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**PROJECT COMPLETION REPORT**

**BRAZIL**

**NORTHWEST REGION DEVELOPMENT PROGRAM HIGHWAY PROJECT  
(LOAN 2062-BR)**

**APRIL 15, 1991**

Infrastructure Operations Division  
Country Department I  
Latin America and the Caribbean Region

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## GLOSSARY

BNDE	Banco National de Desenvolvimento Economico (National Economic Development Bank)
DER-RO	Departamento de Estradas de Rodagem de Rondonia (Rondonia Roads Department)
DNER	Departamento Nacional de Estradas de Rodagem (National Roads Department)
POLONOROESTE	Programa Integrado de Desenvolvimento do Noroeste do Brasil (Northwest Development Program)
SAP	Special Action Program
TA	Technical Assistance
Vpd	Vehicle Per Day

Office of Director-General  
Operations Evaluation

April 15, 1991

MEMORANDUM TO THE EXECUTIVE DIRECTORS AND THE PRESIDENT

SUBJECT: Project Completion Report on Brazil Northwest Region Development  
Program Highway Project (Loan 2062-BR)

Attached, for information, is a copy of a report entitled "Project Completion Report on Brazil Northwest Region Development Program Highway Project (Loan 2062-BR)" prepared by the Latin America and the Caribbean Regional Office with Part II of the report contributed by the Borrower. No audit of this project has been made by the Operations Evaluation Department at this time.

Attachment

A handwritten signature in dark ink, appearing to be 'L. P. ...', is written over the signature line.

**BRAZIL**  
**NORTHWEST REGION DEVELOPMENT PROGRAM HIGHWAY PROJECT**  
**(LOAN 2062-BR)**

**PROJECT COMPLETION REPORT**

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NORTHWEST REGION DEVELOPMENT PROGRAM HIGHWAY PROJECT  
(LOAN 2062-BR)

PROJECT COMPLETION REPORT

PREFACE

1. This is the Project Completion Report (PCR) for the Highway Project of the Northwest Region Development Program in Brazil, for which Loan No. 2062-BR, in the amount of US\$240 million, was approved on December 1, 1981. The Loan was closed on September 30, 1988 two years and three months after the original closing date. Approximately US\$42.1 million was canceled from the Loan account in two separate tranches; US\$34.0 million was canceled as of June 30, 1987 and the remaining balance of US\$8.1 million was canceled effective October 14, 1989.
2. The PCR was prepared by the Infrastructure Operations Division, Brazil Department, of the Latin America and the Caribbean Regional Office. The Borrower provided the information in Part II of the PCR.
3. The PCR was prepared in April/May 1990 in line with the Guidelines of June 1989. It is based inter alia on the Staff Appraisal Report, the Loan and Project Agreements, the correspondence files including supervision reports, and on interviews with Bank staff who prepared and supervised the project.

BRAZIL

NORTHWEST REGION DEVELOPMENT PROGRAM HIGHWAY PROJECT  
(LOAN 2062-BR)

PROJECT COMPLETION REPORT

EVALUATION SUMMARY 1/ 2

Project Objectives

1. The project loan was one of three presented to the Board simultaneously, which together formed the first phase of the Bank's participation in an integrated development program for northwest Brazil (POLONOROESTE program). This program was designed to help bring order to the spontaneous settlement of the federal territory of Rondonia, which became a state early in 1982, and the western part of the state of Mato Grosso. The program aimed at increasing the productivity, income, and social welfare of the region's present and future population, and was expected to benefit directly some 18,200 small-scale farm families. At the core of the program was the paving of the heavily travelled and badly deteriorated 1,500 km Cuiaba-Porto Velho road, and the investments required to achieve the balanced socio-economic development of the road's area of influence (paras. 2.02-2.06).

2. As part of the Northwest Development Program, the highway project aimed to: (a) reduce transport costs and improve traffic conditions by providing permanent road transport facilities in the region; and (b) strengthen the institutional capabilities of the

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1/ Since the project was only a part of a program, which also included agricultural, rural development and environmental protection components which, although financed under separate loans, were designed to jointly achieve the stated development objectives, a qualitative assessment of selected aspects of the POLONOROESTE program was prepared jointly by the Infrastructure and the Agricultural Operations Divisions, and the resulting Program Evaluation Overview is presented as an Annex to this report.

2/ The Evaluation Summary, mainly its project result section, incorporates the main findings and conclusions of the assessment of the program against its stated developmental objectives, since most effects of the program cannot be attributed to its specific components, and in particular to the highway project. The rest of the main report presents an evaluation of the highway project against its narrower objectives, i.e. the improvement of road connections and the strengthening of road administration.

Rondonia Highway Department (DER-RO) in order to improve and rationalize the state's road administration, particularly in order to cope with its increased responsibility under the program.

### Project Description

3. The highway project consisted of the following main components:

- (a) reconstruction, including paving of about 1,084 km of highway, between Corrego Campinas (Mato Grosso) and Ariquemes (Rondonia), and consultant services for supervision of construction;
- (b) upgrading of the Rondonia Roads Department's (DER-RO) administrative and implementation capabilities; and
- (c) construction or improvement of about 500 km of feeder roads in Rondonia and of about 488 km in Mato Grosso.

The bulk of the project was to be implemented over the four-year period 1982-85. The other two associated projects were an agricultural development and environmental protection project (Loan 2060-BR) and a health project (Loan 2061-BR) (para. 3.02).

### Project Implementation

4. The Northwest Highway, the major component of the project, was completed satisfactorily at the end of 1984, about a year ahead of schedule. The DER-RO component, involving the institution building of a state highway department, was completed in 1988 after a three year delay. Problems were encountered in the early stage of carrying out the feeder road component but it was satisfactorily completed in 1986. Only about 50% of the Northwest Flood Rehabilitation component, which was added to the project in mid 1985, was finished. The project was completed at a considerable cost savings in US dollar terms (para. 5) but it required increases in the disbursement rates for most components (paras. 5.03, 5.06, 5.08, 5.09 and 5.12).

5. The Project was completed basically at a cost, in constant local currency, equivalent to the appraisal estimate of the base cost plus physical contingencies. But because of the earlier completion of the highway, of payment delays and of the rapid devaluation of the local currency, the dollar equivalent of the payments made by the executing agencies (US\$365.6 million) were substantially less than the appraisal estimate of US\$687 million (Table 4A). Of the Loan amount of US\$240.0 million, about US\$197.9 million was disbursed; the remaining US\$42.1 million was canceled (paras. 5.12 and 5.13).



6. The reduction of design standards for shoulder widths and the asphalt surface requested by the Borrower for reasons of economy, and agreed to by the Bank in an amendment of the Loan Agreement, do not appear to have been appropriate in the light of projected traffic levels (para. 5.04).

7. In retrospect, the emergency flood rehabilitation component added to the project was difficult to supervise since the works were not in the project area. Originally, they were not limited to highway needs and did not appear to have been clearly identified (para. 5.11).

### Project Results

8. In most respects, the program as a whole did not achieve the sound, sustainable economic and social development of the region, which was its basic purpose. However, by establishing and strengthening institutions and initiating important research, it laid the basis for expanded efforts in the future, provided a strong political commitment is backed with adequate resources of staff and funds. A qualitative assessment of selected aspects of the program is presented in the Annex to this report; the main conclusions are summarized hereinafter:

- (a) the construction and improvement of the highway and of the feeder and access roads achieved their main objectives of facilitating migration to the region and giving settlers access to markets and services. But the component to strengthen the DER-RO was less effective; the department is maintaining less than half the roads under its responsibility (paras. 4-7 of the Annex);
- (b) the effort to consolidate land settlement and agricultural production was too small to make a sufficient impact on the region's development. While agricultural production has increased considerably, the long-term viability and environmental consequences of the agricultural development in sensitive frontier lands is still uncertain (paras. 8-18 of the Annex);
- (c) environmental conditions in the area have continued to deteriorate. Deforestation has been rapid and agro-forestry efforts insufficient. Mining has led to extensive water and soil pollution. Biological reserves, ecological stations, as well as a state environment agency, a forestry and a land institutes, and a forestry military police have been established, but insufficient support has limited their effectiveness (paras. 19-27 of the Annex);
- (d) most of the Indian reserves have been demarcated, but protecting the reserves against illegal invasions has been difficult (paras. 30-37 of the Annex); and

- (e) the economic re-evaluation of the program, which was carried out following the general methodology used for the original assessment, led to a new estimated rate of return of 16%, much lower than the above-50% appraisal estimate. Both estimates, however, are of limited significance since they do not allow for important external costs (e.g. the consequences of unplanned deforestation) and benefits (e.g. the building of institutions), which could not be quantified (paras. 6.03-6.05).

9. It seems likely that without the program, migration would have been less or spread over a longer period of time, depending on the Government's ability to complete the highway without Bank assistance, but that agricultural settlements would have been less orderly and productive and that protection of the environment and the Amerindians would have been substantially weaker.

10. There are a number of reasons for the shortcomings, mainly:

- (a) the Government of Brazil was strongly committed to opening up the frontier area to migration, but it gave lower priority to the other components, especially to the protection of the environment and the Amerindians;
- (b) the shortage of counterpart funds remained pervasive during the period;
- (c) the key institutions responsible for the environment were weak and the implementation schedule of the program was not realistic;
- (d) the volume of migration had not been foreseen, and the scale of the program was too small to deal with the impact of such massive migration;
- (e) the phasing of the implementation of different components undermined orderly development. In particular, the early completion of the road accelerated migration before the institutions and policies were in place to assure proper agricultural settlement and protection of the environment and the Amerindians; and
- (f) the arrangements for monitoring and evaluation did not work adequately (para. 35 of the Annex)

#### Project Sustainability

11. Many sections of the highway (about one third in length) are already in a bad condition as a result of inadequate routine and preventive maintenance, insufficient enforcement of the axle load

restrictions, and of the reduction of the design standards for the asphalt surface. DFR-RO was reported to be maintaining about 2000 km of federal, state and municipal roads, or less than half of the roads under its responsibility; the rest of the network was not adequately maintained (paras. 5.04, 5.07 and 7.01-7.03).

12. The average daily traffic on the highway, however, appears to be close to that forecasted at appraisal (para. 7.02, and Part III, Table 5A). The ongoing extension of the Northwest Highway from Porto Velho westward into the state of Acre will result in increased traffic on the project road beyond the growth that has already taken place.

### Findings and Lessons Learned

13. The implementation of the program offers a number of important general lessons:

- (a) given the fragility of the frontier areas, a strategy for frontier development should be carefully weighed against other policies to improve employment opportunities and living standards (para. 44 of the Annex);
- (b) Government commitment to the objectives of a program is always important, but it becomes crucial when the political and economic risks are unusually high, the institutional basis weak and the Government is faced with serious financial difficulties (para. 45 of the Annex);
- (c) a project which is undertaken as an experiment, with limited knowledge of its potential effects, requires an effective monitoring system to quickly identify any misjudgments made in project design and permit prompt remedial actions during implementation (paras. 46-47 of the Annex);
- (d) the integration and the realistic phasing of the program components, which are essential to the success of the whole program, but inherently difficult because of the different agencies involved, need to be fully addressed during project preparation and implementation (paras. 48-49 of the Annex); and
- (e) for programs or projects of this size and complexity, with such major risks, which require effective monitoring and supervision, the Bank should consider the desirability of stationing its own staff in the field (para. 51 of the Annex).

14. The Bank, by financing the road, may have helped to accelerate migration to the region before the institutions were ready to

handle the rapid increase in population. The Bank does not seem to have questioned the basic strategy for development of the Amazon region, and the financial policies which in effect subsidized uneconomic forest exploitation and were, therefore, inconsistent with the program objectives. Nor did the Bank appreciate that the scope of the program was insufficient to address the range and size of the problems which the region faced (paras. 4-7, 18, and 44 of the Annex).

15. On the other hand, the Bank played a valuable role in promoting orderly settlement, strengthening the protection of the environment and of Amerindians, and in encouraging some necessary modifications during implementation (paras. 8-10, 19-27 and 30-34 of the Annex).

16. The highway project was technically well prepared with the exception of the DER-RO institutional strengthening component, which would have benefited from the participation of a training or management specialist in its preparation and appraisal. Unfortunately, such a specialist was not brought in until implementation started (para. 8.04).

17. The informal suspension, in 1985, of disbursements for the overall program may well have been appropriate in securing Government action on certain environmental issues, but it seriously weakened the implementation of the most difficult project component, the development of DER-RO, because the consulting firm withdrew his staff. Under these circumstances, it would have been more appropriate to have exempted this relatively small component from the suspension (para. 8.05).

18. Most amendments to the loan documents, with the exception of the one noted in para. 6 above, particularly those to increase the rate of disbursement of the loan, were appropriate and helpful to the Borrower in light of the rapid devaluation of the local currency and the time required for disbursements (para. 8.06).

19. The Bank assigned a resident highway engineer to the field to supervise the feeder road and DER-RO components of the program and other feeder roads projects in Brazil. This field assignment, as compared to periodic field missions, substantially increased the effectiveness of the Bank in quickly identifying implementation problems and seeking remedial actions, but it was limited to the road components. After late 1987, the Bank's supervision of the project became barely adequate (para. 8.08).

20. The Borrower carried out the construction components of the project expeditiously and competently. The main executing problems were encountered in carrying out the DER-RO component which experienced a three year delay in completion. Furthermore, the Borrower failed to control axle loading and to maintain the highway adequately (paras. 9.01-9.04).

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NORTHWEST REGION DEVELOPMENT PROGRAM - HIGHWAY PROJECT  
(LOAN 2062-BR)

PROJECT COMPLETION REPORT

PART I: PROJECT REVIEW FROM BANK'S PERSPECTIVE

1. Project Identity

Name	: Northwest Region Development Program Highway Project
Loan Number	: 2062-BR
Loan Amount	: US\$240.0 million
RVP Unit	: Latin America and the Caribbean Region
Country	: Brazil
Sector	: Transport
Subsector	: Highways

2. Background

2.01 By the time the above project was presented, the Bank had a long history of lending to Brazil, including eight loans totalling about US\$650 million to the highway sub-sector. The Northwest Regional Development Program represented a concerted effort by the Bank to expand previous lending operations into a coordinated program of roads, health and agriculture in the northwest, the most underdeveloped part of the country. The Government's POLONOROESTE Program was more concerned with the development of the region and thus concentrated primarily on the building of roads.

2.02 This report re-evaluates the highway project of the Northwest Region Development Program. Phase I of this program, was to have been carried out over the years 1981-1986, and was supported by three World Bank loans, totalling US\$320 million, which covered about 35% of the total Phase I project cost. The three loans included:

- (a) the reconstruction of the Cuiaba-Porto Velho Highway, strengthening of the Rondonia Highway Department and construction of feeder roads. Loan 2062-BR which is the subject of this PCR, amounted to US\$240 million;
- (b) the Rondonia Health Project covered by Loan 2061-BR for US\$13 million;
- (c) the Agricultural Development and Environmental Protection Project supported by Loan 2060-BR for US\$67 million.

Phase II of the program included a Mato Grosso Rural Development Project (Loan 2116-BR, US\$26.4 million) and Phase III included a New Settlements Project (Loan 2353-BR, US\$65.2 million).

2.03 The first three projects, which formed the first phase of Bank participation in the Northwest Region Development Program, were appraised and processed in parallel as a package for presentation to the Bank's Executive Directors. The Government's commitment to carry out the entire program, including measures concerning the protection of the rights of Amerindian communities in the Region as well as environmental protection, was reflected in a decree, signed by the President of the Republic on May 27, 1981.

2.04 The Northwest Region covers approximately 410,000 km<sup>2</sup>, about three-quarters the size of France, although slightly less than 5% of Brazil. It included the entire federal territory of Rondonia which became a state early in 1982, and 14 western municipalities in the state of Mato Grosso, all officially considered within the area of influence of the 1439 km Cuiaba-Porto Velho Highway, BR-364 (Map IBRD 14865R2). The regional population was estimated in the neighborhood of 1,060,000 in 1980. The average population density of the region was still less than three inhabitants per km<sup>2</sup>, mostly concentrated in towns and agricultural settlements built along the project highway.

2.05 Highways and roads constituted the core of the Northwest Region's transport system. In 1978, the region was estimated to have exported about 513,000 tons of goods, 98% by truck and the rest by air and river. The vehicles moving these exports brought an estimated 840,000 tons of goods into the Region. There were about 3,000 km of federal highways, including the project highway, which was the spinal axis of the system. In addition, there were about 2,000 km of state feeder roads and 6,500 km of municipal access roads. However, the condition of the road system was clearly a major impediment to development, since most of the roads, particularly in Rondonia, were tracks open only for seasonal use.

2.06 The lack of physical access to markets, which resulted in high levels of crop loss, was recognized as a major constraint in the development of the Northwest Region. The Northwest Development Program consequently placed a special emphasis on the upgrading and paving of the Cuiaba-Porto Velho Highway as well as on the improvement of the feeder road network in the areas of greatest agricultural potential. The Program envisaged construction or improvement of about 2,880 km of feeder roads and about 5,400 km of farm-to-market municipal access roads. The feeder roads, with an estimated cost of about US\$140 million equivalent, were financed under two subprograms: one of 1,530 km in the territory of Rondonia and one of 1,350 km in the state of Mato Grosso. Phase I packages, which covered about 488 km for Mato Grosso and 500 km for Rondonia, were financed under the highway project.

### **3. Project Objectives and Description**

**3.01 Project Objectives:** As part of the Northwest Development Program, the highway project aimed:

- (a) to reduce transport costs and improve traffic conditions by providing permanent road transport facilities in the region; and
- (b) to strengthen the institutional capabilities of the Rondonia Highway Department (DER-RO) in order to improve and rationalize the state's road administration, particularly in order to cope with its increased responsibility under the Program.

**3.02 Project Description:** The project consisted of three main components:

#### **(i) Highway Construction and Operation**

- (a) civil works by contract for upgrading, including paving, of about 1,084 km<sup>1/</sup> of the Northwest Highway between Corrego Campinas and Ariquemes, the construction of four bridges in the Cuiaba-Caceres section, and the construction of three maintenance residences, one weighing station and about nine highway patrol stations and depots along the entire highway;
- (b) consulting services to assist the National Roads Department (DNER) in the supervision of the civil works, and for installing the weighing station; and
- (c) acquisition and installation of (i) a weighing scale; (ii) vehicles and radio units for the federal highway patrol unit; and (iii) equipment, vehicles and traffic counters for monitoring pavement behavior.

#### **(ii) Strengthening of Rondonia's Highway Department (DER-RO)**

Restructuring and strengthening DER-RO's organization and functions to provide for the planning, programming, execution and control of the state's road network. The project would include:

- (a) construction by contract of about 10,000 m<sup>2</sup> of residences, maintenance depots and workshops;

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**1/** The two end sections, Cuiaba-Corrego Campinas and Ariquemes-Porto Velho, totalling 359 km, were being reconstructed and paved by the Army. The overall length of the highway is thus 1443 km.

- (b) acquisition of about 370 units of plant, equipment and vehicles for road maintenance, training and traffic control;
- (c) equipment for offices, laboratories, workshops and stores; and
- (d) technical assistance to improve DER-RO's administrative and implementation capabilities and to train its personnel as well as that of the municipalities.

(iii) Feeder Road Programs in Mato Grosso and Rondonia

- (a) three-year (1982-1984) programs for construction of new, and improvement of existing feeder roads, including 488 km in Mato Grosso and 500 km in Rondonia. Both programs were to be carried out through the National Economic Development Bank (BNDE);
- (b) preparation of further road construction and improvement projects in Rondonia and in Mato Grosso in support of the Northwest Development Program.

4. Project Design

4.01 Preparation: In 1979, shortly after preparation got underway, the Bank recognized that Brazil had graduated from the standard type of highway construction loans, the main objectives of which were:

- (i) to support the delegation of maintenance to the state level and to build up adequate maintenance capacity at that level;
- (ii) to develop adequate programs to meet mounting rehabilitation requirements on federal and state roads; and
- (iii) to support feeder roads programs and improve related planning and financing systems.

The subject highway project was noted in the project brief as unrelated to the above objectives as it was prepared as one component of a comprehensive program to harness the agricultural development of a vast region covering Mato Grosso and Rondonia. However, the program also included specific agricultural development projects and feeder road programs which were similar to previous projects. It was pointed out that "adequate understanding on the main components of the development program for the zone of influence of the project highway would have to be reached before approval of the road construction project", and that a regional development mission to review the program, was in the field looking into these matters.



4.02 Environmental Issues: Following the visit of the Regional Development Mission to Brazil in October 1979, it became apparent that some major environmental aspects of the program, which would be supported by the proposed highway project, needed further review. Over the next year, environmental issues overshadowed preparation of the project. Shortly after the project was first appraised in June 1980, it became evident that the environmental issues had become of such widespread international concern, that they could only be handled by an integrated program for the development of the Northwest Region. Thus the project was again appraised in March 1981 as part of the overall program as described in para. 2.02 above.

4.03 As the environmental issues in the Northwest Development Program are being covered in a separate project completion report and summarized in the Program Evaluation Overview in the Annex, they are only raised in the report when they particularly affected the preparation and execution of the highway project. Environmental issues were of major concern to the Bank at the time of project preparation and appraisal, and as a result of the Bank's efforts to deal with them adequately, the processing of the project was delayed by about one year.

4.04 Project Concept. The project was clearly different from earlier projects in Brazil and this seemed to have been well understood by the parties involved. The concept of the project was innovative both in scope and size. It represented the single largest overall regional development program yet launched by the Bank, and was designed in line with the scale of the enormous task foreseen in the project objectives and description.

4.05 Project Design and Organization: The project was generally well prepared and involved the contribution of several Bank operational divisions and CPS. The project timing was none too soon as the proposed highway already existed as a track and was in the process of being rebuilt and paved by the Army; but the paving of the highway, when the measures to remedy the adverse effects on the environment were not in place, was actually too early. Participation of the Bank at that time gave it the opportunity to play a substantial role in formulating how the Region was to be developed, and enabled it to raise critical environmental issues which otherwise might have been ignored.

4.06 The roles and responsibilities of the institutions and agencies involved in the project seemed to have been clearly defined, and were well understood, judging by the generally good performance in executing the project, except for the DER-RO component. The most successful aspect of the project design was the thorough effort made in overseeing the design and construction of the Northwest Highway, and its overall supervision by the Borrower.

4.07 Cost Estimates: The total cost of the project was estimated at appraisal at US\$687 million equivalent. The foreign exchange component, which was about 35% of the total cost, i.e., US\$240 million, was

financed by the loan. The remaining cost (US\$447 million) was financed by the Federal Government, either directly or through BNDE.

4.08 The total cost of the Northwest Highway construction was estimated at about US\$487 million equivalent, including about 20% in taxes as well as supervision and physical contingencies. These cost estimates were based on awarded contracts. The average construction cost per km for all road sections in the Highway was about US\$365,000 equivalent, excluding supervision and physical contingencies; including these contingencies, the cost was US\$449,000 per km. The feeder roads were estimated to cost about US\$35,600/km in Rondonia and US\$40,000/km in Mato Grosso. These estimates, which included supervision and physical contingencies, were based on feasibility studies and samples of detailed engineering. No co-financing was involved in the project.

4.09 Execution: DNER was responsible for the execution of the highway construction component, the Rondonia state government was responsible for strengthening Rondonia's Highway Department, while BNDE was the apex executing agency for the feeder road component.

## 5. Project Implementation

5.01 Loan Effectiveness and Project Start-up: Loan 2062-BR was approved on December 1, 1981, signed on December 15, 1981 and became effective on April 26, 1982. The project timetable is given in Part III, Table 2.

5.02 Implementation Schedule: The project was originally scheduled to be completed by December 31, 1985, but the last component was not completed until 1988.

5.03 The construction of the Northwest Highway, which was by far the single largest component of the project, was substantially completed at the end of 1984, a year in advance of schedule. The decision taken following the first appraisal mission, to divide the highway into 19 smaller construction lots, appears to have been wise as the rebidding resulted in lower prices, presumably because of a more competitive atmosphere. Supervision by six local consulting firms was adequate and well coordinated by DNER. As would be expected on such a long highway, some local variants to the alignment were proposed by DNER and were approved by the Bank.

5.04 In mid 1983, DNER proposed to reduce the shoulder width from 1.9 m to 1.5 m and to change the asphalt running surface from triple to double surface treatment. These changes were accepted by the Bank but do not appear to have been realistic in the light of the forecasted traffic of up to 2000 vpd. Given the flat to rolling terrain over which most of the highway was built, it would seem that even the agreed standard of 1.9 m was nominal. A shoulder width of 2.5 m which would allow a truck to pull completely off the pavement, would have been more

appropriate.<sup>2/</sup> As regards the running surface, even a triple surface treatment would appear inadequate for such traffic, although it was agreed between the Borrower and the Bank that the third course would be applied shortly after completion. In hindsight, given the volume of traffic which eventually developed on the Highway, an asphalt concrete pavement would have lasted longer (para. 5.07).

5.05 The reductions in design standards were made at the request of DNER for the purpose of reducing the cost of highway construction. Tight finances also led DNER to request increases in the disbursement percentages for the highway components from 35% of expenditures to 65%. The latter was justified because of the rapid devaluation of the local currency in which the contracts were denominated, to the US dollar, and the time required for disbursements.

5.06 A Bank supervision mission in May 1986 reported that it had observed pavement deterioration and lack of maintenance on some sections of the Northwest Highway. Also, successive supervision missions called attention to the lack of axle load control on all segments of the highway. The project provided two weigh stations, and the Government had specifically agreed to enforce weight restrictions.

5.07 According to the findings of a June 1990 project completion mission, the Highway is not being properly maintained. Only about 26% of the highway is in good condition, 41% is in average condition and 33% is in bad condition. Some of the pavement has reverted to a gravel surface. Emergency repairs by contract were started earlier this year. Axle load restrictions are not being enforced and the two weigh stations financed under the project are not operational.

5.08 The most serious implementation difficulties were encountered in developing DER-RO's institutional capabilities and in training its personnel. The DER-RO component including the construction and equipping of maintenance depots, and the purchase of maintenance equipment was completed after a three year delay. This delay was attributed to a) financial problems in the newly formed state of Rondonia which caused a shortage of local funding; b) difficulties in retaining good managers; and c) delays in appointing the Technical Assistant (TA) consultants. The rather small provision for TA (120 man months over a four year period), and the tight schedule given in the SAR, indicate that the difficulties in establishing DER-RO were underestimated by the Bank. As the project road works were completed ahead of schedule, this placed an even heavier maintenance burden on the fledgling DER-RO.

5.09 In 1985, the Bank suspended disbursements on the three projects in the Northwest Region Development Program because the Government was

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2/ According to the World Bank publication of May 1975 "A Review of Highway Design practices in Developing Countries."

not complying with important loan conditions concerning the Amerindians. Unfortunately, the unintended result of the suspension was that the foreign TA consulting firm who had recently started work, demobilized its staff. However, its local partner continued to work. According to a Bank supervision report dated June 13, 1985, the momentum gained earlier in strengthening DER-RO was largely lost. The report also noted that reactivation of the program would be difficult because of personnel changes in the state government. Finally, in 1986, a new state governor dismissed most of the technical staff in the Highway Department, thus the little progress that it had made appeared to have been disrupted. A further problem to implementing the component was the objection of the Government to use a foreign consultant as originally agreed upon to provide technical assistance. This objection was finally overcome by an amendment to the disbursement schedule to allow the Bank to disburse 100% of foreign costs.

5.10 The implementation of the Feeder Road component got off to a poor start in Rondonia in late 1982. The Bank's resident engineer found that works were "out of control and that cost overruns were likely to reach 65%." This was due to overdesign, poor supervision and contractors pressure to increase the volume of works. Some works were canceled and rebid on the basis of acceptable detailed engineering. In Mato Grosso, the final design of the feeder roads had to be rejected because of over-design. The executing authority was persuaded by the Bank to engage a consultant to review the designs. The firm action taken on this component at the beginning led to the work being satisfactorily completed. The preparatory work for future feeder road projects was also satisfactorily carried out.

5.11 In mid-1985, a fourth component, the Northeast Flood Emergency Rehabilitation of federal roads and urban works was added to the project at an estimated cost of US\$60 million. Because of problems in identifying and locating these works, some of which were not of an emergency nature, the scope of the component was eventually reduced to about half the size originally contemplated when the project description was amended. The Bank mainly financed flood works on federal roads while flood works on state roads were dropped.

5.12 The completion of the feeder roads component was greatly assisted by a Special Action Program (SAP) set-up by the Bank and the Borrower to expedite a number of projects in Brazil. The SAP involved increased participation of the Bank in the cost sharing arrangements, and associated special grants made by the Federal Government to state and municipal agencies.

5.13 Procurement. With the exception of the problem regarding the selection of a TA consultant for DER-RO (para. 5.08), procurement action went well under the project, and Bank guidelines were generally followed.

5.14 Project Costs. The final cost of the total project was US\$366.6 million as compared to the appraisal estimate of US\$687.0 million (Part III - Table 4A). There have been substantial overruns in the earthworks of the Northwest Highway, but they have been partly compensated by the reduction in design standards, including shoulder widths and surface treatments. The highway was completed basically at a cost in constant local currency equivalent to the appraisal estimate of the base cost plus physical contingencies. The bulk of the cost-savings in US dollar terms are credited to the earlier completion of the highway and to the joint effect of payment delays and the rapid devaluation of the local currency.

5.15 Disbursements. Of the loan amount of US\$240.0 million, about US\$197.9 million was disbursed. The estimated and actual disbursements of the loan are given in Part III, Table 3. Disbursements were slower than anticipated at appraisal because of the savings on the highway construction component (para. 5.14), and delays in implementing the DER-RO component. The original loan closing date was extended twice to September 30, 1988. An interim cancellation of US\$34 million was made well after it became evident that substantial savings would accrue: The final disbursement was made on September 14, 1987 after which the outstanding balance of US\$8,059,047.69 was canceled effective October 14, 1989.

5.16 Loan Allocations. The appraisal and actual allocations of Loan 2062-BR are shown in Part III, table 4B.

## 6. Project Results

6.01 Evaluation Overview. Since the project was only a part of a program, which also included agricultural, rural development and environmental protection components which, although financed under separate loans, were designed to jointly achieve the stated development objectives, a qualitative assessment of selected aspects of the POLONOROESTE program as a whole was prepared jointly by the Infrastructure and the Agricultural Operations Divisions. The resulting Program Evaluation Overview is presented as an Annex to this report, and the main results are briefly summarized hereafter.

6.02. Summary of Program Results. In most respects, the program as a whole did not achieve the sound, sustainable economic and social development of the region, which was its basic purpose. However, by establishing and strengthening institutions, and initiating important research, it laid the basis for expanded efforts in the future, provided a strong political commitment is backed with adequate resources of staff and funds. In particular:

- (a) the construction and improvement of the highway and of the feeder and access roads achieved their main objectives of facilitating migration to the region and giving settlers access to markets and services. But the component to

strengthen the DER-RO was less effective; the department is maintaining less than half the roads under its responsibility (paras. 4-7 of the Annex);

- (b) the effort to consolidate land settlement and agricultural production was too small to make a sufficient impact on the region's development. While agricultural production has increased considerably, the long-term viability and environmental consequences of the agricultural development in sensitive frontier lands is still uncertain (paras. 8-18 of the Annex);
- (c) environmental conditions in the area have continued to deteriorate. Deforestation has been rapid and agro-forestry efforts insufficient. Mining has led to extensive water and soil pollution. Biological reserves, ecological stations, as well as a state environment agency, a forestry and a land institutes, and a forestry military police have been established, but insufficient support has limited their effectiveness (paras. 19-27 of the Annex); and
- (d) most of the Indian reserves have been demarcated, but protecting the reserves against illegal invasions has been difficult (paras. 30-37 of the Annex);

**6.03 Economic Re-evaluation.** An economic re-evaluation of the program was carried out following the general methodology used in the assessment made at appraisal (Annex 2 of the SAR). On the cost side of the evaluation were included: (a) the construction and maintenance of the Cuiaba-Porto Velho highway, of the major feeder roads included in the Highway Project (Alimentadoras), and of the other feeder roads included in the Agricultural Development and Environmental Protection project (Loan 2060-BR) and the Mato Grosso Rural Development project (Loan 2116-BR); and (b) the increased off-farm agricultural production costs, as they were estimated in the PCRs for the above projects. Two main kinds of benefits have been quantified: (i) the incremental value added of the agricultural production, net of on-farm costs, in the agricultural component areas of the above projects, resulting from improved and expanded agricultural output; and (ii) the vehicle operating cost savings due to the improved road connections, which have been reduced by those generated by the agricultural project areas (about 10% of total traffic), to avoid double counting such benefits. Vehicle operating costs have been estimated with the help of the Highway Design and Maintenance Model (version 3), on the basis of conservative assumptions regarding future traffic increases (about 3 to 5%) and pavement condition and deterioration (Table 5B).

**6.04 Results.** The net present value of the net benefits of the program, discounted at the rate of 12%, is now estimated at about US\$200 million (against a US\$3.9 billion appraisal estimate), and the rate of

return for the program is now estimated at about 16%, much lower than the above-50% rate in the SAR. These results, however, are not directly comparable. The SAR estimated the incremental value added of agricultural production for the entire program area on the basis of the limited information of the agricultural project areas. Since the agricultural project areas have the best soils, and therefore are not representative of the entire program area, the incremental value added of agricultural production had probably been substantially over-estimated in the SAR. In the re-evaluation, the estimate of incremental value added of agricultural production was limited to the agricultural component areas, as a result of the inadequate data outside such areas, and the program's benefits derived from agricultural development outside these areas or from other activities were estimated on the basis of the new traffic which was generated by the reduction of transport costs. The results reflect both lower costs and substantially lower benefits from agricultural production in the project areas, as well as even lower benefits from agricultural production, if any, in the rest of the program area. Table 5C shows the individual streams of costs and benefits, and the results of the economic re-evaluation.

6.05 Limitations. The significance of the results of the economic re-evaluation of the program is limited by a number of factors. First, it has not been possible, due to the lack of data, to make a reliable, quantitative assessment of the impact of the program on the development of agriculture in the entire program area; and, as noted above, the impact of the program on the agricultural project areas is not representative of the impact in the entire program area. Although some of the effects of the program on the agriculture as well as on the other productive sectors in the program area, including forestry, cattle ranching and mining, might be accounted for in the re-evaluation through the benefits attributed to the traffic generated on the roads as a result of the reduction of transport costs, a direct assessment of the true economic costs and benefits of the new activities would have been more adequate, but it was not possible due to the lack of reliable, quantitative data. Also, the rate of return calculations do not take into account the important external costs and benefits which could not be quantified, such as the costs of the consequences of unplanned deforestation and the benefits of the building of institutions. The Evaluation Overview in the Annex to the report presents a more comprehensive, mainly qualitative assessment of these effects.

## 7. Project Sustainability and Environmental Impact

7.01. Road Maintenance. According to the findings of the June 1990 project completion mission, many sections of the highway (about one third in length) are already in a bad condition as a result of inadequate routine and preventive maintenance, insufficient enforcement of the axle load restrictions, and of the reduction of the design standards for the asphalt surface. DER-RO was reported to be maintaining about 2000 km of federal, state and municipal roads, or less

than half of the roads under its responsibility; the rest of the network was not adequately maintained.

7.02. Highway Traffic. The average daily traffic (ADT) on the highway, however, appears to be close to that forecasted at appraisal. The ADT was ranging from around 900 to around 1,700 vpd in 1987, and substantially higher traffic volumes were registered on some sections with heavy local traffic (Part III, Table 5A). The ongoing extension of the Northwest Highway from Porto Velho westward into the state of Acre will result in increased traffic on the project road beyond the growth that has already taken place.

7.03 The continuing maintenance of the Northwest Highway which is a responsibility of the Federal government, and project feeder roads is of concern. While belated repairs have been started on the Highway, assurances are needed, that they will be promptly carried out. Additional maintenance facilities and equipment were provided to DER-RO for the maintenance of state and feeder roads under the project during the last year of its execution. However, as noted in para. 6.03, DER-RO is maintaining less than half the roads under its responsibility.

7.04 Efforts were made during construction of the Northwest Highway to control borrow pits to the extent possible to minimize the build-up of stagnant water as a breeding ground for mosquitoes. Health care was provided to all construction workers at the contractors' camps.

7.05 The main risks of the overall Development Program continue to be environmental. Deforestation has been rapid in Rondonia, and was mainly the result of clearing for agricultural purposes along the main highway and feeder roads (Annex, section C). Concern was also expressed that while progress was being made in the demarcation of Amerindian lands, it had not yet resulted in the desired level of protection for these areas (Annex, section E).

## 8. Bank Performance

8.01 The performance of the Bank, as reviewed in the context of the overall program, is discussed in the Program Evaluation Overview in the Annex. The main conclusions of this review are briefly summarized in the next paragraph. The paragraphs which follow review the performance of the Bank in the context of the specific objectives of the highway project.

8.02 By financing the road, the Bank may have helped to accelerate migration to the region before the institutions were ready to handle the rapid increase in population. The Bank does not seem to have questioned the basic strategy for development of the Amazon region, and the financial policies which in effect subsidized uneconomic forest exploitation and were, therefore, inconsistent with the program objectives. Nor did the Bank appreciate that the scope of the program was insufficient to address the range and size of the problems which the



region faced. On the other hand, the Bank played a valuable role in promoting orderly settlement, strengthening the protection of the environment and of Amerindians, and in encouraging some necessary modifications during implementation.

8.03 The Bank performed well in preparing the technical aspects of the highway project, with the few exceptions noted below.

8.04 The DER-RO component was inadequately prepared, and this lack of preparation is responsible for much of the implementation delays which were experienced with this component. A training or management specialist was not included in any of the preparation or appraisal missions. A training specialist was only sent to Brazil briefly in late 1981 to help prepare the delayed TOR for the TA consultant and to discuss selection of candidates for training abroad. Even then, he did not visit the project area but only met officials in Rio de Janeiro. If these and other preparatory steps had been taken earlier in the project cycle, the execution of this component might have encountered fewer delays. It is concluded that the difficulties of establishing a new technical organization in a new state to assume responsibility for state and feeder roads, were clearly underestimated by the Bank.

8.05 Supervision missions promptly identified the problems delaying implementation of the DER-RO component, and promptly brought the problems to the Borrower's attention. The suspension of the three loans for the Northwest Region Development Program for lack of action on environmental matters, may have been justified in securing remedial action on these matters, but it was not useful in securing corrective action on the DER-RO component. As a result of the suspension, the foreign TA consulting firm demobilized and the momentum which had been developed in DER-RO was partially lost. It seems doubtful whether suspending Loan 2062-BR was appropriate when the project had already been completed, except for one small and difficult component on which some progress was being made. Preferably, the Loan should have been exempted from the suspension.

8.06 Regarding the Northeast Flood Emergency component, the works were widely scattered, they were not in the project area, and even included non-highway works that required the involvement of urban Bank staff. In light of the Bank's tight supervision resources, it seems in retrospect, that this addition to the project was inappropriate.

8.07 The establishment of a (US\$15 million) Special Account helped expedite disbursements. The Bank displaying flexibility in its dealings with the Borrower, and its willingness to consider the many requests for amendments in the project documents, assisted the Borrower in the light of rapid devaluation of the local currency, and expedited the completion of the project.

8.08 As regards project supervision, the assignment of a Bank resident engineer to Brazil in 1981 to supervise the DER-RO and feeder road components of the project (in addition to other Bank-financed feeder road projects) was a sound decision, given the implementing problems which arose. Their resolution called for the presence of a technical representative on a continuing basis and it undoubtedly contributed to the successful completion of the project. Unfortunately, with the departure of the Bank's resident engineer in October 1985, supervision from headquarters was barely adequate. In 1987, only one supervision mission was sent out, followed by two missions in 1988. The latter were mainly concerned with other Bank projects despite the difficulties encountered in completing the DER-RO component which was not finished until late 1988. However, a project completion mission was sent to evaluate the overall status of the project in June 1990. A strong recommendation in mid 1985 for better supervision, including the appointment of a resident staff member to be based in the north of Brazil to oversee Bank-financed feeder road and agricultural projects, was not acted upon. Staff inputs and mission data are included in Part III, Tables 7A and 7B.

## 9. Borrower Performance

9.01 By 1980, Brazil had gained considerable experience in implementing large Bank financed highway projects, and this was effectively demonstrated by its performance in expeditiously carrying out the highway and feeder road components of the project. Most of the construction contracts were awarded before the loan was approved, despite Bank warnings as to the risks entailed. Thus contracts were completed well before schedule, considerably below estimated costs and to satisfactory workmanship. Compliance with loan covenants was generally satisfactory as indicated in Part III, Table 6.

9.02 A serious shortcoming on the part of the Borrower was the failure of the DNER to control axle loading on the Northwest highway, and to take the necessary steps to monitor, maintain and strengthen the pavement as called for under sections 4.03 and 4.04 of the Loan Agreement. During preparation of the project, it was difficult to foresee the need for by-passes around settlements, however, as they developed along the alignment, service roads were added to reduce traffic congestion.

9.03 The most difficult executing problems, however, as on many other Bank projects elsewhere, were encountered in implementing the DER-RO institution building component (para 5.07). The need to establish and train a new organization in a newly established state posed considerable difficulties and long delays. The loan suspension led to the loss of what had been accomplished up to that time. The result of these difficulties, along with the frequent changes in staff of DER-RO, was a three year delay in completing the component.

9.04 The files indicate that audits of the project accounts were carried out to the satisfaction of the Bank. The main problem noted involved the requests for disbursements from the loan account for the flood rehabilitation works which did not meet the established criteria agreed on at the time the component was added to the project. These were noted by Bank supervision staff, and corrective actions were taken in the field to meet the agreed criteria.

#### 10. Project Relationships

10.01 The Bank enjoyed good relations with the Federal and State authorities which was reinforced by the presence of the Bank's resident engineer in the country. This enabled problems to be identified and resolved promptly. The frequent changes in personnel in DER-RO handicapped the development of this state's maintenance capability and is mainly attributed to the unstable political scene in Brazil. Also, the closing of one of the project executing agents (Rondonia Agricultural Development Company) and the transfer of its duties to DER-RO exacerbated the problems of the latter agency.

#### 11. Consulting Services

11.01 The local consultants involved in the design and supervision of the highway and feeder road component\* performed well as indicated by the completion of these works ahead of schedule, the physical overruns which were limited to 12% despite the difficulties, and by the good quality of the work. The performance of the TA consultant was hindered by the many problems encountered (para. 5.08). However, the component was eventually completed.

#### 12. Project Documentation and Data

12.01 The project was well documented in the appraisal report, the legal agreements and the correspondence files. The supervision reports were particularly informative and helpful in reviewing project execution. Amendments to the project were carefully documented. The main criticisms are the lack of follow-up Bank supervision in 1988-89 to check on the completion of the DER-RO component, the adequacy of maintenance of the Northwest Highway and the feeder roads, and to ascertain project costs and benefits.

**PART II: PROJECT REVIEW FROM BORROWER'S PERSPECTIVE**  
**(Prepared by Borrower) <sup>1/</sup>**

A. Evaluation of the Bank's performance during the evolution and implementation of the project with special emphasis on lessons learned that may be relevant for the future.

The purposes of the Project were to provide permanent transport facilities along the Cuiabá - Porto Velho Highway, to improve the administrative capabilities of DER-RO and to provide a feeder road system in the influence area. The loan became effective in April 1982, the new highway was opened to traffic in September 1984 and since that time has provided adequate service and accelerated development in the influence area. There were considerable savings in loan funds because construction cost overruns were small, which freed contingencies for other uses, and because of inflation in the period between the presentation and payment of contractors billings. However, these achievements were marred by the fact that:

- (a) after six years one third of the pavement is in bad condition,
- (b) a modification in the loan agreement to finance emergency flood relief programmes in the Northeast with the surplus loan funds was only partially successful, and
- (c) US\$ 42 million representing 17.5% of the original loan remained undisbursed and was cancelled.

These difficulties are not directly attributable to the Bank but the following comments might help the Bank and Borrowers to avoid similar problems in other projects.

(1) The original project for the highway dated back to 1974 and envisaged a higher quality pavement for the new road than that adopted. In the design review prior to the Appraisal of the Loan in 1981, there was considerable discussion between the engineers of the Bank and the DNER regarding the traffic projections and pavement design - the Bank opinion which prevailed favored a two stage type of construction wherein a lighter pavement would be strengthened at a later stage as the traffic grew. During construction, in the interest of economy the DNER further reduced the quality of the rolling service from triple surface treatment

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<sup>1/</sup> PART II of the report was prepared by DNER and was received by the Bank in November 1990.

to double surface treatment<sup>2/</sup> on 86 % of the highway and narrowed the shoulder with from 1.9 m to 1.5 m. In hindsight, the option for staged construction was questionable given the cancellation of surplus loan funds and the current need to rehabilitate large sections of this highway. Future decisions on staged construction should be carefully analyzed from the economic, technical and political standpoints bearing in mind:

- (a) the lack of continuity in Brazil from one administration to another in the definition and maintenance of priorities
- (b) the chronic budget deficits which the highway subsector faces making it difficult to divert scarce resources from rehabilitation and improvement works on a major routes with heavy traffic volumes to preventive overlays on highways with less traffic
- (c) the high cost of reconstructing a pavement through lack of timely preventive maintenance, and
- (d) the problem of mobilizing contractors and the transport of construction materials, especially asphalt, in remote areas.

(2) After the completion of the highway some US\$60 millions remained undisbursed. In 1985, the Bank accepted a request by the Federal Government that the funds be made available for an emergency flood relief programme covering critical works for federal state and municipal highways (US\$31.5 million), flood protection, storm drainage and urban water supply (US\$22 million) plus unallocated contingencies (US\$6.6 million). In addition, there was another US\$7.5 million still remaining in the Special Account.<sup>3/</sup>

In practice only US\$8 million was actually disbursed on the highway sector leaving US\$23.5 million to be cancelled - mainly due to a Government decision to limit the World Bank funds to federal highways and a lack of counterpart funds.

Bank representatives visited the stricken areas but most interruptions in traffic were rectified by the local authorities within days of the flood. It was difficult to dimension emergency works accurately and once the flood waters had subsided, to separate emergency relief from long term corrective solutions over extended sections. The

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2/ The bad performance of some contractors in the execution of triple surface treatment also contributed to this decision.

3/ Consequently, in the revised Loan Agreement (October 1985), the unallocated component was US\$14.1 million.

DNER then had difficulties adhering to the Bank procedures on procurement and obtaining sufficient budget.

The results of the Northeast Flood Relief Component<sup>4/</sup> for highways casts doubts on the policy decision of the World Bank to become involved in this type of programme which:

- (a) is difficult to evaluate and tends to include a political component
- (b) leaves few works of a permanent nature to be amortized by the next generation and
- (c) discourages proper contingency planning by local authorities - almost every other year some part of the federal highway network is damaged by heavy rains and flooding.

(3) The preparation and negotiation of a loan with the World Bank demands a lot of time and effort by all parties. After considerable effort to control costs (overrun limited to 12%), completion of highway construction almost one year ahead of schedule, a reduction in technical standards and a lower participation in real terms of Bank funds than that originally envisaged due to inflationary problems and billing mechanisms, it was frustrating not to be able to use the surplus funds on other badly needed permanent highway works. We suggest that the World Bank might in future projects of this type adopt a more flexible position with regard to the use of surplus funds for permanent works, in order to stimulate the interest of the executing agency in early completion and construction economies.

B. Evaluation of the Borrower's performance during the evolution and implementation of the project with special emphasis on lessons learned that may be relevant for the future.

(1) The Borrower was slow

- (a) to request the cancellation of surplus funds and thereby minimize commitment fees, and commitment fees, and
- (b) formulate a coherent plan for their use.

In fact there was some divergence between the authorities involved on the use of these funds. The DNER needed the money for permanent highway works; SUDECO and State of Rondonia and Mato Grosso repeatedly suggested using it on local roads; finally the Government and Bank agreed to finance federal, state and municipal roads as well as urban

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4/ Reference in this context is also made to the extremely slow rate of disbursements under the Rio Flood Reconstruction Programme (Loan 2975-BR).

infrastructure damaged by floods in the Northeast. However, funds were also obtained from the Interamerican Bank for the flood relief programme and it was decided to restrict World Bank finance for the highway component (D.1 of the revised Loan Agreement) to federal highways.

The DNER then unsuccessfully tried to use the funds on major road works in Maranhao and finally in 1987 the Ministry of the Interior requested that the remaining balance be applied to drought relief in the Northeast.

This sequence of events suggests that there was a lack of coordination between all the executing agencies involved in this Loan. The Government of Brazil has since concentrated loan negotiations and overall monitoring with the Secretary of Planning (now incorporated with the Ministry of the Economy) and the latest administrative reform of the public sector is intended to eliminate duplication of responsibility and authority between different organs. It is essential to clearly define in all projects the specific entity charged with the overall monitoring of the programme even though this entity may not have direct executive responsibility over every component.

(2) There was insufficient time for the updating of the engineering design before the start of construction. As a result, many of the material sources indicated in the original 1974 design had been used by the routine maintenance and it was necessary to change the pavement structure of some links. Before bidding future works, including the Sao Paulo - Curitiba Highway, the engineering design should be completely updated and incorporate all the design changes agreed between the DNER and financing agency and which should be binding on all parties.

(3) The traffic counting and weighbridge programmes receive inadequate budget allocations. The latest traffic information available for Mato Grosso dates back to 1987 and the operating record of the two weighbridges on the Cuiabá - Porto Velho Highway as described in item (iii) "Northwest - Highway" is unsatisfactory.

Traffic volumes measure the demand on a particular highway and should be prepared and published annually for all highway sections in the federal network and clear policy guidelines drawn up on the financing and operation of the weighbridge programme.

C. Assessment of the effectiveness of the relationship between the Bank and Borrower during the evolution and implementation of the project.

At the technical level the relationship between the Bank Staff and the DNER was very good.

The DNER being dependent on indirect sources of revenue has traditionally not been fully aware of cost accounting and concepts of cost effectiveness. It thus tends to measure its progress in terms of

physical achievements and targets, for example 1084 km of new construction (the Cuiabá - Porto Velho Highway), 5000 km of rehabilitation per year, 73 new weighbridges. The Bank tries to direct more attention to institutional aspects through covenants in the loan agreement on managerial efficiency, the collection of performance parameters and cost accounting. The success in the implementation of these covenants was patchy and in future more joint effort should be made to the compliance with these covenants some of which are beyond the control of the DNER.



BRAZIL

PROJECT COMPLETION REPORT

NORTHWEST REGION DEVELOPMENT HIGHWAY PROJECT  
(LOAN 2062-BR)

1. Related Bank Loans

<u>LOAN TITLE</u>	<u>PURPOSE</u>	<u>LOAN AMOUNT</u>	<u>YEAR OF APPROVAL</u>	<u>STATUS</u>
Rondonia Health Project (Loan 2061-BR) (Phase I)	Help intensify efforts to control malaria and to expand and improve primary and secondary level health care.	US\$13 M	1981	Completed
Agricultural Development and Environmental Protection Project (Loan 2060-BR) (Phase I)	Help consolidate existing resettlement schemes in Rondonia.	US\$67 M	1981	Completed
Mato Grosso Rural Development Project (Loan 2116-BR) (Phase II)	Help stabilize rural population already settled in Southwest Mato Grosso.	US\$26.4 M	1982	Completed
New Settlements Project (Loan 2353-BR) (Phase III)	Support colonization of unoccupied lands in Rondonia.	US\$65.2 M	1983	Ongoing

BRAZIL  
PROJECT COMPLETION REPORT  
NORTHWEST REGION DEVELOPMENT HIGHWAY PROJECT  
(LOAN 2062-BR)

2. Project Timetable

<u>ITEM</u>	<u>DATE PLANNED</u>	<u>DATE REVISED</u>	<u>DATE ACTUAL</u>
- Identification <sup>1/</sup>			May, 1979
- Preparation			October 1979 <sup>2/</sup>
- Regional Economic Mission			October 1979
- Appraisal Missions	March 1980 <sup>3/</sup>		June, 1980 & March 1981
- Loan Negotiation			September 23-30, 1980
- Board Approval			December 1, 1981
- Loan Signature			December 15, 1981
- Loan Effectiveness			April 26, 1982
- Loan Closing	June 30, 1986	December 31, 1986	September 30, 1988
- Project Completion	December 31, 1985	December 31, 1987	December 31, 1988 <sup>4/</sup>

- <sup>1/</sup> Was carried out as part of an integrated approach to the development of Northwestern Mato Grosso and the Territory of Rondonia.
- <sup>2/</sup> Main issue was understanding specific requirements concerning the overall development strategy for the project area formulated on the basis of the overall Northwest Development Program.
- <sup>3/</sup> As tentatively scheduled in project brief; no other dated planning dates were given in the Project Brief dated October 11, 1979.
- <sup>4/</sup> Represents completion of DER-RO components; remaining components of project completed on schedule.

BRAZIL

PROJECT COMPLETION REPORT

NORTHWEST REGION DEVELOPMENT HIGHWAY PROJECT  
(LOAN 2062-BR)

A. Loan Disbursements<sup>1/</sup>

CUMULATIVE ESTIMATED AND ACTUAL DISBURSEMENTS  
(US\$ million)

Bank FY 1987	1982	1983	1984	1985	1986	1987	1988
Appraisal Estimate	36.0	97.0	158.0	215.0	240.0		
Actual	-	51.5	136.2	176.4	181.0	191.3	197.9
Actual as % of Estimate		53.1	86.2	82.0	75.4	79.7	82.5
Date of Final Disbursement:							
September 14, 1987							

B. Project Implementation<sup>2/</sup>

Calendar Year	<u>BR364 - Highway</u>		<u>Strengthening of DER-RO</u>		<u>Feeder Roads</u>	
	<u>Appraisal Estimate</u>	<u>Actual</u>	<u>Appraisal Estimate</u>	<u>Actual</u>	<u>Appraisal Estimate</u>	<u>Actual</u>
1981	3.3	-	-	-	-	-
1982	21.4	19.0	35.8	-	30.7	7.9
1983	25.3	56.0	20.4	16.3	33.6	68.8
1984	27.5	25.0	11.8	30.3	35.7	3.0
1985	22.5	-	32.0	5.4	-	14.3
1986	-	-	-	22.7	-	-
1987	-	-	-	25.3	-	-
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<sup>1/</sup>US\$34.0 million of surplus funds was cancelled as of June 30, 1987, and the remaining balance of US\$8,059,047.69 was cancelled effective October 14, 1989.

<sup>2/</sup>As a percentage of total expenditures

BRAZIL

NORTHWEST REGION DEVELOPMENT PROGRAM HIGHWAY PROJECT (2062-BR)

Project Costs at Appraisal and Completion  
(in US\$ million)

	<u>Cost Estimate at Appraisal <sup>1/ 2/</sup></u>				<u>Cost at Completion<sup>3/</sup></u>		
	<u>Local</u>	<u>Foreign</u>	<u>Total</u>	<u>Bank Participation</u>	<u>Local</u>	<u>Loan</u>	<u>Total</u>
<b>I. <u>Highway Construction</u></b>							
(a) Civil Works and Construction Supervision	392.8	205.4	598.2	209.2	126.10	144.00	270.10
(b) Equipment for Weighing Station and to Monitor Pavement Behavior	0.4	0.1	0.5	0.3	0.00	0.01	0.01
(c) Vehicles and Equipment	<u>0.5</u>	<u>0.6</u>	<u>1.1</u>	<u>0.6</u>	<u>0.10</u>	<u>0.20</u>	<u>0.30</u>
Sub-Total:	393.7	206.1	599.8	210.1	126.20	144.21	270.41
<b>II. <u>Improvement of DER-RO</u></b>							
(a) Civil Works	5.4	2.8	8.2	3.0	1.18	2.07	3.25
(b) Equipment, Vehicles and Plant	14.2	14.0	28.2	10.1	4.41	5.42	9.83
(c) Technical Assistance	<u>3.0</u>	<u>2.1</u>	<u>5.1</u>	<u>1.8</u>	<u>1.89</u>	<u>2.01</u>	<u>3.90</u>
Sub-Total:	22.6	18.9	41.5	14.9	7.48	9.50	16.98
<b>III. <u>Feeder Roads</u></b>							
(a) Civil Works	30.7	15.0	45.7	15.0	18.10	16.20	34.30
<b>IV. <u>Northeast Flood Emergency</u></b>							
(a) Roads	-	-	-	-	4.11	6.30	10.41
(b) Municipal Infrastructure	<u>-</u>	<u>-</u>	<u>-</u>	<u>-</u>	<u>12.92</u>	<u>21.70</u>	<u>34.02</u>
Sub-Total	-	-	-	-	17.03	28.00	45.03
<b>Total</b>	447.0	240.0	687.0	240.0	168.81	197.91	366.62

1/ Includes prorated contingencies for physical (15% of civil works and supervision and 5% for all others), and price escalation (about 23% of base cost and physical contingencies). No costs were given in local currency.

2/ Source: SAR of October 29, 1981, page 22

3/ Source: Total US\$ cost at completion was derived from the actual monthly payments made in local currency by the executing agency, converted in US\$ through monthly average exchange rates. Local US\$ cost was derived from the total US\$ cost by deducting reimbursements from the loan account.

TABLE 4B

BRAZIL  
PROJECT COMPLETION REPORT  
NORTHWEST REGION DEVELOPMENT HIGHWAY PROJECT  
LOAN 2062-BR

DISBURSEMENT ALLOCATIONS  
(in US\$ million)

	<u>Appraisal<sup>1</sup></u>	<u>Actual<sup>2</sup></u>
1. Northwest Highway	170.7	144.2
2. DER-RO	12.1	9.5
3. Feeder Roads	14.8	16.2
4. Initial Deposit into Special Account	15.0	-
5. Unallocated	27.4	-
6. Northeast Flood Rehabilitation Works	-	28.0
TOTAL	<u>240.0</u>	<u>197.9</u>
Cancelled		<u>42.1</u>
		<u>240.0</u>

1/ Source: Schedule 1 of Loan Agreement 2062-BR

2/ Source: Memorandum Disbursements Division dated March 30, 1990

Note: No Cofinancing was involved in the project

BRAZIL

NORTHWEST REGION DEVELOPMENT PROGRAM HIGHWAY PROJECT (2062-BR)

TRAFFIC ESTIMATES

----- Highway Sections -----			-----1987 Traffic Counts-----							---Appraisal---	
From	To	Length Km	Car	Bus	Medium Truck	Heavy Truck	Heavy Trailer	ADT	Projection	1980	
									<1>	Date<2>	
Porto Velho	Ariquemes	187	855	100	297	344	155	1751	1632	407	
Ariquemes	Ji Parana	173	737	97	248	314	152	1548	1550	506	
Ji Parana	Rio Rondon	200	746	85	146	297	145	1419	1798	603	
Rio Rondon	Baracao Queimado	228	414	70	189	353	155	1181	1253	365	
Baracao Queimado	Porto Espiridao	334	285	61	98	286	160	890	924	230	
Porto Espiridao	Caceres	103	783	118	192	431	165	1689	2458	684	
Caceres	Campinas	47	783	118	192	431	165	1689	840	486	
Weighted Average		1272	585	84	183	329	156	1336	1431	423	

<1> Appraisal Report Table 8.7 (Interpolation for Year 1987)

<2> Appraisal Report Page 38

Source DNER/Consultant

BRAZIL

NORTHWEST REGION DEVELOPMENT HIGHWAY PROJECT

VEHICLE OPERATING COSTS

A. AVERAGE DAILY TRAFFIC  
(Vehicles per day)

a. With Project

Year	Light Car	Medium Car	Bus	Light Truck	Medium Truck	Heavy Truck	Trailer	Total ADT
1985	274	124	56	24	110	244	103	935
1989	333	151	68	29	134	297	125	1136
1994	386	175	79	34	155	344	145	1318
1999	406	184	83	36	163	361	153	1385

b. Without Project

Year	Light Car	Medium Car	Bus	Light Truck	Medium Truck	Heavy Truck	Trailer	Total ADT
1985	274	124	56	24	110	244	103	935
1989	274	124	56	24	110	244	103	935
1994	274	124	56	24	110	244	103	935
1999	274	124	56	24	110	244	103	935

B. ECONOMIC VEHICLE OPERATING COSTS  
(US\$/1000KM)

a. with project

IRI	Year	Light Car	Medium Car	Bus	Light Truck	Medium Truck	Heavy Truck	Trailer
3	1985	77	129	414	262	328	499	914
6	1989	90	148	460	315	406	602	1076
5.5	1994	88	145	452	306	392	584	1047
7	1999	96	155	476	336	436	641	1136

b. without project

IRI	Year	Light Car	Medium Car	Bus	Light Truck	Medium Truck	Heavy Truck	Trailer
16	1985	157	235	652	588	829	1127	1856
16	1989	157	235	652	588	829	1127	1856
16	1994	157	235	652	588	829	1127	1856
16	1999	157	235	652	588	829	1127	1856

Sources: DNER and Mission estimates

BRAZIL  
NORTHWEST REGION DEVELOPMENT PROGRAM HIGHWAY PROJECT  
Economic Analysis  
(in thousands of 1989 US\$)

Agricultural Production Cost 1/					Road Investments 2/						Incremental Agricultural Value Added 4/				Vehicle Operating Costs		
Year	Rondonia	Mato Grosso	Total	NPV (\$12X)	Main Road Invest.	Alimen- taçoras Invest.	Feeder Roads Invest.	Total Invest.	Total in US\$ of 1989 3/	NPV (\$12X)	Rondonia (Total)	Mato Grosso (Increm.)	Total	NPV (\$12X)	Total VOC Savings	VOC savings Mon-Agric Traffic	NPV (\$12X)
1982	18991	2029	21020	21020	70360	4100	11200	85660	123950	123950	-2520	-673	-3193	-3193			0
1983	11046	3979	15025	13415	207360	6900	9000	223260	331318	295820	639	-730	-91	-82			0
1984	17910	2992	20902	16663	92570	9600	6300	108470	163898	130659	4512	-646	3866	3082			0
1985	11998	3569	15566	11080	430	8800	800	10030	14995	10673	3934	962	4896	3485	143070	129192	91956
1986	9537	2941	12478	7930	430	600	300	1330	1681	1068	9764	3224	12988	8254	142850	128994	81978
1987	9267	2332	11598	6581	430	600	300	1330	1537	872	20680	4813	25493	14465	142500	128678	73015
1988	8549	6500	15049	7624	430	600	300	1330	1414	716	28947	5793	34740	17600	137640	124289	62969
1989	23740	1237	24978	11299	430	600	300	1330	1330	602	33107	6487	39594	17910	131970	119169	53906
1990	1785	1238	3022	1221	430	600	300	1330	1330	537	33342	6630	39973	16144	124030	111999	45235
1991	1785	1237	3022	1090	430	600	300	1330	1330	480	35682	7451	43133	15554	115200	104026	37513
1992	1785	1237	3022	973	35120	600	300	36020	36020	11597	34183	7067	41251	13282	157800	142493	45879
1993	1785	1237	3022	869	870	600	300	1770	1770	509	31682	5038	36720	10556	155850	140733	40457
1994	2902	1237	4140	1063	870	600	300	1770	1770	454	31295	5922	37217	9553	153680	138773	35620
1995	1785	1238	3022	693	870	600	300	1770	1770	406	30147	6981	37128	8509	149540	135035	30946
1996	1785	1238	3022	618	870	600	300	1770	1770	362	27868	7285	35153	7193	145180	131098	26825
1997	1785	1238	3022	552	870	600	300	1770	1770	323	24163	7479	31642	5781	140620	126980	23199
1998	1785	1238	3023	493	870	600	300	1770	1770	289	27233	7710	34943	5700	135840	122664	20009
1999	1785	1237	3022	440	870	600	300	1770	1770	258	35816	7768	43584	6348	124830	112721	16417
2000	1785	1237	3022	393	870	600	300	1770	1770	230	37672	7799	45471	5913	113820	102779	13363
2001	2923	1238	4161	483	870	600	300	1770	1770	206	36324	7807	44131	5124	102810	92837	10779
TOTALS				104499					580011					171178			710068

Notes : 1/ Includes off-farm agricultural production costs  
2/ Economic costs (in current US\$) of road investments were estimated as 80% of the financial costs, which were derived from monthly payments made in local currency, converted at the average exchange rate for the month in which the corresponding works were actually made.  
3/ All costs in US\$ of 1989 deflated with Manufacturing Unit Value (MUUV) Index  
4/ Net of on-farm costs

NPV and rate of return estimates			
	Costs	Benefits	Flow
1982	144970	-3193	-148162
1983	346343	-91	-346434
1984	184800	3866	-180934
1985	30561	134088	103527
1986	14159	141981	127822
1987	13135	154170	141035
1988	16463	159029	142566
1989	26308	158763	132456
1990	4552	151672	147119
1991	4352	147158	142806
1992	39042	183744	144702
1993	4792	177453	172660
1994	5910	175990	170080
1995	4792	172163	167370
1996	4792	166250	161458
1997	4792	158622	153830
1998	4793	157606	152813
1999	4792	156305	151513
2000	4792	148250	143458
2001	5931	136969	131038
NPV \$12X	684510	881246	
B/C	1		
ERR	16.31%		



BRAZIL

PROJECT COMPLETION REPORT

NORTHWEST REGION DEVELOPMENT HIGHWAY PROJECT  
LOAN 2062-BR

Status of Loan Covenants

<u>Loan/Project Agreement Art. No.</u>	<u>Covenant</u>	<u>Status</u>
2.02b	Open a Special Account	Done on July 2, 1982.
3.01b	Provide appropriate budgetary allocations to each executing agency for carrying out the project.	For BNDE and DER/RO partially complied with.
3.04	DNER to establish, by March 31, 1982 a coordinating group to supervise execution of the highway.	Accomplish before March 31, 1982.
3.06	DNER to establish and maintain a project revolving fund and make an initial deposit of US\$12 million.	DNER opened a revolving fund account on July 30, 1982 and deposited in it US\$12 million.
3.07	DNER to contribute about US\$4.6 million to BNDE feeder roads program and to assist BNDE in carrying out the program.	Complied with.
4.01	DNER and FUNAI to enter into appropriate arrangements to protect the Amerindians.	Provisions, requested by FUNAI, were included in construction and supervision contracts.
4.02 and Supplemental Letter No. 4	The Borrower to carry out the reconstruction Cuiaba-Campinas and Ariquemes-Porto Velho.	Completed. Works were contracted with the Army.

<u>Loan/Project Agreement Art. No.</u>	<u>Covenant</u>	<u>Status</u>
4.03	DNER to ensure compliance with limitations of size and weight of vehicles.	Two permanent weighing stations have been installed. DNER has repeatedly been requested to take action to control overloading on all sections of the road.
4.04(a)	Maintenance of roads (see Supplemental Letter No. 1).	Ongoing activity. Level of maintenance requires review (Bank telex to DNER of May 28, 1986).
4.05	Auditing of DNER accounts (see Supplemental Letter).	Audit Report covering expenditures up to April 1986 have been received.
4.08	Auditing of project account and revolving fund (see Supplemental Letter).	Audit Reports covering expenditures up to April 1986 have been received.
4.09	Auditing of the special account (see Supplemental Letter).	Special account opened in July 1982. Auditing reports covering activities up to April 1986 have been received.
4.10	Provision of adequate funds for the carrying out of the project.	Complied with.
<u>Project Agreement</u> <u>(State of Rondonia)</u>		
2.02	Rondonia enter into contractual arrangements with BNDE.	Done.
2.03	Rondonia to contract a consulting firm for technical assistance and training.	Done.
2.04a(i)	Rondonia to establish by 09/30/82 a task group (Senior Engineer, Training Advisor, Municipal Engineer).	Done.

<u>Loan/Project Agreement Art. No.</u>	<u>Covenant</u>	<u>Status</u>
2.04a(ii)	Rondonia to establish by 09/30/82 a training unit with at least 5 instructors.	Done.
2.05	Rondonia through DER-Ro maintain the highway network and assist the municipalities in maintaining the municipal road network.	Satisfactory.
2.06	Rondonia to prepare by 6/30/82 a plan of action for recruiting adequate personnel for DER-RO.	Done.
2.07(a)	Rondonia to establish by 1/1/83 adequate accounting procedures with respect to DER-RO.	Has been implemented with some delay.
2.07(b)	Financial statement of DER-RO be audited starting with 1983 Fiscal Year, and to supply Bank Audit Reports.	Audit reports covering expenditures up to April 1986 have been received.

Source: Supervision Report dated 10/16/67

BRAZIL  
PROJECT COMPLETION REPORT  
NORTHWEST REGION DEVELOPMENT HIGHWAY PROJECT  
(LOAN 2062-BR)

A. Staff Inputs  
(staff-weeks)

	<u>1980</u>	<u>1981</u>	<u>1982</u>	<u>1983</u>	<u>1984</u>	<u>1985</u>	<u>1986</u>	<u>1987</u>	<u>1988</u>	<u>1989</u>	<u>1990</u>	<u>Total</u>
Preparation	80.8											80.8
Appraisal		19.1										19.1
Negotiations <sup>1/</sup>												
Supervision	—	—	<u>24.8</u>	<u>21.3</u>	<u>26.2</u>	<u>12.0</u>	<u>10.4</u>	<u>8.7</u>	<u>6.5</u>	<u>1.6</u>	<u>0.5</u>	<u>112.0</u>
TOTAL	80.8	19.1	24.8	21.3	26.2	12.0	10.4	8.7	6.5	1.6	0.5	211.9

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<sup>1/</sup> Records do not identify time spent on negotiations.

Source: Divisional Records.

**BRAZIL**  
**PROJECT COMPLETION REPORT**  
**NORTHWEST REGION DEVELOPMENT HIGHWAY PROJECT**  
**(LOAN 2062-BR)**

**B. Missions**

<u>Stage of Project Cycle</u>	<u>Month/Year</u>	<u>No. of Persons</u>	<u>staff-weeks in Field</u>	<u>Specialization Represented<sup>1/</sup></u>	<u>Date of Report</u>	<u>Types of Problems<sup>6/</sup></u>
<u>Through Appraisal</u>	8/79	4	4	2HE, 2EC	10/11/79 <sup>2/</sup>	
Preparation 1						
Preparation 2	11/79	3	6	2HE, EC	N/A	
Preparation 3	1/80	4	8	2HE, 2C	3/26/80	
Preparation 4	3/80	3	4	HE, EC, C	4/28/80	
Appraisal 1	4/80	3	6	HE, EC, C	6/30/80 <sup>3/</sup>	
Post-Appraisal	10/80	2	5	2HE	1/08/81	
Appraisal 2	1/81	3	10	HE, EC, FA	3/09/81 <sup>2/</sup>	
Post-Appraisal	5/81	4	9	3HE, EC	5/29/81	
Post-Appraisal	7/81	2	2	HE, C	<sup>4/</sup>	
<u>Supervision</u>						
Supervision 1	12/81	1	0.5	TS	2/18/82	
Supervision 2 <sup>5/</sup>	7/82	1	1	HE	10/6/82	Mgmt. of DER-RO
Supervision 3 <sup>5/</sup>	3/82	2	2	HE	3/16/83	
Supervision 4	5/83	1	1	"	6/21/83	
Supervision 5 <sup>5/</sup>	10/83	3	5	2HE, EC	11/30/83	
Supervision 6 <sup>5/</sup>	8/84	3	4	2HE	9/21/84	
Supervision 7 <sup>5/</sup>	5/85	3	7	2HE, EC	6/13/85	Mgmt. of DER-RO
Supervision 8 <sup>5/</sup>	10/85	3	7	2HE	11/26/85	Delays
Supervision 9	3/86	3	3	2HE	5/29/86	Completing
Supervision 10	12/86	1	1	HE	12/19/86	DER-RO Component
Supervision 11	9/87	1	2	HE	10/16/87	
Supervision 12	2/88	2	2	HE	N/A	
Supervision 13	4/88	2	2	HE	N/A	
Supervision 14	6/90	2	1	HE,C	7/ /90	

<sup>1/</sup> HE - Highway Engineer, EC - Economist, C - Consultants, TS - Training Specialist

<sup>2/</sup> Project Brief

<sup>3/</sup> Issues Paper

<sup>4/</sup> Funding incorporated in SAR

<sup>5/</sup> Project Supervision was carried out by HQ engineer who supervised the highway component and Bank's resident highway engineer in Brazil who supervised the remaining components. The latter was assigned to Brazil from October 1981 to October 1985 and spent an estimated 22 man weeks on the project in addition to the time noted above.

<sup>6/</sup> Overall project performance was rated 1 up to supervision report no. 6, and 2 thereafter.

**BRAZIL**

**NORTHWEST REGION DEVELOPMENT PROGRAM**

**EVALUATION OVERVIEW**

**I. INTRODUCTION**

1. This overview of the Northwest Development Program (POLONOROESTE) is based on the Project Completion Reports on the Northwest Agricultural Development and Environmental Protection Project (Loan 2060-BR) and the Northwest Highway Project (Loan 2062-BR), as well as other studies and Bank documents. Its scope is limited because a number of other projects, which also supported the Program, are not dealt with. These include the Northwest Health Project (Loan 2061-BR) and the Mato Grosso Rural Development Project (Loan 2116-BR), which have been evaluated in separate Completion Reports, and the New Settlement Project (Loan 2353-BR), which is not yet completed. There were also other sectoral loans to Brazil with components in the Region.

2. The basic purpose of the Program was to achieve the sound, sustainable economic and social development of the Northwest Region, with a particular emphasis on its rural areas. The specific objectives of the Program and how well they were achieved, is discussed in Section II. Section III discusses the sufficiency of these objectives to meet the basic purpose of the Program. Section IV offers broad conclusions on the impact of the Program on the Region, and Section V outlines lessons for the future.

**II. SPECIFIC OBJECTIVES**

3. Before the Program was initiated in the early 1980's, there had already been extensive migration to the Northwest Region. Much of the resultant increase in population could not be absorbed in official settlement schemes and the Region was faced with mounting socio-economic problems, uncontrolled deforestation and serious threats to the health and culture of the Amerindian population. To address these problems and to assure the sound development of the Region, the Program had a number of specific objectives designed to increase mobility (discussed in Section A), encourage orderly land settlement and agricultural production (Section B), protect the environment (Section C), promote health and education (Section D) and protect the Amerindian population (Section E). Progress in achieving these objectives was to be carefully monitored and evaluated (Section F).

**A. Increased Mobility**

4. More than 50% of the Program costs of about US\$1.6 billion (in 1981 prices) were for road construction to facilitate the movement of people into the Region and of goods to, from and within the Region, particularly from

farms to markets. The movement of people to the Region was part of a long-standing Government effort to encourage migration to frontier areas to alleviate serious unemployment and poverty in other parts of Brazil, and to settle the Amazon region for strategic reasons.

5. The population of Rondônia, the major focus of the Program, had been increasing rapidly from about 110,000 to 490,000 between 1970 and 1980, even before all-weather transport became available. With the paving of the Cuiabá-Porto Velho road and its completion in 1984 under the Program, one year ahead of schedule, the average daily traffic on the road more than tripled from about 435 vehicles in 1980 to over 1,400 vehicles in 1987. The road reduced transport costs by 30% to 60% for different types of vehicles and made transport possible the entire year. Annual migration into Rondônia increased rapidly from about 60,000 in 1981-1982 to more than 150,000 in 1984-1986. As a result, Rondônia's population nearly tripled during the 1980's, reaching about 1.4 million in 1989.

6. The construction and improvement of feeder and access roads was fully completed in 1986, after some initial delays, and this part of the Program also achieved its main objective of giving settlers access to markets and services. However, as discussed in para. 15, some access roads were built in areas later determined to be unsuitable for agriculture, a few were located too close to Amerindian reserves and therefore contributed to the problems of invasions, and designs did not always take adequate account of the land contours and hydrographic features of the settlement areas.

7. The Northwest Highway Project also intended to strengthen the State Highway Department but this component was implemented less successfully. As a result, in 1987 the Department was maintaining less than half the roads for which it was responsible. Moreover, by 1990 one-third of the pavement of the main highway was in poor condition and some short sections had reverted to a gravel surface and was receiving emergency repairs; its maintenance was the responsibility of the Federal Highway Department. Axle load restrictions were not enforced and the weigh stations financed under the project have not been operational.

#### B. Land Settlement and Agriculture Production

8. The second largest component of the Program, including three agricultural projects, and accounting for about 40% of total costs, was to encourage the settlement of farmers in areas where sustained agricultural production was possible and to increase agricultural productivity. In the first of these three projects, the Agricultural Development and Environmental Protection Project (Loan 2060-BR), which accounted for about 13% of total Program costs, the emphasis was on the consolidation of existing settlements in an area with the best soils in Rondônia, although soil surveys were included to prepare for expansion of settlements to other areas under another project. The strategy was to promote a move from shifting cultivation of annual crops to the production of environmentally more suitable and economically more profitable perennial tree crops. At the same time, settlement in unsuitable areas and in those which had not yet been

sufficiently studied, was to be discouraged, and an excessive concentration of land ownership was to be prevented. The following observations refer exclusively to the results of Loan 2060-BR.

9. It is now estimated that the Agricultural Development and Environmental Protection Project provided individual extension services at farm level to about 11,330 farm families, compared to 18,200 expected at appraisal. The decrease is explained by a slower expansion of extension services, especially in the early years (para. 10), the limited availability of credit (para. 12), the reduction in rural centers (para. 30), and a gradual change in the strategy of the extension service from individual to group assistance techniques. As a result of the latter, about 3,300 additional farmers were contacted under a group assistance scheme, bringing the total of assisted farmers to about 14,360, or about 80% of the original target. Also, training courses on specific subjects, such as perennial crop planting, were offered to 13,500 farmers. The incremental area cultivated of about 72,400 ha. is almost the same as expected at appraisal. As a result, the average farmer increased the area cropped by 6.5 ha., instead of 4 ha. estimated in the SAR.

10. Most extension staff received pre-service training, but only 84 participated in specialized in-service courses; this was considerably lower than the original target of 155. The extension service operated under difficult conditions, such as insufficient operating funds, lack of farm credit and limited experience of most agents with the climate and agronomic conditions of the project area. Nevertheless, it provided valuable advice on crop diversification and rotation, efforts to retain forest reserves at the farm level, developing community organizations, simplified storage and processing methods, etc. These activities are only now beginning to take hold among settlers but should yield important wider agricultural and environmental benefits in the future.

11. The value of the annual incremental production under the project was initially estimated at US\$144 million at full development but is now expected to reach only \$71 million. The major reasons are the sharp declines of prices for coffee and cocoa, serious shortages of agricultural credit until the last 3 years of the Program, and lower yields for most commodities, reflecting primarily less intensive use of fertilizer and other inputs. For similar reasons, incremental employment generation, which had been estimated in the SAR at the equivalent of about 20,700 labor-years, is now expected to reach only 14,800 labor-years.

12. Funds for on-farm credit were not included in the Project because interest rates were highly subsidized, but the Government had given assurances in the Loan Agreement that adequate credit would be available from existing sources. However, virtually no credit was made available to the project beneficiaries because of Brazil's tight financial situation. This interfered particularly with the production of perennial crops for which farmers must wait several years before receiving any income. To alleviate the credit restraint, a new program of credit-in-kind was initiated, beginning with the 1985/6 crop year, providing seedlings primarily for coffee and rubber, and



seeds for beans, corn and rice. The credit was essential for the rapid expansion of the area for coffee and bean cultivation.

13. The incomes of the beneficiaries did not rise as much as had been estimated. At appraisal, the average annual income of participating farm families was expected to increase from about US\$850 to US\$11,900, but it is now estimated that incomes will average only about US\$6,600, which is still a substantial increase. The financial rates of return are as high as anticipated and the economic rate of return, while somewhat lower, is still a satisfactory 16%. Lower prices and yields have been offset at least in part by greater production of some crops and lower expenditures for on-farm investments and inputs. For the Program as a whole (including the roads), the economic rate of return is also estimated at 16% compared to a SAR estimate of over 50%, with lower cost more than offset by lower agricultural production. While the method of re-calculating the economic rate of return is comparable to that in the SAR, its significance is limited by the fact that it does not allow for important external costs (e.g., deforestation) and benefits (institution-building) which cannot be quantified. It should also be emphasized that the relatively good rate of return was possible only because this particular project was located in the best soils of central Rondônia; similar results could not be obtained in other, agronomically more marginal, parts of the POLONOROESTE Program area.

14. The Program improved the pattern of land ownership. Titles to land were provided to nearly 19,800 farmers occupying about 2.2 million ha. While this is more than the number of direct project beneficiaries, it is only one third of the 60,000 farm families in the settlement schemes, all of which were to receive title under the Project. However, as a result of the project, the proportion of farm owners, in Rondônia, increased from 40% to 57% of all farm establishments between 1980 and 1985 while the proportion of squatters declined from 51% to 28%.

15. The project also financed soil surveys north of the project area in preparation for possible new settlements under another POLONOROESTE project. Because of the high immigration, the Government and the Bank agreed to start settlement under Loan 2353-BR (New Settlements Project) before the surveys were completed. Unfortunately, much of the area proved to have poor soil and before new settlement could be prevented, three settlement schemes with rural service centers and feeder roads had already been constructed in areas where agricultural production was not sustainable.

16. The number of cattle in the project area increased rapidly from 126,000 in 1981 to 783,000 in 1988. However, the growth of the cattle herd in the project area slowed down during the second half of that period as the mixed farming model promoted by the project and emphasizing perennial crops, took hold, while the increase accelerated outside the project area. For the most part, livestock in the project area serves as a complement to the farm activities of small farmers, supplementing their income and reducing their risks. It does not have the damaging impact of extensive ranching involving major deforestation, land speculation and absentee ownership, as occurred elsewhere in other frontier areas of Brazil.

17. The performance of agricultural production in the project area has been good so far in that farmers who received technical assistance and who had savings or were able to obtain credit, introduced perennial crops and developed sustainable production systems. But many were not able to make this transition and therefore continued shifting cultivation and deforestation. The long-term viability of the agricultural development of sensitive frontier lands will depend on institutional, financial and technical factors. The agricultural institutions which the project helped develop, though still weak, can be sustained with the additional resources which have become available from marketing and export taxes. For individual farmers, financial sustainability is only possible on the basis of intercropping of perennial crops and agro-forestry.

18. An important limitation of the settlement consolidation component is that its size was insufficient to meet the needs of the project area. It planned for the assistance to 18,200 settler families involving some 87,000 people, during a period when Rondônia's population increased by more than a million. Such growth imposed demands on land, infrastructure and institutions far beyond the scope of the Project.

#### C. Environmental Protection

19. A third major objective of the Program was to protect the environment by strengthening the capability to control deforestation; studying the promotion of sustainable forestry operations in suitable areas; establishing natural reserves and ecological stations for biodiversity preservation; and undertaking ecological research. The Northwest Agricultural Development and Environmental Protection Project was intended to address the environmental issues for the entire Program.

20. These activities were estimated to cost about US\$21 million (in 1981 prices), accounting for about 1.4% of total Program costs. The Bank supported project originally allocated US\$15.8 million for environmental protection but the amount was increased to US\$36.7 million in the later years of the project.

21. Deforestation in Rondônia had accelerated rapidly in the late 1970's. By 1975, about 0.5% of the forest was cleared, by 1980 it was more than 3%, by 1983 nearly 6% and by 1988 the estimates ranged between 13% and 24% according to different sources. Most of the deforestation was the result of clearing along the main highway and feeder roads. The number of registered logging operations in Rondônia increased from 400 in 1982 to 1,150 in 1987, and the volume of processed lumber from 1.4 to 4.2 million m3. Such rapid deforestation had, in fact, been encouraged by the government's broad policies to develop the Amazon region, including road construction, colonization schemes, fiscal incentives and subsidized credit, which created high, though short-lived, private profits at substantial public costs.

22. To address this problem, two national forests were established but the plans for their protection and development were not implemented because of lack of funds and staff. While the number of forestry control posts

constructed exceeded the original program, their effectiveness was very limited because the responsible Federal agency, Brazilian Forestry Development Institute (IBDF), was weak and had insufficient resources, the large migration to Rondônia and the rapid development of local wood industries. As a result, deforestation went virtually unchecked for much of the project period. In recent years, a series of corrective measures were taken to improve forestry control, including higher taxes on forest exploration, greater fines on illegal exploration, the establishment of a Forestry Military Police to strengthen enforcement and of a State Forest Institute to provide forest extension services, and an Emergency Program was initiated to control deforestation and burning. These efforts have begun to reduce the rate of deforestation and burning, according to the responsible government agencies, and have laid the basis for possible improvements in the future.

23. The project did not plan for public reforestation, but relied instead on a strategy of smallholder intercropping of perennial crops and agro-forestry development on private lots. Of the two planned seedling stations to promote perennial tree crops and forestry development, only one was completed, and credit constraints limited the number of settlers who could implement such farming systems (paras. 12, 17). Little is known about the distribution, utilization and survival of forest seedlings produced, but they evidently had no significant impact on counteracting deforestation.

24. Several Biological Reserves were established and the National Park of Páguas Novas was strengthened under the project. Because of a shortage of resources of the responsible agencies, maintenance of the reserves is precarious and policing is inadequate to prevent frequent invasions by settlers, loggers and miners. Four ecological stations were built and equipped and a State Environment Agency (SEMAR) was established in 1986 to control pollution and initiate environmental education. Only 55% of the funds for ecological stations were spent because of institutional weaknesses and lack of counterpart funds.

25. The project included US\$7 million for ecological research, but only US\$4 million were spent. About 20 research projects were undertaken, involving 179 researchers from major Brazilian institutions, and more than 200 scientific papers were published. While much of the work reflected very good diagnostic capabilities of the researchers, a lack of policy focus and direct connection with project implementation greatly reduced its impact on project results. The implementation of the environmental protection component was weak and long delayed. However, as awareness of the seriousness of the problems and the commitment to address them grew, the funds for environmental protection were more than doubled, as indicated in para. 20.

26. The most serious difficulty in achieving the environmental objectives was the institutional weaknesses of the two key agencies - IBDF and the Special National Secretariat for the Environment (SEMA). Staffing with appropriate personnel was exceedingly difficult with low salaries, reduced even further by delays in payments during periods of high inflation. As a result, most IBDF employees in Rondônia resigned at different times during project implementation, so that many accomplishments were threatened or even

wiped out. Behind these difficulties were not only the serious budgetary problems of the Government, but an ambiguous commitment to the environmental objectives. However, the lack of effectiveness of IBDF led to the creation of a State Forestry Institute in 1987, which opened local offices in many parts of the project area. It has established a permit procedure for clearing and burning forests which, if pursued consistently, would provide a valuable instrument for controlling forest destruction, but its present effectiveness cannot yet be evaluated since the necessary data are not being collected.

27. The project did not anticipate adequately the very large increase in migration and the massive impact this would inevitably have on the environment. As a result, the scope of environmental measures was too small to meet the scale of environmental problems resulting from the rapid increase in population. On the other hand, the project has laid the institutional and research basis which would permit in the future a greatly expanded effort if supported by the necessary political commitment. But given the serious financial constraints of the State and Federal Governments, the long-run sustainability of this effort remains uncertain.

#### D. Social Infrastructure and Urban Development<sup>1</sup>

28. The Agricultural Development and Environmental Protection Project included US\$5.2 million for education. The number of school places was to be increased from 27,000 to 67,000. In addition, 1,900 new teachers were to be employed and 840 teachers were to be trained. The project as implemented increased the number of school places by 24,300, instead of 40,000, and only 470 new teachers were employed. The quality of education was generally low. The training of teachers and the provision of text-books and teaching aids was deficient primarily because of a shortage of funds.

29. The project also included funds for 39 service centers (NUAR) to provide support to groups of farms, including public water systems, electricity supply, schools, administrative offices, health posts, crop drying and storage units, etc. These NUARs were seen as the forerunners of future towns, under a strategy to encourage a more even development of urban areas in Rondônia and avoid overcongestion of Porto Velho and the other main cities. The number of NUARs was later reduced to 20, mostly in areas where existing small towns were already developing rapidly, and in a few cases because settlement was progressing too slowly to justify construction of a center. Most of the NUARs have since developed into towns and several into the capitals of new municipalities.

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<sup>1</sup> Two of the POLONOROESTE projects not dealt with in this assessment (para. 1) also had social infrastructure components, and the third was a freestanding health project for the Program area. The results of these more significant social investments are not dealt with in this analysis.

**E. Protection of Amerindian Population**

30. The Program recognized that the rapid development of the Region would place increasing pressures on the local Amerindian communities. In particular, there would be increased competition for land traditionally held by Amerindians, they would be exposed to contagious diseases and their culture would be threatened. The SAR regarded this as a critical issue "to be addressed and satisfactorily resolved prior to the further implementation of the proposed Northwest Program" (Annex 8, para. 11). The Federal Government agreed to implement a Special Project to protect Amerindians, involving land demarcation and regularization, health and education services and economic development. The costs of this project (US\$26.1 million) were not included in the costs of the Agricultural Development and Environmental Protection Project, because the Government did not wish the Bank to participate in its financing, but its implementation was a condition in the Loan Agreement.

31. Protection of indigenous lands was the cornerstone of the Special Project. At appraisal, the Special Project sought to demarcate 3,900 kms of Amerindian reserve boundaries covering a total of 3.1 million ha. During project implementation, additional areas were identified and the Government extended demarcation activities to these new areas. As a result some 9,300 kms of Amerindian reserves were actually demarcated, covering about 9.0 million ha of reserves. The share of the Amerindian population living in demarcated reserves in the POLONOROESTE Program area increased from only about 18% in 1980 to 85% in 1989. However, in January 1990, the Government revoked the earlier demarcation of one of the largest Amerindian areas and the total Amerindian population living in demarcated areas is now about 7,500 Indians or 78% of the total.

32. The project greatly accelerated the pace of demarcation, especially after the Bank suspended disbursements in 1985 because of insufficient progress. More land was demarcated after 1985 than in the entire history of Brazil before then. However the protection of the Reserves against illegal logging, mining and squatters has been difficult given the size of the area, the profitability of these operations and the political support they receive, the collusion of loggers and miners with Indian leaders, and the limited capacity of the Government to fully enforce the law against exploitation. There are no accurate data on the extent of such invasions, but they are frequent and involve perhaps 5% of the Indian lands.

33. To strengthen the health services for the Amerindians, 38 infirmaries and health posts and 51 wells were built, also exceeding original targets, and health professionals and workers were recruited. However, living conditions for the staff were poor, many had little training, the turnover was high, medical supplies were frequently not available and equipment was not maintained, so that local medical services became increasingly limited. In time, they became focused on a few central facilities at regional headquarters, but there, too, the quality of medical care declined due to lack of trained personnel, facilities and medicine. The level of diseases such as tuberculosis, malaria, measles, influenza and intestinal parasites among the Indians is very high. Acculturative influences such as the introduction of

powdered milk, and environmental pressures such as deforestation and the consequent reduction of wild game, have adversely affected their diet and nutrition. Nevertheless by the late 1980's, the high mortality rate during the initial contact period had been reduced and the birthrate and the population were increasing.

34. Thirty-two schools were built on the Reserves but the teachers had inadequate training and inappropriate textbooks, and the poor living conditions drove them away. By 1988, virtually the only schools on the Reserves were operated by missionaries.

37. To encourage development, the project provided equipment and supplies for large communal gardens. A few of these were planted and some flour and bananas were sold but in general the Indians refused to work communally, output was low, the equipment was not used and most gardens were abandoned after a short time. A number of trading posts were established but almost all of them closed down quickly since the Indians had no commercial experience.

#### F. Monitoring and Evaluation

35. Given the great uncertainties surrounding the project, major emphasis was placed on establishing a monitoring and evaluation system which would provide timely information on the implementation and impact of the project, and thus permit prompt corrective action. Because of conflicts between the responsible consultant FIPE (The Institute for Economic Research of the University of São Paulo) and the Program management, monitoring and evaluation did not play the important role envisaged, though it was crucial in calling attention to the gravity of the Amerindian protection problem and environmental and health risks. The use of external consultants for monitoring and evaluation was effectively suspended in 1987, in favor of the monitoring system developed by POLONOROESTE's own staff. Information on the result of the project is still quite limited, reflecting more the emphasis of the system on compliance with physical and financial targets than on basic project impact.

### III. SUFFICIENCY OF OBJECTIVES

36. Even if the four major objectives of the Program had been achieved, this would not have been sufficient to assure the sound development of the Northwest Region because two important problem areas were not addressed - mining and urban development.

#### A. Mining

37. The improvements in transport accelerated the development of mining in Rondônia, where between 100,000 and 200,000 people are estimated to be involved in gold and cassiterite prospecting. Cassiterite shipments are estimated at 48,000 tons in 1989 with a market value of nearly US\$200 million. The value of gold mined is not known but some researchers place it as high as US\$1 billion per year.

38. The potential value of mining activities and the extent to which they would develop over the project period were not foreseen by the Bank and the Government at the appraisal stage, and hence adequate regulation and enforcement mechanisms were not built into the design of the POLONOROESTE Program. Mining has led to serious environmental degradation, especially water pollution and deforestation. Placer mining and river dredges have contaminated the rivers with large amounts of mercury and discarded crankcase oil. SEMARO, which was supported with Bank funds, has initiated efforts to control pollution and provide environmental education, but it is still too weak for adequate inspection and enforcement.

B. Urban Development

39. The Program also underestimated what would be an extremely rapid rate of urbanization of Rondônia, because of incorrect assumptions about the likely pace of migration to the State. The urban population had already increased rapidly between 1970 and 1980 from about 60,000 to nearly 230,000 and has since grown to about 700,000. The mining operations require extensive commercial and service activities for support and have contributed to rapid urbanization, so that by 1990 about 45 percent of the population of Rondônia lived in urban areas. The NUAR construction program (para. 30), while helpful, did not provide an adequate response. Many of the other new towns and the largest cities in Rondônia lack adequate infrastructure, such as water supply and sewage disposal, essential public services, including public health, and urban housing conditions are frequently poor. Industrial pollution from saw mills and the processing of raw materials is growing and the official control of these activities is inadequate.

IV. CONCLUSIONS

A. The Impact of the Program

40. As emphasized before (para. 1), this is only a limited assessment of the Program since several projects in its support are not covered. Moreover, some important up-to-date information, such as the distribution of land ownership, is not available. Subject to these limitations, it would appear that in most respects, the Program did not achieve the sound economic and social development of the Region. But by establishing and strengthening institutions and initiating important research, it laid the basis for expanded efforts in the future provided a strong political commitment is backed with adequate resources of staff and funds. Specifically:

- (a) The effort to consolidate land settlement and agricultural production in central Rondônia was too small to make a sufficient impact on the needs of that area. While agricultural production has increased considerably, the long-term viability of this agricultural development is still in question because of series of institutional, technical and financial constraints. The sustainability of agriculture in other, agronomically less

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suitable frontier lands in the Program area is unlikely under existing economic and technological conditions.

- (b) Environmental conditions in the area have continued to deteriorate. Deforestation has been rapid and agro-forestry efforts have not been implemented on a significant scale. Mining has led to extensive water and soil pollution. Biological reserves were established but they suffer from frequent invasions by settlers, loggers and miners. Four ecological stations were established but their effectiveness as research stations has been weakened because of insufficient financial support and many of the results were not effectively utilized. A State Environment Agency, State Forestry Institute, State Land Institute, and Forestry Military Police have been established and which is an important accomplishment in spite of their operational limitations.
- (c) The education system was expanded and is helping to meet demand, but the quality of teaching is not adequate.
- (d) The lands and culture of the Amerindian population continue to be threatened by the rapid development of the Region. Most of the Indian reserves have been demarcated, but protecting the reserves against illegal invasions has been difficult. Health and educational services have had only a limited impact, though the population is now increasing. The effort to initiate economic development did not succeed. The SAR had recognized this as an important risk but believed it could be minimized by a strong Government commitment, a strengthening of the responsible agency (FUNAI) and careful monitoring.

41. It seems likely that without the Program, migration into the Region would have been less or spread over a longer period of time, depending on the Government's ability to complete the road (BR-364) without Bank assistance, but that agricultural settlements would have been less orderly and productive and that protection of the environment and the Amerindians would have been substantially weaker.

**B. Reasons for Shortcomings**

42. There are a number of reasons for the shortcomings of the Program:

- (a) The Government of Brazil was strongly committed to opening up the frontier area to migration, but it gave less priority to the other components of the Program, especially the protection of the environment and the Amerindians. As a result, the major highway to Rondônia was completed ahead of schedule while effective demarcation of Indian reserves started on a significant scale only after the Bank informally suspended disbursements in 1985, and implementation of the environmental protection component was weak until the last years of the project period.



- (b) The economic and financial situation of Brazil was extremely difficult during the period, so that budgets were very limited and by the time funds were received, their value had been further reduced by rapid inflation. The Bank tried to help meet this problem by increasing disbursements under the Special Action Program, but a shortage of funds remained pervasive.
- (c) The key institutions responsible for the environment were weak as a result of serious management, staffing and budgetary problems. The Project had recognized this as a major risk, but improving institutions, especially those operating in frontier conditions, is difficult and takes a long time. The implementation schedule for the Program was not realistic. However, the Program has created or strengthened key institutions in Rondônia, such as those dealing with agricultural research and extension, forestry protection and the environment, which will be important for future development.
- (d) The volume of immigration into the Region had not been foreseen. As a result the scale of the Program was too small to deal with the impact of such massive migration. Related to this was the failure to address adequately the problems of mining and urban development.
- (e) The phasing of the implementation of different components undermined orderly development. In particular, the early completion of the main highway accelerated migration before the institutions and policies were in place to assure proper agricultural settlement and protection of the environment and the Amerindians. Similarly, physical infrastructure such as NUAR's, schools, health posts and forest control posts could not be utilized properly because of inadequate staff and operating funds.
- (f) The arrangements for monitoring and evaluation did not work adequately. Since the Program was inherently experimental and risky, monitoring was particularly important to warn the responsible agencies promptly of problems in implementation.

## **V. MAJOR LESSONS**

43. The implementation of the Program offers a number of important general lessons, in addition to the more specific lessons discussed in the PCRs.

### **A. Strategy for Frontier Development**

44. The Program was based on the Government's strategy of alleviating serious unemployment and poverty, particular in the southern parts of Brazil, by encouraging migration to frontier areas. The Bank does not seem to have questioned that strategy but tried to channel its implementation toward sound

economic and environmental development. Given the fragility of these areas, the limited opportunities they offer for sustainable employment, and the potential for great harm to the environment from their development, such a strategy needs to be carefully weighed against other policies to improve employment opportunities and living standards in Brazil.

**B. Government Commitment**

45. Government commitment to the objectives of a program is always important, but it becomes crucial when the political and economic risks are unusually high, the institutional basis weak and the Government is faced with serious financial difficulties. The SAR recognized the importance of this but the Government's strong commitment to the construction of the road, on the one hand, and the lower priority given to the protection of the environment and the Amerindians, on the other, was not fully appreciated.

**C. Project Preparation and Monitoring**

46. The Project was based on extensive preparation efforts including a comprehensive, multidisciplinary study of the Region, but in retrospect they were not sufficient. The knowledge of soil conditions, of appropriate production and conservation techniques, of methods to protect forests, of mining activities, etc. was incomplete. Moreover, preparation did not address macro-economic policies, such as fiscal incentives and subsidized credit, which were inconsistent with the objectives of the Program by encouraging unsustainable livestock development and deforestation.

47. The SAR recognized the risk of incomplete knowledge, though not the extent of it. There is, however, a trade-off between more preparation, involving costs and time and still inevitably not resolving all uncertainties, and starting a project with more limited knowledge, and recognizing that it is an experiment which needs to be carefully monitored and adjusted as the lessons of experience are being learned. This choice was particularly difficult in this Program since the migration to the frontier was already in full swing. Unfortunately, the risks from insufficient preparation were often not adequately met by prompt modifications in implementation.

**D. Integration and Phasing of Program Components**

48. The various components of the Program are interrelated so that successful implementation of some depend on adequate progress with others. This was not always the case. The early completion of the road encouraged migration before there was sufficient knowledge about soil conditions for farming, and many environmental actions were not initiated until considerable damage had already been done. Such integration of activities, for which different agencies with different degrees of administrative competence are responsible, is inherently difficult but the SAR did not address its importance in achieving the sound development of the Region.

49. A related problem concerning phasing arose from the fact that while most of the infrastructure financed under the Program was built and the

needed institutions were established, their effective operation turned out to be much more difficult than had been anticipated. The road was built, but has been poorly maintained; forest reserves were established, but plans for their protection were not implemented; schools were built but the quality of instruction is inadequate. It is much easier to hire contractors for construction or enact legislation to establish a new agency than to assure the availability of sound management, qualified staff and adequate financial resources. This problem is not unique to the particular projects being evaluated, but it raises important issues about unrealistic goals and expectations, reflected in unrealistic implementation plans. These issues are particularly relevant in this Program because of the very difficult physical environment in which it was being implemented and the need to establish new institutions or rapidly expand old ones, at a time of serious shortages of staff and financial resources.

**E. Role of the Bank**

50. The Bank played a valuable role in promoting orderly settlement, strengthening the protection of the environment and of Amerindians and in encouraging necessary modifications during implementation. On the other hand, by financing the road, it helped to accelerate migration to the Region before the institutions were ready to handle the rapid increase in population. Nor does the Bank seem to have questioned the basic strategy for development of the Amazon Basin and the financial policies which in effect subsidized uneconomic forest exploitation and were, therefore, inconsistent with the Program objectives. The Bank did not appreciate that the scope of the Program was insufficient to address the range and size of the problems which the Region faced.

51. The Project raises an important issue about the Bank's supervision function. Supervision has two purposes - to inform the Bank about progress in project implementation, including compliance with loan conditions, and to provide technical assistance to the implementing agencies. For most projects these functions can be carried out by two or three field missions per year. However, in a project of this size and complexity and with such major risks, the Bank may want to consider the desirability of stationing its own staff in the project area, especially during crucial periods of implementation. It would provide the Bank with more up-to-date information on progress and greater opportunities for technical assistance. But it runs the risk that the Bank would interfere, or could be seen to interfere, with the Government's exclusive responsibility for project implementation and thus even weaken the responsible agencies. If that risk can be minimized, the full-time stationing of staff in the area deserves careful consideration in projects of this type. This was in fact done for the Road Project but not for the Agriculture and Environment Project.