36</u>
							2,940

TOTAL AMOUNT \$2,940,000

All unit costs include parts and supplies allowance of approximately 10%.

Table B.2 - List of Work Methods Audio-Visual Presentations
Prepared by MPH Manpower Development Service

ROAD MAINTENANCE

- . Vegetation Control
- . Erosion Control (2 parts)
- . Cleaning Minor Drainage Structure
- . Hand Cleaning of Ditches
- . Repair of Minor Drainage Structures (2 parts)
- . Spot Patching with Tremix
- . Spot Patching by Penetration (2 parts)
- . Skin Patching
- . Spot Patching with Gravel
- . Grading Unpaved Surfaces
- . Grading Unpaved Shoulders
- . Regravelling
- . Road Sign Maintenance

Training

- . Training Orientation (2 parts)
- . Ring Master Operation

Equipment Servicing

- . Introduction to Preventive Maintenance (2 parts)
- . Basic Daily Maintenance (2 parts)
- . Special Daily Maintenance for Rollers
- . Special Daily Maintenance for Heavy Equipment
- . P/M Walk-Around Inspections and Roads Tests
- . P/M Lubrication (2 parts)
- . P/M for Air Cleaners
- . Basic P/M for Batteries
- . Intermediate P/M for Electrical Systems
- . P/M for Diesel Fuel Systems
- . P/M for Diesel Engines
- . P/M for Clutches

Table B.3

REASONS FOR THE EXCESSIVE DELAYS IN THE SUPPLY OF SPARE PARTS TO MAINTENANCE EQUIPMENT IN THE PEO MOTOR POOL OF CAMARINES SUR PROVINCE

A very large percentage of the equipment in the PEO motorpool of the Camarines Sur province is presently out of commission due to lack of spare parts. This represents a large cost to the province and also the overall economy of the Philippines. The evaluation team was not able to estimate this cost because of lack of clear records on the number of and reasons for the deadlined equipment.

There are a number of reasons for the excessive amounts of immobile equipment in the motorpool of the PEO. Of these, the most important are:

1. Much of the equipment is excess property equipment that was not properly overhauled, and continues to require an excessive number of repairs to keep going (some poorly rehabilitated before provided to province).
2. Inadequate driver training and driver attitudes cause rough handling and unnecessary breakdowns.
3. The equipment receives inadequate preventative maintenance.
4. There are long delays in procuring spare parts due to inflexible administrative procedures and lack of funds.

Of the above reasons, the most important by far appears to be the excessive delays in the procurement of spare parts. When a part is needed and this applies to expensive parts such as a crankshaft as well as small parts like a fanbelt, the following chain of events must be completed before the part can be installed:

<u>Event</u>	<u>Minimum Time Required</u>
1. The PEO prepares a requisition.	1 day
2. The provincial governor approves the requisition when available.	1 week
3. The provincial treasurer checks the availability of funds. If funds are not available due to, for example, the quarterly allotment of the central government for maintenance being delayed, the treasurer must delay approval until the allotment arrives.	1 week

<u>Events</u>	<u>Minimum Time Required</u>
4. According to PD 526, a schedule of bids is solicited.	1 week
5. Contractors present bids and the committee of awards selects the successful contractor.	1 week
6. The provincial contractor prepares a purchase order.	1 week
7. The contractor delivers the part.	10-15 days
8. The new part is inspected by representatives of the provincial auditor, treasurer, and governor's office, and they prepare a "waste materials" report on the old part.	1 week
9. The part is ready for installation.	

At best, therefore, it takes 6-8 weeks to procure a spare part. This time can be far exceeded if essential persons in the approval chain are not available due to holidays, business trips, or for other reasons. Further, delays occur if the part is not available in the province, but must be procured from Manila. In that case, the inspectors must travel to Manila to perform the various physical inspections. According to the Camarines Sur PEO, the total delays in the procurement of a spare part can easily take 5-6 months.

An obvious solution would be to allow the province to maintain a stockpile or reserve of parts from which withdrawals can be made with very little time delay. The stockpile could be replenished at the slow and cumbersome process described above, but time delays in the replenishment of the stockpile would not have a serious effect on the availability of equipment, though inventory costs might be significant.

The PEO of Albay province and the City of Iriga have obtained permission from the governor or mayor and the provincial and city auditors to maintain a small stockpile (less than ₱100,000 in value) of fast moving replacement parts. This has greatly reduced the downtime of their maintenance equipment. According to the Camarines Sur Treasurer, a request by the PEO for such a parts reserve would receive favorable consideration provided the value is less than ₱100,000 and a warehouse (one is presently under construction) with a secure storage is available.

D. Socio-Economic Monitoring of the Project

The evaluation plan for the Secondary and Feeder Roads Project relies on the special Bicol Roads Evaluation Project (BREP). It is headed by a project manager (who is also an attorney). It will evaluate sub-road projects in terms of their impact on income, income distribution, agricultural production, and mobility. The BREP is under the BRBDFO Program Management Department which reports directly to Management Department which reports directly to the BRBDP Program Director. The BREP monitors the progress of the roads program through a series of annual and quarterly studies and publishes the results as Annual Panel Surveys, Quick Look Surveys, and Small Surveys.

1. Panel Surveys

The groundwork for the Panel Surveys was laid in 1974 by the Social Survey Research Unit (SSRU) of the Institute of Philippine Culture (IPC). In April 1974, SSRU interviewers visited a random sample of 3240 households in the 33 municipalities of Camarines Sur. A broad spectrum of data was collected to be used as a baseline against which to measure socio-economic progress in the Camarines Sur portion of the Bicol Program. During 1974 and 1975, a number of research reports (16) were published on the results of the surveys. Of particular interest from the point of view of impact evaluation are the reports #2 on rice farm harvests and practices; #8 on employment; #10 on unemployment and underemployment; #9 on travel patterns; #13 on household incomes and expenditure patterns; and #16 on the availability of the various travel modes between municipalities in the Camarines Sur Province and the passenger travel costs.

It appears that the 1974 Panel Survey offers a satisfactory baseline against which to measure progress in income patterns, income distribution, and mobility. However, it applies to the Bicol River Basin area and does not enable assessment of the incremental impact of the Bicol Roads Project. Further, it applies only to Camarines Sur Province. No 1974 baseline data are available for Albay Province, a portion of which is included in the project area. Finally, the compatibility between the data collected during the 1974 surveys and subsequent panel surveys discussed below should be carefully verified.

In 1978, a second Panel Survey called the Bicol Multipurpose Survey was sponsored jointly by the Bicol Program Office and USAID. The Field Survey was conducted by IPC/SSRU. This survey was an improvement on the 1974 survey in that it covered all three provinces under the Bicol Program and included more questions on mobility (trip frequency, trip purpose, travel times and costs) especially in relation to health and educational facilities. It also included questions on vehicle ownership, and placed a greater focus on agricultural, economic and health issues. However, even though the survey covered a larger area, the sample size of 1906 households

was smaller than that for the earlier survey. The EMS was completed in early 1979 and the tapes and hardcover tabulations will be made available in the near future at various locations in the Philippines for analysts. The BRDPO is contracting some analytical studies utilizing USAID grant funds. There are plans to repeat the field survey in 1981.

Currently, another survey utilizing a modified EMS format is in progress under the auspices of the BRDPO. This survey, called the BRDP/EREP Panel Survey 1, started in January 1978. The household interviews for the Roads Sub-Project 1 zone of influence (San Isidro-Libmanan-Cabusao secondary and feeder roads) were completed in that year by the BRDPO. A contract was awarded (P500,000) to the Executive Management Group, Inc. (EMGI) of Manila to collect the survey information on the other road projects, to prepare the data for computer processing, and to process the data. The special project is scheduled for completion in February 1980. The survey is behind schedule. EREP personnel advised they had not yet worked with EMGI people.

The purpose of the Panel Survey 1 apparently is to collect baseline data that would focus more on the zones of influence of the project roads and be more transport related than was the case for the 1974 Panel Survey and the EMS of 1978. However, comparison of the questionnaires of the EMS and the Panel Survey I does not reveal a great deal of difference in the types of questions asked, either in socio-economic areas or in the transport area. The Panel Survey 1 goes into slightly more detail in trip purpose classification and asks the respondent to indicate his level of satisfaction with travel conditions at the time of the survey.

The last two Panel Surveys discussed above appear to offer a satisfactory baseline against which overall socio-economic progress of all development packages, including the overall Bicol Program and the Bicol Roads Project, can be measured. It also appears possible to use these surveys in assessing the incremental impact of the Bicol Roads Project on the mobility of the general population residing in the Bicol Region. However, they cannot be used for measuring the incremental impact of the transport improvements on the incomes of farmers or for ex-post justification of the design standards for the roads. For the latter purpose, traffic counts on the project roads after they are completed would be necessary.

2. Quick Look Surveys

The Quick Look Surveys are basinwide, as opposed to the Small Studies which focus on specific municipalities, and are used to assess the impact and performance of a single project in the Bicol Basin. The evaluation plan calls for at least two of these to be completed each year. One study has been completed to date, and a second study is in progress.

A Quick Look Survey completed recently (the Pre-construction Report) attempts to develop transport-related baseline data necessary for assessing the impact of the Bicol Roads Project. The interview technique was used to collect information from truck operators on vehicle operating costs, volumes of cargo transported and tariffs; from wholesalers, sugarcane operators, copra dealers, and grain millers on sales volumes, origins and destinations of stocks, and transport costs and handling charges; and from operators of passenger vehicles for information on passenger load factors, vehicle utilization, and passenger fares. The study therefore is a combination transportation census and study of the marketing/distribution channels for some of the important products of the region.

The need for this Pre-Construction Survey arose due to the lack of this type of information in the panel surveys. It was successful in collecting a significant amount of information. However, it appears that the reliability of the data is not sufficient to warrant its use as a baseline for future assessment of the impact of the Bicol Roads Project. A major problem is that the information as collected from the respondents was not adequately checked for accuracy and reasonableness. To cite just one example, the data collected on vehicle operating costs (Table A-VI) shows fuel costs as a percentage of total vehicle operating and maintenance cost varying from 9 to 73 percent. This range is unacceptable and indicates misunderstanding of the question by the respondent, errors in transcribing the information or inaccurate record keeping.

It is suggested that this Pre-Construction Survey be repeated with more emphasis placed in obtaining accurate data. In addition, consideration should be given to expanding the size of the sample. Technical assistance (combination of Filipino and U.S.) to the BREP to assist in the design and execution of this study is recommended.

3. Small Studies

These studies are meant to focus on subregions or municipalities. They are designed to generate information required for planning or evaluating the impact of area specific projects. One such study has been completed and another is in process. Both of these are, in fact, basinwide and might be more appropriately called a quick look survey.

The first small survey addressed the ability of the provinces and cities to provide funds for the maintenance of their road systems. It is based on straight line projections of a short time series of aggregate historical incomes and expenditures. It concludes that funding will not be a constraint in the execution of adequate maintenance. Though the conclusion may be valid, the means by

which it was arrived at is open to question. It may be worth considering the institution of a follow-on study which goes into more detail on the various sources of revenue and expenditure categories by the provinces and cities. Projections of each of these income and expenditure categories under various assumptions as to the state of the overall Philippine economy and possible development in the Bicol Region may provide a more satisfactory basis for assessing the availability of funds for maintenance than the highly aggregated approach followed in the study. This can be programmed and funded under the Bicol Grant project. (See Appendix 7 and 8.)

A second small study aims at assessing the capability of the provincial engineering departments to adequately maintain the local road network. It focuses on the availability of manpower and the availability and operating condition of the maintenance equipment. The study is now being prepared in draft form and should be available in the near future.

A small study currently in progress is the Employment Generation Study. The purpose of this study is to monitor the utilization of local labor on the road construction projects and to estimate the impact of the road projects on reducing unemployment in the Bicol Region. This study is far behind schedule because of difficulties in obtaining the information from road contractors. Most of the contractors claim they do not have time to fill out the simple questionnaires. Additionally, BREP lacks sufficient authority to directly contact contractors. For example, to obtain information on contractor's labor force, the evaluation team was advised the request has to be routed via a chain of command, e.g., from BREP to the Program Management Department (PMD) to the Program Management Office (PMO) to the A&E supervisor to the contractor. It has not proven possible to conduct a survey under such circumstances.

4. Findings and Recommendations

The BREP Office has a vital role in the monitoring and evaluation of road project impacts and providing staff recommendations for remedial action where necessary. Though staffed by dedicated and well educated personnel, the staff lacks experienced senior technical expertise in the design and execution of sophisticated surveys, such as attempted in the Fuel, Quick Look, and Small Studies. Furthermore, it appears they have not supervised the work of survey consultants. There has also been high attrition in BREP. It is therefore recommended that technical assistance (Filipino-U.S.) be provided to the BREP. Such consultant(s) should be highly qualified in the design and execution of surveys aimed at measuring the impact of transport projects. It is also recommended that the BREP be given more authority to request data from construction contractors.

Though the Panel Surveys appear to provide satisfactory information to measure increases in mobility in the Bicol that can be attributed to the Bicol Roads Project (though this should be carefully verified), there is also a need to collect baseline traffic flow information in the two-province Bicol Roads project area. Traffic flow information will provide an estimate of the increases in income that can be expected from reductions in vehicle operating costs. More importantly, the provisional findings of this evaluation team suggest that the government may want to reanalyze the decision to concretize certain road sections. Traffic flow information will be essential for any anticipated ex-post justification of the pavement design standards. Traffic counts and Origin-Destination studies should be started as soon as possible. This is normally the function of the Ministry of Public Highways, and they should be urged to expand their program of traffic surveys in the Bicol Region. If this cannot be done in time, an alternative would be to conduct such a survey by the Bicol Roads Project Office using the resources of the BREP.

E. Economic Analysis

In the 1977 Revaluation Study of the Bicol River Basin Development Project Secondary & Feeder Roads (hereafter referred to as the "Revaluation Study"), it was recommended that the design standards of several of the roads be upgraded by (a) increasing the height of their centerlines above the waterline and (b) substituting PCC and AC pavement for the originally proposed DBST pavement. The first recommendation appears quite appropriate for those roads located in areas that are frequently flooded, and the increased cost of earthworks, right of way and the like appear justified. However, the decision to upgrade the pavement quality was made without the benefit of a complete economic analysis. Though the upgraded roads, in spite of their higher cost, still appear economically feasible (in that their discounted (at 15%) benefits exceed the costs), the decision to upgrade was very costly. The DBST alternative was not included as an alternative in the Revaluation Study. Had it been included, it would have yielded a far greater excess of benefits over costs.

This section of the report first estimates the economic rate of return of the upgraded roads, as of August 1979. It takes into account the unexpectedly high escalation of prices. It then reappraises the upgrading decision and calculates the cost to the Philippine economy of not selecting the DBST alternative.

The evaluation team judged that reappraising the almost completed San Isidro-Libmanan-Cabusao secondary road would give a reasonably valid indication of the impact of price escalation on the economic feasibility of all the BSFRP secondary roads. This road has the advantage that costs are well defined, and the traffic already using the road provides a good check on the projections developed in the Revaluation Report. It was not possible within the time available

to the evaluation team to reappraise the feeder roads. Their economic feasibility depends to a large extent on the generation of a higher value of agricultural production. Measuring this value would have been difficult and premature due to the gestation lags and the relatively short time these roads have been open to transport.

1. Reappraisal of the Economic Feasibility of the Bicol Roads Project

In view of the sharp rise in cost of fuel, cement and construction materials in general and the additional cost of upgrading from DBST to FCC and AC pavements, the economic feasibility of BSFRP was submitted to an updated reanalysis by the evaluation team. This section of the report reappraises the economic feasibility by (a) calculating the escalation in construction cost from April 1977 to August 1979, (b) estimating the escalation in benefits during the similar time period, (c) adjusting the costs and benefits originally presented in the 1977 Revaluation Study, and (d) recalculating the values of the economic indicators (economic rate of return, benefit/cost ratio, net present value). In addition, since vehicle traffic is a crucial element in estimating benefits, traffic counts were taken on the Libmanan-San Isidro road (which is already open to traffic and will be officially dedicated in September 1979) to check on the original traffic projections.

Tables D.1, D.2, and D.3 show the calculations for estimating the increase in vehicle operating costs. Table D.1 presents the escalation in prices of the individual items such as the cost of fuel, maintenance, etc. that constitute vehicle operating cost. Table D.2 adjusts the April 1977 vehicle operating cost to August 1979. Jeepneys show the largest percentage increase in the running cost component (62%), followed by cars (52%) and bus/truck (27%). Cars have the largest increase in fixed costs (25%), followed by jeepneys (15%) and bus/truck (5%). All passenger vehicles have the same increase in time costs (50%). Table D.3 develops the adjustment factor to convert April 1977 vehicle operating cost savings to August 1979 values. The adjustment factor derived here is 1.32, i.e., benefits derived from vehicle operating cost savings increased 32%, during the 1977-1979 time period.

Since vehicle operating cost savings are by far the largest component of benefits on secondary roads, the adjustment factor of 1.30 was used to adjust the 1977 benefits in the revaluation study to the August 1979.

Table D.4 shows the adjusted costs and benefits for the San Isidro-Libmanan-Cabusao road. Construction costs were assumed to have increased by 15% during 1978 and 27% by 1979 over the costs as estimated in the Revaluation Study and as estimated by the BSFRP and evaluation team engineers.

Benefits were estimated under two assumptions concerning traffic. One benefit time stream was estimated using the original traffic projections as made in the Revaluation Study. A second benefit time stream was estimated assuming that the traffic would be only .658 x the projected traffic. The latter may be a very conservative assumption and is based on the traffic observed on the San Isidro-Libmanan road section during the traffic counts of August 1, 2, and 3, 1979 before the road was officially opened (see Tables D.5 and D.6). Though the road was finished except for minor details such as painting the centerline, etc., traffic may still be in process of building up and substantial increases might yet be observed by next year.

The Internal Rate of Return (IRR) for the San Isidro-Libmanan-Cabusao road after making the indicated adjustments for price escalation is estimated at 24.8% assuming adequate maintenance and that the projected traffic materializes. It is 17.7% if the shortfall in traffic corresponds to the August traffic count. The Benefit/Cost ratios are 1.82 and 1.20 respectively. Thus, even assuming a shortfall in traffic, the road appears economically highly feasible. However, as discussed in the next section, the upgrading of the road from DBST to PCC is not economically justifiable as the economic returns would have been much higher if the original DBST design specifications had been followed.

It is also worth noting that, if the required maintenance is not applied, the IRR of the road would drop to 16.3% under the assumption that traffic materializes as projected. It would fall to 9.7% if the observed August 1979 traffic is a true indicator of actual traffic. (See Table D.7.) Thus, lack of maintenance would seriously degrade the economic feasibility of even a road with PCC pavement. The analysis supporting the conclusion, though somewhat rough, is shown in Table D.7. It is assumed that, without maintenance, the road would have to be rehabilitated with an AC overlay every tenth year. In addition, vehicle operating cost savings would gradually decrease until, by the tenth year, they reached a value of only one-third the value for a well-maintained road. Immediately after rehabilitation, the vehicle operating cost savings would be restored to the value corresponding to a well maintained road and the cycle would be repeated. To repeat, the analysis is rough. It is the evaluation team's hope that the government will conduct a more detailed analysis of this important issue.

Table D.1. Increase in Motor Vehicle Operating Costs, April 1977-August 1979

<u>Item</u>	<u>Price</u>		<u>Percent Increase</u>
	<u>April 1977</u>	<u>August 1979</u>	
regular gasoline	₱1.45/liter	₱2.85/liter	96
diesel fuel	₱1.16/liter	₱1.74/liter	50
lubricating oil	₱6.00/qrt	₱9.10/qrt	52
tires	₱267.9/tire	₱304.15/tire	13
maintenance	unknown	unknown	15 (estimated)
capital:			
car	₱28,000/unit	₱35,000/unit	25
jeepney	32,000/unit	37,000/unit	15
bus	94,000/unit	99,000/unit	5
truck	unknown	unknown	5 (estimated)
time cost ¹	₱8/day	₱12/day	50

Source: BREP and Evaluation Team Estimates.

¹ Assumes the government will increase the minimum wage from 8 pesos per day (April 1977) to 12 pesos per day in August 1979.

Table D.2. Adjustment of Vehicle Operating Cost from April 1977 to August 1979 prices.

Basic Running Cost Per Vehicle Per Kilometer (centavos per km)

	Cars	Jeepney	Bus	Truck
Fuel	11.70 x 1.96 = 22.932	12.94 x 1.96 = 25.36	20.24 x 1.50 = 30.36	27.22 x 1.50 = 40.83
Lub	.75 x 1.52 = 1.140	.82 x 1.52 = 1.25	1.91 x 1.52 = 2.90	2.22 x 1.52 = 3.37
Tires	1.68 x 1.13 = 1.90	1.73 x 1.13 = 1.95	5.29 x 1.13 = 5.98	8.64 x 1.13 = 9.76
Maint	5.98 x 1.15 = 6.88	4.21 x 1.15 = 4.84	13.21 x 1.15 = 15.20	18.47 x 1.15 = 21.24
Capital	8.28 x 1.25 = 10.35	2.72 x 1.15 = 3.13	9.89 x 1.05 = 10.38	15.11 x 1.05 = 15.86

Time Cost:
 Cars - ₱6.72/hr x 1.50 = 10.08 P/hr
 Jeepney - 6.73/hr x 1.50 = 10.09 P/hr
 Buses - 10.10/hr x 1.50 = 15.15 P/hr

This assumes the government will increase the minimum wage from 8 pesos per day (April 1977) to 12 pesos per day effective (retroactively) to May 1979.

Basic Fixed Costs

Cars - .51 P/hr x 1.25 = .64 P/hr
 Jeepney - 3.68 P/hr x 1.15 = 4.23 "
 Buses - 9.41 P/hr x 1.05 = 9.88 "
 Trucks - 9.18 P/hr x 1.05 = 9.64 "

Source: Revaluation Study and Evaluation Team Estimates.

Table D.3 Adjustment of Vehicle Operating Cost Savings to the Year 1979

<u>1977 cost x adjustment factor = 1979 cost</u>	
Savings in running cost (pesos)	
cars	142,764 x 1.52 = 217001
jeepney	197,956 x 1.62 = 320669
bus	629,359 x 1.26 = 868630
truck	669,116 x 1.27 = <u>849777</u>
Total	1,699,225 x 1.51 = 2,256,097
Savings in Fixed Cost (pesos)	
cars	15,021 x 1.25 = 18776
jeepney	190,309 x 1.15 = 21885
Bus	344,819 x 1.05 = 362060
truck	235,146 x 1.05 = <u>246903</u>
Total	785,295 x 1.08 = 846,595
Savings in Time Cost (pesos)	
cars	197,925 x 1.50 = 296888
jeepney	348,038 x 1.50 = 522057
bus	361,890 x 1.50 = 542835
truck	0 <u>0</u>
Total	907,853 x 1.50 = 1,361,780
Total Savings	3,392,373 x 1.32 = 4,464,472

Source: Evaluation Team and Appendix 60 of the Reevaluation Study. Appendix 60 is the only source of information enabling the updating of traffic cost (Calabanga-Tinambac Road) but should be representative of the other roads.

Table D.4. San Isidro-Libmanan-Cabusao Road: Revaluation of Costs and Benefits to August 1979 Assuming Adequate Maintenance of Road. (1000 Pesos)

	<u>Costs</u>	<u>Benefits</u> ¹	<u>Benefits</u> ²
1978	9150 x 1.15 = 10522		
9	9150 x 1.27 = 11620		
80		3644 x 1.30 = 4737	3117
1		3927 x 1.30 = 5105	3559
2		4210 x 1.30 = 5473	3601
3		4464 x 1.30 = 5803	3818
4		4770 x 1.30 = 6201	4080
5		5060 x 1.30 = 6578	4328
6		5372 x 1.30 = 6983	4595
7		5687 x 1.30 = 7393	4865
8		5997 x 1.30 = 7796	5130
9		6318 x 1.30 = 8213	5404
1990		6636 x 1.30 = 8627	5676
1		6914 x 1.30 = 8988	5914
2		7189 x 1.30 = 9346	6149
3		7468 x 1.30 = 9708	6388
4		7774 x 1.30 = 10106	6650
5		8052 x 1.30 = 10468	6888
6		8456 x 1.30 = 10993	7233
7		8864 x 1.30 = 11523	7582
8		9273 x 1.30 = 12055	7932
9		9682 x 1.30 = 12587	8282
2000		10092 x 1.30 = 13119	8632
		IRR = 24.8%	IRR = 17.7%
Discounted Value (15%)	17936	32637	21589

Summary of Economic Indicators

	<u>Benefits</u> ¹	<u>Benefits</u> ²
NPV (1000 Pesos)	14701	3653
IRR	24.8%	17.7%
B/C	1.82	1.20

- ¹ Assuming traffic is projected in feasibility study.
² Assuming traffic as observed in August 1979.

Table D.6. Comparison of Actual Traffic and Projected Traffic for the San Isidro-Libmanan Section of Package I.

	Traffic Observed in August 1979 (Reference 1)		Traffic Projected by Reference 2 for Opening Year (1980)		Traffic Projected by Reference 3 for Opening Year (1975)	
	Vehicles per day	%	Vehicles per day	%	Vehicles per day	%
Cars	92	24.4	157	27.4	48	21.1
Jeepneys	115	30.5	83	14.5	14	7.9
Buses	143	37.9	43	7.5	14	7.9
Trucks	27	7.2	290	50.6	101	57.1
Total	377	100	573	100	177	100

Sources: Reference 1: BREP Three-Day Traffic Count, August 1, 2, and 3, 1979.

Reference 2: Techniks Planners, Inc and Integrated Philconsult Inc. "Reevaluation Study of the Bicol River Basin Development Project Secondary & Feeder Roads," Department of Public Highways, August 1977 (Reference 1)

Reference 3: Bicol River Basin Farm-to-Market Roads, Transport Planning Group, Bicol River Basin Council, Undated (Probably 1974)

Table D.7. San Isidro-Libmanan-Cabusao Road: Costs and Benefits Assuming Continuation of Present Inadequate Maintenance Policy. (PCC pavement) (1000 Pesos)

	<u>Costs</u>	<u>Benefits 1</u> ¹	<u>Benefits 2</u> ²
1978	10522		
9	11620		
1980		4737	3117
1		4445	2925
2		4152	2732
3		3860	2540
4		3568	2348
5		3275	2155
6		2983	1963
7		2691	1771
8		2398	1578
9	6064	2106	1386
1990		3627	5677
1		8027	5282
2		7427	4887
3		6827	4492
4		6227	4097
5		5627	3703
6		5027	3308
7		4427	2913
8		3827	2518
9		3227	2123
2000		2627	1729
		IRR= 16.3%	IRR= 9.7%

¹Assuming traffic as projected in feasibility study.

²Assuming traffic as observed August 1979.

2. Reappraisal of the Pavement Upgrading Decision

This analysis proceeds simply by comparing the economic indicators of the DBST pavement alternative with those of the PCC, AC and DBST/AC alternatives analyzed in the Revaluation Report. Table D.8 presents the economic analysis of the DBST alternative. Construction cost for the DBST alternative include the cost of the upgraded design standards related to raising the road center-line above the water level. Costs for the DBST alternative were estimated by the evaluation team. For the same reason as discussed in the previous section, the reappraisal was done only for the San Isidro-Libmanan-Cabusao road. The evaluation team assumes that because the traffic on the Libmanan road is somewhat higher than that for the other upgraded roads, the conclusions concerning the economic feasibility of upgrading will also hold for the other roads.

As shown in Table D.8, the IRR of the DBST alternative is 34.7%. The NPV and B/C ratio at a 15% discount rate are ₱14.2 million and 2.90 respectively. Table D.9 presents an overview of the economic indicators for the DBST, DBST/AC, AC, and PCC alternatives. Though the NPV of all four alternatives is positive and therefore all are economically feasible, the DBST alternative is by far the superior one. Its NPV is ₱5.3 million (\$700,000) higher than the next candidate, and the construction cost is only ₱10.1 million vs ₱15.3 million for the next cheapest candidate.

The columns in Table D.9 showing the incremental IRR and B/C ratio indicate that the incremental benefit of upgrading the pavement design above DBST is less than the incremental cost. In other words, the evaluation team's analysis indicates that the upgrading is not justified on economic grounds.

It may be of interest to note that the benefit time streams of all alternatives are approximately the same. This is because vehicle operating costs - the major determinant of benefits for secondary roads - do not vary much between the four pavement alternatives. From the point of view of vehicle operation, all four pavements are equally smooth. The loss of NPV is almost all due to the increased construction cost of the higher quality pavements. In total, the evaluation team's provisional estimate is that the additional construction cost due to upgrading exceeds ₱47 million (\$6.3 million). The more durable surface is indeed more expensive.

Finally, as explained in Table A.1 of this report, the upgraded pavement alternatives do not appear justified on technical grounds either. Constructing a high quality DBST pavement is well within the capability of the Philippine construction industry, and typhoon flooding would require only local rehabilitation and might cause road closure for only a few days with minor adverse economic impact

Table D.8. Calculation of the Costs and Benefits of the San Isidro-Libmanan-Cabunao Road with the DBST Alternative (1000 Pesos, August 1979 Prices)

	<u>Costs</u>	<u>Benefits</u>	
1977	1000		
8	5000		
9	4150		
1980		3597	
1		3879	
2		4162	
3		4436	
4		4729	
5		5013	
6		5324	
7		5640	
8		5955	
9		6270	
1990		6589	
1		6860	
2		7136	
3		7415	
4		7700	IRR = 34.7%
5		7975	
6		8383	NPV @ 15% = 14,253,710 pesos
7		8792	
8		9202	B/C @ 15% = 2.90
9		9612	
2000		10023	

Source: Revaluation Study and Evaluation Team.

Table D.9. Comparison of PCC, AC, and DBST/AC Upgrading Alternatives Against DBST Alternatives. (August 1977 prices)

<u>Name of Road</u>	<u>Alternative</u>	<u>Construction Cost (P x 10⁶)</u>	<u>Improvement Level</u>	<u>NPV (P x 10⁶)</u>	<u>Economic Indicator</u>			
					<u>Incremental</u>		<u>Overall</u>	
					<u>IRR</u>	<u>B/C</u>	<u>IRR</u>	<u>B/C</u>
					<u>%</u>			
San Isidro-Libmanan-Cabusao	1	10.1	DBST	14.2	34.7	2.9	34.7	2.9
	2	15.3	DBST/AC	8.9	15%	1	24.2	1.7
	3	17.0	AC	9.5	15%	1	23.6	1.8
	4	18.3	PCC	8.7	15%	1	22.2	1.7

Alternatives: DBST - Double Bituminous Surface Treatment
 AC - Asphalt Concrete
 DBST/AC- Staging: DBST for 1980-1990; AC for 1990-2000
 PCC - Portland Cement Concrete

Note: Estimates for alternatives 1, 2 and 3 are derived from the "Revaluation Study" of August 1977.
 Estimates for the DBST alternative were developed by the Evaluation Team.

3. Estimation of the Cost of Program Slippage

There are at least three losses associated with slippage on the program schedule. First, there are the losses in benefits that would have accrued had a road been completed as scheduled. Second are the costs of real cost increases in construction inputs such as cement, steel, fuel and labor. Third are the additional costs imposed on traffic that is forced to use detours and must travel over the rough surfaces of the roads during the additional time they are under construction.

This section will develop crude estimates of the first two costs. The loss due to escalation of prices is assumed as the product of total construction cost, the annual rate of price escalation, and the number of dry months lost expressed as a fraction of a year. For example, the escalation losses for road project 1 would be:^{1/}

$$P26.416 \text{ million} \times 10\% \times 4/12 = P.881 \text{ million.}$$

Where the construction cost is P26.416 million, the annual rate of increase of construction materials is 10%, and 4 dry months were lost.

The loss in benefits is calculated as the product of the first year benefits and the number of dry months expressed as a fraction of a year. For example, the losses in benefits for road project 1 would be:

$$P3.591 \text{ million} \times 4/12 = P1.197 \text{ million.}$$

The first year benefits (P3.591 million in the road project 1 case) are derived from the Revaluation Study or, if not given there, are assumed equal to 10% of the investment in construction.

Table D.10 presents the losses for each project. In total, the losses due to schedule slippage are approximately P24 million (\$3.2 million), or since the average loss of dry months is 5.9 months, about P4 million (\$.54 million) per month of dry season construction lost. About 46% of this loss is due to price escalation and 54% due to losses in benefits.

To repeat, the analysis is crude and the loss figures merely illustrate the importance of avoiding implementation slippage. The evaluation team hopes the government will undertake a more detailed analysis of this problem which appears to be a concern in all of its ambitious development undertakings.

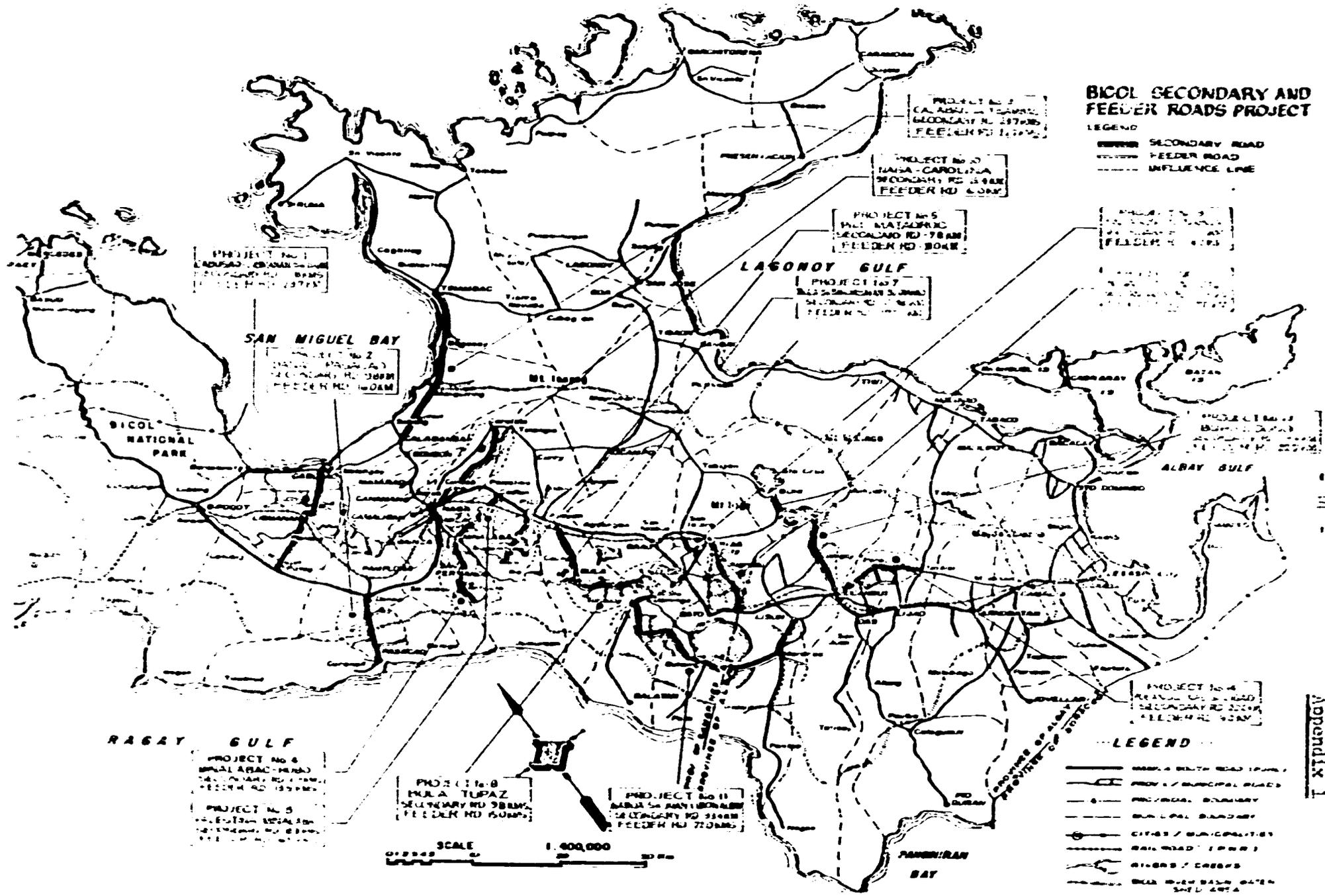
^{1/} This analysis is valid if construction costs increased by 10% a year more than the general rate of price inflation in the economy. If such a relative increase in construction costs is not the case, then this point should be reconsidered.

^{2/} USAID comment: This is a gross benefit loss concept that fails to net out the planned social opportunity costs of the investment saved by the delay. Nor does it consider the delay of higher benefit levels in later years. A conceptually more appropriate measure of net benefits foregone by the delay could be calculated simply by applying the social discount rate for the period of delay to the forecast net present value (NPV) of the project delayed. The difference between the adjusted NPV and the original NPV will represent the net social benefit lost due to the delay.

Table D.10 Losses in Benefits and Price Escalation Due to Program Slippage.

<u>Road Project</u>	<u>Construction Cost</u> (million pesos)	<u>First Year Benefits</u> (million pesos)	<u>Dry Months Lost</u> (months)	<u>Escalation Loss</u> (million pesos)	<u>Benefits Loss</u> (million pesos)
1	26.416	3.591	4	.881	1.197
2	11.634	1.911	8	.776	1.274
3	26.909	4.612	4	.897	1.537
4	12.986	.827	3	.325	.207
5	15.378	.895	8	1.025	.597
6	4.500	.779	9	.338	.584
7	11.489	2.204	8	.766	1.469
8	11.567	1.156	5	.482	.482
10	11.149	1.149	7	.650	.670
11 A	16.705	1.671	6	.835	.836
B	17.278	1.728	7	1.008	1.008
B-1	20.056	2.006	6	1.003	1.003
12	5.307	.530	9	.398	.398
13 A	14.435	1.443	6	.722	.722
B	10.647	1.065	6	.532	.528
14 A	9.200	.920	6	.460	.460
B	1.429	.142	5	<u>.060</u>	<u>.059</u>
Total				11.156	13.030

Source: Revaluation Study and Evaluation Team Estimates.



BICOL SECONDARY AND FEEDER ROADS PROJECT

LEGEND
 [Symbol] SECONDARY ROAD
 [Symbol] FEEDER ROAD
 [Symbol] INFLUENCE LINE

PROJECT No. 1
 CALAPAN - TOWN
 SECONDARY RD. 237000
 FEEDER RD. 137000

PROJECT No. 2
 NAGA - CAROLINA
 SECONDARY RD. 234000
 FEEDER RD. 134000

PROJECT No. 3
 MALABAC
 SECONDARY RD. 238000
 FEEDER RD. 138000

PROJECT No. 4
 MALABAC - TOWN
 SECONDARY RD. 238000
 FEEDER RD. 138000

PROJECT No. 2
 SAN MIGUEL BAY
 SECONDARY RD. 238000
 FEEDER RD. 138000

PROJECT No. 5
 MALABAC - TOWN
 SECONDARY RD. 238000
 FEEDER RD. 138000

PROJECT No. 6
 MALABAC - TOWN
 SECONDARY RD. 238000
 FEEDER RD. 138000

PROJECT No. 6
 MALABAC - TOWN
 SECONDARY RD. 238000
 FEEDER RD. 138000

PROJECT No. 8
 NULA - TUPAZ
 SECONDARY RD. 238000
 FEEDER RD. 138000

PROJECT No. 11
 MALABAC - TOWN
 SECONDARY RD. 238000
 FEEDER RD. 138000

PROJECT No. 4
 MALABAC - TOWN
 SECONDARY RD. 238000
 FEEDER RD. 138000

LEGEND
 [Symbol] NATIONAL HIGHWAY
 [Symbol] PROV. / MUNICIPAL ROAD
 [Symbol] PROVINCIAL BOUNDARY
 [Symbol] MUNICIPAL BOUNDARY
 [Symbol] CITIES / MUNICIPALITIES
 [Symbol] RAILROAD (FORMER)
 [Symbol] RIVERS / CREEKS
 [Symbol] SEA LEVEL BATHYMETRY
 1:50,000

SCALE 1:600,000

Appendix I

Results of the Three-Day BREP Traffic Count, August 6, 7 and 8 on the Pili-Matabrac Secondary Road.

Station	Day	Period	Cars	Jeeps	Bus		Truck		Tr-Trailer or Semi-trailer	T-cycle	Total (ex-tricycle)
					Mini	Large	Medium	Large			
2	8/6/79	am	3	33	0	0	3	0	0	34	39
		pm	0	35	0	0	2	0	0	17	37
2	8/7/79	am	3	14	0	0	0	0	2	29	19
		pm	4	28	0	0	0	0	0	13	32
2	8/8/79	am	0	17	0	0	0	1	0	18	18
		pm	1	17	0	0	0	0	0	8	21
Total (including)			9.7	48.0	0	0	1.7	.3	.7	29	99.3

Note: The average daily traffic on station 1 located on the sidebranch feeder road consisted of 2 cars, 4 jeeps, and 11 tricycles.

Vehicles belonging to construction contractors are excluded from the counts.

Comparison of Actual Traffic and Projected Traffic for the Pili-Mataooc Secondary Road.

	Traffic Observed In August 1979 (Reference 1)		Traffic Projected by Reference 2 for Opening Year (1980)		Traffic Projected by Reference 3 for Opening Year (1975)	
	Vehicles per day	%	Vehicles per day	%	Vehicles per day	%
Cars	6	10.7	30	23.3	19	14.2
Jeepneys	48	85.7	22	17.1	33	24.6
Buses	0		2	1.6	2	1.5
Trucks	2	3.6	75	58.1	80	59.7
Total	56	100	129	100	134	

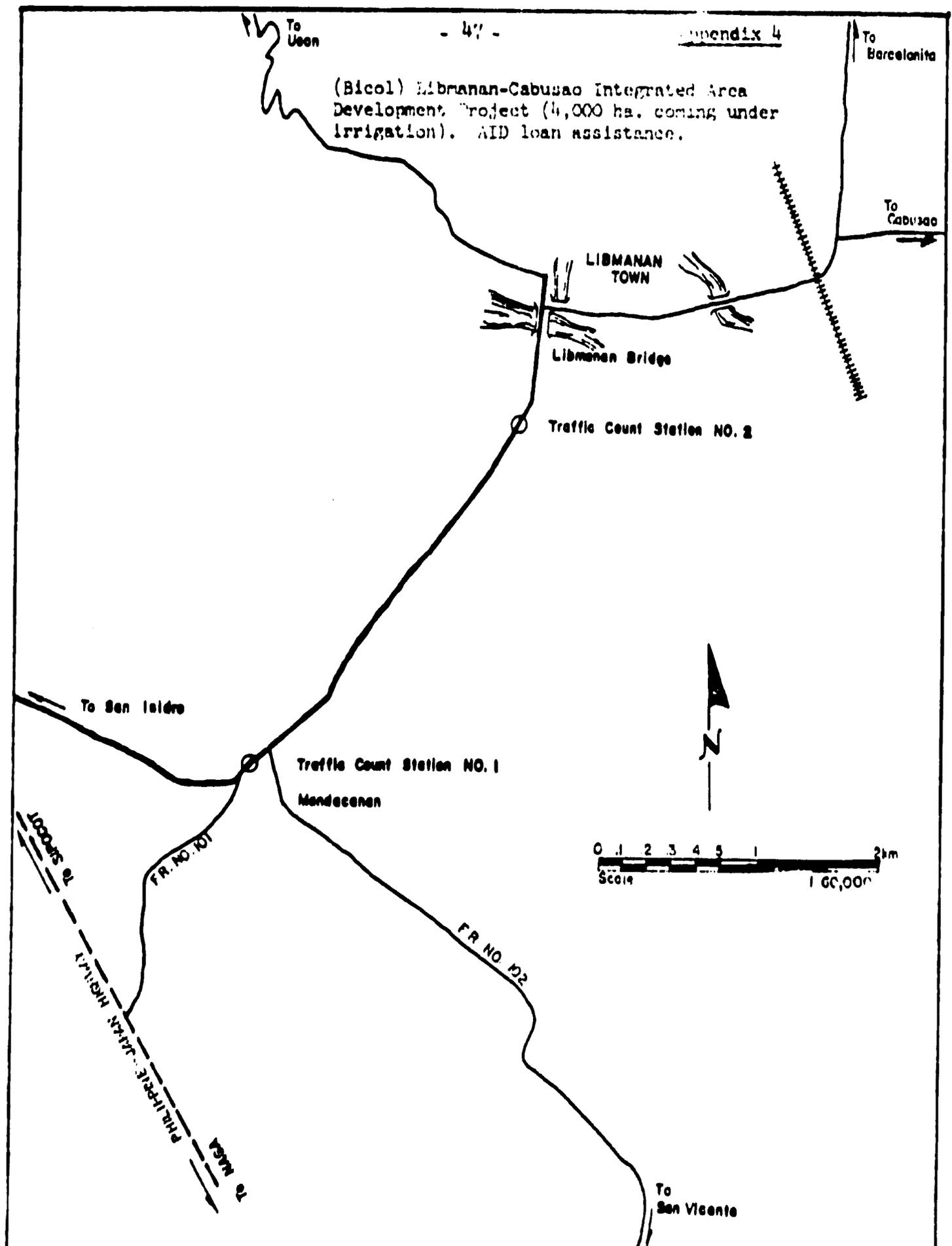
Sources: Reference 1: BREP Three-Day Traffic Count, August 1, 2, and 3, 1979.

Reference 2: Techniks Planners, Inc. and Integrated Philconsult Inc. "Reevaluation Study of the Bicol River Basin Development Project Secondary and Feeder Roads," Department of Public Highways, August 1977 (Reference 1).

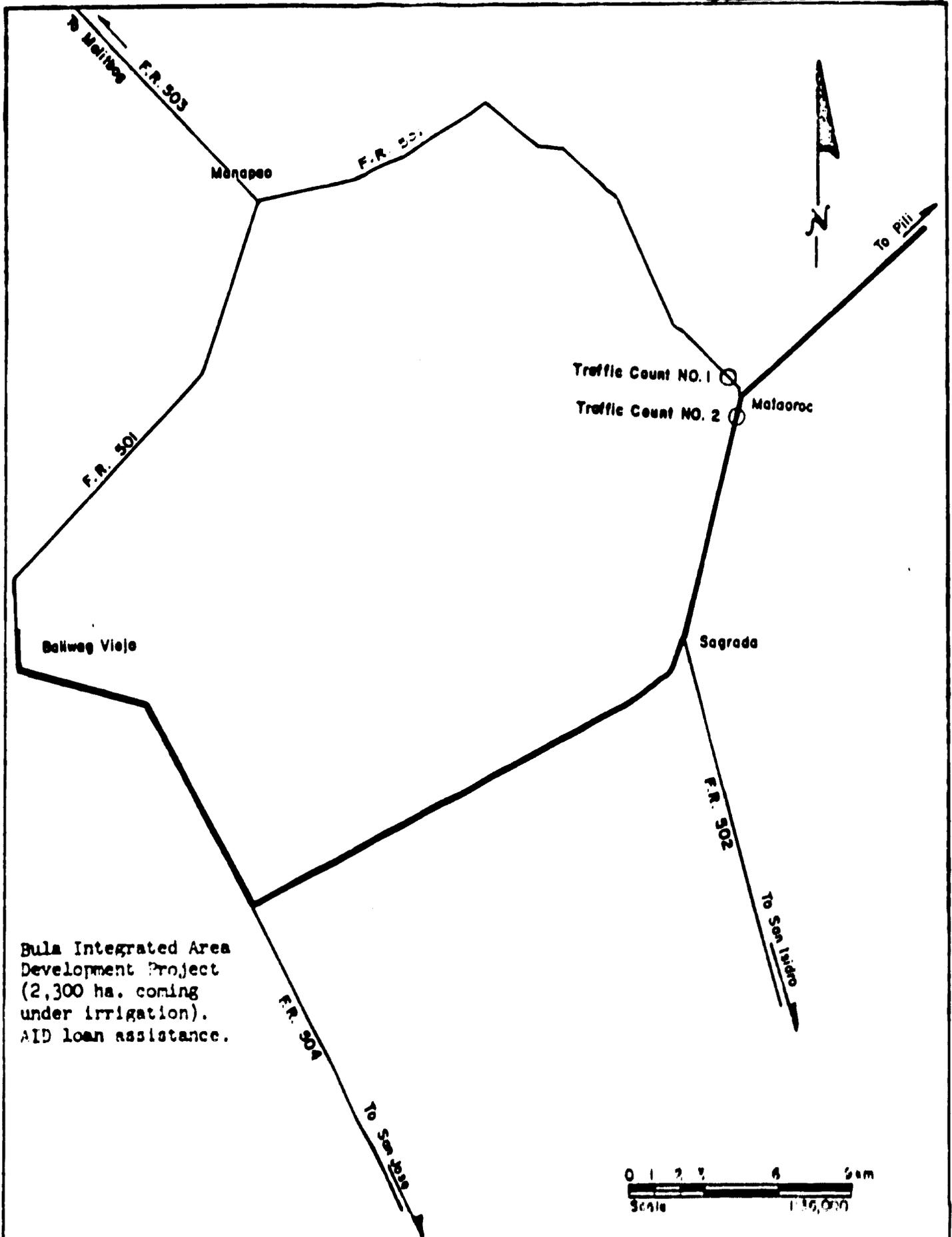
Reference 3: Bicol River Basin Farm-to-Market Roads, Transport Planning Group, Bicol River Basin Council, Undated (Probably 1974).

Vehicles belonging to construction contractors are excluded from the counts.

(Bicol) Libmanan-Cabusao Integrated Area Development Project (4,000 ha. coming under irrigation). AID loan assistance.



LOCATION OF TRAFFIC COUNTING STATIONS
San ISIDRO-LIBMANAN ROAD



Bula Integrated Area
Development Project
(2,300 ha. coming
under irrigation).
AID loan assistance.

**LOCATION OF TRAFFIC COUNTING STATIONS
PILI-MATAOROC ROAD**

Comparison of MPH and PED Unit Construction Costs (1979)
with Contract Bid and Government Estimate (1979)
(Pesos)

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>MPH</u>	<u>PED</u>	<u>Contract Bid</u>	<u>Govt. Est.</u>
105	Road and Drainage Excavation	cu.m.	4.00	5.22	23.00	21.00
107	Common Borrow	cu.m.	20.00	1.00	32.00	29.00
100	Selected Borrow	cu.m.	31.00	25.00	54.00	51.00
200	Aggregate Base Course	cu.m.	51.00	30.00	61.00	62.00
314 (2)	Single Bituminous Surface Treatment	M.T.	-	-	2,600	(neg.)
314 (3)	Double Bituminous Surface Treatment	M.T.	-	-	3,040	3,000
310	Bituminous Concrete (AC)	M.T.	-	-	354	285
405	Class "A" Concrete	cu.m.	450.00	480.00	738.00	748.00
406	Reinforcing Steel	kg.	5.20	5.20	7.10	7.15
413.A	Reinr. Conc. Pipe - 36" dia.	L.M.	235.00	230.00	632.00	633.00
	Ave. Box Culvert Single Barrel:				L.M. computed by Eng. Div. = 3,640	3,770

Source: Project Paper (page 30)
P.10

**Revenues and Expenditures of the
PROVINCE OF CAMARINES SUR, 1977-1978
(P000)**

<u>Revenue Categories</u>	<u>FY 1977</u>	<u>FY 1978</u>
A. General Revenue Fund		
1. Real Property Taxes	681	654
2. Other Receipts	<u>7,001</u>	<u>8,303</u>
Subtotal	7,682	8,957
B. Road and Bridge Fund		
1. Real Property Taxes	226	224
2. Other Receipts	<u>4,893</u>	<u>8,969</u>
Subtotal	5,124	9,193
C. Road and Bridge Maintenance Funds	<u>2,142</u>	<u>3,079</u>
TOTAL REVENUE	<u><u>14,948</u></u>	<u><u>21,229</u></u>

Source: Provincial Treasurer's Office, Camarines Sur.

51

Revenues and Expenditures of the Province of Albay
1976-78
(P)

<u>Revenue Categories</u>	<u>FY 1976</u>	<u>FY 1977</u>	<u>FY 1978</u>
A. General Revenue Fund			
1. Real Property Taxes	381,546.73	443,133.27	458,903.05
2. Other Receipts	<u>5,221,270.90</u>	<u>6,387,312.40</u>	<u>7,069,266.20</u>
Subtotal	5,602,817.63	6,830,445.67	7,528,169.25
B. Road and Bridge Fund			
1. Real Property Taxes	139,228.60	144,241.22	152,050.22
2. Other Receipts	<u>2,032,621.42</u>	<u>368,492.07</u>	<u>2,840,144.46</u>
Subtotal	2,171,850.02	512,733.29	2,992,164.68
C. Road and Bridge Maintenance Funds			
TOTAL REVENUE	<u>9,377,148.65</u>	<u>10,608,686.96</u>	<u>12,589,333.93</u>

Source: Provincial Treasurer's Office, Albay.