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USAID

STRENGTHENING ROAD MAINTENANCE PROJECT

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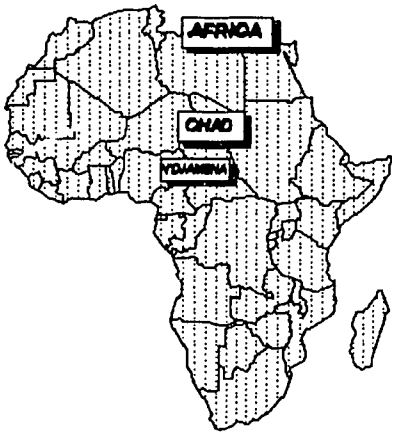
FINAL PROJECT REPORT



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END OF PROJECT REPORT

STRENGTHENING ROAD MAINTENANCE PROJECT

(S.R.M.P.)

USAID PROJECT 677-0050
REPUBLIC OF CHAD

September 30, 1993

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EXPLANATORY NOTES ON THE REPORT

This final report presents data and discussions, sometimes anecdotal, of the USAID project accomplishments and concludes with the recommendations. Its perspective focuses mainly on the cost of maintaining roads in Chad and on the future of road maintenance under the new system of privatization.

LBII only participated in the second phase of the project, that is over its last three years. Five members of the seven-person team in place in the last twenty or so months were different from those who had originally replaced the first phase consultant thirty-six months earlier. Therefore, the report presents data collected mainly over the last three years and the writer's perspective, in September of 1993, is not entirely of knowledge gained from first hand experience which somewhat limits the discussions.

The report compares the performance of OFNAR in the last few months of the project with what was ideally perceived as stated project purpose and goal. Recommendations benefit from hindsight which is freely and hopefully gainfully used in framing the various recommendations presented throughout the report.

There are sources of information which were not available to the writer by the time that the final report was prepared concerning Phase 1 of the project. It proved to be difficult to obtain documents pertaining to the creation of SNER in the summer of 1993 and because AID requested that this report be finalized before PACD, it deprived the writer of relating the experience of the last days of OFNAR and the first month of SNER. These would have afforded the opportunity to present more impartial views and dispassionate opinions and the final episode of the project performance.

The writer is a civil engineer and does not know what the OFNAR organization was like in its early years, but he does know that up until OFNAR was created in 1984, no road organization in Chad had been capable of maintaining any roads and he also knows that OFNAR would have been capable of doing the routine 93-94 road maintenance campaign in the N'Djamena Agency, starting in September 1993 had it been allowed to continue to exist and had it been financed adequately. That knowledge, compared to the stated project objectives, forms the principal and positive conclusion of the report.

The new perspective after disbanding OFNAR in the summer of 1993 to regroup some of its elements under a newly created organization (SNER) is discussed in this report in the chapter called SURVIVABILITY. This casts an overall view not only of what the writer expects SNER to become but more importantly for Chad, the expectations of future road maintenance throughout the country.

There is a characteristic of this report which is important to keep in mind, it concerns the presentation of data, as explained in this paragraph. A considerable amount of data was generated by OFNAR, especially during its last few years of existence, upon which judgmental decisions were based by its management as well as by all the consultants associated with road maintenance in Chad. Most of the data that LBII assisted OFNAR with was financial. Short of doing its bookkeeping, LBII had to rely heavily upon the output of the OFNAR accountants who in turn relied on the data input from the various Directorates. A substantial part of data that LBII had a chance to study, such as that generated by the Directorates of Works and that of Equipment, both of which were under the executive powers of other consultants, was found to be unreliable. On the other hand there was a considerable amount of anecdotal reports which provided the setting under which OFNAR and all the consultants operated. To the extent that it is possible, the writer has tried to identify factual data and their reliability and to relate the situations which contributed to the mood under which roads were being maintained in Chad over the period 1991 to 1993. **The selection criteria for incorporating the few tables found in this report was their reliability. In order to avoid that a casual reader draw undeserved conclusions from a hasty perusal of the report, tabular data of doubtful reliability were purposely omitted.**

Recommendations, where deemed pertinent and useful for future reference, are presented in bold type text after each discussion in order to facilitate the correlation with discussions.

There is no way to avoid the fact that the recommendations are based on hindsight which affords a better perspective of how things should have been handled. They are offered with the intent that they may find their true value by being applicable to similar future projects.

The following chapters present the project salient points and their discussions. They are: CHRONICLE OF ROAD ORGANIZATIONS IN CHAD, PROJECT PURPOSE AND GOAL, COST OF ROAD MAINTENANCE, PROJECT HEAVY EQUIPMENT, THE ADVISORY TEAM, THE MANAGEMENT BY USAID, THE MANAGEMENT BY OFNAR and SURVIVABILITY. The last section of the report presents the CONCLUSIONS. Emphasis was given to the chapters on COST and SURVIVABILITY.

Unless otherwise specified in the report, the FCFA currency of costs was expressed in U.S. dollars at an exchange rate of 275. During the last two years of the project, this rate fluctuated between about 230 and 310. The FCFA rate of exchange with respect to the French Franc remained at 50. Inflation in Chad during the last two years was negligible.

LESSONS LEARNED

This section of the report was requested by USAID to be included after the review of its final draft. Lessons learned are very subjective and substantially not only from individuals but also organizational standpoints. What is lesson to one may be repeat to another. The project as generally conceived by USAID was very good, the hurdles that had to be overcome were mainly connected with the uniqueness of the host country. It initially offered very difficult conditions after the conclusion of the war when the SRMP started and there were relatively short periods when there was probably more concern about personal and community welfare than about seeing the work through. In Phase 2 for the most part there existed a sincere and fruitful cooperation between USAID, OFNAR and the consultant.

For these reasons, a couple of ideas presented in this section reach somewhat outside of the project context rather than relate to its particulars. The recommendations offered in the report presumably take care of specific points and could be inferred, by some, as lessons learned. There are three salient points to emphasize.

The first pertains to the various costs of maintaining dirt roads in Chad. A considerable amount of time was spent evaluating and then analyzing available data to arrive at the figures that are presented. This type of information is often times difficult to come by unless a specific study is undertaken for that purpose.

The second is that it is unrealistic to expect to be able to create a completely new organization, such as a national highway department, from scratch, and bring it up to an independent, efficiently functioning body in a time span of less than a decade. This project, as well as other road maintenance projects financed by other donors, lacked the long haul work needed to impart an accumulation of small but lasting improvements needed to create a permanent set-up. There is more to creating an organization than providing appropriate hardware and individual training. A significant observation was made on the behavior of the Chadian personnel of OFNAR at all levels. Over the last eighteen months, there was a loss of morale, particularly among the upper management cadre, as a feeling of creeping despair grew as, first the EEC, then the World Bank (BCEOM), then USAID and finally the enforced privatization projects of technical assistance to road maintenance brought an ever increasing feelings of insecurity, of wasted individual professional efforts, and of serious concern with regard to personal future welfare.

The third and less tangible lesson relates to the selectivity of contributed effort. Were there too many consultants and other haphazard contributions, such as the gift of heavy equipment

(nations other than the US), to still be able to impart a feeling of self reliance among the Chadians? To what extent does the apparent ease of acquisition of goods and services dull the eagerness of the recipient to go it on his own? The funding by USAID of the rehabilitation of the rock quarry and of some of the OFNAR buildings and of part of the construction of the paved road to Dandi were lasting contributions and, at least in the case of the quarry and the paved road, had and will continue to have a real economic life beyond that of the project. It may be that the Chadians, had they been given more of a feeling of urgency in their own accomplishments, would have developed better management skills? Observations indicate that there were too many instances where the absence of an expatriate for even the shortest period of time was excuse to delay action. (An outstanding exception must be made to this remark which concerns the behavior of the Director General who was indeed unafraid and decisive in the course of action to take to see OFNAR through its internal as well as external dealings). This third lesson could be summarized by the familiar adage that too many cooks can spoil the broth.

I. SUMMARY

Foreign financial assistance to Chad is needed to maintain, rehabilitate and construct national roads of any kind. Although it fell short of meeting its purpose, which was to transform OFNAR into a technically competent and financially responsible organization, the SRMP project was successful in reaching its goal, which was to help maintain some roads in the N'Djamena region.

Historically, OFNAR was short lived. It had barely a nine-year life span. It was organized after a couple of false starts under other government agencies, always under-funded. OFNAR was the first successful endeavor by Chadians to maintain some priority roads.

The 33 million dollars grant financed a USAID project over an eight-year period. By 1993, $13.1 million had been invested directly into OFNAR. This represented less than half of all foreign financial assistance for roads provided to Chad during that time period, which amounted to about $30.4 million. The project concentrated on maintaining about 550 kilometers of earth-surfaced roads, or a little more than 14 % of the maintainable primary road network of the country and about 7 % of all the main roads. It also contributed, through the World Bank, to meet part of the costs of paving the Dandi road and to help rehabilitate a stone quarry at Dandi.

Because past methods of mechanically maintaining roads in Chad were uneconomical, no one really knows what the minimal cost would be to maintain dirt roads in a trafficable condition. Truck traffic on national roads does not exceed 50 per day, too small a volume to economically justify costly improvements to the road network. Project experience, up to 1993, showed that under the OFNAR management, maintenance cost per kilometer varied from $1,538 to $4,264. The higher cost being that of the AID project, inclusive of cost of the technical assistance team. Excluding that cost, the unit cost drops down to $2,693 per kilometer, well within the range for the rest of the country. The cost of routine mechanical maintenance could be as low as $2,000 per kilometer, based on new tasks as defined by the writer. Periodic maintenance would be around $500 per kilometer. World Bank costs estimates for the 1994 (and beyond) campaigns, vary from about $179 to $2,797 per kilometer. There are obviously several important variables that enter into these Bank estimates but none have been defined to account for the large cost spread. Some are inferred in this report.

There were some glaring omissions in the make-up of the project funded heavy equipment purchases. More efficient use of the compactors could have been made had the project purpose included some engineering aspects.

OFNAR's management team turned out to be the most stable compared to that of the consultant and that of USAID, both of which experienced many personnel changes which impaired the continuity of the project.

The project faced two major management problems. One was the lack of engineering criteria. The other was that over the project years, there were five concurrent technical assistance programs to OFNAR, financed by World Bank, African Development Bank, European Economic Community and the European Development Fund. Both restricted and diluted the project efforts to reach its purpose.

The privatization of road maintenance work, starting in 1993, raised the question of survivability in the years ahead not only of the project accomplishments but most importantly of the future of road maintenance in Chad. The SNER, (ex-OFNAR), is not expected to survive for two main reasons; 1) its work will be financed by the government of Chad and 2) it will have the least lucrative contracts of the national program. From that standpoint, the decision by USAID/Chad to end its participation in the transport sector could not have come at a worse time for the future of road maintenance by the SNER, the sole heir of the project efforts. AID should have provided funds to the Ministry of Public Works, Directorate of Roads, in order to partly finance the work to be undertaken by this newly created organization and to safeguard the previous training imparted to OFNAR personnel transferred to SNER. Beyond 1993, road maintenance by other private sector organizations will be mainly financed by the international community. They are expected to be able to keep the roads open to traffic as long as foreign funds remain available. Since the majority of the maintenance work will be financed under this program, it is expected that most of the road network slated for maintenance in Chad will continue to operate adequately. Details are presented in the Chapter entitled SURVIVABILITY.

II. CHRONICLE OF ROAD ORGANIZATIONS IN CHAD

The Office National des Routes (OFNAR) evolved from two changes brought to a first organization called the Roads Fund, created in 1960.

Initially, a Roads Fund created in 1960 after independence was to collect taxes on fuel sold in Chad. Revenues were turned over to the National Treasury to finance road maintenance nationwide. The Fund lost its credibility as a funding agency with the international donors interested in the transportation sector because it was not capable of collecting taxes efficiently. Consequently, financial assistance started to dwindle and the government, in an attempt to restore confidence, disbanded the Fund to create a new organization called the Road Maintenance Fund (RMF).

Contrary to its predecessor, the RMF was given control over funds disbursement for road maintenance work but since it depended for its revenues on the national treasury who took over the collection of the fuel tax, it never had an operating budget. By 1979, when a war broke out in Chad, no money had ever been deposited into the account of the RMF.

It was after the war that OFNAR was created as a department of the Directorate of Roads of the Ministry of Public Works and Transportation, with funding by the treasury based on the collection of fuel taxes and from grants and loans of foreign donors. OFNAR was created in February of 1984 to maintain primary roads and ferry crossings. The rehabilitation and construction of roads, bridges and ferries remained the province of the Ministry which awarded contracts to the private sector to undertake these improvements. These contracts were mostly funded by various foreign assistance programs.

In November of 1988 a study for the reorganization of OFNAR was concluded by Louis Berger International, Inc. It was sponsored by the World Bank and is entitled "Etude de Reorganisation de l'Office National des Routes". The salient point of the study was the structural make-up of the organization for which eight options were presented and one (so-called option # 3) was retained even though option # 7 had originally been preferred by the Ministry of Public Works. The adopted option gave OFNAR responsibility over the Equipment Park, Road Maintenance Work and Tax Collection (on fuel) and left Planning and Control to the Directorate of Roads. Organization efficiency and coherence were sacrificed for the sake of the option requiring the least amount of changes.

In addition, the report recommended that equipment be rented to the local private sector in order to provide a system to improve the management of the equipment stock.

Until the summer of 1993, OFNAR was responsible for the maintenance of about 3,800 kilometers of the national road system. In the last couple of years of its existence, it encountered serious funding problems from the National Treasury and it became impossible to meet their recurrent costs participation of the AID project expenses.

In 1991, foreign assistance to OFNAR amounted to $5.6 million dollars worth of investment of which $1.1 million was from USAID and an additional $3.8 million for recurrent costs, of which $1.96 million came from USAID [1]. During that year, the Government of Chad budgeted contribution was $7.6 million, $7.4 million of which were to come from the fuel tax and the balance from income from ferry tolls, equipment rental and interest. For 1992, USAID assistance amounted to $0.9 million, that of other donors to $1.9 million and the fuel tax was supposed to amount to $5.9 million of which only about a third was in fact received [2].

OFNAR was dissolved in July of 1993 in preparation for the privatization of road maintenance and in September, it was in fact transformed into a parastatal organization called Societe Nationale pour l'Entretien des Routes (SNER). Its management was modeled after that of a private organization. Its assets, estimated at about 500 million FCFA (equivalent to about $2 million dollars) consisted of the OFNAR's N'Djamena facilities and its serviceable equipment and spares stock. This included, among many other items, all of the project heavy equipment, tools, vehicles, water wells, office furniture and building rehabilitation and training materials.

The financial resources of SNER were to be the revenues from contracts received from the Ministry of Public Works for the routine mechanical maintenance of some earth surfaced roads. The estimated budget of the Ministry for the maintenance of the secondary road network was about $7.1 million per year. Only a fraction of this would be awarded to SNER for various contracts. No foreign aid funds were earmarked, through the Ministry of Public Works, to pay for the work of SNER and it was once again expected to be funded by the revenues from the fuel tax and other levies collected by the Chadian government, a funding source proven three times over to be either non-existent and/or insufficient. The lion's share of road maintenance work will be undertaken by the private sector, financed by foreign aid.

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[1] OFNAR, "Budget Previsionnel, 1991"

[2] OFNAR "Bilan au 31-12-92"

The USAID project to assist OFNAR was divided into two phases. The first, of five years, was entrusted to Gannet-Fleming Corddry and Carpenter, Inc. It concentrated on some building rehabilitation and training at the work production levels. The second phase lasted three years and was awarded to Louis Berger International, Inc. It focused on the Central Workshops management training, achieving road maintenance goals and rehabilitating some building.

III. PROJECT PURPOSE AND GOAL

The interpretations of both purpose and goal need to be discussed in order to frame the context of the writer's viewpoint and, later on, his recommendations. They also affect the conclusions. Persons who were earlier connected with the project may have had interpretations that differ in parts or in whole from those of the writer. For these reasons it is necessary that they be defined here in greater detail than they were in the contract document.

Both Purpose and Goal definitions basically ignored two characteristics of the project. One concerned the roads; not all primary roads of the N'Djamena Agency were in a good enough condition to be maintained. The other was the framework in which the USAID project fitted. It consisted of several other assistance programs which had an input into how OFNAR was to develop.

In an ill-defined way, the project wanted to improve a few roads in Chad and try to better the management capabilities of the highway authority. If no steps were eventually taken early enough to ease the transition of OFNAR into a privatization of the road maintenance work in Chad by coordinating the efforts of all of the assistance programs, it is because there was very little or no initiative on the part of the World Bank to guide the projects towards the new orientation.

A. Purpose

As defined in the statement of work , the purpose of the SRMP was "to develop a technically competent and financially responsible organization for the maintenance of the road network in Chad".[1] In 1992, this was changed to read "... for the maintenance of the road network in the N'Djamena Agency in Chad." [2] This amounted to a realistic and welcome focusing by USAID on what the project could aim for and accomplished.

It may be that the original intent was for the project to have created a national organization capable of standing on its own for the routine maintenance of some of the dirt roads in Chad. Because of its lack of input at a high enough management level, this was not a realistic purpose to try to achieve. It is however difficult not to construe the quoted sentences of the

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[1] Contract No. 677-0050-C-00-0010-00, USAID, April 27,1990

[2] Modification No.5 Contracting Issues, Contract No 677-0050-0010, May 27, 1992.

preceding paragraph as to mean anything else but that OFNAR would be able to maintain either the entire road network of Chad or that of the N'Djamena Agency. The fact that the project could only involve the N'Djamena Agency was recognized late and it appears that it never realized that by assisting OFNAR, it tied itself to an organization which had no say in how reliably it would be funded and had no control over which and how many roads were to be maintained. The Directorate of Roads of the Ministry, after review by the Council of Ministers, decreed the yearly maintenance programs nationally and for the N'Djamena Agency, that was to amount never to exceed some 550 kilometers.

The financial responsibility aspect of the purpose is very difficult to pinpoint. It is true that for at least the last three years of the project, OFNAR's Directorate of Finance's responsibility did not go much beyond that of bookkeeping to pay employees salaries and meet operational costs such as the purchase of fuel, lubricants and office supplies. The fiduciary aspect of the work, even though introduced in Phase 2 of the project, such as amortization of building and equipment, replacement and maintenance costs, future expansion costs, revenues potential from other activities (equipment rental and sale of old materiel), were never a serious consideration, mainly because of the learning process that they required. Amortization of equipment and cost accounting were in fact mainly undertaken by the Directorates of Equipment and Works of OFNAR, neither having any input from the project at that level.

Although technical competence must be considered from its individual and collective aspects, it is very clear that the purpose of the project was to develop competence at the organizational level. Successes in training at the individual level were too often confused by all donors with imparting collective competence. In other words successful efforts at training individuals did not result in altering the Chadian work practices. Trainees had a tendency to return to the established practices rather than try to use their training to create changes.

It is argued in the next paragraphs that the purpose of the project to develop technical competence and financial responsibility was not only ill-conceived but so broad as to be beyond the possibility of an evaluation.

If one interprets the term **"develop"** to have meant for both technical competence and financial responsibility to have been reached, then the purpose of the project was not achieved. It was ill- conceived because it called for reaching a condition within two vital Directorates (Works and Equipment) which were, at least in Phase 2, in the hands of other foreign consultants, therefore outside the possibility of LBII to control. Although the project was at one time criticized for not cooperating enough

with other assistance programs, the criticism ignored the fact that cooperation is a two-way street and goodwill on one side only is not sufficient to establish channels of communication.

It is not possible to understand to what extent the expatriate managers of other consultants had input into the management of OFNAR since, outside of the monthly USAID/OFNAR meeting, there never was a joint meeting of the various consultants to try to coordinate programs. There is no doubt that the influence of other consultants was considerably more pronounced than that of the project's Phase 2 consultant since they were in executive rather than advisory positions.

From the financial standpoint, there was and had been since the inception of the Road Fund in 1960, a lack of Government of Chad (GOC) funds to finance road maintenance. The GOC at the end of the SRMP was not able to finance OFNAR's commitments to the USAID (as well as other) projects. It is difficult to achieve competence when there is not enough money to pay the salaries of agents at the end of each month. The shortcoming translated into a lax personnel management style. Petty and, not so petty, thefts at both the Agency and the Central administration levels were ever present and. although officially not tolerated by management, disciplinary measures were rare. There were countless anecdotes of the use of equipment for personal purposes throughout the OFNAR organization. The chief of the training asphalt brigade sold the fuel which had been assigned to him to operate the bitumen lance on the day that he received it but he maintained his position. Although officially forbidden, these where condoned "within reason", probably for the purpose of allowing the agents to acquire some cash. The use of services of mechanics for the repair and maintenance of privately owned vehicles and the use for personal purposes of craftsmen, such as electricians and carpenters, during official work hours was also of common occurrence. It was difficult for the upper managers to enforce discipline when employees had serious salary claims, all of which comprised a part of financial responsibility in its broader sense.

The USAID Phase 2 project had a small technical training funding component. Several competent persons were trained at OFNAR some of whom were later hired by the private sector which was able to attract them with higher and most of all, regular salary payments. Most of the training of the agents was done by the French consultant retained by the World Bank, with a few individuals sent out of country.

Based on these few examples, the project had no chances of success to develop "technical competence" among a coherent staff and the "financial responsibility" ought to have been directed at a higher level than that of OFNAR. In the writer's opinion, the

purpose remained not only unachieved but not achievable as long as local funds remain scarce.

B.Goal

The project goal became eventually "to maintain the road network in the N'Djamena Agency". This definition lacks the identification of the roads and a qualifier of the verb "maintain". This may be because the goal appears to have been developed without even a cursory understanding of what OFNAR actually does in the field.

As defined, the goal is incorrectly stated for two reasons. First it lacks the qualifier PRIORITY to the term road network. There are many roads in the N'Djamena Agency which are not considered part of the priority networks. It was not the intent of the project to finance their maintenance, nor to technically train personnel to ever do their maintenance, which would be quite different than that needed for the priority system. There are several roads considered priority roads in the Agency, such as the road from Guelendeng to Bousso and on to Miltou, which were not included in the AID project because the maintenance was financed by other international donors and therefore totally outside of the project's influence.

Of approximately one thousand kilometers of major roads in the N'Djamena Agency, only around 550 kilometers were included in the primary network of dirt roads whose maintenance was financed by the project. At one period in the project, in late 1991, AID appeared to place a lot of importance on the number of kilometers that the N'Djamena Agency was capable of maintaining and at one time even had set up yearly goal increases in the number of kilometers that the Agency would maintain [1]. This presumably would have been considered as a measurable indication of OFNAR's increasing capability to do "something". The concept referred to was that OFNAR would have to do go from the 550-kilometer program scheduled for 1991 to a 750-kilometer program in 92, a targeted downgrade issued in a Project Paper Supplement of May 1989, from the original goal of 1,600 kilometers. These arbitrary progress benchmark completely ignored the fact that it was not the responsibility of OFNAR to decide which roads were maintained from year to year. This decision of AID was obviously set by uninformed non-technical persons because, due to the lack of engineering criteria to gage performance (neither the width of the road surface nor the degree of compaction of the soils placed on the road were ever defined), meeting the benchmark would have in no way proved or disproved any development of OFNAR in either its technical competence or financial responsibility. It would

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[1] "Assessment of Project Impact" USAID/N'Djamena. Fiscal Year 1991, Target # 2 of Transport Sector, Part C.

have been a proof of how flexible the definition of mechanical maintenance could be. Besides, since the project brigades went at least twice over the entire length of the 550 kilometers of road, one could conceivably argue that the brigades maintained (without qualifier) 1,100 lineal kilometers of road.

This brings the comments to the second flaw of the definition of the goals. The maintenance should have been defined as MECHANICAL maintenance (as opposed to manual maintenance) and it should have gone further in defining how the equipment was to be used, that is to say that the project should have insisted that in the N'Djamena Agency, a modicum of engineering standards had to be met.

Whereas the project purpose is considered by the writer to be unrealistic, the project goal is deemed to be so loosely defined as to be too easily attainable. The project goal as defined by USAID can therefore be considered as achieved. As a matter of fact, it was most likely achieved within the first couple of years after the arrival in Chad of the project-purchased heavy equipment. It was achieved early because there was so much flexibility in the program interpretation as defined by the Directorate of Works.

C.Discussion

By combining institutional management issues and physical accomplishment, the overall impact of the project is difficult to fairly evaluate. It is certain that the gift of heavy equipment and spare parts to OFNAR had a major beneficial consequence on the condition of the roads in the N'Djamena Agency. This contribution and the equipment adequate upkeep ought to have been identified in the project goal. The same comment pertains to the financing of the construction of twelve water wells. These should have been programmed to play a much bigger role than that of serving the OFNAR brigades for three weeks out of the year.

Management improvements targeted above the N'Djamena Agency level by the project involved the activities of other consultants retained by the World Bank. At one time that organization was financing 25 advisers to work on solving the administrative road maintenance problems faced by Chad. This personnel was inserted at the Ministry of Public Works and at OFNAR from the Directorate to the field brigade levels. In addition, there were German and Italian consultants at OFNAR and new equipment gifts from Saudi Arabia, none of which was coordinated with the AID project.

The next page presents the organizational chart of OFNAR as it existed during Phase 2 of the project life. The three shadowed boxes represent the sections where the AID technical assistance teams were inserted as advisers. The numeral in the boxes indicate the number of advisers assigned to the particular

department. The three-D boxes represent the directorates where other consultants, all in executive positions, were introduced into the organization. Both Directors of Works and Equipment were expatriates, financed by the World Bank.

The chart shows that six of the project's Phase 2 advisers were placed in positions subordinate to that of expatriates in executive positions. This of course means that the USAID project advisers did not have decision on the policy issues but were in fact restricted to advise Chadians on the way to carry out specific work orders as they were passed on down the line. In fact, except for the financial adviser, these advisers worked at the level of mechanics and job foremen. For any of the AID team advisers to have had an input in the management issues in the Directorates of Works and Equipment may have confronted them with other expatriates rather than with the Chadian staff.

D. Recommendations

The writer recommends that the following wording ought to have been used for the project purpose:

> **The purpose of the AID project is to purchase earth moving equipment and other imported and local commodities necessary to operate and maintain equipment for road mechanical maintenance work. The work will be performed in conformance with basic engineering requirements, for a period of (x) years. Equipment operators, mechanics, crew chiefs and managers (both technical and financial) at the N'Djamena Agency will be trained and basic engineering standards will be established to control the quality of the maintenance work performed.**

The writer recommends the following wording for the project goal:

> **The project goal is to mechanically maintain, in accordance with a modicum of engineering standards, about 1,000 kilometers of the national priority road network in the N'Djamena Road Agency of the Office National des Routes of the GOC.**

AID should have insisted that its consultant have the latitude to incorporate some technical aspects into the program to

1) introduce more efficient use of the USAID funded equipment; this would have required that the N'Djamena Agency be able to develop its own methods of doing maintenance work.

2) to introduce concepts of engineering requirements at the brigade level to the work performed, such as maintained roadway width and compaction of soil.

AID should have worked in close cooperation with the Ministry of Public Works to annually increase the network of roads within the N'Djamena Agency scheduled for routine maintenance. It is very likely that had this been conceived initially, the unit cost of mechanical road maintenance in the N'Djamena Agency would have decreased significantly and would have ended in the low part of the cost range.

IV. COST OF ROAD MAINTENANCE

Cost is the most important consideration, next to most economical cost. It is not possible to ascertain what is the most economical cost of maintaining dirt roads in Chad. OFNAR never had enough experience and had not accumulated sufficient data to correlate cost to traffic volume, climate and soil conditions and maintenance practices and the Ministry did not have the data to determine what the relationship was between benefit to the user and the level of maintenance.

It would appear logical that for given climate and soil conditions and quality of road work in any one region, the cost of mechanically maintaining dirt roads would be in direct proportion to the amount of traffic that the roads carry. For the past years up to 1993, this did not appear to have been the case if one is to trust available data up to that time. That was possibly due to two reasons, one that traffic was so light everywhere that it could not measurably influence cost and two, that the method of utilizing the equipment was so inappropriate to the road conditions that maintenance costs remained the same, regardless of the state of deterioration of the road, short of being severely deformed.

The World Bank projected costs for the years 1994 through and including 1996 vary so much (by a factor of about 22) that the explanation must rest with the type of mechanical maintenance performed [1]. Hopefully this reflects substantial changes in the practices of putting the heavy equipment to work from what was done by OFNAR. This is discussed under Section D below.

A. Traffic Volumes

By international standards, major road traffic in Chad in general is light. By far the greatest activity is in the Southern half of the country. Traffic is almost at a stand still during the rainy months of July and August, when the roads are closed by means of manned barriers to avoid excessive deterioration.

In 1985/86 at the beginning of the project, the highest reported Average Daily Traffic (ADT) was 80 vehicles per day between N'Djamena and Massaguet [2]. In 1991, in the N'Djamena Agency,

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[1] Draft of the "Proces-Verbal des Negotiations entre la Republique du Tchad et l'Association Internationale de Developpement", May 1993.

[2] "Etude de Reorganization de l'Cffice National des Routes" Rapport de Premiere Phase, Louis Berger International, Inc. January, 1988.

the truck traffic accounted for about 30 to 50% of the ADT; it varied from 17 to 31 trucks per day on dirt roads [1]. There appears to have been no significant increase in truck traffic over the life of the project and a few areas, such as the Guelendeng-Bousso-Sarh road, partly in the N'Djamena Agency, show a substantial decrease of some 25% between 1963 and 1986 and possibly an additional decrease of some 10% from 1986 to 1991. The traffic counts are not considered reliable data conclusions should not be drawn based on traffic volume without undertaking a new and controlled count. The important fact to keep in mind is that whether the traffic volume is in fact either in the 30 or 80 odd trucks per day, it is nevertheless very low for a national system.

B. OFNAR'S Budget and Maintenance Costs

This section briefly discusses what it took to run OFNAR. The figures presented here were the latest available from OFNAR's 1992 balance sheet at the time of preparation of the report.

Figure 1 presents the total cost for the four tasks recorded by OFNAR for the 1992-93 campaign. Figure 2 on the next page shows total costs by region.

For calendar year 1992, which corresponds to the OFNAR fiscal year, operational costs amounted to $6.57 million. The three largest cost items shown on OFNAR's balance sheet for that year were personnel costs, at $2.33 million, diesel fuel cost at $1.30 million and spare parts at $1 million.

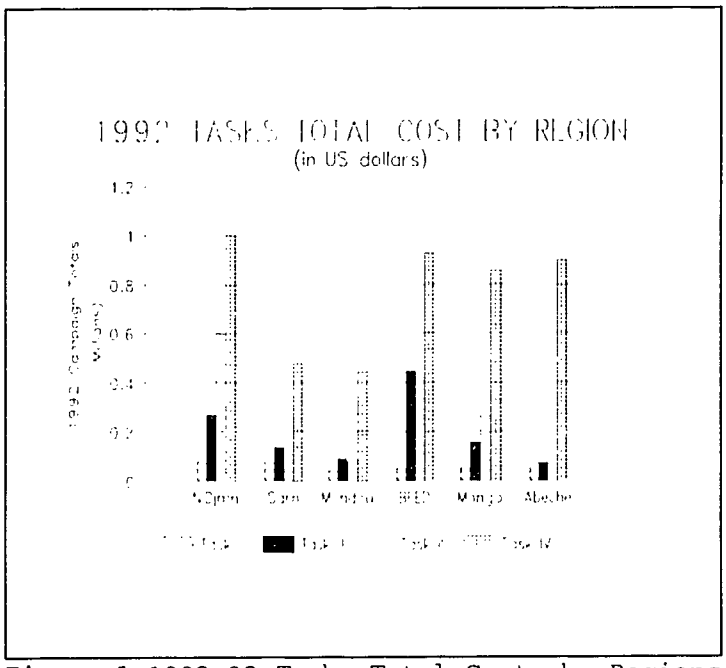

Figure 1 1992-93 Tasks Total Costs by Regions

[1] "Second Evaluation Study, SRMP" De Leuw Cather International, Limited, March 1992.

Three donors financed $2.90 million of these costs, which includes USAID's share of $0.92 million for that year.

By the end of 1992, there were eight foreign sources of funding which had invested, up to that time, $26.77 million into OFNAR. The OFNAR investment amounted to $1.11 million. By the end of 1992, AID had invested $6.17 million.

In 1992, new acquisitions amounted to $3.75 million to which OFNAR contributed a little less than $8,000 and AID $346,643. The bulk of the acquisition was funded by the FAD, for their contribution amounted to $2.47 million.

In 1992, from the OFNAR balance sheet, the writer calculated average unit cost per kilometer of maintaining the roads in each of the five administrative regions plus the Fond Europeen de Developpement (FED) brigade is presented below, which includes the foreign aid components:

Abeche Agency	**$1,538**
Mongo Agency	**$1,863**
Mondou Agency	**$2,439**
FED brigade	**$3,200**
Sarh Agency	**$3,501**
N'Djamena Agency.(AID project)	**$4,264**

The data used in the newly installed cost accounting procedures is not reliable enough to give authoritative amounts for any one road. Eventually, as the system would have improved, it would have been possible to closely estimate unit costs for major roads in Chad.

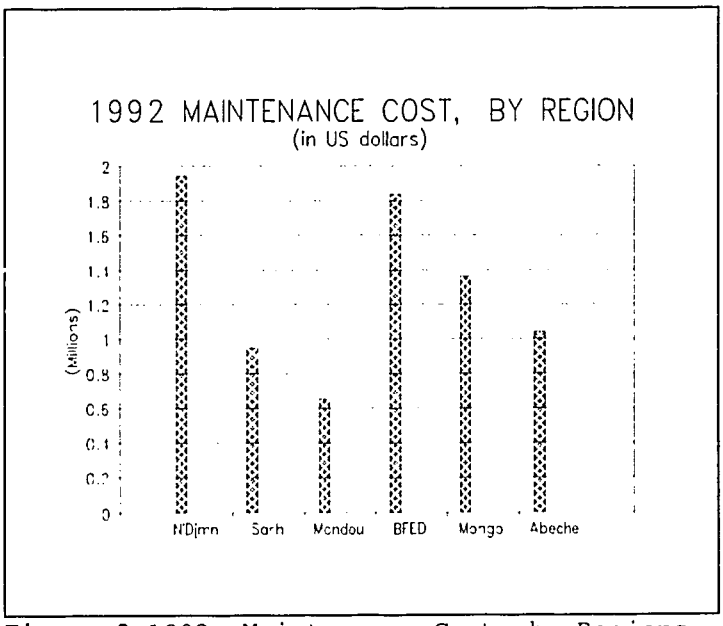

Figure 2 1992 Maintenance Costs by Regions

Referring to Figure 2, it must be remembered that about half of the FED work was done in the N'Djamena region. By far the greatest maintenance effort was made in that region.

C. The USAID Project Unit Cost

Unit cost per kilometer calculated from the budget of the USAID project (see Table I) yields an amount of **$4,079**, but that included the cost of foreign technical assistance team which for the AID project amounted to 34%, or $1,387 per kilometer. [1] Excluding the cost of the technical assistance, the AID contribution to the maintenance cost of the project roads was $2,692 per kilometer. Additional cost must be taken into account for the OFNAR contribution to the project in the form of rental of equipment not funded by AID. From January to June of 1992, that is for the 1991-92 campaign, this amounted to about $250,000, which corresponded to an additional $454 per kilometer. **Therefore the cost of maintaining the roads in the N'Djamena Agency can be stated as $3,146 per kilometer, well within the range of the OFNAR breakdown per Agency.**

TABLE I
USAID PROJECT BUDGET
(Total for project length)

CATEGORY	BUDGET PROVISION (in dollars)
Technical assistance, long term	6,100,000
Heavy equipment	3,400,000
Light vehicles	250,000
Machine tools	900,000
Spare parts	1,500,000
Road materials	2,700,000
Light vehicle operations	400,000
Other operating costs	2,700,000
TOTAL	17,950,000

[1] Report entitled "Etude de Reorganisation de l'Office National des Routes", Ministry of Public Works, Louis Berger International Inc. January 1988

D. World Bank Estimated Future Unit Costs

With the assistance of the World Bank, the Ministry of Public Works established cost estimates for the maintenance of the primary and part of the secondary national systems of some 4,725 kilometers for 1994 and beyond at about $14.5 million per year.[1] That averages out at around $3,069 per kilometer nationally. Table II presents partial details of the cost breakdown (Maintenance budget for and distances of paved roads for instance are not included).

TABLE II
1994 ROAD MAINTENANCE BUDGET
(provisional, in US dollars)
(Exchange rate of 255 FCFA/$)

PERIODIC MAINTENANCE	LENGTH (km)	1994 BUDGET	UNIT COSTS
BDEAC	528	1,667,000	3,157
CCE	715	2,549,000	3,565
IDA	198	2,596,100	13,111
TOTAL	1,441	6,812,100	
ROUTINE MAINTENANCE			
CCE	715	1,278,400	1,787
CHAD	3,917	3,001,800	769
TOTAL	4,632	4,279,200	

It is not known what type of mechanical maintenance is envisioned by the new programs to perform at a unit cost of over $13,000 per kilometer. The scope of work for this work had not been issued by the time this report was finalized, but it is guessed that it must include rehabilitation work rather than maintenance, or it could be an error. The above table does not give a full insight of unit costs and one should generally refrain to average over too large a data field. Additional details in the referenced document show that the 1994 estimate per kilometer of **primary** dirt road varies from **$179** to **$3,989**, and that for the **secondary** network ranges between **$242** and **$383**. It also shows that the

[1] Proces-Verbal des Negociations entre la Republique du Tchad et l'Association Internationale ed Developpement. PST 2, May, 1993, Annex 2.

SNER's greatest number of projects will consist uniquely of routine maintenance of secondary network roads.

Hopefully, the large variation in the range of unit costs for the years to come will reflect variety in the methods of doing mechanical maintenance. These new methods ideally would be tailored to meet the actual road conditions as they are generally known to be year after year. Progress would be realized if the four work categories (described in the next section) which used to be blindly applied to all earth roads are abandoned in the years to come.

As a matter of interest rather than analysis, the expected financial commitments for the Periodic maintenance of dirt roads in Chad over the next five years is presented on Figure 3. It shows that both the IDA and the Chad plan to increase the yearly funding over the five-year period from 1994 to 1998. The BDEAC and the CCE will maintain a participation of 1.6 and 2.55 million dollars respectively.

The Chadian government will increase its funding from about $1.3 to about $2.3 million in 1998.

It is assumed that the periodic maintenance will correspond to the rehabilitation rather than the maintenance of the roads. That would explain why the routine maintenance unit costs are substantially lower than those of the periodic maintenance.

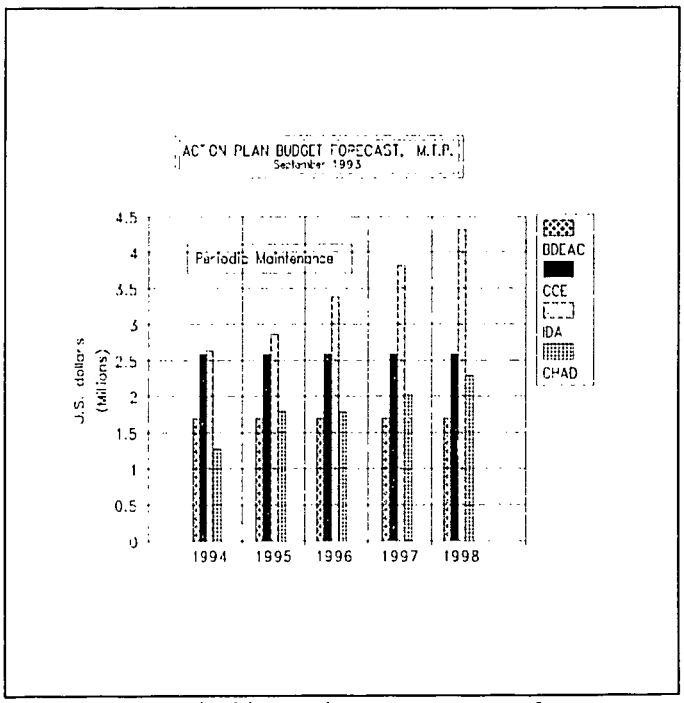

Figure 3 Periodic Maintenance Funds

E. Discussion

The cost of mechanically maintaining the earth surfaced roads in Chad ought to vary from one region to another. Some regions have

good soil materials which, once properly placed on road surfaces, require less maintenance than those of the N'Djamena Agency. The cost of maintenance is influenced by the traffic intensity, traffic type, topography, precipitation, quality and frequency of maintenance and quality of the initial construction or rehabilitation work of the roads.

It is meaningless to discuss costs of doing road maintenance work without going into the details of what the work consisted of and, more importantly, what work quality was achieved. The latter however was never included as an issue in the project and its control was not made part of the programs of either the Directorate of Works of OFNAR or of the Ministry of Public Works. There is no doubt that the control of the work, if done in accordance with accepted engineering methods, would add to the cost of maintenance and it may be that this added cost is argument enough for some to not include it in the programs. There is just as little doubt that the quality of the earthwork, Categories II, III and IV (defined on Table III), done by the two OFNAR brigades in the N'Djamena region was of extremely poor quality and did not warrant the deployment of the heavy equipment beyond that required for grading.

It is also meaningless to criticize the past actions without offering at least one suggestion for a more cost efficient method and estimating its cost. This is related to OFNAR's personnel management as well as its work and is presented in the Chapter VIII, entitled THE MANAGEMENT BY OFNAR.

Because of the wide variation in the unit costs, the data in this chapter shows that in fact, no one now knows in Chad what was or will be the cost of maintaining a national dirt road. The maintenance program consisting of four tasks performed over the entire network is certainly not the most economical way to keep the roads trafficable. There is no doubt that there exists conditions where road rehabilitation is needed rather than maintenance in order to make subsequent maintenance possible at a minimal cost, as was the case in June of 1993 for the 68 kilometers of road from Massaguet to Massakory. The World Bank estimates for the coming years indicate that there is a concept that there are cheaper methods of road maintenance.

Dirt roads in the N'Djamena Agency are maintained by two heavy, mechanized brigades. Both brigades are scheduled each year to perform four distinct types of operations which amount, on paper, to grading 1,343,000 (see Table III) lineal meters of road and moving 154,500 cubic meters of soil. The brigades work every workday of the nine- to ten-month campaign. This is equivalent to grading almost three times the entire network of the N'Djamena region's road identified for mechanical maintenance. Because there are no control standards, the quality of the work becomes immaterial from the control standpoint as well as for the

performance of the road, since during the ten months campaign, there will be at almost any one spot along the road a grader every three months to put it back in an acceptable condition. In fact, both brigades perform considerably less work than what is scheduled, but as long as the road serviceability is acceptable and there is money available to meet the costs, there is no criticism. That is the core reason why the maintenance program can be improved, by keeping the quality of the road while reducing costs of its maintenance.

Earthwork in the N'Djamena Region is by far the most expensive of all aspects of road maintenance. For the sake of completeness, mention is made of the hand maintenance, consisting of cleaning culverts and repairing head walls and concrete fords. Table III shows the OFNAR budgeted costs for the various types of mechanical operations.[1] The last four entries of Table III show that the entire length of the network is scheduled, every year, for three passes with a grader each called Dry, Compact and Heavy and a final pass with filling. The writer knows from experience at the sites that not even half of the network requires the Compact and the Heavy grading and that less than 10% of the total length maintained by the project requires yearly filling.

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[1] OFNAR'S "Programme des Travaux 92-93" in a letter of the Direction des Travaux, dated May 4, 1993, Ref. N 130/DG.OFNAR/DT175/93

TABLE III
OFNAR'S COST ESTIMATES OF WORKS
(N'Djamena Agency)

TASKS	QUANTITY	AMOUNT (dollars)
Culvert cleaning	12,000 l.m.	8,400
New culverts	200 l.m.	36.200
Gabion	40 m3	4,420
Masonry	10 m3	4,600
Dry grading, Cat I	340,000 l.m.	70,500
Compact grading, Cat II	340,000 l.m.	247,300
Heavy grading, Cat III	663,000 l.m.	554,500
Filling, Cat IV	154,500 m3	1,309,600

The cost rates of task Categories might explain the large variations in the estimated unit costs of maintenance per kilometer of road. These correspond respectively to $228, $800, $920 and $2,797 per kilometer, assuming for Category IV that 300 m3 are placed per kilometer of road. It is most likely that the rates specified in the 1994 World Bank estimates vary not only according to road category but mainly due to newly defined maintenance types. This suggests that the higher cost would entail at least Categories II and III type tasks, while the lowest rate would correspond to the Category I task, that is just one dry grading per year. Similar assumptions could be drawn about the other costs of the possible permutation and combination of the road categories and maintenance types. However and most importantly, as an attempt to correlate the estimates with the truck traffic volume showed that none existed, it must be hoped that the cost variations are based much more on local experience reflecting weather, soils and workmanship quality than to traffic volume conditions.

What is not shown on Table III and ought be included is the work needed at a few road spots every year which, through some quirk of weather or road accident, require more work than any listed above. This type of task usually demands more effort but over a very short time than that normally required for maintenance. In these spots, heavy equipment usually performs a considerable amount of earthwork more akin to rehabilitation than routine maintenance.

The Ministry of Public Works identifies the roads to be maintained by OFNAR according to traffic volumes. Roads with the

largest amount of truck traffic are chosen. Each year, before the start of a new campaign in September, and also as needed occasionally during the campaign, the Ministry issued its directives to the Director General of OFNAR indicating which roads were maintained. Therefore the program defined for the entire campaign in September could be changed during the course of the dry season. In mid-May 1993, thus almost at the end of the 1992-93 campaign, the Ministry ordered maintenance stopped on the road from Ngoura to Bokoro (108 kilometers) and asked that the project North Brigade be moved to the Massaguet-Massakory road (68 kilometers) to do maintenance on a road that was so badly neglected that it ought to have been rehabilitated rather than maintained. The cost of this type of maintenance must truly be unaffordable since the quality of the work was so poor (black clay was used to regrade and refill the road in some places) and the benefit derived therefrom of extremely short duration (one month). This also exemplifies how production can be manipulated when no standards (control) assure some quality. Form rather than substance becomes important and transcends technical competence and financial responsibility. The Chadian personnel involved were fully aware of the shortcoming but found it simpler, in this particular case, to follow orders at the end of the campaign rather than make an issue which could have embarrassed OFNAR management.

Generally accepted practice is to define the type of work from the degree of deterioration, not only of any particular road but of any substantial segment displaying similar stages of degradation. OFNAR, through its Directorate of Works, was responsible to determine what types of maintenance were needed, theoretically after an inspection of the selected roads. In early September the Directorate of Works would issue letters to each of the five regions transmitting the maintenance program and each new year's program was very similar to that of the previous campaign. For the N'Djamena Agency, each year the four categories of work were included for the 550-kilometer network. It is likely that each year the characteristics of the roads were fairly identical to those of the previous year and it is indeed very probable that over the great majority of the network each campaign needed to be very similar to the preceding one. What was very unlikely was that the four categories were needed throughout the entire network indiscriminately, year after year.

The condition of the roads in the project area at the beginning of the campaigns in 1991 and 1992, right after the end of the rainy season, was fair to good with short stretches being bad but passable. The bad areas required more rehabilitation work than maintenance.

F. Recommendations

Based on the field observations made in the project area and with the intent to keep the roads at an acceptable level of trafficability, the following recommendations are made:

1) It is recommended that the primary and the secondary road geometries be defined by specifying both vertical and horizontal requirements and that engineering standards be established to control all earthwork.

2) It is recommended that a rigorous system of road inventory be implemented in order to determine which of the roads of interest are maintainable.

3) It is recommended that the routine and periodic mechanical maintenance tasks be newly defined to reduce the costs of maintenance by making more economical use of the equipment available. Mechanical maintenance must only be practiced on roads which are in sufficiently good condition to warrant the deployment of the equipment.

The first recommendation would standardize all national roads by introducing minimal dimensions and requiring that a sufficient and well applied amount of compaction will be imparted to the soils placed on the road.

Vertical standards would define the thickness of soil above natural terrain in areas subject to flooding, the soil cover over culverts to prevent damage and the minimum thickness of earth lifts and their numbers, for earthwork.

A claim could be made refuting the necessity for the second recommendation on the ground that such a system to perform periodic road inventories exists at OFNAR, it is necessary to **implement** (the key word) the system and have a follow through for the end use of the inventoried data.

The third recommendation would eliminate costly tasks where not needed or just as importantly, avoid applying them to roads that have deteriorated to the point where rehabilitation rather than maintenance is needed. The cost of undertaking tasks presented here in the next few paragraphs and in the Annex is based on new definitions of the work. There would be two types of mechanical road maintenance work 1) Routine Maintenance and 2) Periodic Maintenance

As defined in Annex I, the Routine Maintenance would cost around $1,997 per kilometer and the Periodic maintenance would be around $507 per kilometer. These costs were derived from the rates furnished by OFNAR which we already have seen were unreliable.

In addition the Periodic maintenance would have required the additional cost to control the quality of the work. This could easily have doubled its unit cost to somewhat over $1,000 per kilometer.

Details on how the two tasks are redefined are presented in Annex II of this report, entitled "Scenario for New Tasks for Mechanical Road Maintenance".

The reason why these recommendations were not made at the time of the project was that the Directorate of Works was run by an expatriate adviser and definition of tasks was his bailiwick, not that of the project consultant. An exception could have been made for the N'Djamena Agency if USAID had originally insisted on standards being applied.

V. HEAVY EQUIPMENT

The cost of heavy equipment purchased with project funds amounted to about $3.1 million. The budgeted amount was a little over $3.7 million. Most of the project-procured equipment arrived in Chad in 1987, except for the compactors, which arrived in 1988.

The writer does not agree with the way that the road maintenance work was programmed by the Directorate of Works. Consequently the type, but mainly the number, of equipment would have been different from what was actually procured. This is further discussed under Recommendations at the end of this chapter.

Taking into consideration the tasks assigned by the Directorate, the equipment purchased by USAID did not adequately outfit the two maintenance brigades and yet was too much to have met the needs of one brigade. For the last three years of the project, two brigades had been organized, one for the South and one for the North. In order to fully equip the two brigades, equipment was rented from OFNAR. It is assumed that at the time the needs for equipment were determined, the method of doing maintenance had already been established by the Directorate of Works. If it had not, then USAID missed an opportunity in the early days of the project to set standards for the N'Djamena Agency.

A. Quantity

The type of heavy equipment financed by AID and assigned to the N'Djamena Agency is given in Table IV, List of Heavy Equipment Type. The shortcomings of the equipment procurement fall into four categories, namely **omission**, **unsuitability**, **insufficiency** and **needlessness**.

The glaring **omission** were lowboy trucks; none were purchased and two were necessary to meet the needs of two brigades. They were indispensable for the transport over long distances of bulldozers, compactors and of other equipment not capable of returning to the Central Workshops for repairs.

The purchase of four compactors could be classified either as **unnecessary** or as **unsuitable**. Because OFNAR had no soil engineering standard that had to be met, compaction was undertaken in a totally arbitrary way and could just as well have been achieved by construction and commercial traffic. Under those conditions the cost of 85,000 dollar per compactor is hardly defensible. Compactors were not necessary for the type of work undertaken by OFNAR. This of course does not mean that proper soil compaction was not necessary, in fact compaction was needed in many locations on the project roads and the project should originally have insisted with OFNAR to impose standards for the N'Djamena Agency.

TABLE IV
LIST OF USAID-FINANCED HEAVY EQUIPMENT TYPE
N'DJAMENA AGENCY

TYPE	MAKE	NUMBER	REMARKS
Bulldozer DH7	Caterpillar	2	-
Grader 120G		2	-
Loader 950B		2	Rubber tire
Compactor 213D	Bomag	2	Vib steel roller
Compactor BW6		2	Vib Sheepfoot
Compact. LP75H	Dynapac	1	Hand compactor
Compact. E00	Robin	1	
Concr. mixer	Seaman	1	One m3
Trucks 26x28	Mercedes	8	Dump type
Tank truck 26x28		2	Water, 18m3 each
Tank truck 26x28		1	Fuel, 19.5 m3
Truck 911		1	Mobile repair truck
		1	Maintenance truck

Regardless of that argument, the compactors acquired were not suited for the type of soils and compaction practiced. Sheepfoot rollers are used for the construction of engineered fills of several feet in thickness because they very deeply scar the surface that they are compacting. Steel rollers are only useful on flat, plane surfaces and are very inefficient on uneven surfaces such as the sloping sides of dirt roads which tend to be rounded rather than flat. Vibratory rollers are only efficient for the compaction of saturated or near-saturated sands at depth. They are detrimental for sands at very shallow depths or at the ground surface, such as those of worked in the N'Djamena Agency Region. In soils typical of the Region, with over 12% of fines (silts and clays) they are totally useless. The adequate type of compactor for the soil and work conditions met at the project is what was used, that was the multi-rubber tire compactors. Two were rented from OFNAR.

Within the framework of the tasks defined by the Directorate of Works, **insufficient** numbers of water trucks were acquired. The capacity of the two project funded water trucks was 38 cubic meters. At the minimum, one brigade used 200 cubic meters per day and there were periods when 800 cubic meters were used in one day. Since one brigade was supplied with 19 cubic meters, the minimum number of trips to the water point was about 10 per day and it took on the average 45 minutes for the truck to make the round trip and almost half an hour to be filled. The work day was seven hours long.

The replacement cost of the heavy equipment on OFNAR's books was fixed in December of 1991 and came to just under $18 million.[1] The replacement value of the USAID equipment listed on Table IV amounted to $2.83 million, a figure determined by the Equipment Directorate of OFNAR in 1993. The AID equipment contribution represented about 16% of the total OFNAR stock.

In addition to the heavy equipment the project funded the purchase of light vehicles, water pumps, one agricultural tractor, four house trailers, welding machines, electric generators, fuel reservoirs, air compressors, mobile short wave radios and numerous small equipment and tools, spare and replacement parts for the AID-financed equipment as well as for the equipment used by the project but funded from other sources.

The deficiencies in the capacity to transport water, to compact soils and to move equipment around were filled by first borrowing and then renting the right type of equipment from OFNAR. Unfortunately, that equipment was so old that good management practice ought to have relegated them to the junk heap. Ar two monthly meetings in 1992 between OFNAR and USAID this subject was tabled and the Director of Equipment produced a list of equipment identified to be junked. The action required approval from the Director General and was never granted till August of 1993. Based upon the recommendations of the consultant to USAID, project money was spend and down time experienced in the repair and maintenance of this equipment, particularly the low boy trucks, which in part of the 1992 and all of the 1993 campaigns gave badly needed service.

In 1992, when it became obvious that OFNAR would not be able to meet its financial commitments to the project and when the Equipment Directorate had in place the framework of a cost accounting method, the consultant recommended that the equipment loaned to the project be in fact leased at OFNAR's internal rental rates to it so that at least on paper, this particular OFNAR contribution could be quantified in terms of a monetary

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[1] "Bareme Horaire de Loaction Interne" OFNAR, Direction du Materiel, November, 1991.

value and would be considered as part of OFNAR's contribution towards meeting the recurrent costs of the project.

B.Management

By far the largest management concern of the OFNAR equipment was its maintenance and repair. The basic management style of OFNAR's Directorate of Equipment, not by intent but by unbreakable practice born from poor record keeping, was to perform corrective instead of preventive work on the equipment. A piece of equipment would not be brought back into a shop until it needed repair. Routine maintenance work, which requires shutting a piece of equipment down, as recommended by the manufacturer, was seldom if ever done because the historical follow-up of each piece was either incomplete or not available. In the field, mechanics would change oil and check levels of fluids, but a belt or other engine component would never be replaced until it broke. In 1992, OFNAR, then newly equipped with a workshop truck, organized a country-wide mechanical inspection of all of the heavy equipment. This was carried out systematically to run diagnostic tests and was supervised by expatriates. The campaign resulted in a lengthy list of repairs that needed done and were in fact partly done during the 1992 dry season. In 1993 no such inspection trip was organized, one of the reasons being that the stock of spares of OFNAR was so low that it would have prevented most of the repair and rehabilitation work needed on non-project funded equipment. The other reason of course was that OFNAR was to be disbanded during the dry season.

The overall management of the equipment park of OFNAR was done by the Directorate of Equipment. It was under the direct responsibility of an expatriate consultant financed by the World Bank who was the titular director until the end of the AID project. This responsibility included the allotment of the equipment to each of the five regions, the equipment maintenance schedule, repair work assignments and the management of the spare parts stock and, probably most important of all, the establishment of a cost accounting system. Over the three years that LBII was assigned to the N'Djamena Agency, a stock and equipment management system was implemented there which never carried over to the Central administration for the very simple reason that the French consultant there had introduced their, equally good but different system. The latter was in fact developed to determine the cost of maintaining and repairing the equipment and to determine internal rental rates for OFNAR, as opposed to commercial, external rates.

The cost accounting system developed at the Directorate of Equipment was new and therefore fraught with errors. It was not considered reliable in its initial stage, mainly due to errors in entering data and in the accounting of time that mechanics spent

on any particular job. This is the reason why none of the tables are reproduced in this report. It is also for this reason that statistical data were not developed based on the cost accounting. Any such data developed elsewhere and reported for the years 1992 and 1993 ought to be considered by the reader as highly unreliable. For instance, the spreadsheet accounting for the 1992 cost of repair to one of the bulldozers showed a cost allocation for the placement of tires, even though dozers are track mounted. Another showed the installation of a grader blade on a light vehicle. There are reportedly many such errors which are not as obvious to the non-technical reader.

Table V presents the headings of the entries of a table, produced by OFNAR, called "Cost of Maintenance and Repairs of OFNAR Equipment, N'Djamena Agency". This table gives the factors needed to calculate calendar yearly costs, in FCFA, for each of the entries. Each row applies to a identifiable piece of equipment or vehicle.

TABLE V
TYPICAL COLUMN HEADINGS
FOR EQUIPMENT AMORTIZATION
(from OFNAR spreadsheet)

1	2	3	4	5	6	7	8
Amort	Labor	Tires	Batt	Cons	Spare	Ins	Fuel
.050	.064	.045	.018	.020	.034	.020	.000

Where Cons are consumable such as oil, hydraulic fluids, filters, Ins is insurance and taxes. For what it is worth, the Equipment Directorate reported a total cost for 1992 equipment maintenance and repair of $352,198 for all OFNAR equipment, of which $183,366 were for the USAID funded equipment. The record shows that the yearly Labor cost for the USAID funded equipment amounted to an obviously erroneous $5.75. None of the data is considered reliable because the system was in its infancy.

In 1993, OFNAR assumed an annual inflation factor of 3% for the replacement value of all of their equipment. In 1992, the life of all the heavy equipment was assumed to be ten years, but this was later revised downward to better approximate the actual equipment life. The system, if implemented correctly was good but will never be better than the information generated at the lowest level of the hierarchy.

The equipment and spare parts stock funded by the project were made available for the work carried out by the N'Djamena Agency and until the last few months of the project USAID retained the right to dispose of the equipment. But in order to fill the deficiencies in the project heavy equipment, some horse trading

did occur. This was the case for the compactors for instance. It has already been stated that the project compactors were not suited for the type of work done by the project brigades. Two project compactors were traded for a couple of rubber tire Albaret belonging to OFNAR which were appropriate to the specific work. Eventually, two low boy and several water trucks and other equipment were rented to meet the needs.

Rental rates developed by the Directorate of Equipment were based on the cost of equipment replacement, on the cost of its maintenance and on the assumed life of the particular piece of equipment. For instance, the heavy equipment was assumed to have a 10-year economic life, transport equipment one of 6 years, except for trucks which was assumed at three years; small equipment, four years. On the average, the equipment was assumed to be operated for 1,500 hours per calendar year to account for the two months of the rainy season and other non-productive times such as holiday, down time for repair and maintenance.

The argument used to discredit the repair and maintenance costs is a valid for not delving too long on the rental rates. Rental rates which were used for the campaigns of 91-92 and 92-93 are given on Table VI, OFNAR DEFINED EQUIPMENT RENTAL RATES. The rates were calculated by the Equipment Directorate and were proposed by LBII to apply to all OFNAR equipment used on the USAID project but that was not financed by the USAID assistance program. These were accepted by USAID and OFNAR out of the necessity to maximize the financial participation of OFNAR in the project. No explanation was available at OFNAR as to why a lowboy truck would rent at 2 $/hr or 89$/hr.

The rates applied to the USAID project were neither the lowest nor the highest ones mentioned here but were those calculated for the specific piece of equipment placed in service in the N'Djamena Agency. In addition, it is important to note that the internal rental rates developed by OFNAR were applied to the OFNAR equipment assigned to the project.

TABLE VI

OFNAR DEFINED EQUIPMENT RENTAL RATES
(consumable and operators not included)

TYPE	RATE $/HOUR
Hyser compactor, CPA 006	14
Albaret compactor, M6	8 to 11
Graders, Cat 120 B	22 to 24
Graders, Cat 120 G	26
Backhoe, Cat 428 SII	13
Berliet dump trucks(5 to 7 m3)	5 to 6
Mercedes dump trucks(5 - 7 m3)	6 to 21
RVI dump trucks (5 - 7 m3)	12 to 17
Berliet water truck	3
RVI water truck	18
Lowboy truck	2 to 89

Bulldozers and front-end loaders were not included since the project had provided adequate quantities and types. The price ranges for some of the same equipment given in the above table reflect the condition (age) of the equipment made available.

The method used of determining the rental rates as developed by the Directorate is good. For each piece of equipment there is a set of data which is comprised of Purchase price, Replacement cost, an Inflation rate (3%), followed by decimal factors for Amortization Spare Parts, Small Maintenance, Insurance and Taxes and finally the cost of labor in the work shops. Various types of equipment are given different life spans and different number of hours expected to be placed in service per year. This is then multiplied by an arbitrary factor, usually about 2, in order to arrive at an external rental amount calculated on an hourly base, which should also include a profit.

The 1991-1992 estimated total campaign revenue of OFNAR for the rental of their equipment to the project amounted to over $250,000. Since the equipment rented for the 1992-1993 campaign was very similar, this amount was to be credited to OFNAR as part of their contribution to the recurrent costs for that period. Even though equipment rental rates were known to be based on unreliable data,

they were used to quantify the OFNAR contribution to the project, for lack of choice.

C.Discussion

The problem of reporting accurately the time of the personnel and use of the equipment in the field as well as in the various workshops will be difficult to overcome and it was expected that there was little correlation between actual time spent and that reported. This was and will remain the most difficult hurdle to overcome under the privatized system. Many hours were spent by the consultant at the Agency going over the field and workshop time sheets and it was very obvious that the deficiencies were not due to a lack of understanding of the process by the supervisors but in great part due to the illiteracy of the personnel and their reluctance to account for their time in details.

Why were two brigades equipped? Throughout the project they never maintained more than about 550 kilometers of dirt roads in the N'Djamena Agency, yet it has at least twice that amount of road considered of national character. It is possible to determine what would have been the right quantity of equipment to purchase in order to have maintained all of the roads in the N'Djamena Agency. Nevertheless, the cost would have proven to be too expensive. If one looks at the project from the purpose perspective, it could be argue that equipping two brigades was too much, since one would have been sufficient to accomplish the purpose. On the other hand, if the project goal is considered, the conclusion that two brigades were needed could be reached since not all of the major roads in the N'Djamena Agency were being maintained.

Nonetheless, had the project required a more efficient way to do the maintenance, it is certain that the 550 kilometers of road could have been maintained just as well with less equipment or that given the equipment cost as it were, more roads could have been maintained. In 1993, the EEC assistance program had placed a brigade in the South of the N'Djamena Agency to do maintenance work on the road going from Guelendeng to Sarh via Bousso, while the project brigade continued to work on the Guelendeng-Bongor-Lai axis. This situation was not conducive to urge the project brigades to become more efficient.

The quantity of equipment purchased for the project will always remain an arguable variable. A better definition of the goal, as recommended in the initial part of this report, where it is suggested that 1,000 kilometers of road could have been maintained, would have led not only to a better definition of the needed equipment quantity but of the way in which it was to be utilized.

It was not possible to effectively manage an equipment park like OFNAR's with more than one consultant in place. There were many instances during the campaigns when requests for low boy trucks

made by the project brigades at the suggestion of the consultant were countermanded by the Director of Equipment. This resulted in work progress delays sometimes amounting to a full week of work when bulldozers were immobilized for lack of transport. For the same reason, it was also not possible to meet the performance requirements without consultants in executive positions at management level.

When the initial task was to create an entirely new national organization, either the World Bank or the USAID projects ought to have provided experts in executive positions at all management levels at both the Central and the five regional administrative regions. The World Bank project came closest to realizing this since they financed not only the position of director of the Equipment Directorate but also that of directors at some of the regional levels excluding that of the N'Djamena Agency. In advising management by Chadians of the Central and the N'Djamena Agency workshops, LBII found two of its advisers helping to carry out policies which were generated by other consultants and with which they did not always concur. At times it came to the point where the situation of "too many cooks spoiling the broth" had to be avoided. The fact that no AID consultant was in an advisory position in two of the main departments, namely the Directorate of Works and that of Equipment, both headed by foreign directors, made the matter of intervening in procedural matters a potential for confrontation. This was also avoided.

D. Recommendations

There are two major considerations to take into account before ordering project equipment, and they usually are. The first is to assess what and how the project intends to physically accomplish and then determine what will be needed. This has to be done to the smallest possible details in order to not omit major components of the procurement. The latter was evidently not done since a substantial amount of equipment had to be borrowed (and eventually rented) from OFNAR.

The second is to determine the make-up of the existing equipment park of the agency in order to avoid as much as possible a diversity of manufactures of equipment which create, down the line, serious complications in the stocking of spare parts and in the training of the personnel responsible for the maintenance and the operation of the equipment. The following recommendations will prove to be helpful on similar future projects:

1) It is recommended that the heavy equipment procurement list be prepared by a qualified person with experience in the execution of the work contemplated and to obtain, from the host government, an agreement on the detailed manner in which the project goals will be achieved.

2) If procurement is limited, the manner and the extent to which the host government will contribute will be formally established.

3) The manufacture of the equipment will be that which is most common in the existing stock of the host government.

VI. THE ADVISORY TEAM

LBII's scope of work, as defined in the contract, was to work toward the achievement of the Phase 2 of the project purpose (nothing was said about the project goal)[1]. This was to be done by providing a team of seven long term persons (241 person-months) and various short term specialists (43 person-months) with three person-months of home office support and 134 person-months for local hire in administrative and clerical positions. All of the personnel was provided by LBII for the contract times specified.

In early 1993, at the direction of USAID, the long term effort was reduced by 22 person-months because the Ministry of Public Works had issued a revision to OFNAR's maintenance campaign which shortened the 1992-93 campaign to the end of March, 1993 instead of the usual termination date of June 30. Subsequently, after the negotiations between LBII and USAID had been completed, the Ministry of Public Works once again revised the campaign program to end it at its traditional end of June date. Finally, in May of 1993, the Ministry made another program change by ordering the North brigade to work on the Massaguet-Massakory road which had deteriorated so badly (not having been part of routine maintenance in the previous years) that what was actually needed there was rehabilitation rather than maintenance. Consequently, the section of road between Ngoura and Bokoro (108 km) was left without the Task IV type of maintenance.

All of these program changes were made without any forewarning to OFNAR and its various consultants. The end of the last campaign consequently was hectic and limited on project advisers.

A. Objectives of Long-Term Advisers

This report section summarizes the objectives of each of the six long-term LBII advisers and one chief of mission for Phase 2 of the project. Together they were to transform the N'Djamena Agency into a technically competent and financially responsible organization.

The six advisers were divided into two distinct groups. The first, composed of four persons, was assigned to the N'Djamena Agency. The second group of two was assigned to the OFNAR headquarters workshops. For the sake of clarity, each position is described and a short discussion is included in the following paragraphs.

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[1] USAID Contract 677-0050-C-00-010-00, USAID, April 27,1990

1. Road Maintenance Engineer (at the Agency)

He advised his counterpart, the head of the Agency who was responsible for all its operations.

Professional qualifications called for the adviser to be a registered professional engineer with experience in highway construction or highway maintenance engineering.

This requirement was superfluous due to the lack of engineering standards. It became evident that the team did not need a road engineer since there were no engineering issues involved and no engineered roads to work on. LBII's terms of reference excluded the engineering aspects of road maintenance work, yet they made provisions for the posting of a road engineer at the N'Djamena Agency level. No provisions were made to insert an adviser at the Directorate of Works where the actual method of doing mechanical work were defined and where engineering input would have been worthwhile.

Initially this position was filled by LBII with a civil engineer whose knowledge of French was not sufficient to make him as efficient as he should have been with his counterpart. He was eventually replaced by a French national who had many years of experience pertaining to road work and who within a six months period, from September 1992 to April 1993, completely reorganized the bituminous pavement maintenance brigade which had been inactive for some years.

2. Field Operations Adviser (at the Agency)

His responsibility was to advise the North and South Brigade chiefs in equipment deployment and utilization. His qualifications were that of a grading and equipment foreman. This function was well defined and well staffed by LBII. The same adviser, over his three-year stay, had continuous contact with all elements of the brigades in the field and contributed significantly to the day to day training of the various chiefs of brigades and the Chadian equipment foremen.

3. Financial and Procurement System Adviser (at the Agency)

The counterpart of this person was to be the Agency's accountant and he was to advise the store room manager on inventory control or materials accounting and interface with the main OFNAR accountant. He was also to be available to the Central Workshop for short-term assignments. Part of his qualifications were to be a graduate accountant.

By far the most pressing problem of OFNAR in the last three years of the project was its financing of the recurrent costs of the operation of the N'Djamena Agency. For the great majority of the time the Agency had no money other than what was given at irregular intervals by the Finance Directorate to pay the salaries of the employees. Most of the time there was no money to buy any kind of basic office supplies, much less to repair equipment such as photocopying machines and it became evident that there was no need for the adviser to spend much time with the Agency accountant after a bookkeeping system was installed since there were no money transactions. Most of his time was spent at the Directorate of Finance to assist the staff in bringing the books up to date.

The Agency warehouse stocked only off-the-shelf type replacement parts such as belts, oil and fuel filters, batteries and tires.

Most of the time of the Financial adviser was spent in assisting the Directorate of Finances in bringing their accounting system up to date and installing a project procurement system control which became standard operating procedures for all project procurement. A considerable amount of time was spent with the Finance Directorate in preparing OFNAR documents for the 1992 audit of OFNAR by USAID. In the overall OFNAR financial management system, this long-term adviser played a minor role, but he proved indispensable for the management of the project funds allocated to the recurrent costs expenditures and procurement and the compilation of the monthly financial project reports submitted to USAID.

4. Service Foreman/Field Mechanic (at the Agency)

The head of the Agency workshop was to be his counterpart and he was to impart the capacity to do routine maintenance and light repair of equipment at the brigade levels. He was also to be available for short duration assignments at the Central Workshop.

This position was well-defined and because of the well-focused responsibility, the adviser was able to spend over half of his time in the field with the brigades where he not only provided every day assistance but was also able to train the mechanics with hands on practice.

5. Shop Superintendent (at the Central Workshop)

He was a mechanic advising the chief of the Central Workshop of OFNAR where all major repair work on equipment was performed for the entire OFNAR equipment inventory.

In the last thirteen months of the project, the chief of the Central Workshop was a Chadian who had a doctorate degree in mechanical engineering from a foreign university whereas the LBII team adviser was a mechanic with past experience as a hands on

manager of heavy equipment repair and maintenance. There definitely was a communication gap created by the significant difference in the levels of education of the two individuals. The Chadian chief of the workshop had a doctorate degree in mechanical engineering from a European university. Prior to his assignment to the position, there was an elderly manager who had little knowledge of management but who was too advanced in experience to be willing to adapt to recommended and needed changes. Because this created a production problem at the Central Workshop, the Chadian manager was eventually replaced.

6. Equipment/Engine Foreman (at the Central Workshop)

The particular responsibility of this person was to advise the chief of the engine repair shop, a section of the Central Workshop.

Because of the compatibility of the adviser and his counterpart, this position turned out to be a very good aspect of the assistance program. The same LBII adviser person filled this position for the three years of the contract and a considerable amount of training was effected through daily, lengthy contacts of working side by side.

7. Chief of Party

The contract provided a chief of party whose responsibility was to manage the technical assistance team, including the short-term advisers. It also called for advisory capacity to the management of the Agency, the Central Warehouse, and to insure communication between OFNAR Director and the team members, and coordination of the contributions of the team to the overall OFNAR effort. He was to meet periodically with the AID project officer and was responsible for preparing all the team's report to USAID. Part of his qualifications was to have a degree in engineering or technical degree or MBA.

There was little to do in the way of daily management advise to do for the Chief of Party at the Agency level since it had four advisers. Monday morning weekly meetings were organized for the T.A. team, usually attended by the USAID project manager, which afforded a discussion of common and particular problems and to give direction to specific short term efforts. Monthly meetings were organized with OFNAR, USAID and the French directors of the Works and Equipment Directorates for the same purposes.

A considerable amount of time was spent organizing and providing support for the short term advisers who were continuously present at the project in various numbers.

The chief of project made two major recommendations regarding the OFNAR financial management of the project. The first concerned the pay of the agents of the N'Djamena Agency. It was never

implemented because it would have required a fundamental change in the personnel policy which would have resulted in a considerable decrease in the total remuneration of the field personnel. The time was not propitious (salaries were being paid with several months od delay), to introduce downward salary revisions. The other which was implemented, was to account for the rental of equipment of OFNAR assigned to the AID project.

The recommendation regarding the salaries of the agents concerned the per diem pay of personnel working in the field. The OFNAR policy for the N'Djamena Road Agency was that all agents were based in N'Djamena even though the work places were removed from the city. This meant that for all agents spending a day out of the city were entitled to per diem. The 55 agents working regularly at the brigade worked almost all of the time outside the city. An agent's per diem amounted to a rate equal to the monthly base salary, divided by 28.85. A typical total monthly amount for the N'Djamena Agency was 1.324 million FCFA (December, 1992), or some $5,200. The total per diem expenses amounted to 28 % of the N'Djamena Agency permanent, recurrent salary expenses.

Because OFNAR maintained two satellite stations, one in Karme (North of N'Djamena) and the other in Bongor (South), the per diem expense could have been eliminated by designating those two small towns as the bases of the two brigades personnel. This would have saved OFNAR over fifty thousand dollars per campaign.

The other recommendation of charging rental for the use of non-project purchased equipment of OFNAR was adopted. It was discussed under the Equipment Chapter of this report.

B. Objectives of the Short-Term Advisers

The short-term specialists were planned to advise or conduct studies in the job described below. Because of the latitude afforded by the terms of the contract, considerable changes were made in order to better fit the needs. Basically these changes shifted emphasis from the major management issues and private sector interventions to specific personnel training needs and providing management skills for the finalization of host country contracts such as building rehabilitation and water wells installation.

Eventually all of the person-months scheduled were filled.

1. Private Sector (to undertake road maintenance)

This assignment was never carried out by the consultant in Phase 2 because of its redundancy. For at least a year and one half of the project (1991 and 1992), and possibly longer, the Directorate of Works had a full time expatriate in charge of the PME (Petites et Moyennes

Entreprises) division. He was responsible for issuing contracts to the private sector for minor road maintenance work, such as cleaning culverts and repairing shoulders. No work was ever awarded since OFNAR did not have any money to subcontract work. The PME division set up typical contract texts and then was disbanded in late 1992 when the expatriate left and his position was cancelled.

The USAID project did however finance, through the PME division, a small contract to clean out culverts on the Djermaya to Ngoura road.

2. Management Information Systems Specialist (Agency)

This LBII specialist came to Chad and prepared a comprehensive report at the end of his mission. Implementation was the responsibility of the Directors of Works and of Equipment, both expatriates working for the World Bank assistance project.

3. Operations Research Specialist (Central Workshop and Agency)

This position was filled and a report presented. Recommendations implementation was the responsibility of the two World Bank expatriates directors.

4. Personnel Specialist (Central Workshop and Agency)

This position never was filled. As was the case of the Private Sector adviser, it was a redundant position since OFNAR had three full-time expatriates in executive positions dedicated to staffing and training of the OFNAR personnel. They were responsible not only for identifying the job descriptions but also for training personnel to fill the positions. They operated out of the buildings that the project rehabilitated at the Central Directorate of OFNAR.

5. Training Specialist (Central Workshop and Agency)

See comments above which apply to this position.

6. Electrical Mechanic (Central Workshop)

The electrical mechanic spent a considerably longer time than anticipated because he not only formally trained OFNAR personnel but also became very much involved in the renovation of the electrical distribution and of the installation of a new system of compressed air in all of the shops at the Central and Agency facilities.

7. Technical Specialists (various)

Almost twelve person-months were allocated to this for the management of the water wells and the building rehabilitation host-country contracts in order to be able to finalize them within the time frame allocated.

C. Accomplishments

LBII reached all of its work plan objectives but what did this mean in terms of advancements in the road maintenance activities? The 1993-94 road maintenance campaign performance will answer that question.

It is difficult to assess the overall accomplishments achieved by the two USAID project consultants over the eight-year project period when the organization which was advised no longer exists and when only the last couple of years of the project can be related from first hand experience. Accomplishments were considerably more successful when considering the execution of specific tasks and work programs rather than in assessing institutional improvements.

From an institutional viewpoint, there were some efforts which accomplished very little and probably were not worth the cost. Such was the case for the financial adviser to the N'Djamena Agency. This adviser in fact spent most of his time keeping track of the project expenses and assisting the Financial Directorate of OFNAR in keeping their books up to date and assisting them in preparation of financial reports in a format acceptable to USAID.

The advisers at the two workshops of the OFNAR headquarters and the two advisers at the Agency accomplished very little in terms of making OFNAR technically competent, but their daily presence in the shops and at the brigades significantly contributed to production and, to the benefit of the agents assigned in the workshops, to improving their individual practical and technical skills.

The last assigned engineer at the Agency accomplished not only the training of a team for the maintenance of paved roads but actually performed this maintenance for the two roads from N'Djamena to Djermaya (North) and to Guelendeng (South). Nevertheless, this could have been performed as a short-term assignments rather than a long term position. The chief of party position was mainly administrative in nature and he could have performed the technical responsibilities of the engineer assigned to the N'Djamena Agency.

The rewarding assignments, as mentioned above, were those involving daily contacts of the team members in the workshops and the field, the training sessions that were administered for the mechanics and the management of the host-country contracts for the buildings rehabilitation, the wells installation and the installation of the

fuel station at the Agency. The specific attention to equipment maintenance paid by the advisers in the workshops both at the Central administration and the Agency levels, contributed significantly to the good upkeep of the project equipment which, by the end of the last campaign, was in condition to start a new maintenance year even though it had reached its seventh year of service.

The various accomplishments of the LBII long-term and short-term advisers were presented in several reports compiled over the last three years. These are listed in the Annex IV.

Training took two forms. One was through formal sessions with short-term consultants and the other was with hands on experience on a daily basis.

1.Training at the N'Djamena Agency level

The training that occurred at the brigade and in the Agency management levels was the most intensive of all training efforts of the project. It provided for one adviser on a full time basis working with brigades (made up of 55 agents) and one field mechanic who also worked at the Agency workshop. This type of training was informal but continuous and dealt with micro-management problems rather than with general policy issues which were handled by the Directorate of Works.

Although it could easily be argued that, from the standpoint of production and efficiency, the two advisers ought to have been placed in executive positions, the manner in which they actually worked with the brigades as advisers, when the brigades were managed by competent OFNAR agents, particularly proved more beneficial to the Chadians. When the brigades were led by incompetent persons, the actual work results were very poor and frequently frustrating to the advisers.

Under favorable conditions, the advisers were in fact giving hands-on training to the brigade chiefs and section chiefs. This procedure trained people in the deployment of the equipment, its utilization and its maintenance and repair.

2. Training at the Central Workshops

At the central shop the same type of advisory involvement eventually trained mechanics capable of performing repairs on heavy equipment that had previously not been possible. This was to the detriment of the private sector as it translated into fewer contracts with the private sector for the repair of equipment in local garages during the last year of the project.

In addition to the training of mechanics, there was informal training of the agents of OFNAR on the use of new forms introduced

at the N'Djamena Agency for managing the stock of parts and work orders for small repairs and maintenance of the heavy equipment.

3. Formal Training

The training component of the project budget was small. Its initial amount was fifty thousand dollars.

Probably the most successful effort was the training of six mechanics for a period of three months in electro-mechanics and the two formal sessions financed by the project to bring a Caterpillar expert to train mechanics on the routine and major maintenance of the heavy equipment. This was done by a short-term consultant and consisted of formal class room lectures with text materials and manuals. This was followed by practical sessions of working on the brigade equipment. The candidates offered by OFNAR were capable individuals and followed the training course very well. Unfortunately for OFNAR, after completion of the training, three found work in the private sector and left OFNAR in 1992.

There were other attempts at training which were less successful. For instance, in the financial directorate of OFNAR, the accountants used a French system of bookkeeping unfamiliar to the US financial adviser assigned to the project. It was considerably easier to keep the existing procedures which were quickly mastered by the adviser, rather than to change it. In late 1992, the consultant attempted to initiate a cost accounting procedure for the Central Workshop due to a system established and under implementation by the World Bank consultant at the Directorate of Equipment. This was stopped in order to avoid duplication of systems.

D. Discussion

In September of 1992, LBII submitted a Work Plan [1] which was accepted by USAID. It included action items as well as limitations.

Four action items were identified which were fully implemented on schedule. Details of the implementation were reported in Quarterly Reports submitted by LBII. The four issues addressed were:

- Assistance to the management and maintenance of the equipment at the Central Workshop and the N'Djamena Agency levels.

- Assistance to the management of the N'Djamena Agency in terms of administration, equipment maintenance and achieving

[1] "Work Plan for Technical Assistance, October 1992-September 1993", September 1992, Louis Berger International, Inc.

the goal of the road maintenance program for the 1992093 campaign.

- The elaboration of the management issues to involve the private sector in road maintenance activities.

- The termination of the project and the preparation of an End of Project Report.

General comments follow which pertain to the make up and the performance of the team members.

Some of the technical assistance team positions were inappropriately defined, some of the personnel were over-qualified for the assignments and LBII assigned one person who did not meet the language requirement sufficiently to be adequate in his role. This person was eventually replaced.

There were obvious staffing problems with both the first consultant and the LBII teams. The services of the initial consultant for the first five years of the project were terminated in 1990 and replaced by those of LBII. Political troubles in 1990 led to the physical evacuation of LBII's personnel. There were serious disruptions of the services that year and in the beginning of 1991. After the emergency situation abated, some personnel did not wish to come back to an unstable country and several of the LBII team were eventually replaced in late 1991. By then the political situation once again flared up and although no evacuation of project personnel was ordered, the travel of the advisors outside of N'Djamena was often times forbidden. In 1992 a project vehicle with the AID project manager and one of the team members was shot at by a soldier near Guelendeng.

Personnel turnover of the LBII TA team was excessive. Only two of the original seven long term specialists remained at post from the beginning of the LBII involvement by completing their three years tour of duty. Others were replaced prior to the completion of their assignment. Eventually, all the contract person-months were fulfilled. Despite the turnover, good relations were maintained during the last year and a half with other consultants working at OFNAR and with USAID.

The largest constraint on the performance of the LBII team was the presence of the World Bank consultant at the headquarters of OFNAR. Although each was careful to respect the sphere of activity of the other, there is no doubt that the USAID team, being in a subordinate position to the other consultant, was limited in its effectiveness.

Training of local personnel rather than institutional upgrading was probably the largest role played by all consultants assigned to OFNAR.

The USAID management properly recognized that training outside of the local context had doubtful values. Therefore it purposely refrained from financing training outside of Chad and opted for the alternative of bringing experts to Chad to afford greater opportunity to the local staff to be exposed to new techniques and operational procedures. The AID project did not finance any overseas training for Chadians.

USAID also financed the cost of specialized training in Chad on Caterpillar equipment for two two-week training seminar given by an expert of Caterpillar from Yaounde, Cameroon. This approach was particularly efficient because it provided for individual experts to come to Chad and work with a multiplicity of Chadians on all types of that particular manufacture of equipment.

At OFNAR, almost all Chadians selected for training performed well technically but once returned to their assigned units, faced the problem of functioning within habitual economic, social and work attitude frameworks which forced them to lower performance to remain acceptable elements of the whole. The diversity of the formal education of local staff gave totally different perspectives on the work. Some persons were trained in the old USSR (most engineers in Chad were educated in Moscow), some in China, some in other African countries, many in France, and some in Belgium.

Training of the local personnel was by and large successful if one considers achievements on an individual level rather than an organizational level. Most of the OFNAR agents who were formally trained or worked side by side with the advisers profited from the experience but, too many were either transferred to other regions and departments within the organization or found higher paying jobs in the private sector to have markedly benefited OFNAR as a whole or the N'Djamena Agency.

This became a source of disappointment for some of the advisers who considered their efforts towards the project purpose to be thwarted. For instance, over the course of 1992 and 1993 campaigns, the N'Djamena Agency had three different brigade chiefs. During April and through May of 1993, the two project brigades worked under one chief. This proved almost disastrous since the young chief was not motivated and took advantage of the situation to be absent from work since he could always claim to be at one brigade when not found at the other.

E. Recommendations

The diversity of consultants at OFNAR most hampered the performance of the AID project in attaining its purpose. In order to meet the

project purpose the role of the consultant ought to have been quite different, as demonstrated in the context of the following recommendations.

1) It is recommended that a consultant be given executive responsibilities throughout the chain of command of the entire organization.

2) When it is not possible to insert administrators at the upper levels of an institution, it is recommended that advisers be defined with specific, assignments of short duration not dealing with institutional reorientation.

VII. THE MANAGEMENT BY USAID

The insecurity in Chad over considerable times of the project period which adversely affected the performance of the consultant also impaired the project management by USAID.

A. Financial Management of Host-Country Contracts

The AID project management concerned mainly two categories of disbursement identified in Project Implementation Letters (PIL). There were thirty six of these for the project. They consisted of contractual agreements between AID and the aid recipient on how the funds are disbursed. One category concerned the local currency, host-country contracts and the other embraced recurrent costs to run the N'Djamena Road Agency.

LBII had a project bank account funded by requesting advances from USAID to manage OFNAR's project ordering procedures and settle all invoices of the recurrent costs on a monthly basis. Monthly financial reports were required by AID to be submitted by the consultants. In addition, OFNAR had to submit periodic reports to account for their contributions.

AID administered the host-country contracts but LBII recommended many of the purchases. All settlements of accounts were made directly by USAID. LBII had practically no contribution nor intervention in the administrative process of some of the host-country contracts, such as that for the water wells and the rehabilitation of some of the buildings, and none whatsoever in the payment process. LBII eventually took over all implementation aspects of these contracts.

From January 1992 to September 1993, PIL 34 defined the budgets that are shown on Table VII. (The budget of table entries missing from the sequential code numbering in the left hand column of the table had been exhausted by January 1992). The dollar values were converted by LBII from FCFA at the rate of 240 FCFA to the dollar, as instructed by USAID, however, the AID accountants used a higher exchange rate of 260. This made the LBII and AID accounts tedious to compare and certainly reduced the budget amounts by 8 percent.

The policy of two-year personnel rotation of AID in Chad created some administrative problems particularly in the different interpretations made by newly posted persons of AID regulations. This was particularly rankling when it came to interpret the regulations regarding the consultant's personnel. For instance Separate Maintenance Allowance was granted to some of the team members who were not American citizens under one Contract Officer's management and denied to others who had arrived after the change of person in the Regional Contract Officer slot. This person did not

cancel the SMA granted previously even though it had erroneously been granted by his predecessor.

Delays and indecision about project procedures, due to the learning curve and lack of institutional memory, hindered progress. During the last twenty months of assignment of the LBII chief of project, the financial management at AID was under three different controllers.

TABLE VII
PIL 34, FOR JANUARY 1992 TO SEPTEMBER 1993
(in dollars)

CODE	DESCRIPTION	BUDGET
	Host-country CONTRACT	
6	Misc. equipment	70,000
7	Equip. rehabilitation	781,619
8	Road maintenance material	24,668
9	Office equipment	8,000
10	Building rehabilitation	125,319
15	Training	12,000
18	Water wells	582,194
	RECURRENT COSTS	
19.1.1C	Gasoline	27,556
19.1.1D	Diesel	284,787
19.1.1E	Lubricants	62,779
19.1.1L	Spare parts	589,056
19.1.1M	Tires	195,504
19.1.1N	Batteries	35,801
19.1.1P	Misc. consumable	25,752
19.3	Laboratory work	20,000

There were several bills for host-country contracts which were not paid for almost a year after the reception of goods or services by USAID. Such was the case for the first two bills from STECHE (water well drillers), totalling $322,666.

This particular example is discussed in some details below as it encompasses several aspects of the difficulties of the management

by AID, namely: **misplaced delegation of authority, lack of technical expertise, difficulty in following up, inertia** and **confusion of administrative procedures**. Other technical problems are also related.

USAID **delegated its authority** by entrusting management of the contract to drill water wells to the Directorate of Works of OFNAR. Ten wells were to be drilled along the North road and three along the South road. The communication link between USAID and OFNAR was mainly entrusted to a Chadian civil engineer employed by the Mission. The Directorate of Works made up a contract document which was approved by AID and went through all of the correct procedures to finally select STECHE, an experienced local drilling contractor, to do the work. When problems developed between OFNAR and STECHE on the interpretation of the work achievements, the Directorate of Work placed the issues on a very low priority and the contract came to a standstill, payments were refused and the wells were not finished.

OFNAR refused to accept part of STECHE's work because of their contention that one of the wells had been drilled without encountering water. OFNAR interpreted the contract as requiring the contractor to find water, since he was drilling water wells. After LBII took over the management of this contract, it was quickly determined that there was no clause requiring the contractor to find water, the document was very specific about the depth for each well and also about each well location. The contractor had fulfilled both requirements. LBII recommended to USAID that the works be accepted and the contractor paid. They also recommended that the dry well be abandoned since it was located at the village of Ngoura where there existed a producing well and a large concrete reservoir belonging to ONHPV. This recommendation was accepted. Furthermore, LBII recommended the abandonment of the well at Bokoro which, for some reason, had been drilled in the middle of the town where there was no space to construct a needed earthen reservoir to store water for the road work.

By the time that the contract with STECHE had come to a standstill, the AID project officer left and was replaced by a person who was not aware of the importance of the delay. Because of the **lack of follow-up** which engendered **inertia,** this matter languished until it became obvious that unless some action was taken, the wells would never be finished before the end of the project. It was then in the summer of 1992 that LBII's recommendation to take over the management of the contract was accepted by USAID. This removed the Directorate of Work from any future involvement.

A final couple of months delay in payment was experienced due to **confusion in administrative procedures** at the controllers department when it proved difficult for them to gather up all of the contractor's invoices. On two subsequent occasions the

contractor was asked by AID to re-submit past invoices which somehow had been misplaced.

The well rehabilitation brings into consideration the **lack of engineering expertise**. Evidently, OFNAR made no attempt to correlate well production with demands. One brigade doing the Task IV work as specified by the Directorate of Work, progressed at an average of 2 kilometers per day and required a minimum of 200 cubic meters of water per day, with peaks going to as much as 800 cubic meters per day. Wells were spaced at about twenty kilometers, therefore each well would have been expected to supply one brigade for a period of about 10 days out of the year. With wells production averaging between 5 and 9 cubic meters per hour it was obvious that large reservoirs had to be constructed to store water so that water trucks, filled by surface pumps of up to 90 cubic meters per hour capacity, could be filled at that rate, rather than the slow rate of the well pumps. Since the well capacity was only about a tenth of the requirement, each well site required a reservoir large enough to allow the water storage capacity of about 4,000 cubic meters per well site.

It is almost certain that had sufficient technical evaluation been given this contract from the beginning, USAID would have included in the project purposes for the use of water other than supplying water for the road maintenance. In a very arid area, the water wells could have been placed in service for other uses most likely with a monetary gain possible.

Because the management by OFNAR had made host-country contracts for building rehabilitation and for the wells and reservoirs installation fall behind schedule, management was taken over by LBII.

As the USAID contract officer for Chad is based in Yaounde, Cameroon, there were often lengthy delays in resolving contractual issues.

B. Project Evaluations

There were two project evaluations by independent consultants.

The first, completed in May 1988, was carried out by Parsons Brinkerhof International, Inc[1]. It recommended to continue with the technical assistance program but to change the definition of some of the technical assistance positions. Although it recognized that other projects were being implemented, it failed to consider their impact on the AID project. The recommendations were implemented by USAID.

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[1] "Strengthening Road Maintenance Project Evaluation Study" PBI, May 1988.

The second evaluation was carried out by De Leuw Cather International Limited and ended in March of 1992. Its purpose was to assess progress toward accomplishing project objectives, and to indicate the most appropriate area(s) for a follow-on road maintenance project[1] .

The report correctly identified the lack of overlap between the two consultants' teams. It failed, as had the first evaluation, to recognize the limitations imposed on the AID project goals by other assistance projects. Of its ten recommendations, seven were outside of the area of influence of the consultant's team, five pertained to the two Directorates (Works and Equipment) where the SRMP had no advisers, and the other two were entirely within the scope of the World Bank assistance program. The useful recommendations regarded the repair of equipment reaching the end of its useful life, the further development of roadway and equipment maintenance capabilities and effectiveness and the identification and evaluation of additional local sources of revenue and equipment financing opportunities.

It is interesting to note that of the 60 references listed in the second evaluation report finalized in 1992, not a single one refers to the privatization of the road maintenance in Chad and the reorganization of OFNAR into a private company. Furthermore, the last recommendation made by the evaluation team was to design and implement a program for private sector participation in maintenance of equipment and delivery of road maintenance services. Nothing was said about how to finance such a participation.

C. Discussion

There is an inherent contradiction in the USAID system that is beyond any peculiarity of the mission in Chad. It is inherent in the way that personnel are assigned to posts. Projects can be up to ten years long but the longest term of assignment is normally four years. In Chad, because of the difficult living conditions, the term is two years. The project had a duration of eight years. Consequently, the personnel rotation detracted from the smooth implementation of the project. This may be the underlying reason why the World Bank and other donors' policy of privatizing road maintenance in Chad went as far is it did without engendering a considerable realignment of the project purpose and goal. It is hard to understand how else assistance was continued in full knowledge that the institution was slated to be terminated, unless one considers the withdrawal of AID from the transport sector.

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[1] "Second Evaluation Study, Strengthening Road Maintenance Project" Contract PDC-0249-I-00-0019-00, March 1992, De Leuw Cather International Limited.

In the two years that the writer was associated with the project, USAID relied heavily on the consultant's recommendations and this definitely was a positive aspect of the management by AID.

There were instances where it appeared that USAID placed a priority on their procedural system over that of accomplishment of the project intent. This was particularly the case for the format in which AID required financial reports of OFNAR to be submitted. Serious delays were experienced in the repayment to OFNAR by AID for fuel used by the brigades because some requirements of the AID systems had not been met. When one considers that the monthly project consumption of diesel fuel ran well over ten thousand gallons, the cost of lengthy delays turned out to be high.

USAID had an audit of OFNAR project accounts performed in the first semester of 1992. Its recommendations were under consideration by both OFNAR and USAID in September of 1993. Evidently provisions had been made at the Ministry of Public Works to keep all accounts of OFNAR open for a period of 18 months after the dissolution of OFNAR for the purpose of finalizing pending issues.

D. Recommendations

There is little in the way of recommendations to make regarding USAID management. From what may be an incomplete knowledge by the consultant of the rational of USAID, it appears that the assistance to the Ministry of Public Works ought to have been continued with the specific stipulation that this would have been restricted to the road maintenance work that would be done by SNER. This would have provided the opportunity to see some of the project efforts carried over to the privatized environment. it would also have given AID leverage in identifying some of the secondary roads to be maintained, or even rehabilitated which serve any one of their agriculture and health projects.

VIII. THE MANAGEMENT BY OFNAR

The two principal aspects of the management of the project by OFNAR concerned activities connected with the project equipment and the execution of the work in the N'Djamena Agency.

Over most of the project life, the technical team was mainly concerned with the financial assistance to the N'Djamena Agency rather than with the Directorate of Finance. as the personnel management was under this directorate, the AID project had practically no input into this important aspect of overall management activities.

OFNAR's financial management in the closing years of the project, when financial responsibility was supposedly being achieved with project participation, remained a juggling act. There cannot be responsibility when there are not sufficient funds to pay salaries.

Therefore, this report only presents data and discussion about two directorates as presented in the following paragraphs.

A. Equipment Directorate

The equipment of OFNAR was under the overall responsibility of the Equipment Directorate. In the last years of the AID project, this Directorate was headed by an expatriate of a French consulting firm financed by the World Bank.

Part of the improvement was to install a system of cost accounting, which was done. One of the by-products of that assistance was to keep track of the cost of maintaining most of the OFNAR equipment. Copies of these costs spreadsheet were given to the USAID technical assistance team in the first quarter of 1993. An initial review by the writer turned up costs such as allocating tires for tracked bulldozers. Upon enquiry into the reliability of the data, it turned out that there were many instances of replacement pieces being allocated to the cost of equipment which does not use that type of parts. It appeared that the documents contained numerous errors of this type. Inconsistencies were brought to the attention of the Director who, in most instances, was aware of the inaccuracies and measures were underway to gradually correct the data as it was being updated.

Because of shortage of spare parts caused by the lack of sufficient funds to purchase them, OFNAR was disheartened in the implementation of the routine inspection of the equipment. Several inspection trips were organized to all of the five Agencies during the last couple of years of the project. LBII had issued a manual for this type of inspection. These were done under the immediate observation of the Director mainly as a training exercise for the inspection team rather than as a first step to repair equipment.

The trips made in 1992 did result in some of the equipment being brought back to the headquarters to undergo major repair. The procedure was not repeated in 1993 mainly because OFNAR was being disbanded and to a lesser extent due to the fact that there were very few spares to effect repairs that would have been reported as needed. Unfortunately, OFNAR's management of equipment was based on a repair-as-it-breaks philosophy rather than on preventive maintenance.

It also proved to be very difficult for the Director of Equipment to convince the upper management that it was more economical to discard old equipment than to keep them and it was only in 1993 that authorization was given to the Directorate to sell or dispose of all equipment considered to be beyond economic rehabilitation potential.

The Director and all of his subordinates, including the LBII advisers, had a very difficult time in obtaining reliable time sheets and spare parts use and equipment utilization reports from the brigades and the various workshops. This was due to two causes. One was the illiteracy of a substantial number of mechanics and operators which made it either impossible or embarrassing for them to fill out the time sheets. The other was the resentment towards a system of control too detailed to hide idle time. Thus time sheets when submitted, were mainly filled out to reflect what the supervisor thought his superior wanted to see rather than what was happening at the shop or at the brigade.

B. Work Directorate

As was already stated, OFNAR did not determine which roads of the national network were to be mechanically maintained

1. Personnel Policy about Home Base

There was a practice in the N'Djamena Agency to consider the work done in the Agency as being away from the base. This classification, quite arbitrary, required that the agents working at the Brigade level and all official travellers from N'Djamena to the brigade sites be paid a per diem. During the 1992-93 campaign, this per diem amounted to $5,200.

This practice was discussed by LBII with the Financial Director and the Director General of OFNAR with the intent of considering a change in the policy. It was proposed to OFNAR that because there were two satellite bases for the N'Djamena region, one located at Karme in the North and the other at Bongor in the South be designated as the bases for the North and South brigades respectively, thereby eliminating the need for per diem. Although this was agreed to be a possibility by all, OFNAR never made the decision to change the designation in order to reduce costs during

a period when funding from the GOC was unreliable but remuneration was a very sensitive issue.

2. Road Maintenance Practices

The mechanized routine maintenance of earth-surfaced roads in the N'Djamena Agency was done annually. The last campaign (1992-93), as in the previous ones, covered about 550 kilometers. Project roads were maintained by two brigades equipped with heavy equipment, following a program made by the Directorate of Works. The total maintenance campaign in the Agency, including some roads whose maintenance was funded by the EEC, kept about 700 kilometers of road open for about ten months of the year.

The four tasks performed by OFNAR for the maintenance of the roads were described in the chapter entitled COST OF ROAD MAINTENANCE.

C. Discussion

This section presents arguments to alter the tasks in order to perform cheaper mechanical maintenance. They are based on the writer's personal experience as chief of party of the LBII technical assistance team for almost two years at OFNAR.

The new method, presented under the recommendations following this section, would enable the same brigades to maintain approximately one thousand kilometers of roads within the N'Djamena Agency, although it is important to keep in mind that, due to limited resources, not all of the primary roads of the national network could be mechanically maintained annually and furthermore OFNAR had little or no input in deciding which roads would be maintained.

The four task categories that should have been eliminated are listed below with the 92-93 program where they were applied. A brief review of the data shows that the probability was extremely low that the entire length of each road required, or did not require, the task indicated. Even though the Directorate was supposed to update an inventory of the road condition at the end of the rainy season and that the results of the inventory translated into a work program for the campaign, it was obvious that the inventory was done in a cursory manner, if at all, when one looks at the over-simplified program for each of the roads in an Agency.

N'Djamena Agency WORK PROGRAM FOR 92-93

Road	Length (km)	CAT I RPS (km)	CAT II RPC (km)	CAT III RPL (km)	CAT IV RCG (m3/km)
Djr-Ngr	171	171	171	171	350
Ngr-Bkr	103	0	0	103	250
Gld-Kym	169	169	169	169	100
Kym-Lai	70	0	0	70	100
Gld-Mgo	150	0	0	150	300

This simple approach resulted in what can only be guessed at a lot of wasted time, excessive equipment hours and use of large fuel quantities. Not all sections of any one of the roads would be satisfactorily maintained by any one work type combination and not all of the length of a road required the same level of effort. More importantly, this four-task program ignored the existence of substantial sections on all of these roads which require no or very little annual intervention from the mechanized maintenance brigade.

Focusing on the practical significance of by far the most expensive task, namely the RCG (bringing in new fill and compacting it), the rate of placement of imported soil varied from 100 to 450 cubic meters per kilometer for all regions of Chad. For the 92-93 program of the N'Djamena Agency, the RCG varied form 100 to 350 cubic meters per kilometer. Assuming that if the road width was seven meters (an assumption here is needed since there were no standards) this translated into a thickness of new soil spread and compacted over the roadway varying from 1.4 to 5.0 centimeters. It is impossible to compact and bond such thin layers of soil to the original road surface layer. Engineering standards require that minimum soil thickness for compaction be not less than 15 centimeters, after compaction.

Bonding could have been done by scarifying the existing road surface before placing the new soils and then compacting not only the layer of imported soil but also that scarified beneath it. That however was not done by the brigades in spite of the fact that the necessity of doing so was pointed out time and time again by the LBII advisers. The additional scarification work would have been time consuming and therefore not acceptable.

The reality of the work then was that the compaction made in the RCG task was totally inadequate. The thin new soil layer flaked off rather rapidly under the action a few trucks.

This system had four main disadvantages. The biggest as mentioned earlier, is that the system did not take into account good stretches of road.

The second was that it was easily modified to meet the Works Directorate schedules. It was very easy to pass from one phase to the other since, except between the RPS and RCG, the same equipment was used and there were no standards to be met by any one of the tasks. If a random control were made of the work that found a fault let us say with the RCG, because the import soil thickness was insufficient, the foreman could easily state that the brigade was doing RPL or even RPC and that they were slightly behind schedule. Other than by visual inspection, and for the RCG counting truck loads, there was no way to check the amount of work accomplished within any one of the tasks. It was impossible to verify quality of workmanship. The project adviser divided his time between the North and South brigades alternatively and had no administrative means to demand compliance to better practice. The Directorate of Works never demanded that either.

The third drawback was that scheduling of the tasks required that two passes be made over the entire length of the roads. The first pass usually consisted of the RPS and RPC. The second was the RPL and RCG. This meant that the entire brigade had to be brought back to the starting points at about mid-way through the campaign.

Finally, to the user, the road appeared to be under construction practically throughout the dry season, year after year.

The unit cost data presented below should be considered as subject to important future reassessment because of the inaccuracies mentioned earlier in the newly installed cost accounting system. It is however the data that was relied upon by the Ministry of Public Works to determine its budgets.

Because no other data was available, it is used later in this section to estimate the cost of the recommended procedures.

TASKS	UNIT COSTS (in US dollars)
RPS	0.2375 per km
RPC	0.8333 per km
RPL	0.9583 per km
RCG	9.7125 per m3

In the 92-93 campaign, these rates translated into an annual cost of maintaining 663 (USAID plus part of the FED programs) kilometers of earth surfaced roads of $2.419 million over a period of ten months, or $3,649 per kilometer. The RCG alone amounted to $1.5 million, an equivalent of $2,263 per kilometer, or about 62% of the total cost of performing mechanized road maintenance.

To explain the large unit cost spread between the three RP- tasks and the RCG, it must be pointed out that the RCG, in addition to the cost of one bulldozer per brigade, included a considerably larger number of dump truck hours.

After looking at both sets of data, it does not require much imagination to determine how to orient a revisions to a road maintenance program with the idea of reducing costs. Task IV must be reduced to a bare minimum predicated on the actual condition of the road at very well identified locations requiring the intervention of bulldozers and a large truck fleet.

D. Recommendations

The recommendations of this Chapter completely redefine not only the nature of the maintenance tasks, along with the amount of equipment but also the organizational set up of the N'Djamena Agency. It is estimated that if implemented, the system could cover a road network of about 1,000 kilometers. It is very likely that it would be applicable in its majority to the rest of the country. It must be kept in mind that the system in place at OFNAR had been established by other consultants who were responsible to carry out the work and train the OFNAR personnel in its implementation. Proposing the recommendations given below a year or two before the end of the project would have been totally out of context of the scope of work of USAID assistance team.

The proposed program would consist of two quite different tasks.

1) It is recommended that minimum construction standards be established for all national roads.

2) It is recommended that all national roads or parts thereof meeting the established standards be classified in one of two categories, that is maintainable or not maintainable.

3) It is recommended that mechanical road maintenance be practiced on roads that are categorized as maintainable and that it consist of two tasks, a) Routine Maintenance, (Entretien Courant) and b) Emergency Maintenance (Point a Temps or P.A.T.).

Each task is discussed in details in the following paragraphs.

The Routine Maintenance consists of a Quick Pass which would lightly grade the roads with graders, this could be done at least three times a year.

A grader of the type presently used at OFNAR can on the average, grade 3.5 km/day of road, that is one pass on both sides of the road. Assuming that there are 260 working days per year (by subtracting 8 weeks for the rainy season, plus mechanical downtime), a grader could grade 910 kilometers of road per year. Since the road is not uniformly in need of maintenance, there would be stretches where longer distances are covered in a day and a few needed more work that would be skipped entirely.

The Quick Pass would reshape the road by cleaning the longitudinal ditches, pushing the material back towards the center of the roadway and letting the traffic compact the thin soil layer.

The typical team would consist of one grader and one truck for the transport of fuel, grease, oil and the mechanic and operators. No engineering standards would have to be met other than maintaining an adequate road width. Therefore no controls would be required other than an occasional visual inspection and random width measurements with a tape.

The estimate of the unit cost of this new program, if implemented as recommended is detailed in the Annexes I and II. To remain within the perspective of what the project had done, it is assumed that 550 kilometers of road would be maintained and that the cost rate of Category I work in vigor at OFNAR is correct to afford a basis of cost comparison. The estimate assumes that there would be an aggregate of some 75 kilometers of work to be done by the P.A.T brigade.

Based on these assumptions, the cost of the recommended procedures would be about $1,860 per kilometer. A substantial savings for the conditions of the N'Djamena Agency.

The smallest administrative unit of the new program would consist of a Sector which could be responsible for up to three Routine maintenance teams. Besides the foreman, it would have one more driver and operator than would be necessary for the teams and one clerk for records keeping. There would be one truck and one motorcycle assigned to the Sector. The Sector facilities would have the capacity to store about one month's worth of supply of fuel for the equipment and one small equipment repair facility and provide space for two offices.

The next administrative unit above the Secteur would be the Agency. A region could have up to three Sectors. It would be administered by one engineer responsible for a staff of one store keeper, one records keeper/secretary and one workshop. In addition, each Agency would have up to two, but usually one P.A.T. brigade, that is a team equipped so that it is capable to actually do road repair work over short stretches of road as explained in the next section of this report.

The P.A.T. brigade (for Point a Temps) would be a flying brigade to repair hot spots. This brigade would be called into action where small sections of road require considerable amounts of earthwork to repair and rehabilitate very small sections of road. Its task would be to remove large quantities of soil and replace the roadway embankment and roadway surface over sections of road usually not exceeding a couple of hundred meters in total length at any one spot. This brigade could also raise the roadway grade by a meter or more over short areas where the roadway floods and to enlarge

the roadway where it is too narrow when crossing over culverts. It would probably be called into action most often where large culverts have been carried away or where the roadway requires removal of unsuitable material and replacement with select soils.

Equipment assigned to this unit would consist of a bulldozer, a compactor, a grader, a front end loader and three dump trucks, a 30,000 liter water truck. The dump trucks would be used for the transport of fuel, oil, grease, personnel and for the import of select materials where needed.

It is anticipated that this brigade would work over less than an aggregate of three percent of the roadway network areas which would b typical of what used to be the N'Djamena Agency, all arising in stretches of less than 500 meters in length.

IX. SURVIVABILITY

Because of the drastic changes engendered by the privatization of the road maintenance in Chad, it appears appropriate to discuss survivability rather than sustainability. As of the middle of September, on the eve of finalizing this report, two Directors and two workshop chiefs at SNER were of the opinion that SNER would not be ready to start a new campaign in 1993. Salaries of employees for the month of August had not been paid and the stocks of both diesel and gasoline fuels were exhausted. There were no funds to buy the necessary quantities to replenish them and orders for fuel to the local suppliers had to be cancelled. The presidential decree needed to create the SNER had not yet been signed. The traditional starting date of the maintenance campaign had been reached and it was impossible to field one brigade out of N'Djamena.

Almost all of the equipment located in the yard at the Central Directorate then was in need of repairs and there were not sufficient spares to place them back in service. All of the AID equipment was parked at what was the Agency yard and presumably was in working order but in need of maintenance after the last two months of inactivity. None of the drivers and operators had been called back to work.

There was the possibility that some emergency road work would be done before then to repair bad spots on major roads. This would not be road maintenance work in the traditional sense of the word.

What does survivability mean for OFNAR and more importantly for the road maintenance in Chad? OFNAR had no survivability because it was replaced by the SNER. But since SNER inherited most of the OFNAR assets, including project contributions, estimating the SNER's prospects is in fact assessing the project survivability. Since road maintenance will depend considerably more on the financial resources rather than management and operating skills, these are discussed in details in the next section.

A. Sources of Financing

Road maintenance in the five years to come will be financed from four sources, namely Chad, BDEAC (Banque de Developpement des Etats de l'Afrique Centrale), CCE, and IDA (International Development Association)[1]. The next page shows graphs representing the relative parts of each over the 1993-98 five-year plan. It shows that the IDA will loan some $17 million for the Periodic

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[1] "Proces-Verbal des Negotiations entre la Republique du Tchad et l'Association Internationale de Developpement concernant PST 2" Annex 3, June 1993.

Maintenance although the terms of the loan agreement only earmarked $6.2 for that type of maintenance, the balance being for rehabilitation of 300 kilometers of secondary roads (The contradiction in the allocations of funds is typical of the way data circulated during the period of the project and only time will tell how the funds will actually be disbursed).

The cynic may argue that since OFNAR no longer exists, the project in its last year was flogging a dead horse since survivability, taken in its strictest sense by not looking beyond OFNAR, was nil. This is not the writer's opinion.

A more detail evaluation of the survivability of the project input is presented in the following paragraphs. At the Central Directorate, the impact of training on personnel and of the administrative methods implemented will almost certainly disappear very quickly. By July of 1993, the staff of OFNAR had been reduced by more than 400 persons (two third of the personnel was terminated) and many who had been trained formally and informally over the years were let go. There is a very strong possibility that the new management will impart procedures that will be different from those implemented. Therefore, the project input at the Central Directorate level is expected to have no follow up, that is no survivability.

At what was the N'Djamena Agency level, the prognosis is more favorable. Although he Agency no longer exists, its make up will survive. For one thing, almost all of the equipment funded by the project will be active at least in the first campaign under the SNER. Some of the foremen and operators trained under the project were kept on the job. Therefore as long as funds will be sufficient to pay for salaries, to repair and maintain and fuel the equipment, the project-funded equipment will continue to maintain roads for about one or possibly two more campaigns.

Because the future campaigns for the SNER do not include the project roads (they will be awarded to the private sector), there will be no possibility of follow-up from any one of the two project roads standpoint since that reference base will no longer be there.

There is an additional $28.6 million budgeted from the CCE ($6.5 million) and Chad over the same five years for Routine Maintenance of which $18.7 million (Chad financed) will be accessible to SNER in competition with the private sector. The only guaranteed income that the SNER appears to be getting from the Ministry of Public Works will be that derived from the maintenance of asphalt roads, where a five-year budget is foreseen to amount to $3.4 million.

Overall, Chad will be contributing $35.1 million for road maintenance including management costs (which are estimated to amount to $7.8 million over the five years to cover the services of ferries, rain barriers, traffic counts and other items).

Over the five-year plan, Chad will derive its revenues from four sources, namely from the receipts of ferries ($0.99 million), $5.5 million from the N'Gueli bridge toll, $13.1 million from truck licensing, $1.9 million from the sale of equipment belonging to the Ministry (this from 1994 to 1996) and $22.2 million from the collection of taxes on the sale of petroleum products.

B. The S.N.E.R

Survivability of the project accomplishments is very important; it is a measure of the success of the assistance program. For the particular future impact of this project whatever its benefits were, they cannot be extrapolated into a entirely new framework of references, much broader than that for which they were created.

According to the SNER's Action Plan data, it appears that SNER will only bid on Chadian-funded secondary road maintenance work. It is difficult to imagine a successful SNER bidding against experienced private contractors (assuming that they would be interested in this type of work) and coming out with a contractual agreement with the Ministry of Public Works that will be financially rewarding.

Initially SNER will be restricted to the maintenance work on secondary roads, where the unit cost of maintenance would only be between $193 dollars and $2,029 per kilometer, whereas that for the private sector is expected to vary between $252 and $4,300. The maintenance of the paved roads by SNER will bring them theoretically $1,961 per kilometer. It is obvious that where there is less money there is less total profit.

The institutional make up of what was OFNAR and became SNER will most likely not survive more than a couple of years for two reasons. First, the personnel efforts will most likely wither away due to lack of, or insufficient funding and will no longer be a significant contribution to the road maintenance effort and the people that were trained under OFNAR will gradually migrate to better jobs elsewhere. As such they will be representing a disconnected source of man power some of which may still be active in the road maintenance business. Second, the project equipment will be discarded within the next two to three years as the individual pieces reach retirement age.

Whereas OFNAR maintained all of the designated roads in Chad, the SNER will only work, in the measure that they will be successful low bidders, on at most 1,065 kilometers of the secondary system. That in itself may be considered by some as a final judgement on the declined degree of trust in the capability of what remained of the team that was OFNAR.

The termination of the USAID assistance program has come at the worse possible time in the history of the road organization in Chad. USAID could have given another infusion into the road

transport sector by financing maintenance of secondary roads, earmarked for work by SNER, which would have increased its chances for survival.

Although SNER will not survive if all of the proposals described above become a reality, it may be that eventually it will be restructured and after associating with a foreign firm, may eventually become a viable business. But it would bear no resemblance to what had been built up institutionally by the donor community.

The added responsibility of SNER to eventually make a financial profit in the road maintenance business once operations start will also most certainly be too much and may even distract from the physical accomplishments expected during the next campaigns. The success of SNER will not depend on the abilities of its staff to do road maintenance field work, it has acquired sufficient skills to do that. Throughout the various assistance programs the necessary skills were acquired for that purpose individually to do the work, however inefficiently. SNER will fail in its attempt to make money.

There were never any attempts by USAID and other donors to redefine the goals or the purpose of their respective projects to meet part of the requirements of doing business for a profit. A transitional period of several years should have been planned under the OFNAR setup in order to retrain the personnel at all levels in the efficient management of time, personnel and equipment. Under the various other projects up to 1993, efficiency was never an issue (cost accounting was just becoming a reality when OFNAR's mandate was terminated), only the installation of management systems was a matter of concern.

C. Road Maintenance

When one considers that from 1994 and subsequent years, 4,760 kilometers of dirt roads are programmed to be maintained in Chad when up to 1993, OFNAR had maintained about 3,800 kilometers, there are reasons to be optimistic about the improvement of the road conditions for the next five years. This, provided that the assistance programs remain on track. It was mentioned earlier that there was a two months delay in setting up the privatization of road maintenance. Unless work starts in October, traffic which will resume then and will quickly start to deteriorate what are still maintainable roads. If this process is allowed to occur for three or four months, what was maintainable would cease to be and enter the category of roads that require rehabilitation. Delays now could lead to disastrous consequences over a short period of time.

Initially, this seems to be optimistic because it assumes that the Ministry of Public Works will have the capacity to administer a

multitude of contracts with the private sector from the initial advertisement all the way to the quality control stages and final negotiations.

It is not enough to be able to predict the survivability of institutions or systems such as discussed so far here. It is important to look at it from the user's standpoint. That is how good a road network will the new system yield? Unless there is a mechanism to control the quality of the work in an acceptable manner, such as by introducing the quality control standards suggested for the alignments and the earthwork, there will be no improvement in the quality of the roads. The "Laboratoire National du Batiment et des Travaux Publics" (LNBTP) has some capabilities to provide the control required, but it most likely lacks the experience of doing this on a mass production basis. It may not be able to cover the totality of the national network. Can and will this laboratory be utilized to try to improve the maintenance work, or will it turn out to be added cost to road maintenance? If it does come into play, will it be able to enforce adherence to the standards? Will there be enough money to pay for the control? Only time will eventually answer these questions.

There will be an innovation for the work that will from now on be undertaken by SNER and the private sector. In addition to the many new unknown hurdles that lie ahead there will also be the requirements imposed by a quality control involving numerous laboratory and road profile checks. This procedure will be new to the SNER if not to other private contractors and there remains to be seen how effective this will be in improving quality.

There will have to be transparency and responsibility of the Ministry to the general public regarding the performance of the roads in Chad. Without that, no roads will be well maintained in the future.

X. CONCLUSIONS

From the operational standpoint, the biggest drawback to reaching the project purpose certainly was the multiplicity of consultants on technical assistance and the subordinate position of the USAID advisers in the hierarchy of the organization. Because of overlapping responsibilities of foreign technical input, parts of the project purpose were totally outside of the sphere of activities of the AID technical team. It is also certain that the goal of the project could have been better accomplished had some engineering requirements been imposed
to standardize the quality of the work performed and reduce its cost.

From the production standpoint, almost all of the project activities had both negative and positive aspects.

On the negative side must be listed the failure to increase from 550 kilometers to about 750 kilometers the road network maintained in the N'Djamena Agency; the shortcomings in the equipment acquisition; the undiscerning selection of the Technical Assistance team personnel categories introduced into the OFNAR organization; the failure to retain trained personnel at OFNAR; and the failure to provide a smoother transition and continue the efforts of OFNAR in its metamorphosis into the private sector.

The positive side of the ledger is that the project did contribute significantly to the stock of equipment, spares and tools of OFNAR to do maintenance in the Agency. Training, when considered on an individual basis, was successful. The building rehabilitation at the central directorate and the construction of a fuel station at the Agency contributed significantly to the improvement of the last road organization in Chad.

Had OFNAR been allowed to live, they would have been able to perform the maintenance of the roads in the N'Djamena Agency to the extent that financing was assured in the previous years amounts. There was a substantial contribution to the financing of construction of the paved road from Djermaya to Dandi and it paid for the construction of twelve water wells and financed a substantial amount of the cost of renovation of the buildings and insured an adequate supply of spare parts for the project equipment and the rehabilitation of the Dandi rock crushing plant.

XI. SUMMARY OF RECOMMENDATIONS

Reference Page 13

The purpose of the AID project is to purchase earth moving equipment and other imported and local commodities necessary to operate and maintain equipment for road mechanical maintenance work. The work will be performed in conformance with basic engineering requirements, for a period of (x) years. Equipment operators, mechanics, crew chiefs and managers (both technical and financial) at the N'Djamena Agency will be trained and basic engineering standards will be established to control the quality of the maintenance work performed.

Reference Page 25

1) It is recommended that the primary and the secondary road geometries be defined by specifying both vertical and horizontal requirements and that engineering standards be established to control all earthwork.

2) It is recommended that a rigorous system of road inventory be implemented in order to determine which of the roads of interest are maintainable.

3) It is recommended that the routine and periodic mechanical maintenance tasks be newly defined to reduce the costs of maintenance by making more economical use of the equipment available. Mechanical maintenance must only be practiced on roads which are in sufficiently good condition to warrant the deployment of the equipment.

Reference Pages 35, 36

1) It is recommended that the heavy equipment procurement list be prepared by a qualified person with experience in the execution of the work contemplated and to obtain, from the host government, an agreement on the detailed manner in which the project goals will be achieved.

2) If procurement is limited, the manner and the extent to which the host government will contribute will be formally established.

3) The manufacture of the equipment will be that which is most common in the existing stock of the host government.

Reference Page 47

1) It is recommended that a consultant be given executive responsibilities throughout the chain of command of the entire organization.

2) When it is not possible to insert administrators at the upper levels of an institution, it is recommended that advisers be defined with specific, assignments of short duration not dealing with institutional reorientation.

Reference Page 60

1) It is recommended that minimum construction standards be established for all national roads.

2) It is recommended that all national roads or parts thereof meeting the established standards be classified in one of two categories, that is maintainable or not maintainable.

3) It is recommended that mechanical road maintenance be practiced on roads that are categorized as maintainable and that it consist of two tasks, a) Routine Maintenance, (Entretien Courant) and b) Emergency Maintenance (Point a Temps or P.A.T.).

ANNEX I

TASKS COST ESTIMATES, 1993

TASKS COST ESTIMATE, 1993

. ROUTINE MAINTENANCE (Team work)

Grading tasks for the N'Djamena Agency — Exchange rate: 255

Base locations; Karme and Bongor

Number ot team requ'd 3

Network length: 1,000 km — 0 — 1,997 /Km

Hours/campaign: 1,500 Hours

Assumed sectors: 1

ALL COSTS IN DOLLLARS

Per team

Personnel:

Class	Number	Hourly rate	Total
Foreman	1	15	23,159
Drivers	2	8	23,588
Operator	2.33	10	34,265
Mechanics	2	10	30,906
			0
			111,918

Per team

Equipment*:

Type	Number	Hourly rate	Year Total
Graders	2.33	86	301,817
Dump trucks	2	80	240,647
Motor cycle	1	8	11,250
			553,714

* Includes consumables and yearly maintenance

I. PERIODIC MAINTENANCE (Brigade work)

Grading tasks for the N'Djamena Agency — Unit cost, period 507 per kilometer

Base locations; Karme and Bongor

Number ot team requ'd 1

Network length: 1,000 km

Hours/campaign: 500 Hours

Assumed sectors: 1

Personnel:

Class	Number	Hourly rate	Total
Foreman	1	15	7,720
Drivers	5	8	19,657
Operator	3	10	14,706
Mechanics	3	10	15,453
			57,535

Equipment*:

Type	Number	Hourly rate	Year Total
Bulldozer	1	77	115,759
Dump trucks	4	80	160,431
Grader	1	87	43,375
Compactor	1	51	25,645
Loader	1	98	49,000
Water truck	1	103	51,327
Motor cycle	1	8	3,750
			449,287

* Includes consumables and yearly maintenance

ANNEX II
ORGANIZATIONAL CHARTS

This annex presents two charts. The first is the organizational chart of OFNAR as it was during Phase 2 of the project. It shows three different kinds of boxes. The shadowed boxes represent the locations within the organization where the project advisers were assigned. The number in each of the two boxes represents the number of advisers. There were four advisers placed at the ARN and two at the Central Workshops. The project leader was not assigned an advisory position.

The 3-D boxes represent the locations of the World Bank financed staff. These positions were executive functions, not advisory ones. Not shown because it was disbanded before 1993, is the section for PME which was also headed by a World Bank financed expatriate and came under the Works Directorate.

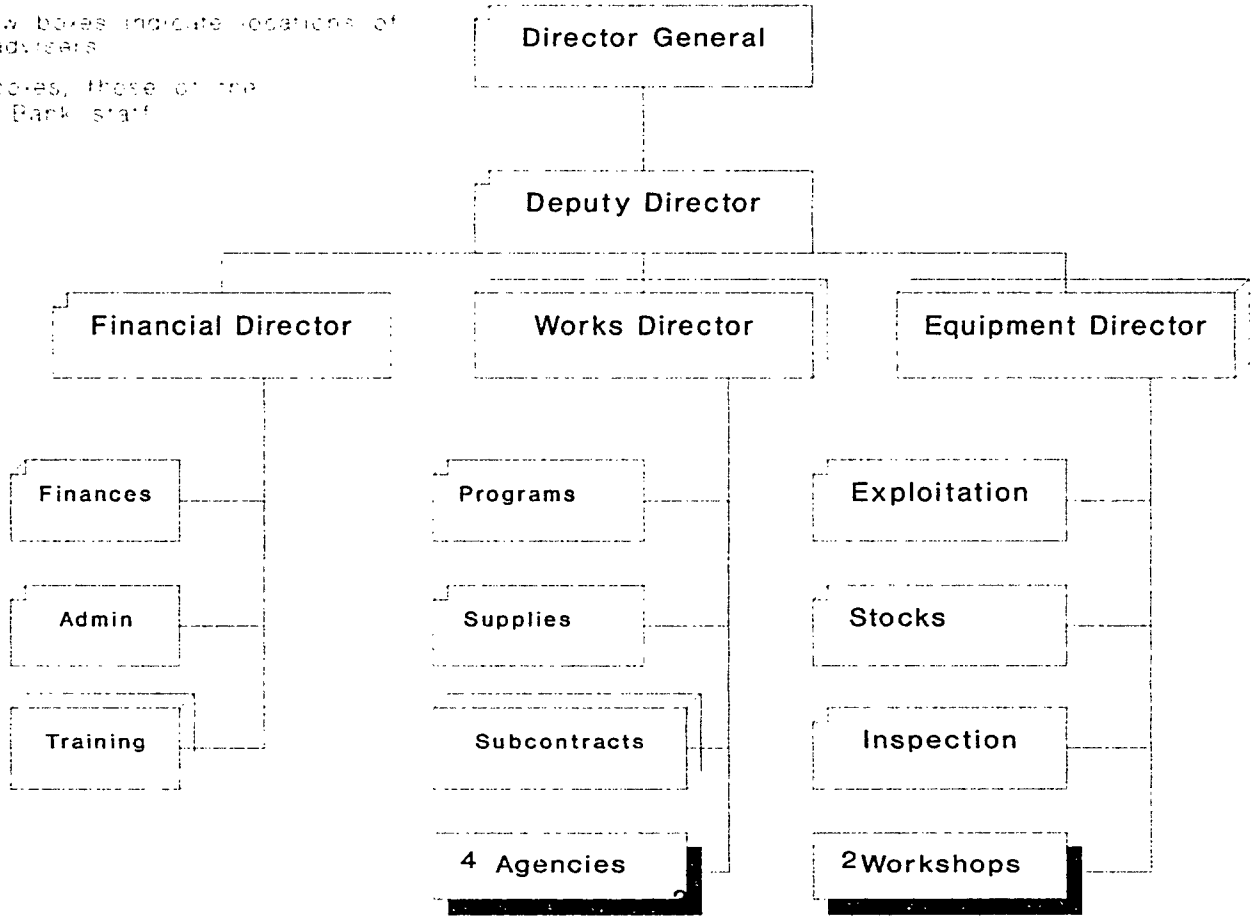
The second chart represents two set-ups. The top is the existing organizational chart of the ARN showing the two satellite stations at Karme and Bongor with the Central workshop located in N'Djamena. The lower part of the sheet represents the recommended set-up which would have broken up the ARN into two sectors, each headquartered at the satellite stations which would have required one adviser.

ORGANIZATIONAL CHART

OFMAP in 1993

Shadow boxes indicate locations of LBII advisers

3-D boxes, those of the World Bank staff



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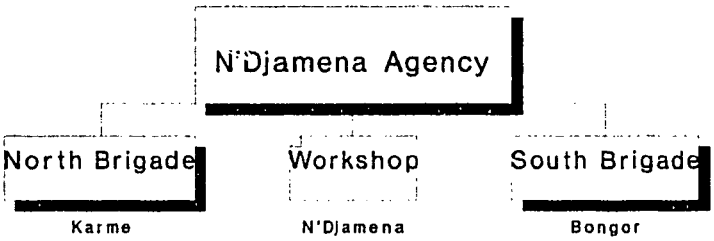
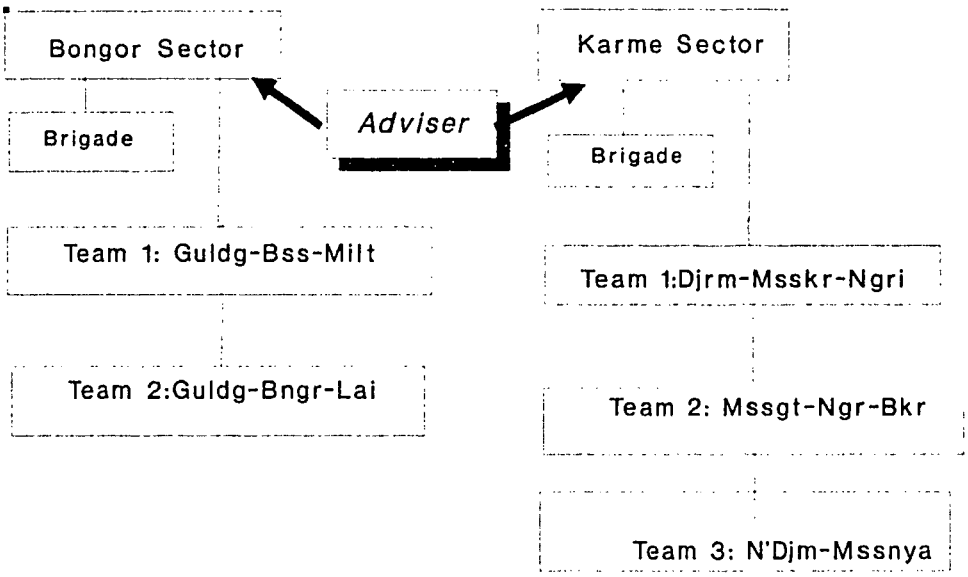
ORGANIZATIONAL CHARTS

Reorganization of a Geographical Area



EXISTING SET UP



RECOMMENDED SET UP

Each Sector has its own workshop

ANNEX III

ESTIMATE OF RENTAL COSTS OF OFNAR EQUIPMENT
FROM JANUARY TO JUNE 1992

ANNEX III

ESTIMATE OF RENTAL COSTS OF OFNAR EQUIPMENT from January to June 1992

The table on the following page was made up in part from the records of the project regarding the utilization of equipment of OFNAR which had not been purchased by the project and in other from the Directorate of Equipment who determined the rental rates for the various pieces of equipment.The following paragraphs explain some of the entries in the Table.

The rates for rental are based on the number of hours that a piece of equipment will be rented per year, this information appears in the column entitled "Base de Calcul Hr/an OFNAR" which has entries from 473 to 432 hours for compactors, for instance. At the head of the table, below the title, there is a list of hours per year which include the total workable hours per year (2,080), the 359 hours spent during the two rainy months on repair and maintenance of the equipment and the legal holidays hours (49). The maximum actual work hours per year amounts to 1,672.

The next column over to the right gives the number of hours that the particular piece of equipment was assigned to the brigade, from mid-September, 1991. This is the number of hours that the equipment was rented to the project. For compactors this varied from 1,379 to 1,323. After the hourly rental rate in $/hr column, there are three columns which represent the hours of down time due to Mechanical Failures, the hours of Production and the hours of Standby. Each one of these columns is assigned a percent value of the applicable rental rate. These percentages are 7% for Mechanical Breakdowns, 100% for Production time and 85% for Standby. Note that the 7 and 85% rates are purely arbitrary and assumed by the writer, because OFNAR does not differentiate between Productive time, Down time and Standby time. To calculate the cost of the first compactor listed, which had an incredible 1,358 hours of down time, that number of hours is multiplied by 7% and the Standby hours by the 85 %, the two are added and then multiplied by the hourly rate to arrive at the total of $1,611. Eventually the total cost is multiplied by the six months factor of 0.6 (from January to June out of a ten months campaign).

The hourly rate of OFNAR for a compactor is $40.82 per hour, based on a utilization rate of 473 hours per year. For project purposes, this rate was changed to reflect the much higher utilization rate by the project . This was done by multiplying the $40.82 rate by 473 and dividing by the hours actually used of 1,379 to give 14.27$/hr.

With the table information and the method of calculation just described, the estimated total cost of the use of OFNAR equipment amounted to $250,184 for the first six months of 1992.

From the data furnished by the Equipment Directorate the second graph was developed by fitting curves to the few points of observed data. The mathematical curve represents the theoretical down time of the equipment and is given here to illustrate the type of information that can be developed from the cost accounting system that was being implemented by OFNAR. Because of the unreliability of the input data, these curves are not to be used for any purpose other than that stated above.

ocation.wq1

PROPOSITION DES TAUX DE LOCATION DU MATERIEL OFNAR

Date: 26-Aug-93

Cette liste represente les types d'engins loues au projet 677-0050
pour les mois de janvier a juin de la campagne 1991-92

Heures/an:	2080		Coefficient	
Hrs/revisio	359		de 6 mois	0.6
Hrs/cmpgn:	1721			
Hrs conges:	49	Grand Total:	US$	250,184
Hrs travail	1672		Taux:	250

ature du materie	Marque	Code	Type	Prix de neuf X 1000	Base de calcul hr/an ORNAR	Heures totales 1992-93	US$/h sans lubrifian	Heures carbpanne 7.00%	Heures oeuvre 100%	Heures standby 85%	Total US$/h
mpacteur pneus	Hyser	CPA006	C350A	32,000	473	1379	14.27	1358	0	21	1,611
mpacteur pneus	Albaret	CPA007	H6	25,000	459	1365	11.18	1330	21	14	1,408
mpacteur pneus	Albaret	CPA008	H6	25,000	459	1361	11.21	819	423	119	6,519
mpacteur pneus	Albaret	CR1	PF3	17,000	432	1323	7.90	393	706	224	7,297
				Moyenne:	455.75	1357.00			Total Compacteurs		16,835
iveleuse	Caterpill	NAM014	120B	33,000	444	1225	24.37	560	488	177	16,516
iveleuse	Caterpill	NAM019	120B	33,000	444	1370	21.79	159	938	273	25,741
iveleuse	Caterpill	NAM030	120G	36,000	450	1259	25.80	153	840	266	27,784
				Moyenne:	446.00	1284.67			Total Niveleuses:		86,876
ractopelle	Caterpill	TPC003	428SII	20,000	400	1408	12.56	15	987	406	16,746
				Moyenne:	400.00	1408.00			Total Tractopelle		16,746
mion benne	Berliet	CBE002	GLR160	5,100	459	1193	4.63	287	157	749	3,767
mion benne	Berliet	CBE005	GL900	8,900	419	1386	5.79	315	595	476	5,918
mion benne	Mercedes	CBE010	LAK911	9,000	460	1393	6.39	707	329	357	4,357
mion benne	Mercedes	CBE013	LAK911	9,000	460	420	21.19	119	77	224	5,843
mion benne	Mercedes	CBE018	LAK911	9,000	460	1393	6.39	784	476	133	4,114
mion benne	RVI	CBE061	CLR230	24,400	492	1393	17.04	14	1071	308	22,723
mion benne	RVI	CBE063	JE13	17,500	490	1407	12.29	0	1155	252	16,828
				Moyenne:	462.86	1226.43			Total Bennes:		63,550
mion citerne/ea	Berliet	CCE001	GLC6	4,300	403	1393	3.05	259	637	497	3,364
mion citerne/ea	RVI	CCE025	CLR230	25,800	501	1393	18.29	0	1064	329	25,943
mion citerne/ea	RVI	CCE026	CLR230	25,800	501	1393	18.29	0	1183	210	26,422
				Moyenne:	468.33	1393.00			Total Citernes:		55,728
mion tract rout	Mercedes	CTR005	2624	?	450	1393	2.46	0	1393	0	3,673
mion tract rout	RVI	CTR006	TBH280	51,800	502	1393	88.53	0	1393	0	131,952
				Moyenne:	476.00	1393.00			Total Tracteur Ro		135,624
mi remorque	Titan	RPE006	60SRPE	51,800	480	200	63.38	0	200	0	13,563
mi remorque	Titan	RPE011	60SRPE	51,800	480	200	63.38	0	200	0	13,563
				Moyenne:	480.00	200.00			Total Semi remorq		27,127
m.cit. carburan	Ameg	CCT006	3000 li	2,200	250	250	4.62	0	200	50	1,186
m.cit. carburan	ACIM	CCT008	Origina	2,200	250	250	4.62	0	200	50	1,186
				Moyenne:	250.00	250.00			Total Remor. Carb		2,372
racteur agricole	Renault	TAG005	R3142	2,500	108	108	20.97	0	108	0	2,423
racteur agricole	Renault	TAG014	R3142	2,500	108	108	20.97	0	108	0	2,423
				Moyenne:	108.00	108.00			Total Tract. Agri		4,846
mp. vib. manuel	BOMAG	CVM007	BW65S	3,600	450	1379	6.30	21	0	1358	7,267
					450.00	1379.00			Total Comp. Vibra		7,267
roupe motopompe	Lombardin	PAM024	3LD510	1,200	98	1393	8.16	0	450	943	10,470
roupe motopompe	Lombardin	PAM034	3LD510	1,200	98	1393	8.16	0	450	943	10,470
				Moyenne:	98.00	1393.00			Total motopompe:		20,939

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ANNEX IV

PARTIAL LIST OF LBII REPORTS

ITEM	DATE	TITLES	LANGUAGE	AUTHOR
1	25-Mar-93	Stage de Formation Bitume	French	S. Monin
2	05-Sep-92	Work Plan fro T.A. 1992-93	English	G. Gendamre
3	24-Sep-92	Evaluation du Programme d'Entretien Routier de l'Agence de N'Djamnena pour la Campagne 1992-93	French	G. Gendarme
4	10-Aug-92	Programme Deatille d'Entretien Routier	French	G. Gendarme
5	06-Jun-92	Preliminary Consideration for the	English	G. Gendarme
	06-Jun-92	Privatization of the Maintenance of Roads in Chad		
6	01-Jun-92	N'Djamena Agency Equipment Utilization from October 14, 1991 to March 30, 1992	English	G. Gendarme
7	02-Apr-92	Rapport de Fin de Mission, Formation Ele	French	C. Evrard.
8	04-Mar-92	Participation of PME's in the Maintenanc of Primary Roads in the N'Damena Agency	English	G. Gendarme
9	15-Dec-91	Specialiste en Informatique	French	A. Persson
10		Guide d'Inspection du Materiel	French	
11	01-Dec-91	Sysyteme de Gestion de l'Agence de N'Dja	French	A. Persson
12	01-Dec-91	Systeme de Gestion a l'Atelier Central	French	A. Persson
13	01-Nov-91	Systeme de Gestion du Materiel de l'Agence de N'Djamena	French	A. Persson A. Persson
14	01-Nov-91	Proposition de Plan d'Action pour l'Amelioration de l'Atelier Central	French	A. Persson A. Persson
15	01-Nov-91	Plan d'Action Informatique	French	A. Persson
16	01-Jun-91	Cours d'electricite automobile	French	C. Evrard
17	01-May-91	Rapport de Mission	French	C. Evrard
18	none	Guide d'Inspection et de Diagnostic Periodique de la Direction du Materiel	French	A. Person
19	Quarterly	Quarterly Activity Reports	English	Chief of Party
20	Final	End of Project Report	English	G. Gendamre

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