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DECENTRALIZATION: FINANCE & MANAGEMENT PROJECT

Managed by
Associates in Rural Development, Inc.

In collaboration with
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Indiana University • Workshop in Political Theory & Policy Analysis

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Rural Roads Maintenance Systems Policy:

DISTRICT EQUIPMENT POLICY STUDY

Final Report

Prepared for USAID/Jakarta by:

Decentralization: Finance and Management
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PREFACE AND ACKNOWLEDGEMENTS

In response to a request from USAID/Indonesia, the Decentralization: Finance and Management (DFM) Project conducted a Special District Equipment Policy Study for USAID's Rural Road Maintenance System Project. The results of that study are presented in the Final Report and its three Annexes.

To accomplish the objectives of the study, research teams conducted two field investigations. The first, from October through December 1992, included compilation of data in several kabupatens and interviews with officials at all government levels--national, provincial, and local. At the end of the initial field work, draft reports were prepared and distributed for comment.

The second field visit took place from late-January to early-March 1993. This field work was dedicated to review and consolidation of plans for the pilot project, including additional meetings with relevant government officials, and finalization of the research reports. The second field visit culminated in a meeting on March 4, 1993 with senior government officials to present the findings of the study and the proposed action plan for implementation of the pilot project.

The study team would like to acknowledge the support received for its efforts by numerous public officials in Indonesia, as well as by USAID/Indonesia. We are particularly grateful for the support provided by Fred Pollock and Wouter Sahanaya of USAID, Chuck Witmarsh of STV/Lyon, and the staff of *Bangda* who greatly facilitated visits to the *kabupatens*. Finally, a special note of appreciation goes to Taswin Munier who served as the team's administrative assistant

The DFM Project is an applied research program of USAID's Research and Development Bureau, Office of Economic and Institutional Development. The DFM Project's primary focus is the analysis of institutions that perform key funding, management, and maintenance functions in order to suggest ways in which these institutions can improve performance and establish policies which encourage sustainability. The Project provides research and technical assistance to AID field missions and central bureaus to help analyze institutional structures that support local autonomy and sustainable management of resources. The DFM Project is managed by Associates in Rural Development, Inc. in collaboration with the Metropolitan Studies Program/Maxwell School of Citizenship & Public Affairs of Syracuse University, and the Workshop in Political Theory and Policy Analysis of Indiana University.

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GLOSSARY AND ACRONYMS

APBD	*Anggaran Pendapatan dan Belanja Daerah*, Local Government Budget (*Dati I & II*)
APBN	*Anggaran Pendapatan dan Belanja Negara*, National Government Budget
ALKAL	Provincial Public Works depot and workshop for PU equipment
APPAKSI	*Assosiasi Perusahaan Pengelola Alat-alat Konstruksi Indonesia*, Indonesian association for construction equipment management
ARD	Associates in Rural Development
Bagian Keuangan	Finance Division
Bappeda	*Badan Perencanaan Pembangunan Daerah*, Regional Development Planning Board (*Dati I & II*)
Bina Marga	Directorate General in Ministry of Public Works in charge of roads
BPD	*Bank Pembangunan Daerah*, Regional Development Bank (government owned)
BUMD	*Badan Usaha Milik Daerah*, State owned corporation, supervised at provincial/ local level
BUMN	*Badan Usaha Milik negara*, state owned corporation supervised at national level
bupati	head of *kabupaten*
daerah	region; autonomous level of government (*Dati I & II*)
Dati I	*Daerah Tingkat I*, Administrative Region Level I (province)

Dati II	*Daerah Tingkat II*, Administrative Region Level II (*kabupaten*)
DFM	Decentralization: Finance and Management (Project)
dinas	sectoral agency at *kabupaten* or provincial level
Dinas Pendapatan Daerah	Local Revenue Agency
DIP	*Daftar Isian Proyek*, Approved Projects List
Dipenda	*Dinas Pendapatan Daerah*, Local Revenue Agency (also referred to as Dispenda)
DPRD	*Dewan Perwakilan Rakyat Daerah*, Regional Assembly (province and *kabupaten*)
DPU	*Departemen Pekerjaan Umum*, Ministry of Public Works
DPUK	*Departemen Pekerjaan Umum Kabupaten, Kabupaten* Public Works
DPUP	*Departemen Pekerjaan Umum Propinsi*, Provincial Public Works
DRM	*Daftar Rekanan Mampu*, List of Capable Supplier
DURP	*Daftar Usulan Rencana Proyek*, project proposal (later approved as DIP), for new projects
FY	fiscal year
GAPENSI	*Gabungan Pengusaha Konstruksi Indonesia*, the association of contractors
GOI	Government of Indonesia
hire	the renting of equipment on a contractual basis; leasing
hirer	the party (usually a contractor) contracting use of equipment from the owner

IBRD	International Bank for Reconstruction and Development (World Bank)
Inpres	*Instruksi Presiden*, central government block grants to provincial and *kabupaten* government
Inpres Dati I	*Instruksi President Daerah Tingkat I*, block grants for provincial government
Inpres Dati II	*Instruksi President Daerah Tingkat II*, block grants for infrastructure development
IPJK	*Inpres Peningkatan Jalan Kabupaten*, block grants for rural roads renovation/ rehabilitation
IPAIR	*Iuran Pemakai Air Irigasi*, irrigation users fee
kabupaten	district; administrative subdivision of *Dati II*
KADIN	*Kamar Dagang dan Industri*, chambers of commerce and industry
kanwil PU	Ministry of Public Works provincial offices
Kas Daerah	provincial and *kabupaten* government funds
Kas Negara	central government funds
KEPMENPU	*Keputusan Menteri Pekerjaan Umum*; Minister of Public Works's decision letter
KEPPRES	*Keputusan Presiden*, Presidential Decree
MOF	Ministry of Finance (*Departemen Keuangan*)
MOHA	Ministry of Home Affairs (*Departemen Dalam Negeri*)
NTT	*Nusa Tenggara Timur* (Province)
OECF	The Overseas Economic Cooperation Fund (of Japan)
owner	the owner of equipment - regarding equipment hire, the kabupaten or private owner of equipment

pajak daerah	local taxes
PALAN	*Direktorat Peralatan Jalan*, Directorate in Ministry of Public Works in charge of road equipment procurement.
PALAN workshop	one of eight Bina Marga "base" workshops
PBB	*Pajak Bumi dan Bangunan*, property tax
Pemda	*Pemerintah Daerah*, local government (used in report for kabupaten government)
Perda	*Peraturan Daerah*, Government Regulation
plant hire	renting equipment on a contractual basis; equipment leasing
PP	*Peraturan Pemerintah*, Government Regulation
PU	*Pekerjaan Umum*, Public Works
retribusi daerah	local fees (retribution)
Rp.	*rupiah*, unit of Indonesian currency
RRMS	Rural Roads Maintenance Systems (Project)
SDO	*subsidi daerah otonom*, grant to local government
sekwilda	*sekretaris wilayah daerah, kabupaten* or provincial secretary
SIAP	*Sisa Anggaran Proyek/Pembangunan*, unused part of a project/development budget
SK	*Surat Keputusan*, Decision Letter
SulSel	South Sulawesi
Swadana	A unit or agency authorized by MOF to be self-funding
Swakelola	force account
TA	technical assistance

Undang-undang	national law
UPT	*Unit Pelayanan Teknik*, Technical Service Unit
USAID	United States Agency for International Development

EXECUTIVE SUMMARY

A. Objectives

In response to a request from USAID/Jakarta, the Decentralization: Finance and Management (DFM) Project formed a team to carry out a Special Study on District Equipment Policy. The objective of this study is to assess the current equipment maintenance system and determine whether the deficiencies in the kabupaten (district) equipment maintenance program could be resolved by privatizing components of kabupaten equipment maintenance services.

A second and closely related objective is to determine whether a revised equipment hire policy[1] would lead to the more judicious use and care of kabupaten equipment.

B. Methodology

The Statement of Work presents the technical approach for conducting the study in three phases

In the first phase of the study, the study team compares the features of government maintenance operations with the potential equipment maintenance service capabilities of private contractors, to determine whether privatized service would be more manageable, cost-effective and sustainable.

In the second phase, the study team analyzes government procedures regarding the acquisition, ownership, hiring and maintenance of construction equipment. The study team investigates current hiring practices, and submits proposals for revised hire policies designed to encourage the more efficient use and maintenance of the kabupaten fleet.

In the last phase, the study team develops an action plan to initiate a pilot study of privatized services. The development of the action plan will involve full consultation with the relevant ministries and local government agencies.

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[1] Every attempt has been made to use terminology which is common usage in Indonesia, in both Indonesian and English The terms *hire* and *plant hire* are used in reference to the rental or leasing of equipment The *hirer* is the contractor who leases equipment from the *owner*, which is an agency of the government.

C. Findings: Current Equipment Maintenance Practices

Current kabupaten equipment maintenance practices were found to be deficient in a number of areas, resulting in poor condition of equipment which is utilized for road maintenance. Deficiencies vary between kabupatens in the study area, but the condition of equipment in all kabupatens is below levels required for effective equipment utilization

Equipment is provided in large part with donor assistance. Ownership of donor-funded equipment remains with the Department of Public Works, rather than the kabupaten governments. The kabupatens purchase only a small part of their fleets with local funds. Permission is required from the owning agency each time a unit is hired out to a contractor.

All kabupatens report shortages of equipment vis a vis current needs. Shortages of equipment exist during periods of high activity, which extend to only part of the year Equipment condition is often not reported accurately, with a significant number of units reported as being in better condition than inspections indicate. The poor condition of much of the fleet in turn causes shortages, due to down time required to repair machinery.

Equipment is used primarily by contractors who hire the equipment from the kabupaten for work on kabupaten road projects. There is limited use by the kabupaten for force-account projects. Due to unavailability of certain types of equipment, inadequate knowledge of proper use and maintenance, and lack of proper transportation vehicles, there is a noticeable amount of misuse of the kabupaten equipment. Misuse is also attributable to the hiring system and its regulations on liability.

Hours of equipment utilization are very low in relation to industry standards. Much of the kabupaten fleet is old in terms of years, but with total hours of utilization that would normally be found in a much younger fleet. Due to the government budget cycle and weather conditions, equipment utilization is heavy during only certain months of the year, with equipment lying idle or seldom used during other periods.

A comprehensive Equipment Maintenance System is currently being introduced by the technical assistance team under the Rural Roads Maintenance Systems Project (RRMS). This is a recent endeavor, and the adoption of system components is uneven between kabupatens, but not yet fully implemented anywhere. Current deficiencies include poor performance in documentation of maintenance and repair activities, implementation of routine maintenance, monitoring and budgeting.

All kabupatens experience shortages in skilled personnel, both management and technical. Both numbers of staff and their skills are lacking. Many staff members are non-permanent status rather than civil servants, making it difficult to develop skills through investment in training. Many of the civil service personnel hold multiple positions, and do not devote themselves full-time to equipment maintenance activities.

Parts provision is a common problem, due to inadequate budgets, poor planning and procurement difficulties.

Workshop facilities are generally sufficient and well-equipped, having recently been upgraded. Further upgrading is scheduled through the RRMS project. Utilization of facilities is uneven, but low overall. Repairs are often carried out at the project site, contractors send repairs to other workshops, and much required maintenance is not carried out at any location. Due in large part to personnel problems mentioned above, management of workshops is inadequate.

Budgets for maintenance are funded through annual Inpres grants. Current budgets are inadequate to cover needs calculated by the study team, and with one exception do not follow EMS guidelines. Funding through Inpres results in partial-year availability, due to late availability of funds Budget components vary widely between kabupatens, in terms of allocations for staff, operational costs and parts Maintenance budgets are supplemented through a system decreed by central government guidelines whereby contractors are responsible for nearly all maintenance and repair, including spare parts and repair work performed in the kabupaten workshops. Data are not available to calculate contractors' maintenance expenditures.

Equipment hiring rates and procedures are set by central government guidelines. Rates for kabupaten equipment can be set by the local government, but these rates nearly always follow central government guidelines. Rates are far below those required to cover the cost of operating, maintaining and replacing equipment, and far below those charged by private companies hiring equipment Contractors are responsible for all maintenance and most repairs, wages for operators and mechanics (who are kabupaten employees), and other operating costs. Hire revenues are paid into general revenues rather than being earmarked for equipment-related expenses. Revenues are paid to the level of government where ownership is registered, meaning that most revenues are accrued to central government general funds.

D. Causes of Maintenance Deficiencies

Two fundamental constraints to efficient equipment maintenance are limited markets and uneven demand for equipment. These are related to each other, and present enormous obstacles to sustainable improvement of the equipment maintenance system in the kabupatens. The market for equipment in the study kabupatens is heavily dependent upon local government road projects, which generate a limited market for equipment. This limited market is aggravated by the government budget cycle which creates peaks and valleys of demand for equipment throughout the fiscal year.

These two factors limit the interest and ability of the private sector to enter the equipment market, and result in a shortage of equipment required for road maintenance. The government has responded to this shortage by providing equipment available for hire to

contractors. Due to limited government resources donors have assisted in providing equipment to the kabupatens in order to address this shortage. This results not only in difficulties in providing appropriate equipment resources in a variety of kabupatens with different needs, but also in a gap between equipment-related revenues and expenditures. Specifically, expenditures for equipment maintenance are not tied to such variables as equipment hire or cost of equipment. Dependent on central government grants for equipment maintenance budgets, the kabupatens have generally been unable to adequately fund equipment maintenance.

Due to low maintenance budgets, kabupatens are forced to move costs for maintenance to hirers of equipment, and in addition are not able to develop the management and technical skills required for effective maintenance. Hire rates are artificially low, and the resulting rates and manner of equipment utilization are poor. All of these factors converge and result in maintenance deficiencies.

E. Options for Privatization

1. Contracted Equipment Maintenance

Option One leaves the ownership of equipment and facilities unchanged, and contracts out all or some of the maintenance operations to private firms. Two methods of contracting are considered:

1a *Contracted Equipment Maintenance*, which would allow contracting equipment maintenance activities to private firms operating in their own facilities; and

1b *Contracted Workshop Operation*, which would contract out equipment maintenance to one firm which would also operate the existing kabupaten workshop.

2. Autonomous Equipment Maintenance Unit

Option two leaves the ownership of equipment and facilities unchanged, and establishes the workshops and workshop equipment as Autonomous Equipment Maintenance Units owned by the government. Two organizational models are considered:

2a *Autonomous Equipment Maintenance Unit - New Organization*, which would establish new entities for equipment maintenance, such as a Unit Swadana, BUMN or BUMD, and

2b *Autonomous Equipment Maintenance Unit - Amarta Karya*, which would establish equipment maintenance operations under an existing government-owned enterprise (BUMN).

3. Privatized Equipment Maintenance Unit

Option Three leaves the ownership of equipment unchanged, and transfers the existing kabupaten workshops and workshop equipment to privately owned and managed firms.

4. Autonomous Plant Hire Unit

Option Four transfers ownership of equipment and facilities to Autonomous Plant Hire Units owned by the government. Two methods of establishing these autonomous units are considered:

4a *Autonomous Plant Hire Unit - New Organization*, which would establish new entities for equipment hire and maintenance, such as a Unit Swadana, BUMN or BUMD; and

4b *Autonomous Plant Hire Unit - Amarta Karya*, which would establish equipment hire and maintenance operations under an existing government-owned enterprise (BUMN).

5. Privatized Plant Hire

Option Five would encourage privatization of both workshops and equipment, and thus transform the present kabupaten equipment management systems into competitive privately owned and managed plant hire firms. Privatization could be carried out in several ways, but would involve the transfer of equipment ownership to the private sector.

F. Criteria for the Evaluation of Privatization Options

Options for privatization should meet the goal of more efficient utilization of equipment In order to meet that goal, several factors need to be dealt with which will affect the feasibility of the option. Both internal and external factors are considered. Nine criteria were used to evaluate the options.

1. Efficient Equipment Utilization

To what extent does the option encourage the proper use of equipment for tasks for which it is suited and in a manner which is most efficient? Are there incentives to maintain equipment so as to increase its life and availability? Are there incentives to scrap and replace equipment at the proper time?

2. Risk Minimization

Does the option involve risks to the parties involved, including the local government, hirers and owners? Risks include financial risks to investors and risks to the efficient completion of road maintenance projects.

3. Financial Viability

Will the new system of managing and maintaining equipment be financially viable? Consideration needs to be made of the amount and source of revenues required to cover equipment maintenance costs.

4. Conflict with Existing GOI Policy

Is the option consistent with existing government policies, regulations and procedures? What changes in policies, regulations and procedures would be required to allow for implementation of the option?

5. Addresses System Deficiencies

Does the option address the causes of maintenance deficiencies which are identified in the study. These causes are primarily the limited market and uneven demand for equipment. Will the effects of fragmentation be resolved?

6. Qualified Providers

Are there organizations with resources available which are required for implementation of the option? Resources include facilities, equipment, management, capital and skilled personnel.

7. Mobilization of Resources

Will the responsible organization be able to mobilize its potential and actually carry out the duties required? Are there incentives for the organization to utilize its potential to provide services as described in the option? Are there obstacles to development of the full potential of the organization, based on current or past performance, organizational structures or environmental factors?

8. Human Resource Development

Does the option encourage training and other aspects of human resource development which are necessary for the efficient utilization of equipment? Does the option stimulate demand for skills?

9. Potential For Development into Sustainable Privatization

I the option likely to develop into a sustainable method of providing efficient equipment utilization and maintenance? If the option is not fully sustainable or efficient by itself, does it hold the possibility of encouraging the development of a more sustainable and efficient option?

G. Comparisons and Evaluation of the Options

Option 1, *Contracted Equipment Maintenance*, faces potential problems in reaching the objective of effective maintenance and efficient equipment utilization, as well as questions regarding financial viability. The central problem faced in implementing this option would be that it does little to change the funding system for equipment maintenance, and thus remains dependent on government budgets for funding, rather tha on more direct and dependable revenues Although in most areas, private sector capabilities are available, there is no guarantee that use of the private sector will produce better maintenance, because of this revenue problem as well as other institutional limitations, such as monitoring capabilities. Additionally, deficiencies in equipment utilization, which affect the condition of equipment, would not be addressed. It should be noted that in the kabupatens, most or even all equipment maintenance is already performed by the private sector, although not on a long-term contract basis. This private sector involvement does not appear to be a factor in the quality of equipment maintenance--condition of equipment is poor in all areas.

Option 2, *Autonomous Equipment Maintenance Unit*, is the least desirable option for approaching privatization. It does no more than option 1 to address funding issues, and has added problems of developing new institutional structures and human resources. None of the institutional vehicles considered in this option would sufficiently overcome the obstacles in these areas.

Option 3, *Privatized Equipment Maintenance Unit*, contains the advantages that the private sector has to offer, such as strong potential for mobilizing human and other resources at its disposal, but inadequately addresses problems of viability, risk and government policy. It is considered unlikely that GOI and local government would be willing and able to implement this option, with all of the risks it entails.

Option 4, *Autonomous Plant Hire Unit*, addresses the financial issues which constitute the biggest obstacle to the previous options, but it is not clear whether it is able to do so sufficiently. Implementation of this option will be constrained by the limited and uneven market for equipment. Although it is does not call for full privatization of equipment management, in consideration of the risks involved and the constraints of government policy, it could conceivably be viable as a pilot, except for the effects of the limited market and uneven demand. The choice of institutional vehicle would be important, and in this regard, option 4a involves a far more appropriate institutional structure than 4b. Option 4a involves

the establishment of locally-controlled enterprises devoted solely to management of kabupaten equipment, as opposed to 4b, which requires an existing firm to add to its various duties.

Option 5, *Privatized Plant Hire*, addresses the same issues as option 4, with notable exceptions. Because it involves full privatization, risk for the government and the private sector is potentially high. Proper approaches to implementation can alleviate much of this risk. Financial viability remains in question, for the same reasons as in option 4. The added disadvantage is that, unlike Option 4, if profits are not generated, private operations will simply fail, whereas government operations could conceivably be subsidized, at least for the short term. Largely due to the risk involved, conflicts are likely to arise regarding government policy, which have up to now supported provision of equipment via the local government.

H. Conclusions and Recommended Option

Option 4a, *Autonomous Plant Hire Unit - New Organization*, is recommended, with reservations, for pilot implementation.

Option 4a provides the opportunity to operate equipment in a commercial manner which will associate equipment-related revenues with equipment-related expenses. Establishment of a plant hire unit rationalizes equipment ownership and provides plant hire units with the responsibilities and benefits of ownership. It therefore provides incentives such as increased revenue generation and accountability, for efficient maintenance and utilization of equipment. It is designed to conform with GOI regulations and the government's interests as owners and operators of equipment.

As with all of the other options, Option 4a is not able to adequately address certain fundamental problems associated with equipment management in Indonesia. Because the market for equipment in the pilot area is dependent upon local government project needs, it is subject to the uneven nature of government funding. Peak periods of project activity require far more equipment availability than at other times of the fiscal year. In order to meet equipment needs at peak periods, commercial operations would need to invest in what would amount to an excess capacity of equipment, if measured on an overall basis. This would result in the need to set rates above those which would be applied if demand were steady, in order to cover costs. Higher equipment rates would in turn result in significant increases in costs for implementing road projects.

Implementation of the plant hire unit option requires a choice on the part of GOI, as owner of the units, regarding the proper course of action regarding this supply and demand dilemma. The ideal approach would be to adjust the project funding system in order to eliminate the uneven demand caused by budget cycle problems. This would improve the incentives for the private sector to enter the equipment hire market. Unfortunately, this

approach would involve major changes in the current nation-wide budgeting system, and is therefore a long-term solution beyond the scope of this study.

An alternative to this global approach to budget cycle problems would be to make use of the donor project funding mechanism to partially alleviate the problem. Strategies to release donor funds at the beginning of the fiscal year may be more readily designed and implemented than those dealing with GOI funds. These possibilities should be explored during the design stage of the pilot.

In the absence of a mechanism for correcting the distortions caused by the budget cycle, the government will need to consider alternative approaches to funding equipment costs. The most feasible approach would be to devise methods to increase budgets for road projects with a calculation of increased equipment costs. This would require providing project budgets for the pilot areas with higher unit costs than in other areas. Because there is no way to calculate total expenditures on equipment paid by government and contractors together, it is not possible to use current costs to calculate the difference in project costs that would be required. Costs would need to be calculated based on an estimate of equipment utilization rates.

I. Action Plan

The primary goal of the Action Plan is to develop a basis for moving in the direction of commercially viable plant hire operations, as opposed to achieving privatization in the short term. The first step in this process is to rationalize management of equipment through the establishment of plant hire units

The first objective during implementation of the pilot will be to develop an understanding and accounting of the cost of equipment. Subsequently, sources of income must be rationalized and managed in order to cover costs. Improved management of all physical and human resources will be an integral part of this rationalization. In this manner, the foundation will be laid for eventual sustainable, self-financing equipment management. In the short term, improved equipment maintenance and utilization should result, with positive effects on road maintenance. The action plan discusses the institutional, financial, and monitoring and evaluation actions to be taken in order to implement the recommended pilot activities.

1. Institutional Process for Implementation of the Pilot Plan

It is recommended that the process for implementation of the pilot plan include the following steps:

- planning meeting for all parties involved;

- Bangda (as the lead agency) formally deciding to proceed with pilot plan implementation; and

- establishment of the legal basis for the pilots at the kabupaten level, with the support of legal documentation from the provincial and central government levels, including: from PUOD, completion of guidelines for establishment of Unit Swadana; from Bangda, instructions to local governments to establish pilots; instructions from provincial governors to kabupatens to establish pilots; completion of applications by local governments to establish Unit Swadana; directives from the bupati of each of the nine project kabupatens regarding establishment of pilot projects; approval by local assemblies for establishment of the plant hire units and for setting of hire rates.

2. Determination of Finances for the New Units

At the beginning of pilot preparation, decisions need to be made by appropriate authorities regarding financial policies for the plant hire units. Assets of the unit, most importantly equipment, need to be inventoried before the establishment of the unit, and costs for initial repair of transferred equipment need to be determined. Policy and data for costing repairs, and for inventory, need to be determined before the unit begins operation. Hire rates will have to be calculated. Budget preparation will need to be completed before the initial operation of the unit, and annually thereafter.

It is anticipated that plant hire units will experience deficits in their budgets Hire revenues are not expected to equal expenditures if equipment utilization is as low as is estimated. In the first year of operation, additional expenses for repair of equipment transferred to the kabupatens will need to be considered. Budgetary shortfalls will need to be funded through sources other than hire revenues. Agreement regarding sources of such funds will best be made before the beginning of the pilot preparation period, and annually thereafter.

3. Monitoring and Evaluation Activities

The primary goal of the pilot is to develop the basis for moving in the direction of commercially viable plant hire operations. With that goal in mind, systems will be designed (during the pilot preparation stage) to monitor and evaluate changes regarding understanding and accounting of the costs of equipment, rationalization and management of income, improved equipment maintenance, and improved road maintenance.

I. INTRODUCTION

A. Objectives

In response to a request from USAID/Jakarta, the Decentralization: Finance and Management (DFM) Project formed a team to carry out a Special Study on District Equipment Policy The objective of this study, as presented in the statement of work, is to assess the current equipment maintenance system and determine whether the deficiencies in the kabupaten (district) equipment maintenance program could be resolved by privatizing components of kabupaten equipment maintenance services.

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The statement of work presents the technical approach for conducting the study in three phases.

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In the second phase, the study team analyzes government procedures regarding the acquisition, ownership, hiring and maintenance of construction equipment. The study team investigates current hiring practices, and submits proposals for revised hire policies designed to encourage the more efficient use and maintenance of the kabupaten fleet.

In the last phase, the study team develops an action plan to initiate a pilot study of privatized services.

To carry out this program, the team met with central, provincial and kabupaten government officials, private contractors, and consultants to various donors, in order to assess the current maintenance system and potential for privatization. Leaders of the team first met in the United States with DFM core research staff to determine a framework for analysis. Mobilizing in Jakarta in October, 1992, the team carried out interviews in Jakarta before beginning the field study. Field appraisals and meetings with the public and private sector occurred in the provinces of South Sulawesi and East Nusa Tenggara, and included visits to all nine kabupatens where the RRMS project is being implemented. A survey questionnaire was used for collecting data from private contractors, and in-depth interviews were conducted with private enterprises most likely to be involved in pilot activities.

C. Reports

Final Report--The Final Report provides an overall summary of findings and recommendations from the more detailed reports in Annexes I-III. It also includes the Action Plan.

Action Plan--The study team prepared an Action Plan to test the feasibility of the recommended option. The Action Plan is contained in the Final Report, and presents the various steps required for implementation of pilot activities, along with a proposed implementation schedule and recommendations for technical assistance.

Annex I: Background Report: Current Equipment Hiring and Maintenance Practices--The team collected data in all areas from the public and private sector to prepare a background report on current equipment maintenance and hiring practices in the study areas. This report is presented as Annex I from this study, and includes an analysis of current equipment resources and maintenance practices, hiring practices, costs and budgeting. It concludes with a description of deficiencies in the current kabupaten and an analysis of the causes of these deficiencies.

Annex II: Options for the Implementation of Privatized Equipment Maintenance--The team prepared a second report on options for the implementation of privatized equipment maintenance. For this report, the team compiled data regarding private sector activities in the study area, and an assessment of private sector capabilities *vis a vis* equipment maintenance for the kabupaten fleets. The report includes a background discussion of privatization and how it may apply in the study area. The core of the second report is a discussion of options for privatization, which were proposed at the beginning of the study and revised following initial field observation. Five options are proposed and evaluated Options are evaluated against nine criteria, designed to determine the option which would best meet the goal of more efficient equipment utilization through improved maintenance. One option is recommended for implementation using this analysis, and requirements for implementation as a pilot are discussed.

Annex III: Recommended Equipment Hire Policy--Based on findings on hire policy in the study area, the team prepared a third report on recommendations for changes in equipment hire policy. The report contains recommendations in connection with the implementation of the recommended option, and general recommendations for changes in policy in the event there is no pilot implementation.

II. ANALYSIS OF CURRENT SYSTEM

A. Findings

Current kabupaten equipment maintenance practices were found to be deficient in a number of areas, resulting in poor condition of equipment which is utilized for road maintenance. Deficiencies vary between kabupatens in the study area, but the condition of equipment in all kabupatens is below levels required for effective equipment utilization.

Equipment is provided in large part with donor assistance Ownership of donor-funded equipment remains with the Department of Public Works, rather than the kabupaten governments The kabupatens purchase only a small part of their fleets with local funds. Permission is required from the owning agency each time a unit is hired out to a contractor.

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Hours of equipment utilization are very low in relation to industry standards. Much of the kabupaten fleet is old in terms of years, but with total hours of utilization that would normally be found in a much younger fleet Due to the government budget cycle and weather conditions, equipment utilization is heavy during only certain months of the year, with equipment lying idle or seldom used during other periods.

A comprehensive Equipment Maintenance System (EMS) is currently being introduced by the RRMS consultants. This is a recent endeavor, and the adoption of system components is uneven between kabupatens, but not yet fully implemented anywhere. Current EMS deficiencies include poor performance in documentation of maintenance and repair activities, implementation of routine maintenance, monitoring and budgeting.

All kabupatens experience shortages in skilled personnel, both management and technical. Both numbers of staff and their skills are lacking. Many staff members are non-permanent status rather than civil servants, making it difficult to develop skills through investment in training. Many of the civil service personnel hold multiple positions, and do not devote themselves full-time to equipment maintenance activities.

Parts provision is a common problem, due to inadequate budgets, poor planning and procurement difficulties.

Workshop facilities are generally sufficient and well-equipped, having recently been upgraded. Further upgrading is scheduled through the RRMS project. Utilization of facilities is uneven, but low overall. Repairs are often carried out at the project site, contractors send repairs to other workshops, and much required maintenance is not carried out at any location. Due in large part to personnel problems mentioned above, management of workshops is inadequate.

Budgets for maintenance are funded through annual Inpres grants. Current budgets are inadequate to cover needs calculated by the study team, and with one exception do not follow EMS guidelines. Funding through Inpres results in partial-year availability, due to late availability of funds Budget components vary widely between kabupatens, in terms of allocations for staff, operational costs and parts Maintenance budgets are supplemented through a system decreed by central government guidelines whereby contractors are responsible for nearly all maintenance and repair, including spare parts and repair work performed in the kabupaten workshops. Data are not available to calculate contractors' maintenance expenditures.

Equipment hiring rates and procedures are set by central government guidelines. Rates for kabupaten equipment can be set by the local government, but these rates nearly always follow central government guidelines. Rates are far below those required to cover the cost of operating, maintaining and replacing equipment, and far below those charged by private companies hiring equipment. Contractors are responsible for all maintenance and most repairs, wages for operators and mechanics (who are kabupaten employees), and other operating costs. Hire revenues are paid into general revenues rather than being earmarked for equipment-related expenses. Revenues are paid to the level of government where ownership is registered, meaning that most revenues are accrued to central government general funds.

B. Deficiencies in Current System

Two fundamental constraints to efficient equipment maintenance, limited markets and uneven demand, are related to each other, and present enormous obstacles to sustainable improvement of the equipment maintenance system in the kabupaten.

1. Limited Markets

There is little market for equipment hire in any of the pilot area kabupatens other than that provided by government projects. These are virtually all awarded by Dinas PU Tingkat II.

The limited market for equipment has been identified as a major factor which deters private sector interests from entering the equipment hire market and which discourages contractors from owning their own equipment.

2. Uneven Demand

The government fiscal year starts on 1 April. Kabupaten road projects are primarily funded with Inpres block grant funds which are allocated annually and must be expended before the end of the fiscal year.

There is always a delay in obtaining confirmation of Inpres project allocations for the new fiscal year and it is usually July or August before the agency concerned is in a position to award construction contracts. The result is that there is no work for construction equipment from April to July and the potential working year is reduced to a maximum of eight months. Other obstacles such as contracting and tendering procedures, and weather conditions, further hamper project implementation and reduced demand for equipment during certain months. Not all funds are spent by the end of the fiscal year, further decreasing overall demand for equipment.

In combination with the already limited market for equipment in the project areas, this uneven demand prevents utilization of equipment from being high enough to justify a contractor purchasing his own equipment for use on kabupaten road projects. In addition, it would be unprofitable for private businesses to purchase equipment to hire out to others, since income could be generated only during part of each year.

3. Fragmentation Resulting from Root Causes

Attempts by the government and foreign donors to deal with limited markets and uneven demand have resulted in fragmentation of responsibility for equipment maintenance. No one unit has responsibility for the total control of any item and no one therefore works within a system of incentives for its successful operation in either technical or financial terms. Furthermore, the responsibilities as currently allocated in this fragmentary way often encourage those concerned to take action which is in their own short term interests but which conflicts with the best interests of the equipment fleets in the longer term.

Due to limited government resources, donors have assisted in providing equipment to the kabupatens, in the absence of adequate privately-owned equipment. Funding mechanisms and government policies combine to result in difficulties in providing appropriate equipment

resources in various kabupatens as well as fragmentation of ownership and responsibility for equipment. Expenditures for equipment are not tied to such variables as equipment hire or cost of equipment. Revenues from equipment are not paid into the same account which provides for equipment-related expenditures. No provisions are made for maintaining accounts for total cost of equipment. Various parties are responsible for financial and administrative duties related to equipment.

Fragmentation also means that no comprehensive records are available anywhere to show:

- utilization rates,
- repair histories, and
- operating costs.

4. Donor Provision of Equipment

For many years donor agencies have helped provide new equipment for infrastructure development projects which they finance, in the interests of successful project implementation. Donors do not generally finance the ongoing maintenance and repair of the equipment or provide spare parts for its entire working life.

This has resulted in ever-increasing fleets of equipment which the GOI cannot maintain or repair within current budgets. Kabupatens allocate a certain amount of their annual roads (IPJK) budget for equipment maintenance. The amount of funding varies between kabupatens, but is never sufficient to cover all maintenance and repair costs Government policy shifts liability for these costs to the contractors who hire the equipment, as discussed in section 11, below.

A further problem associated with donor funding for equipment purchase is the failure of government departments to account for replacement costs. A commercial equipment hire unit would calculate hire rates which were geared to the replacement of the machine at the end of its working life.

5. Equipment Resources and Ownership

Standardization of equipment fleets in the kabupaten has led to fleets which are either excessive related to overall needs or in some cases unbalanced when related to a particular project. In addition, donor provision can mean delays in obtaining new equipment, as well as loss of control by the local government over the composition of the equipment fleet in the kabupaten.

More importantly, due to the provision of equipment funded by donors through the central government, much of the equipment hired out by the kabupatens is not technically owned by them but by the Department of Public Works. Equipment provided by donors and the central government is owned by the central government. In NTT, the kabupatens also have equipment provided and owned by the province. Very little of the equipment in the kabupatens is actually under kabupaten ownership. Lack of ownership is an important obstacle to proper maintenance and utilization.

Regulations stipulate that the kabupaten must obtain the permission of the owning agency before hiring their equipment, even though the hire rates are already prescribed in the legislation. This requirement adds an extra administrative step to every hire contract, and limits the kabupaten's discretionary authority to allocate equipment.

This fragmentation of owners and users results in a gap between equipment-related revenues and expenditures. Because kabupatens are responsible for maintaining equipment they do not own, maintenance budgets are provided through Inpres grants, rather than from kabupaten revenues.

6. Revenue - Expenditure Gap

Fragmentation of responsibilities is also demonstrated in financial arrangements. Ownership of most of the equipment operated by the kabupaten remains with central government agencies and hire revenue therefrom is channelled outside the kabupaten to central government accounts (Kas Negara).

Revenues are not retained at the kabupaten level except for the few pieces of equipment that are actually owned by the kabupaten. Funds are always treated as general revenues rather than being channelled to particular agencies or particular uses. No financial provision is made for the replacement of equipment.

Because of these problems in collecting and channelling revenues, kabupatens need to obtain funds for operation and maintenance of equipment from other sources. The most visible source of GOI funds is the annual maintenance budget, discussed in section 10 below. Costs for maintenance and repair during the hire period are made the responsibility of the equipment hirer (contractor). This fragmentation of revenues and expenditures has also removed any incentive to determine economic hire rates.

7. Low Hire Rates

Existing hire rates for equipment in the kabupaten are set by reference to formulae contained in KepMen 585/1988 and KepMen 167/1991, and are all far too low for the following reasons:

- the assumption of 2,000 hours hire revenue per annum is far in excess of that actually being achieved;

- the assumed 10 percent residual value for the equipment at the end of its economic working life is unrealistic;

- no provision is included in the hire rates for the cost of the mid-life major overhaul (repair level V); and

- no provision is made in the hire rates for the inevitability that the machine which will eventually be purchased to replace that being hired will be more expensive due to technological development, exchange rate movements and inflation.

8. Contract Prices

Under Unit Rate contracts, the contractors receive income for the use of equipment on their projects based upon a measure of the production which it is capable of achieving at maximum utilization rather than upon the number of hours which it has spent on the project. Rates for each activity are expressed in terms of production volume (square or cubic meters).

DPU has calculated standard prices for most activities for inclusion in Owner's Estimates, these being the amounts which it will pay for each unit of production These figures are known to, and used by, the contractors in preparing their tenders. Lump Sum contracts, although they do not express a rate for each activity, are estimated on the same basis. The calculation of standard prices is based on the cost per hour of a machine and its hourly productive capacity.

Hourly costs are considerably in excess of the equipment hire rates currently charged by DPU and the local governments. Conversely, the hourly production actually achieved is believed to be far below the maximum capacity assumed in the rates. This is mainly due to long periods during which the equipment stands idle, reasons for which include the following:

- mismatched fleets, with some items standing idle while another machine completes a preceding process;

- poor quality contractor site management;

- delays caused by the project owner's mistakes; and

- force Majeure (rain, etc.).

A further contributory cause is that equipment, although working, is not achieving the standard output. This may be due to an inexperienced operator or to the material being different from that specified. The result is that calculations of equipment costs paid to contractors are not related to actual hire rates. Under the current system, calculating true equipment costs is not possible, nor is calculation of actual equipment utilization.

9. Utilization

As described above there are two major constraints on the demand for equipment, which result in low utilization:

- there is virtually no demand outside the public works sector, of which the largest element is kabupaten roads; and

- uneven demand causes a period for several months annually, during which little construction work takes place.

In addition to the problems of limited market and uneven demand, several other factors limit utilization of equipment:

- Road projects do not normally allow machines to operate continuously during the working day. There are frequent idle periods while a machine on one operation waits for a preceding operation to be completed.

  Delays can be caused by poor supervision of the project by the contractor, by mismatched fleets (e.g., insufficient asphalt sprayers to allow effective utilization of dump trucks and rollers), and by delays in availability of certain equipment currently used on another project.

- Working hours are restricted by public holidays and other factors. In particular, when the operator is provided by the kabupaten, he will expect to work standard government hours, which may differ from those normally worked by the contractor's staff. Calculation of hire rates, both in bills of quantity and hire contracts, are based on working days of five or seven hours. Private sector equipment hirers calculate rates based on eight hour days.

- Down-time for repairs must be taken into account. Since these are the contractor's responsibility, they will usually occur during the periods when the machine is on hire.

- Poor technical skills among operators mean that equipment breaks down more often. Lack of skill among mechanics means that it takes longer to put equipment back into working order.

- Lack of management skills among both kabupaten staff and contractors' site personnel also results in lack of proper monitoring and guidance, and leads to poor utilization.

- The difference between the method of calculating payment to a contractor for work done by equipment (see above), along with the basis for calculating its actual cost to him makes it difficult to identify how much under-utilization is occurring. In addition, low hire rates do not provide incentives to contractors to improve utilization rates.

- The channelling of funds whereby the kabupatens receive none of the hire revenue means that they have little incentive to maximize utilization. Indeed, there is a negative incentive since additional periods worked by the machine will increase the operating costs which the kabupatens (or the hirer) bears with no corresponding increase in the income to the kabupaten

Overall, actual annual machine utilization for equipment operated by the kabupatens is calculated to be in the range of 500 to 900 hours per year, or even less. This was borne out by the inspection of hour meters on machines in every kabupaten visited. These were mostly supplied ten years ago under OECF funding and had recorded between 316 and 9,000 hours. The average for the 34 machines seen was 400 hours per annum.

10. Maintenance Budget

As discussed above, revenues from equipment hire and expenditures from maintenance are not associated, both in terms of determination of amounts and in channelling to and from the same entity. Specifically, expenditure needs for equipment maintenance are not tied to such variables as equipment hire or cost of equipment. Rather than generating funds for maintenance of equipment, kabupatens are dependent upon central government grants for equipment maintenance budgets. This results in an inability to adequately fund equipment maintenance.

With inadequate maintenance budgets, kabupatens are unable to invest in human resource development. At present, the staffing levels in the kabupaten workshops are inadequate, for both management and technical positions.

11. Repair Liability

In order to overcome maintenance budget constraints, the procedure adopted under Kepmen 585/1988 has been to make the hirer responsible for all maintenance and repair costs, except for the one major mid-life overhaul (repair level V).

This procedure has several disadvantages:

- The hirer has little interest in the longer-term welfare of the equipment. Rather than carry out proper scheduled maintenance and repair at manufacturer's recommended intervals, he will tend to carry out only the very minimum level of repair necessary to enable the machine to complete his project, and he may economize even on this by using sub-standard parts. This approach to maintenance and repairs often causes the machine to break down again shortly after, but it will by then probably be on another project and be the responsibility of another contractor.

- There are great difficulties in keeping accurate records of maintenance and repair as required under the EMS. These records would be valuable in monitoring the lifetime costs of each machine, a key parameter needed by management when formulating policies for replacement. Without these data, it is impossible to set accurate hire rates which would include owner liability for maintenance.

- A risk to the contractor in hiring kabupaten equipment is that he is responsible for all repairs during his contract for hire. According to regulations, machines are to be inspected and released to hirers in good condition, but low technical skills and administrative problems make this difficult in practice. Additionally, due to this policy of contractor liability, equipment is often returned in a condition necessitating maintenance or repair, with the kabupaten unable to carry out the repairs because of low budgets. In this instance, even with adequate budgets the kabupatens would be placed in the position of providing repairs for which they are not directly responsible.

- The division of responsibility for the operation and cost of equipment between equipment owners and hirers results in a poor understanding by both parties of the true cost of owning and operating equipment.

12. Technical Skills

Annex I details the deficiencies in technical skills found in the kabupatens. While this lack of skill in part reflects the more general problem of availability of skilled mechanics and operators which is experienced by the public and private sector in the study areas, it is more specifically the result of low maintenance budgets and poor management skills in the kabupatens.

Kabupaten maintenance budgets are low, and generally do not provide for salaries for workshop staff. The cost of mechanics and operators is generally the responsibility of the hirer, even though these personnel are provided by the kabupatens. Mechanics and operators

work, therefore, only when equipment is hired. There is no budget for the kabupaten to pay wages to mechanics to perform maintenance and repair independent of what is paid for by the hirer. Therefore, even maintenance needs identified by the kabupaten upon return of equipment are not carried out, except by agreement with the previous or next contractor to hire the machine.

Technical assistance is provided in the study areas to improve the skills of mechanics, but is not sufficient to raise overall skill levels. Long-term investment in training would be required, and personnel selected for training would need to have a minimum level of capabilities to benefit from training. Even with adequate budgets for long-term training, results would be disappointing due to personnel policy constraints. These personnel policies can be directly attributable to budgetary constraints.

Individuals often serve as both mechanics and operators. This would necessitate training in both areas. Most kabupaten mechanics and operators are not permanent civil servants, rather they work on a daily basis at low wages. If they improve their skill levels through training, they are free to leave the kabupaten workshop following effective training and seek a job in the private sector with higher pay.

13. Management Skills

Technical skills are generally not developed through experience in the workshop due to the frequent inability of workshop management to provide guidance and on-the-job training. This inability to provide technical assistance is due to several factors. Although some workshop managers are experienced as mechanics or educated in relevant fields, many are not, and would not be able to provide sufficient guidance under any conditions Even for those technically able, personnel policies, budget constraints and administrative procedures hinder effective informal training. These personnel policies can be directly attributable to budgetary constraints.

Many workshop managers hold more positions in addition to that of head of the Equipment Subsection in Public Works, and must devote time to these other duties. If an employee is more skilled in another area, finds job duties more congenial or receives greater rewards, he will tend to devote more time to these functions than to workshop duties.

Budget constraints prevent adequate monitoring of project-site operations, where many repairs take place, and where much maintenance should take place. Inadequate monitoring, aggravated by inability to perform proper monitoring of equipment utilization and maintenance, results in inadequate and improper utilization by the hirer.

Administrative procedures place an emphasis on record keeping, so that skilled and ambitious managers develop capabilities in this area rather than in technical matters.

With little prospect of achieving a reasonable level of utilization, no financial incentive to maximize revenues, and inadequate budgets to carry out maintenance, repairs and monitoring, it is inevitable that the motivation on the part of the kabupaten staff will suffer, among mechanics, operators and management. Staff without the technical capabilities to perform their job duties fully do not have incentives to carry them out. The end result of this lack of incentives is poor utilization and maintenance deficiencies.

14. Maintenance Deficiencies

Specific maintenance deficiencies have been identified in the previous section of this report. Although there are variations between kabupatens in the study area, all kabupatens experience deficiencies in the areas of routine maintenance and repair, with a large percentage of their fleet in poor condition or inoperable. Causes of these deficiencies, as discussed above, include poor utilization, insufficient maintenance budgets, policies regarding repair liability, inadequate technical skills and management skill, and lack of incentives to provide adequate maintenance These factors result in part from the fragmentation of responsibility in equipment management.

III. OPTIONS FOR IMPROVEMENT

A. Options for Institutional Reform and Privatization

1. Contracted Equipment Maintenance

Option One leaves the ownership of equipment and facilities unchanged, and contracts out all or some of the maintenance operations to private firms. Two methods of contracting are considered:

1a *Contracted Equipment Maintenance*, which would contract out equipment maintenance activities to private firms operating in their own facilities; and

1b *Contracted Workshop Operation*, which would contract out equipment maintenance to one firm which would also operate the existing kabupaten workshop.

2. Autonomous Equipment Maintenance Unit

Option Two leaves the ownership of equipment and facilities unchanged, and establishes the workshops and workshop equipment as Autonomous Equipment Maintenance Units owned by the government. Two variations of this option are considered:

2a *Autonomous Equipment Maintenance Unit - New Organization*, which would establish new entities for equipment maintenance, such as a Unit Swadana, BUMN or BUMD; and

2b *Autonomous Equipment Maintenance Unit - Amarta Karya*, which would establish equipment maintenance operations under an existing government-owned enterprise (BUMN).

3. Privatized Equipment Maintenance Unit

Option Three leaves the ownership of equipment unchanged, and transfers the existing kabupaten workshops and workshop equipment to privately owned and managed firms.

4. Autonomous Plant Hire Unit

Option Four transfers ownership of equipment and facilities to Autonomous Plant Hire Units owned by the government. Two methods of establishing these autonomous units are considered:

4a *Autonomous Plant Hire Unit - New Organization*, which would establish new entities for equipment hire and maintenance, such as a Unit Swadana, BUMN or BUMD; and

4b *Autonomous Plant Hire Unit - Amarta Karya*, which would establish equipment hire and maintenance operations under an existing government-owned enterprise (BUMN).

5. Privatized Plant Hire

Option Five would encourage privatization of both workshops and equipment, and thus transform the present kabupaten equipment management systems into competitive privately owned and managed plant hire firms. Privatization could be carried out in several ways, but would involve the transfer of equipment ownership to the private sector.

B. Criteria for Evaluation of Options

Options for privatization and institutional reform should meet the goal of more efficient utilization of equipment. In order to meet that goal, several factors need to be dealt with which will affect the feasibility of implementation of the option. Both internal and external factors are considered. Nine criteria were used to evaluate the options:

1. Efficient Equipment Utilization

To what extent does the option encourage the proper use of equipment for tasks for which it is suited and in a manner which is most efficient? Are there incentives to maintain equipment so as to increase its life and availability? Are there incentives to scrap and replace equipment at the proper time?

2. Risk Minimization

Does the option involve risks to the parties involved, including the local government, hirers and owners? Risks include financial risks to investors and risks to the efficient completion of road maintenance and improvement projects.

3. Financial Viability

Will the new system of managing and maintaining equipment be financially viable? Consideration needs to be made of the amount and source of revenues required to cover equipment maintenance costs.

4. Conflict with Existing GOI Policy

Is the option consistent with existing government policies, regulations and procedures? What changes in policies, regulations and procedures would be required to allow for implementation of the option?

5. Addresses System Deficiencies

Does the option address the causes of maintenance deficiencies which are identified in the study. These causes are primarily the limited market and uneven demand for equipment. Will the effects of fragmentation be resolved?

6. Qualified Providers

Are there organizations with resources available which are required for implementation of the option? Resources include facilities, equipment, management capacity, capital and skilled personnel.

7. Mobilization of Resources

Will the responsible organization be able to mobilize its potential and actually carry out the duties required? Are there incentives for the organization to utilize its potential to provide services as described in the option? Are there obstacles to development of the full potential of the organization, based on current or past performance, organizational structures or environmental factors?

8. Human Resource Development

Does the option encourage training and other aspects of human resource development which are necessary for the efficient utilization of equipment? Does the option stimulate demand for skills?

9. Potential For Development into Sustainable Privatization

Is the option likely to develop into a sustainable method of providing efficient equipment utilization and maintenance? If the option is not fully sustainable or efficient by itself, does it hold the possibility of encouraging the development of a more sustainable and efficient option?

C. Comparisons and Evaluation of Options

Option 1, *Contracted Equipment Maintenance*, faces potential problems in reaching the objective of effective maintenance and efficient equipment utilization, as well as questions

regarding financial viability. The central problem faced in implementing this option would be that it does little to change the funding system for equipment maintenance, and thus remains dependent on government budgets for funding. Although in most areas, private sector capabilities are available, there is no guarantee that use of the private sector will produce better maintenance, because of this revenue problem as well as other institutional limitations, such as monitoring capabilities. Additionally, deficiencies in equipment utilization, which affect the condition of equipment, would not be addressed It should be noted that in the kabupatens, most or even all equipment maintenance is already performed by the private sector, although not on a long-term contract basis. This private sector involvement does not appear to be a factor in the quality of equipment maintenance -- condition of equipment is poor in all areas.

Option 2, *Autonomous Equipment Maintenance Unit*, is the least desirable option for approaching privatization. It does no more than option 1 to address funding issues, and has added problems of developing new institutional structures and human resources None of the institutional vehicles considered in this option would sufficiently overcome the obstacles in these areas.

Option 3, *Privatized Equipment Maintenance Unit*, contains the advantages that the private sector has to offer, such as strong potential for mobilizing human and other resources at its disposal, but inadequately addresses problems of viability, risk and government policy. It is considered unlikely that GOI and local government would be willing and able to implement this option, with all of the risks it entails, including monopolization of equipment maintenance outside of government control.

Option 4, *Autonomous Plant Hire Unit*, addresses the financial issues which constitute the biggest obstacle to the previous options, but it is not clear whether it is able to do so sufficiently. Implementation of this option will be constrained by the limited and uneven market for equipment. Although it is does not call for full privatization of equipment management, in consideration of the risks involved and the constraints of government policy, it could conceivably be viable as a pilot, except for the effects of the limited market and uneven demand. The choice of institutional vehicle would be important, and in this regard, option 4a involves a far more appropriate institutional structure than 4b. Option 4a involves the establishment of locally-controlled enterprises devoted solely to management of kabupaten equipment, as opposed to 4b, which requires an existing firm to add to its various duties.

Option 5, *Privatized Plant Hire*, addresses the same issues as option 4, with notable exceptions. Because it involves full privatization, risk for the government and the private sector is potentially high. Proper approaches to implementation can alleviate much of this risk. Financial viability remains in question, for the same reasons as in option 4. The added disadvantage is that, unlike option 4, if profits are not generated, private operations will simply fail, whereas government operations could conceivably be subsidized, at least for the short term. Largely due to the risk involved, conflicts are likely to arise regarding

government policy, which have up to now supported provision of equipment via the local government.

D. Conclusions and Recommended Option

Option 4a, *Autonomous Plant Hire Unit - New Organization*, is recommended for pilot implementation.

The study team concluded that the deficiencies in the kabupaten equipment maintenance program are caused by fundamental constraints of limited markets and uneven demand for equipment in the study areas, and the fragmented system of equipment management which has developed to deal with these two root causes.

Five approaches to privatization and institutional reform were considered as options to overcome the deficiencies in kabupaten equipment maintenance. Evaluation of the five options led to the conclusion that the most viable and effective approach to improve equipment maintenance is to establish Autonomous Plant Hire Units, which would consolidate management of equipment under local government management. As such, it addresses both of the objectives of privatizing equipment maintenance services and revising equipment hire policy.

Of all options considered, the recommended option is seen as most appropriate to partially overcome maintenance deficiencies. However, the root causes of deficiencies in the system--limited markets and uneven demand--will remain, as they are determined by larger, systemic factors which are beyond the scope of this study. As long as these fundamental constraints remain, full privatization is not viable. Further, these same constraints render the full self-financing of a plant hire unit impossible. The recommended option moves in the direction of privatization by consolidating equipment management in a commercially operated plant hire firm. When, in the future, economic and policy changes succeed in removing the constraints of limited markets and uneven demand, the plant hire unit will be able to provide a firm basis for privatized services.

IV. FRAMEWORK FOR PLANT HIRE

A. Principles

1. Consolidated Management

Fragmentation of Responsibility

The new hire unit will bring together all aspects of management and control, a deficiency under the present system which is largely responsible for the poor quality of equipment maintenance.

Planning, Budgeting and Monitoring

The sections below explain how the finances of the new unit will be determined.

Initial planning

This will include:

- preparing priced lists of the spare parts required to carry out each level of repair for each type of machine;
- establishing the staffing needs for the workshop and administration and identifying funding sources to be used; and
- setting hire rates.

Budgets

A detailed annual budget must be prepared in a format which permits meaningful monthly monitoring of actual results against budget. This will be based on:

- forecast of annual hours usage for each machine;
- forecast, machine by machine, of the cost of spare parts to be fitted to carry out all scheduled maintenance and repair including rectifying any backlog;
- forecast of cost of additional and replacement equipment;
- forecast of the cost of running the workshop including staff, consumable materials and overheads; and

- forecast of funding sources other than hire rates.

Monitoring

Active monitoring is essential with positive follow up action by management to correct variances from budget. This will be particularly important in the first few years when the quality of budgeting will be poor due to lack of historical cost data.

The EMS prescribes the system in detail. Key areas to be monitored are:

- hours utilization with separate totals for hours on site and hours actually working;
- hire revenue earned;
- hours working for which no hire revenue is earned (e.g., swakelola and community benefit projects);
- cost of spare parts, with separate totals for parts purchased and used; and
- cost of workshop operation and other overheads.

All monitoring should include making comparisons between budgeted and actual figures.

2. Self Financing

The Plant Hire Unit should be structured with the goal of being fully self-financing It should be able to cover its costs without GOI budget support and also be able to store revenues enabling it to replace equipment without the need for continuing donor support.

In the short term, full self-financing of units will continue to be constrained by limited markets and uneven demand. Approaches for dealing with these constraints are discussed in section B, below.

The establishment of a self-sustaining unit is in accordance with government policy for the take-off phase in the country's development which is due to start in FY 1994/95.

3. Hire Rate Policy

The new unit must charge economic hire rates based on realistic forecasts of hours work achievable by each machine. The rates:

- must cover the full operating costs of the unit;

- may provide for a return on capital; and

- should start to provide the necessary funds for eventual replacement of each machine at the end of its effective working life.

The use of hire rates which properly reflect the true cost of equipment enable rational choices to be made between equipment- and labor-intensive methods of construction where such alternatives exist. Local governments and plant hire unit managers need to consider the three bases of calculating hire rates, and determine the most appropriate approach in consideration of financial requirements.

4. Alternative Bases for Calculating Hire Rates

Three different bases of calculating hire rates have been considered. They are described briefly below. Annex III contains more detailed presentations of the calculations, and the Appendix to that Annex contains some indicative hire rates calculated on the new bases.

All three bases assume the following:

- Operating hours 1,000 per annum. Current rates are generally based on 2,000 hours per annum. Plant hire units will need to determine the appropriate utilization rate, as discussed in section 5g, below.

- No scrap value at end of working life. Current rates include a 10% scrap value.

- Cautious estimate of working life of equipment--seven years for most items. Current rates assume ten year life for most equipment.

- Maintenance and repair costs based on formulae in the DPU maintenance manual which uses percentages of original cost applied to each year.

BASIS 1

- This basis does not make the unit fully self sustaining. The original cost of the equipment is included in the rate but no provision is made for the higher cost of the eventual replacement.

- No interest on capital or capital recovery factor is included.

BASIS II

- This basis makes the unit fully self sustaining. The original cost of the equipment is adjusted to allow for both inflation and other price increases which may apply to the cost of replacement.

- No interest on capital or capital recovery factor is included.

BASIS III

- Makes the unit fully self sustaining.

- The rates provide for a return on investment of 20 percent per annum, including 7.5 percent per annum for inflation.

- Use of a high rate of return means that, if correctly stored, adequate funds will be available for eventual replacement of machines at prices current at the time of replacement.

Bases II and III, although based on different principles, give indicative hire rates which are not greatly different from each other

The following section discusses the main factors to be considered in calculating hire rates, once the local government determines the policy on hire rates, using one of the three bases discussed here.

5. Calculation of Hire Rates

The following factors should be considered in calculating hire rates.

Original Purchase Price of Equipment

For new equipment, the actual price paid (or, if available, the government standard price at the time of purchase) should be incorporated in the hire rate calculation.

For old equipment, it is suggested that the standard government price be used. This may be taken either from KepMen 167/1991 or from other guidelines issued by DPU. Although the prices in such lists will be greater than those actually paid, they will be in line with replacement costs on which the hire rates should be based.

Spare Parts

Standard lists of prices are needed covering each level of maintenance and repair for each type of machine. Provision for the preparation of these lists is contained in the Action Plan.

To establish hire rates, the lifetime cost of spare parts must be calculated and divided over the lifetime working hours. Since no accurate cost data currently exists, the indicative hire rates prepared under this Study have used the repair cost formulae set out in the Manual (Kriteria Pemeliharaan Peralatan) issued by the DPU Secretariat General in February, 1983. For implementation of the new policy, the calculation of hire rates must be based on more specific data, as it becomes available.

Workshop Facilities and Staff

Since most maintenance and repairs will be carried out in the kabupaten workshop, using its own staff, the total cost of operating the workshop should be treated as a fixed overhead, to be allocated over all the machines in the fleet, and included in their hire rates, on some equitable basis.

It is suggested that only wages for staff classed as 'harian' (i.e., those mechanics and clerks who are not full time civil servants) should be included in the hire rate. The unit will not be responsible for bearing the cost of permanent civil servants, for whom separate budget arrangements exist.

Operational Costs

It is recommended that costs of fuel, oil and the operator's salary should be the responsibility of the contractor. They are not therefore included in the hire rate. Similarly transportation, if provided by the owner, will be recharged to the contractor separately and will not be included in the hire rate.

Funds to Meet Extra Cost of Replacement

It is inevitable that any replacement machine will cost more than the original price used above. Costs rise due to:

- technological advances incorporated into new models; and
- local inflation;

and for equipment with imported content:

- inflation in the supplier's country; and

41

- exchange rate movements.

Only Bases II and III incorporate surplus income which can be used to meet these costs.

Increases in Hire Rate to Cover Inflation

Hire rates established when the unit is first set up will be valid only for the first year. They should be reviewed each year and increased as necessary, either on the basis of a flat percentage related to published statistics on inflation rates or, in cases of dramatic changes, by carrying out a detailed recalculation of each rate.

All three Bases assume inflation will be reflected in future years' hire rates.

Utilization and Working Life

The annual costs of each item, calculated as above, must be divided by the expected number of hours of operation to obtain an hourly hire rate. It is important that this level of utilization be realistic, otherwise under-recovery of costs will result and the unit will make losses which have not been budgeted for.

The detailed examples of calculations which are contained in Annex III apply a utilization rate of 1,000 hours per annum for all three bases of calculation. The problems associated with determining a realistic utilization rate are discussed in section B-2, below.

Return on Investment

In a self-financing operation, an investment in equipment is required to earn a return which would both pay for interest on the capital invested and generate surplus funds for future expansion.

Different considerations apply to GOI equipment because:

- the cost, being donor funded, does not appear as an asset of the unit; and
- any interest payable is recorded only within the Ministry of Finance and not debited to the unit.

However, in calculating costs, GOI often includes cost of capital through the use of a Capital Recovery Factor (CRF).

Basis III shows the rates needed to earn a return at a rate of 20% per annum on the amount invested in the equipment. The evaluation technique used is Discounted Cash Flow (DCF), which gives a better measure of the time value of money than does the Capital

Recovery Factor. A brief description of DCF is included with the indicative hire rates in the Appendix to Annex III.

B. Plant Hire in Current Environment

1. Consolidated Management Ownership

The equipment currently operated by the kabupatens belongs to a number of different owners. Only a small proportion of each fleet actually belongs to the kabupaten. Most of the items belong to DPU and are formally placed under the control of the kabupaten each year through an authorization system known as 'SPRIN'. Some kabupaten also have equipment which belongs to the provincial government.

This situation is scheduled to change with a transfer of ownership of certain items of equipment from DPU to local government. KepMen PU 711/1992 has established a team consisting of members from DPU and MOHA, who are required to produce a list of equipment recommended for transfer. Transfer of equipment will allow local government to consolidate management and finances.

Channelling of Funds - Unit Swadana

It is recommended that a Unit Swadana be selected as the institutional vehicle for the new unit. Plant hire units should be organized as Unit Swadana in each kabupaten. Under this organization, all income and expenditure would be under the control of the management who would set up and operate proper systems of budgetary control. Monies would not only be controlled at the local level, but could be allocated directly to the plant hire unit, without being channeled to general government funds

2. Constraints to Self-Financing

Low Utilization and Constraints on Setting Hire Rates

Utilization is low in all the kabupatens due to two root causes:

- there is virtually no demand for equipment outside the public works sector, of which the largest element is kabupaten roads; and
- the GOI budget cycle causes a period of low demand during the first months of every fiscal year, during which no Inpres funds are available to the kabupaten and little construction work takes place. The problem is compounded later in the fiscal year by the onset of the rainy season, which causes intermittent working in several of the remaining months of the year.

As long as these constraints continue to cause a low annual utilization rate, it will be very difficult to establish a fully viable equipment hire unit for the following reasons:

- if hire rates are set based on the current realistic estimate of working hours (e.g., 500 hours per year), a very high rate would result. Contractors could not afford to pay without very considerable increases in the contract rates for construction activities; and

- conversely, if hire rates are more affordable, based on a more desirable utilization rate (e.g., 1000 hours per year) the unit will require some form of additional financing to cover the difference between actual utilization and the estimated hours used to calculate hire rates.

The unit's viability and the various approaches to financing in light of these constraints are discussed in section 3, below.

Non-reimbursable Utilization

Even within the low utilization rates of 500 to 600 hours per annum being achieved, there are hours which are not revenue-earning. There are two categories:

Force Account (*Swakelola*)

Projects implemented by the DPUK itself rather than by contractors generally utilize GOI equipment without paying for it. Under the plant hire system, force account project budgets will need to include equipment costs. No accounting has been made of the amount of utilization of equipment for these projects under the current system. Estimates for the first year of plant hire operations can be made based on project plans. Accurate records for future allocations can be made once the unit is operational.

Community Projects

Equipment is also being used free of charge on other projects, often outside the public works sector, where the local government considers the project to be for the benefit of the local community but for which no budget funds have been allocated. Under the plant hire system, local governments will need to review their policy regarding such use of equipment, and the method for financing this utilization. No estimates of use of equipment for community projects is possible at this time. Accurate records will need to be kept once the unit is operational.

Age of Equipment

Part of the working life of every item of equipment which the unit will be operating has already passed and the revenue therefrom has been paid over to GOI. In some cases very little working life remains in which to collect and store revenues. Thus some donor support will be needed to fund the next replacement of these items.

Maintenance Backlog

Detailed evaluations of the condition of the items of equipment to be transferred have not yet been carried out but it is apparent that there is a significant backlog in repairs. In particular, few if any major mid-life overhauls (Level V) have taken place, even on equipment which is now more than ten years old.

The new hire rates are not designed to cover the cost of overdue repairs. The Action Plan provides for a determination of backlog repair costs and financing thereof at the time of transfer.

Forecasting the Shortfall

The first year's budget for the hire unit will be based on a number of assumptions which, due to the lack of historical data, cannot be substantiated. Only when the actual results during the first year of operation are monitored and evaluated will it be become clear what level of surplus or deficit the unit will incur. Based on this experience, more accurate figures can be forecast and incorporated in the second year's budget. Similarly, experience in the first year of operation may indicate that the hire rates set initially were incorrect and they may require revision.

3. Options for Financing

Due to constraints discussed above, full self-financing will be difficult to attain. Plant hire units will need to address these constraints using one or a combination of the following approaches:

- fully realistic hire rates and increased contract unit rates;
- outside funding for replacement equipment;
- one-time GOI budget allocation for maintenance backlog; and
- GOI subsidies for operating deficits.

Fully Realistic Hire Rates and Increased Contract Unit Rates

If the proposed hire rates are to be implemented to make the unit self sustaining, it will be necessary to increase the rates paid to contractors for all equipment-related items in road maintenance and construction projects. The relevant prices in the Owners' Estimates and standard pricing manuals would have to be recalculated.

Raising the unit rates in road contracts would address the fact that current prices paid for roads do not fully recognize the cost of the equipment used thereon. This subsidy has been concealed by the provision of equipment by donors and by the fragmentation of cost recording and budget sources.

If contractors receive realistic rates for equipment-related construction, two other trends may be expected to develop which would lessen the dependence of contractors on government-owned equipment, and lead to more private equipment ownership:

- more contractors would be encouraged to purchase their own equipment; and
- more privately owned equipment would appear on the hire market, as hire rates rise, allowing for profit in equipment hire.

Outside Funding for Replacement Equipment

Most items of equipment have already expended most of their effective working lives with none of the revenue having been stored to finance their replacements. The new unit will receive hire charges only during the last few years of operating life and this will not allow it to accumulate sufficient funds for the next replacement. Some form of GOI budget funding, with or without donor support will be needed.

Any items which the unit acquires new should produce sufficient revenue over its life for replacement without any support, provided Basis II or Basis III hire rates are adopted and if the required number of hours are worked.

One-Time GOI Budget Allocation for Maintenance Backlog

KepMen 585/1988 specifically states that the owner, not the hirer, will bear the cost of major overhauls. The hire revenue collected in accordance with the KepMen rates has been channelled into GOI general budget revenues. Allocations for these deferred major overhauls and other repairs which have been deferred while equipment was under DPU ownership can be made on a one-time basis, so that the new unit could commence operating without needing to cover these high costs.

GOI Subsidies for Operating Deficits

The viability of each unit in its first year of operation will be forecast during the planning and budgeting process described in Section A above and provided for in the Action Plan. One method of dealing with budget deficits is to provide for an annual budget allocation for plant hire units, similar to the current IPJK equipment maintenance budgets.

V. ACTION PLAN

A. Objectives of the Action Plan

The objectives of the Action Plan are more limited in scope and more specific than privatizing equipment maintenance services. Due to the constraints of limited markets and uneven demand, full self-financing cannot be achieved. The primary goal, then, must be to develop the basis for moving in the direction of commercially viable plant hire operations, rather than achieving privatization in the short term.

The first step in this process is to rationalize management of equipment through the establishment of plant hire units. The first objective during implementation of the pilot will be to develop an understanding and accounting of the cost of equipment, which is impossible under the current fragmented system. Subsequently, sources of income must be rationalized and managed in order to cover costs. Improved management of all physical and human resources will be an integral part of this rationalization In this manner, the foundation will be laid for eventual sustainable, self-financing equipment management. In the short term, improved equipment maintenance and utilization should result, with positive effects on road maintenance.

The Action Plan outlines and discusses the steps to be taken in order to implement the recommended pilot activities, in the following areas: institutional, financial, monitoring and evaluation. In addition, technical assistance for carrying out these activities is proposed, along with a recommended schedule for implementation of the various components of the Action Plan.

B. GOI Selection of Option for Implementation

The consultants have presented their findings and recommendations to a number of central government departments and to agencies of local government in the project areas, and have received broad agreement with the proposals. The government now needs to make a formal decision to proceed with pilot implementation, and select the appropriate option. It is recommended that this process follow these steps.

1. Planning Meeting

All parties involved should meet at the first opportunity to discuss the consultants' findings and recommendations, and to select an option for implementation. The participants in this meeting should include the following:

- Direktorat Jenderal Pembangunan Daerah (Bangda), Departemen Dalam Negeri (MOHA) - lead agency;

- Direktorat Jenderal Bina Marga, Departemen Pekerjaan Umum;
- Badan Perencanaan Pembangunan Nasional (Bappenas);
- Direktorat Jenderal Pembinaan Urusan Otonomi Daerah (PUOD), Departemen Dalam Negeri (MOHA);
- Direktorat Jenderal Anggaran, Departemen Keuangan (MOF);
- Provincial government, including Biro Bina Bangda, Bappeda, Dinas Pekerjaan Umum (DPUP), PBPJK;
- Kabupaten government, including Sekretariat Wilayah Daerah, Bappeda, Dinas Pekerjaan Umum (DPUK);
- USAID; and
- RRMS consultant (STV/Lyon).

The following items should be considered in the planning meeting:

- consultants' findings and analysis;
- recommended option for pilot implementation;
- scheduling of pilot implementation; and
- financial requirements for pilot implementation.

2. Bangda Determination

As the lead agency, Bangda will need to make a final determination to proceed with implementation of pilots. This determination should be made as soon after the planning meeting as possible, and communicated to all participants.

C. Institutional Activities

A certain amount of legal documentation is required to establish pilot activities. A legal basis for pilots needs to be established at the kabupaten level, supported by legal documentation at the provincial and central government levels. A limited amount of technical assistance is recommended to develop the legal framework for the pilots.

1. Legal Documentation, Central Government - PUOD

Although principles and procedures for the establishment of Unit Swadana have been laid out in three documents (Keputusan Presiden 38/1991, Keputusan Menteri Keuangan 47/1992 and 235/1992), specific guidelines for implementation of these procedures (Petunjuk Pelaksana) at the local government level have not been completed. PUOD needs to complete work on these guidelines as the first step in the implementation process.

2. Legal Documentation, Central Government - Bangda

Bangda will issue a directive (Surat Edaran) instructing local government to establish pilots in accordance with decisions made in step 1, above. The directive will include the following information:

- instructions for kabupatens to proceed with pilot implementation. The recommendation is for each kabupaten to establish an Autonomous Plant Hire Unit;
- choice or choices of institutional vehicle for pilot implementation. The recommended vehicle is Unit Swadana;
- instructions to provincial and kabupaten governments to issue the appropriate legislation to implement the pilots;
- local government agencies, facilities and equipment which will be affected by the pilots; and
- reference to legal background for establishment of the pilots, including Keputusan Presiden 38/1991, Keputusan Menteri Keuangan 47/1992 and 235/19921.

Technical Assistance - Institutional, to provide appropriate institutional framework for legal documentation. Two weeks, in conjunction with task D-4, Hire Rate Policy.

3. Legal Documentation, Provincial Government

The governor of Sulawesi Selatan and the governor of NTT will issue directives (Surat Keputusan) instructing the kabupatens to establish pilots in accordance with instructions from Bangda. The directive will include information similar to the directive from Bangda.

4. Legal Documentation, Swadana Application by Local Government

Application procedures for permission to establish Unit Swadana are outlined in Kepmen Keuangan 235/1992. As stated above, these procedures will be supplemented at the

local level by instructions from the Ministry of Home Affairs (MOHA-PUOD). Current procedures include the following steps:

- completion of the application packet, which includes organizational and budgetary information, to be submitted on the following forms:
  - -- Daftar Rencana Tatalaksana Pelayanan (Service Organization Plan);
  - -- Daftar Penerimaan Fungsional dan Tarif (Functional Revenues and Tariffs);
  - -- Daftar Realisasi dan Perkiraan Seluruh Penerimaan dan Pengeluaran (Actual and Estimated Revenues and Expenditures);
- submission of application via Ministry of Home Affairs to the Ministry of Finance, with copies to the Ministry for the State Apparatus (Menpan); and
- approval by Ministry of Finance and Ministry for the State Apparatus.

Because the application packet contains financial and budgetary information, it is vital that budget planning be carried out before this step. This is covered in Section C, Financial and Budgeting Activities, below.

5. Legal Documentation, Kabupaten Government

The bupati of each of the nine project kabupatens will issue a directive (Surat Keputusan) regarding the establishment of a pilot project in accordance with instructions from the governor of the respective province. The directive will include the following information:

- establishment of Unit Swadana to operate as Plant Hire Units;
- procedures for setting hire rates and managing finances of the unit; and
- organizational structure of the unit, including duties and functions.

Establishment of Plant Hire Units, as well as setting of hire rates, will likely require the approval of the local assembly (DPRD). Scheduling of the preparation of legal documentation will need to consider the discussion and decision making process in the kabupaten.

D. Financial Activities

A considerable amount of work will need to be carried out to determine the finances for the new units. Technical assistance is recommended for completion of financial and budgeting activities. Activities include those during the preparation stage, as well as activities required for initial operation of the unit. At the beginning of pilot preparation, decisions need to be made by appropriate authorities regarding financial policies for the plant hire units. Assets of the unit, most importantly equipment, need to be inventoried before the establishment of the unit, and costs for initial repair of transferred equipment need to be determined Policy and data for repair costing and inventory need to determined before the unit begins operation. Budget preparation will need to be completed before the initial operation of the unit, and annually thereafter. It is recommended that technical assistance be provided for subsequent years of operation, due to the lack of data availability prior to the first year of operation.

1. Repair Cost Data

Budgeting for the plant hire unit will require data regarding the cost of maintenance and repair. An initial cost list can be made during the initiation of the plant hire unit, and updated annually. This list should include the following:

- for each machine in the fleet parts to be fitted under each level of maintenance and repair (Bina Marga levels I through V);
- latest manufacturers' prices for these parts; and
- summary of standard costs for each level of maintenance and repair

Technical Assistance - Mechanical, to prepare repair cost data and provide instructions on updating the data set to the kabupatens. One month.

2. *Transfer of Equipment*

According to Keputusan Menteri Pekerjaan Umum 711/1992, ownership of equipment now allocated to kabupatens but owned by DPU will be transferred from DPU to the kabupatens. This will comprise the bulk of the plant hire unit fleet. Monitoring of the process will be necessary. In addition, because of the backlog of maintenance for the equipment to be transferred, costs of initial repairs need to be made, along with determination of funding sources for repair work. The following steps will be followed:

- receive list of items recommended to be transferred, prepared by the team set up by KepMen 711;
- carry out engineer's inspection of all items;

- prepare cost estimate for restoring equipment to full working order, using repair cost data in (1), above; and

- prepare list of potentially competing equipment which is not being transferred, indicating where located, current utilization and condition.

Technical Assistance - Mechanical, to direct and carry out inspection of equipment and revisions of equipment inventory lists. Expatriate 10 weeks, two local consultants each ten weeks. Special funding may be required to pay for temporary kabupaten workshop staff to help carry out this inspection, if wage structures in the hire unit have not been changed by the time of the inspection

3. Inventory Policy

Spare parts inventory must be maintained effectively to maximize utilization of equipment. Inventory policy must be set by each kabupaten before establishing the plant hire unit. Policies may differ according to local conditions but, in general, the kabupatens should.

- decide which types of spare parts are to be held; and

- set maximum and minimum levels (economic re-order level, economic re-order quantity).

4. Hire Rate Policy

Hire rates should be determined according to procedures discussed in Annex III, Appendix I, Hire Rates. Certain decisions need to be made by local government, according to the following steps in order to determine the policy for initial hire rates:

- decide which basis of hire rate calculation is to be adopted;

- decide whether only hours actually worked are to be charged; and

- decide what utilization levels are to be used in calculation of hire rates.

Technical Assistance - Financial and Institutional to prepare material for local government determination of policy, and to assist the local governments in the decision making process. Two consultants. Financial consultant two weeks preparatory in Jakarta, working with central government, and four weeks working with local government. Institutional, same schedule, in conjunction with task III-2, Legal Documentation - Bangda, in Jakarta.

5. Hire Rate Calculation

Hire rates should be determined according to procedures discussed in Annex III, Appendix I, Hire Rates. According to policy determined in step 4, above, hire rates will be calculated for the initial year of operation, and annually thereafter, adjusted according to changing variables with the following procedure:

- calculate hire rates for all items in the fleets;
- review standard productivity levels for all activities; and
- review contract rates paid to contractors.

Technical Assistance - Financial to assist local governments in determining hire rates and adjusting contract prices as necessary. Nine weeks, in conjunction with task E-6, Budget Preparation. Mechanical to assist with (b), in conjunction with tasks IV-1 and IV-2.

6. Budget Preparation

A budget needs to be determined for each plant hire unit before the first year of operation. The initial budget will out of necessity be based on very approximate estimates of utilization, revenues and costs. An annual budget will be made in following years, with increasingly accurate data on which to base it. The following factors will be considered in determining the budget, according to the steps described.

Hire Revenue

- List each machine in the fleet, showing:
  - -- description
  - -- serial number
  - -- condition
  - -- hire rate (as calculated above).
- Forecast the number of hours which each machine will work.
- Forecast the number of those hours which will not be hired at the standard rates due to the machine being on:
  - -- swakelola projects
  - -- non-chargeable, community projects.
- Prepare forecast of Hire Revenue for the year.

Maintenance and Repairs

- List each machine in the fleet showing:

  -- description
  -- serial Number
  -- condition.

- Forecast how many of each level of maintenance and repair will be required in the year based on the forecast of equipment utilization, above.

- Using Repair Cost Data, prepare forecast of repair costs for the year.

Personnel

- List all personnel engaged in the management, care and hire of equipment showing separately:

  -- civil Servants whose salaries are paid from central SDO budget
  -- staff who are to be paid from Dati II budgets
  -- staff who are to be paid as a cost to the unit.

- For staff in the last category, forecast:

  -- honoraria/daily rate
  -- Biaya Lembur.

Travel Expenses

For each level of staff, forecast the number and duration of visits required, and use this to determine travel expenses.

Workshop Operational Costs

Forecast the cost of operating a workshop including:

-- electricity
-- stationery and office supplies
-- consumable materials (e.g., welding rods).

Spare Parts Inventory

Based on the Inventory Policy, forecast the cost of spare parts to be purchased to bring inventory levels up to the minimum as set.

Transport Vehicles

- Identify vehicles (pick-ups, motor cycles, etc.) which are to be the responsibility of the unit and forecast the annual cost of:

  - Spare parts
  - Fuel
  - Lubricants
  - Taxes.

- Identify any additional or replacement vehicles required during the budget year.

Technical Assistance - Financial, to assist hire units prepare budgets. Nine weeks, in conjunction with task D-5, Hire Rate Calculation.

7. Funding Requests

It is anticipated that plant hire units will experience deficits in their budgets. Hire revenues are not expected to equal expenditures if equipment utilization is as low as estimated. In the first year of operation, additional expenses for repair of equipment transferred to the kabupatens will need to be considered. Budgetary shortfalls will need to be funded through sources other than hire revenues. Agreement regarding sources of such funds will best be made before the beginning of the pilot preparation period, and annually thereafter

In addition, during the first year, accurate calculation of budgets may not be possible before the relevant deadlines for government budget submission (e.g., Rakorbang, DURPDA deadlines). Estimates for the first year budget submission will need to be made using broad calculations of hire revenues and the costs listed in section 6, above with the following procedure:

- calculate the total of all expenses for the year (items b through g above);

- subtract total expenses from estimated hire revenue (item a) to determine funding required from other sources; and

- prepare requests for funding from sources such as:

  -- IPJK
  -- APBD II.

E. Monitoring and Evaluation Activities

1. Objectives

The primary goal of the pilot is to develop the basis for moving in the direction of commercially viable plant hire operations. The fist objective during implementation will be to develop an understanding and accounting of the cost of equipment. Second, sources of income will be rationalized and managed in order to cover costs. In order to realize these objectives, improved management of physical and human resources will be necessary.

2. Outputs to be Measured

During the pilot preparation stage, systems will be designed to monitor and evaluate the following factors, in accordance with the stated objectives.

Understanding and Accounting of the Cost of Equipment

- determination of unit costs;
- reporting system for equipment utilization; and
- accounting and reporting systems for equipment costs.

Rationalization and Management of Income

- establishment of economic hire rates;
- consolidation of unit finances;
- accounting and reporting systems for hire income; and
- management information system for unit operation.

Improved Equipment Maintenance

- amount and quality of equipment maintenance performed; and
- condition of equipment;

Improved Road Maintenance

- Road maintenance deficiencies due to equipment problems.

Technical Assistance - Financial and Institutional, to design a monitoring system. Financial, three weeks. Institutional, three weeks in conjunction with task B-5.

F. Technical Assistance

Three categories of technical assistance will be provided to assist local governments with the establishment of plant hire units. **Institutional** assistance will be provided to assist with legal documentation, application procedures for establishing plant hire units as Unit Swadana, as well as for determining policies for operation of the units. **Financial** assistance will be provided to assist with determination of hire rates and budgeting. **Mechanical** assistance will be provided to assist local governments in determining both initial and ongoing costs of repairs to equipment.

The following shows the major tasks and their duration for each of the technical assistance personnel.

1. Team Leader/Local Government Specialist (expatriate)

Tasks and Schedule

Legal Documentation, Bangda	1 week
Swadana Application, Kabupaten	1.5 weeks
Hire Rate Policy	5 weeks
Design Monitoring System	1.5 weeks
Final Reports and Administration	3 weeks

TOTAL - 12 weeks

2. Finance Specialist (expatriate)

Tasks and Schedule

Hire Rates Policy	6 weeks
Hire Rates Calculation	4.5 weeks
Budget Preparation	4.5 weeks
Design Monitoring System	3 weeks

TOTAL - 18 weeks

3. Mechanical Engineer/Equipment Specialist (expatriate)

Tasks and Schedule

Repair Cost Data	4 weeks
Transfer of Equipment	10 weeks

TOTAL - 14 weeks

4. Equipment Specialist (two local)

Tasks and Schedule

Transfer of Equipment	2 x 10 weeks

TOTAL - 20 weeks

TABLES AND CHARTS

TABLE 1

MAINTENANCE SYSTEMS DEFICIENCIES FLOWCHART

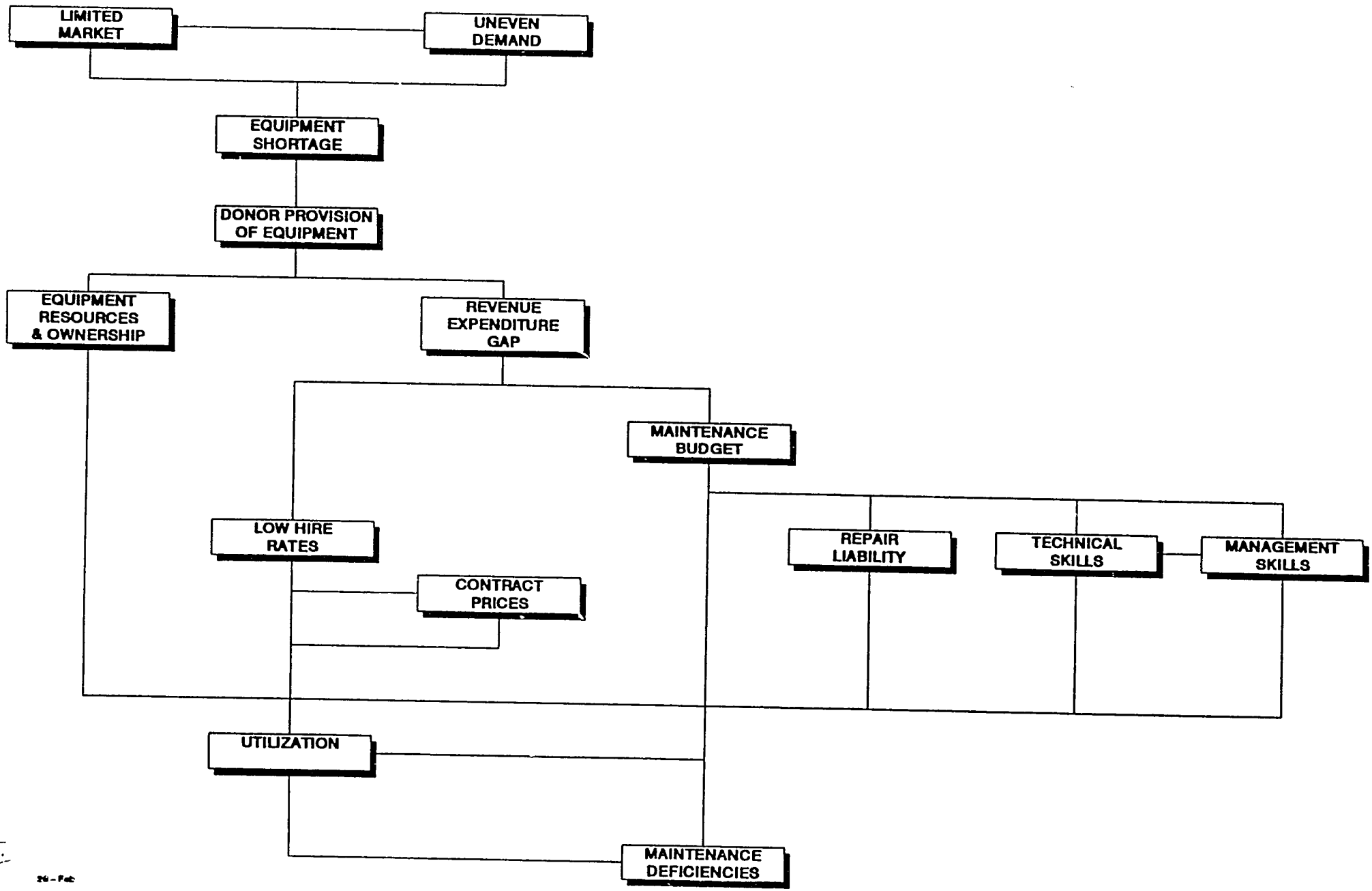


TABLE 2

26-Feb

EVALUATION OF OPTIONS

NO	OPTION	EVALUATION CRITERIA									SCORE
		1	2	3	4	5	6	7	8	9	
1a	Contracted Equipment Maintenance	−2	2	−3	−2	1	3	5	4	0	8
1b	Contracted Workshop Operation	−2	3	−3	−3	1	2	5	4	0	7
2a	Autonomous EM Unit – New Organization	−3	4	−3	3	1	−2	−2	−2	1	−3
2b	Autonomous EM Unit – Amarta Karya	−3	5	−3	1	1	2	−5	−2	1	−3
3	Privatized EM Unit	−2	−2	−3	−5	0	1	5	4	2	0
4a	Autonomous Plant Hire – New Organization	4	3	3	3	4	−2	1	3	2	21
4b	Autonomous Plant Hire – Amarta Karya	3	1	3	4	4	2	−5	1	0	13
5	Privatize Plant Hire	5	−4	4	−5	4	1	5	5	3	18

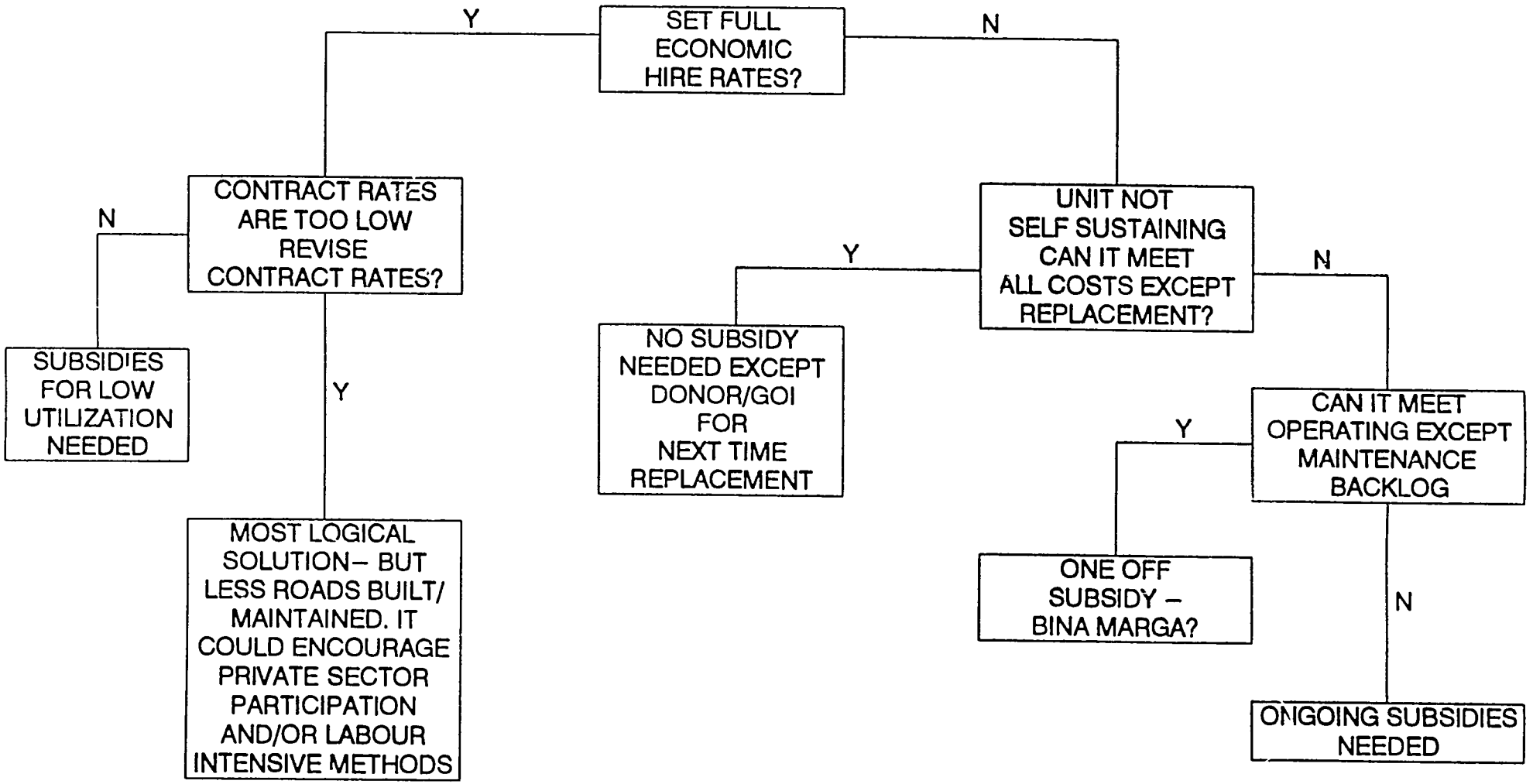
EVALUATION CRITERIA

1 Efficient Equipment Utilization
2 Risk Minimization
3 Financial Viability
4 Conflict with Existing GOI Policy
5 Addresses System Deficiencies
6 Qualified Providers
7 Mobilization of Resources
8 Human Resource Development
9 Potential for Development into Sustainable Privatization

CRIT-5

TABLE 3

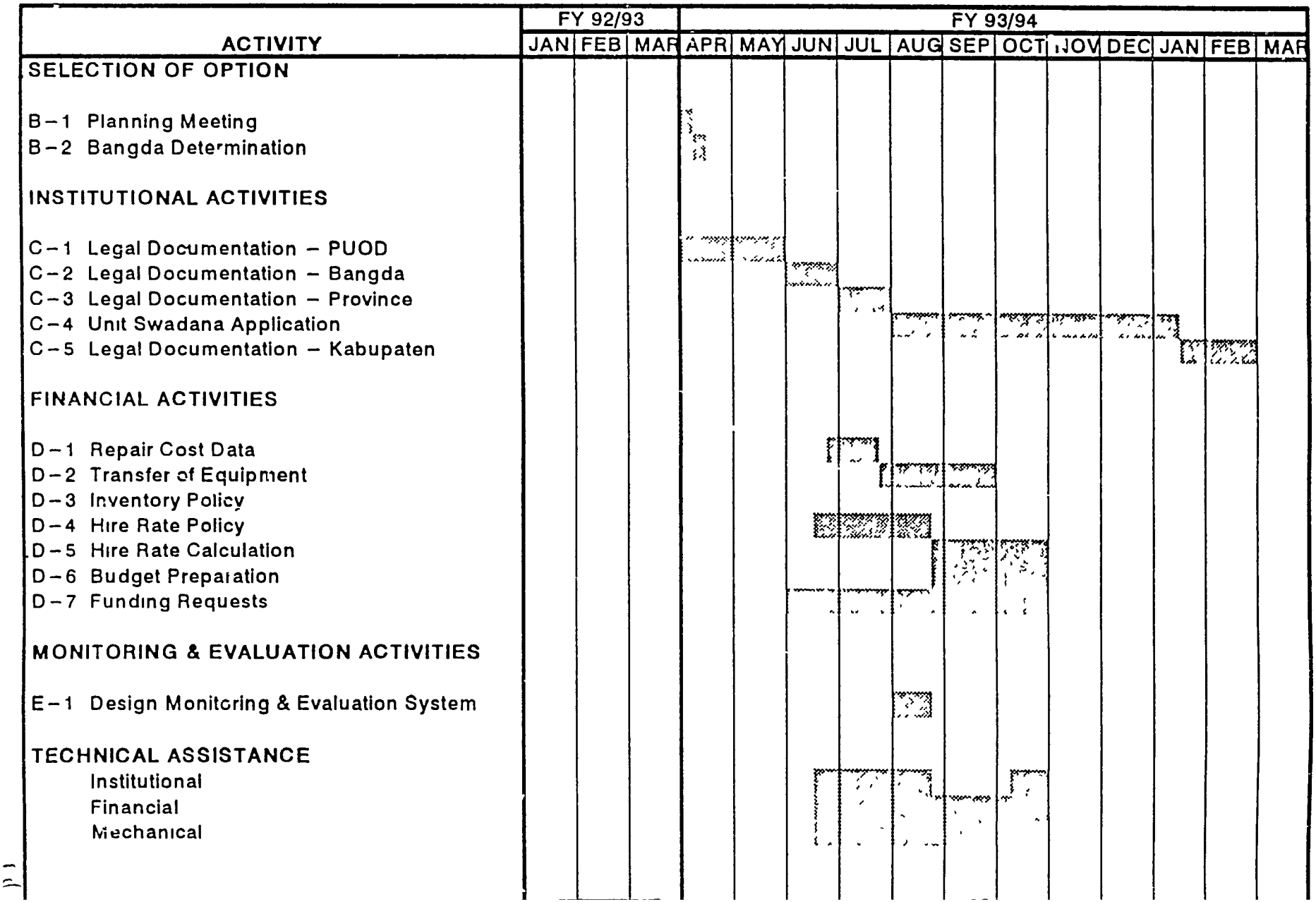
OPTIONS FOR FINANCING



FIVE\OPTIONS

TABLE 4
IMPLEMENTATION SCHEDULE

ACTION PLAN FOR IMPLEMENTATION OF EQUIPMENT MAINTENANCE PILOT STUDY



APPENDIX I

PERSONS INTERVIEWED

LIST OF PERSONS INTERVIEWED DURING DISTRICT EQUIPMENT POLICY STUDY

Government of Indonesia

Mahadi Sinambela (MOHA)
Sidi Poernomo (Bina Marga, DPU)
Sumaryanto Widayatin (Bina Marga, DPU)
Djoko Wahono (Biro Perlengkapan, DPU)
Hinu E. Sayono (Biro BSP, DPU))
T.A. Salim (Bappenas)
Syahrir (Bappenas)
I Gusti Gde Sudjaja (MOF)
Sahat Panjaitan (PUOD)
Tambunan (PUOD)

Offices and Officers in South Sulawesi

Province

H.A.M. Aras Mahmud (*Asisten EkBang*)
Abdullah Dalie (Kabid Alkal)
A. Rachman Iskandar (Pimpro PBPJK)
Agussalim (Bappeda)
M. Farid Suaib (chief of *Biro Bina* Bangda)
A. Justin (Bangda)
H. Rifai (Bangda)
A. Baliraja (Bangda)
Mudrik Yahya (Bangda)

Kabupaten Bone

H.B. Paturungi (Sekwilda)
Andi Sakka Makkulau (chief of PU)
Mudjetaba Yunus (deputy chief of DPUK)
Salahuddin (chief of workshop)
Ali Dachir (DPUK staff)
Ir.H. Zubair Suyuthi (chief of Bappeda)

Kabupaten Bulukumba

M. Riefad Suaib (chief of DPUK)
Makmur M. (chief of workshop)
Yeneng Usman (chief of warehouse)

Kabupaten Jeneponto

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M. Jabir Laho (chief of workshop)
M. Basir (staff of DPUK workshop)

Kabupaten Pinrang

A. Firdaus Amirullah (*Bupati*)
Mappigau Samma (Sekwilda)
Abd. Kadir Pais (chief of Bappeda)
Noce Rumlawan (chief of DPUK)
Simon Menggoe (chief of workshop)
Eko Budihartanto (DPUK staff)

Kabupaten Sidrap

Andi (Sekwilda)
Achmad Akil (DPUK)
Fadjar Suseno (IPJK, DPUK)
Munta, BE (Administration caretaker)
M. Yasin Yusuf (chief of workshop)

Kabupaten Sinjai

Drs. H.M. Said Tjulia (Sekwilda)
Ir. A. Herry Iskandar (chief of DPUK)
Arief (chief of equipment)
Anwar Wahid (chief of Administration)

Kabupaten Takalar

Syahrul S. (*bupati*)
H. Mustabi Rahim (chief of DPUK)
Hasnaha (DPUK staff)
Ambo Dalle (DPUK staff)

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Province

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Dan Woda Paile (deputy chief of Bappeda)
AD. Abdulmanan (Bappeda)
J. de Puloir (Bappeda)
Nailyu (chief of Biro Bina Bangda)
Petrus Masan Bali (Pimpro PBPJK)
Katipana (Alkal, DPUP)
John Lutuh (Alkal, DPUP)

Kabupaten Belu

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Avelinus da Silva (Sekwilda)
Mattius Lay (Chief of Bappeda)
Ir. Yusuf Dea (chief of DPUK 1992)
Ir. Piter Djami Rebo (chief of DPUK 1993)
Alex Tuka Penu (chief of workshop)
Daud Manafe (chief of equipment)
A.P.E. Lepez (chief of warehouse)
Julius Adoe (chief of Bangda)
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Sofian (Trakindo)
Harry Harnanto (Trakindo)
M. Jazid (Trakindo)
James J. Rook (Caterpillar)
Thomas A. Finby (RJTMI)

Amir Darwin (Amarta Karya)
Susanto Hardjosukanto (Amarta Karya and APPAKSI)
Susanto (APPAKSI)
Suparto Soejatmo (IMI)

Ujung Pandang

Harsono Yohanes (United Tractors)
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M. Yunus Pane (United Tractors)
Husain Ibrahim (KADIN)
H.M. Aksa Mahmud (Bosowa, Gapensi)
Darius Parenrengi (Gapensi)
Fernando Gonzales (Trakindo)
Eddy Iskandar (Trakindo)
Poerwanto S (Trakindo)
Slamet Riyanto Gadas (Trakindo)
Joko Prasetyo (Barata Indonesia)
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Gonzales P. (Tuju Wali-wali)
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Kabupaten Bone

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A. Rachman Rivai (Putra Turatea)

Kabupaten Pinrang

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APPENDIX II

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APPENDIX III

QUALIFICATIONS OF TECHNICAL ASSISTANCE PERSONNEL

QUALIFICATIONS OF TECHNICAL ASSISTANCE PERSONNEL

1. Team Leader/Local Government Specialist (expatriate)

Qualifications

- advanced degree in public administration, political science or related discipline and have at least five years of experience with local government in Indonesia;
- familiarity with problems associated with equipment ownership and maintenance in the public sector in Indonesia; and
- experience in the design, preparation and implementation of pilot projects in Indonesia.

2. Finance Specialist (expatriate)

Qualifications

- experience in the preparation, analysis and implementation of Indonesian laws and regulations on public finance, financial analysis and budget preparation;
- familiarity with financial management of equipment in the public and private sectors, including current financial practices in local government in Indonesia; and
- competent in bahasa Indonesia.

3. Mechanical Engineer/Equipment Specialist (expatriate)

Qualifications

- experience in the management of equipment maintenance, repair and operations, planning and scheduling of equipment maintenance services, workshop operations, parts inventory control, costing of repairs, and inspection of equipment;
- familiarity with equipment maintenance program in Indonesia, particularly as it is implemented by local government; and
- competent in bahasa Indonesia.

4. Equipment Specialist (two local)

Qualifications

- experience in the management of equipment maintenance, repair and operations, planning and scheduling of equipment maintenance services, workshop operations, parts inventory control, costing of repairs, and inspection of equipment; and

- familiarity with equipment maintenance program in Indonesia, particularly as it is implemented by local government.

Rural Roads Maintenance Systems Project:

District Equipment Policy Study

Annexes One - Three

March 1993

Prepared for USAID/Jakarta by:

Decentralization: Finance and Management Project
Associates in Rural Development, Inc.
Research Team:
Michael Bishop, Team Leader
Liam Eaton
Richard Evans
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ANNEX THREE: RECOMMENDED EQUIPMENT HIRE POLICY

GLOSSARY

APBD	*Anggaran Pendapatan dan Belanja Daerah*, Local Government Budget (*Dati I & II*)
APBN	*Anggaran Pendapatan dan Belanja Negara*, National Government Budget
ALKAL	Provincial Public Works depot and workshop for PU equipment
APPAKSI	*Assosiasi Perusahaan Pengelola Alat-alat Konstruksi Indonesia*, Indonesian association for construction equipment management
ARD	Associates in Rural Development, Inc.
Bagian Keuangan	Finance Division
Bappeda	*Badan Perencanaan Pembangunan Daerah*, Regional Development Planning Board (*Dati I & II*)
Bina Marga	Directorate General in Ministry of Public Works in charge of roads
BPD	*Bank Pembangunan Daerah*, Regional Development Bank (government owned)
BUMD	*Badan Usaha Milik Daerah*, State owned corporation, supervised at provincial/ local level
BUMN	*Badan Usaha Milik negara*, state owned corporation supervised at national level
bupati	head of *kabupaten*
daerah	region; autonomous level of government (*Dati I & II*)
Dati I	*Daerah Tingkat I*, Administrative Region Level I (province)
Dati II	*Daerah Tingkat II*, Administrative Region Level II (*kabupaten*)
DFM	Decentralization: Finance and Management
dinas	sectoral agency at *kabupaten* or provincial level

Dinas Pendapatan Daerah	Local Revenue Agency
DIP	*Daftar Isian Proyek*, Approved Projects List
Dipenda	*Dinas Pendapatan Daerah*, Local Revenue Agency (also referred to as Dispenda)
DPRD	*Dewan Perwakilan Rakyat Daerah*, Regional Assembly (province and *kabupaten*)
DPU	*Departemen Pekerjaan Umum*, Ministry of Public Works
DPUK	*Departemen Pekerjaan Umum Kabupaten, Kabupaten* Public Works
DPUP	*Departemen Pekerjaan Umum Propinsi*, Provincial Public Works
DRM	*Daftar Rekanan Mampu*, List of Capable Supplier
DURP	*Daftar Usulan Rencana Proyek*, project proposal (later approved as DIP), for new projects
FY	fiscal year
GAPENSI	*Gabungan Pengusaha Konstruksi Indonesia*, the association of contractors
GOI	Government of Indonesia
hire	the renting of equipment on a contractual basis; leasing
hirer	the party (usually a contractor) contracting use of equipment from the owner
IBRD	International Bank for Reconstruction and Development (World Bank)
Inpres	*Instruksi Presiden*, central government block grants to provincial and *kabupaten* government
Inpres Dati I	*Instruksi President Daerah Tingkat I*, block grants for provincial government

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Inpres Dati II	*Instruksi President Daerah Tingkat II*, block grants for infrastructure development
IPJK	*Inpres Peningkatan Jalan Kabupaten*, block grants for rural roads renovation/ rehabilitation
IPAIR	*Iuran Pemakai Air Irigasi*, irrigation users fee
kabupaten	district; administrative subdivision of *Dati II*
KADIN	*Kamar Dagang dan Industri*, chambers of commerce and industry
kanwil PU	Ministry of Public Works provincial offices
Kas Daerah	provincial and *kabupaten* government funds
Kas Negara	central government funds
KEPMENPU	*Keputusan Menteri Pekerjaan Umum*; Minister of Public Works's decision letter
KEPPRES	*Keputusan Presiden*, Presidential Decree
MOF	Ministry of Finance (*Departemen Keuangan*)
MOHA	Ministry of Home Affairs (*Departemen Dalam Negeri*)
NTT	*Nusa Tenggara Timur* (Province)
OECF	The Overseas Economic Coperation Fund (of Japan)
owner	the owner of equipment - regarding equipment hire, the kabupaten or private owner of equipment
pajak daerah	local taxes
PALAN	*Direktorat Peralatan Jalan*, Directorate in Ministry of Public Works in charge of road equipment procurement.
PALAN workshop	one of eight Bina Marga "base" workshops
PBB	*Pajak Bumi dan Bangunan*, property tax

Pemda	*Pemerintah Daerah*, local government (used in report for kabupaten government)
Perda	*Peraturan Daerah*. Government Regulation
plant hire	renting equipment on a contractual basis; equipment leasing
PP	*Peraturan Pemerintah*, Government Regulation
PU	*Pekerjaan Umum*, Public Works
retribusi daerah	local fees (retribution)
Rp.	*rupiah*, unit of Indonesian currency
RRMS	Rural Roads Maintenance Systems (Project)
SDO	*subsidi daerah otonom*, grant to local government
sekwilda	*sekretaris wilayah daerah, kabupaten* or provincial secretary
SIAP	*Sisa Anggaran Proyek/Pembangunan*, unused part of a project/development budget
SK	*Surat Keputusan*, Decision Letter
SulSel	South Sulawesi
Swadana	A unit or agency with MOF permission to be self funding
Swakelola	force account
TA	technical assistance
Undang-undang	national law
UPT	*Unit Pelayanan Teknik*, Technical Service Unit
USAID	United States Agency for International Development

I. INTRODUCTION

A. Objectives

In response to a request from USAID/Jakarta, the Decentralization: Finance and Management (DFM) Project formed a team to carry out a Special Study on District Equipment Policy. The objective of this study, as presented in the Statement of work, is to assess the current equipment maintenance system and determine whether the deficiencies in the kabupaten (district) equipment maintenance program could be resolved by privatizing components of kabupaten equipment maintenance services.

A second and closely related objective is to determine whether a revised equipment hire policy would lead to the more judicious use and care of kabupaten equipment.

B. Methodology

The Statement of Work presents the technical approach for conducting the study in three phases.

In the first phase of the study, the study team compares the features of government maintenance operations with the potential equipment maintenance service capabilities of private contractors, to determine whether privatized service would be more manageable, cost-effect and sustainable.

In the second phase, the study team analyzes government procedures regarding the acquisition, ownership, hiring and maintenance of construction equipment. The study team investigates current hiring practices, and submits proposals for revised hire policies designed to encourage the more efficient use and maintenance of the kabupaten fleet.

In the last phase, the study team develops an action plan to initiate a pilot study of privatized services.

To carry out this program, the team met with central, provincial and kabupaten government officials, private contractors, and consultants to various donors, in order to assess the current maintenance system and potential for privatization. Leaders of the team first met in the United States with DFM consultants to determine a framework for analysis. Mobilizing in Jakarta in October, 1992, the team carried out interviews in Jakarta before beginning the field study. Field appraisals and meetings with the public and private sector occurred in the provinces of South Sulawesi and East Nusa Tenggara, and included visits to all nine kabupatens where the RRMS project is being implemented. A survey questionnaire was used for collecting data from private contractors, and in-depth interviews were conducted with private enterprises most likely to be involved in pilot activities.

C. ANNEXES

Annex One - The team collected data in all areas from the public and private sector to prepare a background report on current equipment maintenance and hiring practices in the study areas. This report is presented as Annex One from this study, and includes an analysis of current equipment resources and maintenance practices, hiring practices, costs and budgeting. It concludes with a description of deficiencies in the current kabupaten and an analysis of the causes of these deficiencies.

Annex Two - The team prepared a second report on options for the implementation of privatized equipment maintenance. For this report, the team compiled data regarding private sector activities in the study area, and an assessment of private sector capabilities *vis a vis* equipment maintenance for the kabupaten fleets. The report includes a background discussion of privatization and how it may apply in the study area. The core of the second annex is a discussion of options for privatization, which were proposed and revised at the beginning of the study and following initial field observation. Five options are proposed and evaluated. Options are evaluated against nine criteria, designed to determine the option which would best meet the goal of more efficient equipment utilization through improved maintenance. One option is recommended for implementation using this analysis, and requirements for implementation as a pilot are discussed.

Annex Three - Based on findings on hire policy in the study area, the team prepared a third report on recommendations for changes in equipment hire policy. The report contains recommendations in connection with the implementation of the recommended option, and general recommendations for changes in policy in the event there is no pilot implementation.

Action Plan - The study team prepared an Action Plan to test the feasibility of the recommended option. The Action Plan presents the various steps required for implementation of pilot activities, along with a proposed implementation schedule and recommendations for technical assistance.

Final Report - The Final Report provides a summary of findings and recommendations from Annexes One through Three. It also includes the Action Plan.

ANNEX ONE: BACKGROUND REPORT
CURRENT EQUIPMENT HIRING & MAINTENANCE PRACTICES

I. CURRENT KABUPATEN EQUIPMENT MAINTENANCE PRACTICES

A. Equipment in the Kabupaten

1. Actual Equipment Available in the Kabupatens

a. Equipment Resources

Tables II-1 to II-9 show the equipment currently available to the kabupatens under the authority of the Kabupaten Public Works Agency (DPUK) These tables are based on the monthly reports sent by the kabupatens to the RRMS consultant, STV/Lyon Associates, and do not differentiate between equipment working on projects, equipment on standby or equipment broken down waiting for repair. They do show scrap equipment.

Kabupaten equipment consists of heavy equipment, (such as bulldozers, motor graders, wheeled loaders, stone crushers and rollers), and light equipment which generally consists of transport vehicles, including pick-up trucks and motorcycles, but also includes compressors, pedestrian rollers and plate compactors.

b. Condition

i. Current

The condition shown on tables II-1 to II-9 is the current condition, according to the monthly equipment lists prepared by the Kabupaten workshops, copies of which are submitted to the RRMS consultants, STV/Lyon Associates.

Random inspections of equipment during visits to the Kabupatens has often shown that machines listed in good condition are only in fair or poor condition.

It would appear that if a machine can be easily started and moved, then it is considered to be in good condition (and therefore available for use, if it is not actually working), regardless of its actual working condition and potential reliability.

See Table II-10 for a comparison of the actual condition and the reported condition of machines inspected during field visits to the Kabupatens.

ii. Historic

For most of the machines, particularly the older ones, no accurate, reliable records are available for the major part of their working lives. Many hour meters are broken, and until the start of EMS, regular records of hours worked were often not kept at all.

Through the EMS project, equipment record keeping is being re-introduced, but the information in these records is limited to very recent histories of the equipment, and many kabupatens are not yet keeping regular records of hours worked or maintenance histories. From visual inspections of the equipment during site visits to the kabupatens, it would appear that equipment maintenance generally has been insufficient. There also appear to have been incidents of misuse and incorrect applications.

Hours shown on hour meters and the ages of the machines inspected during field visits to the Kabupatens are also shown on Table I-10.

iii. Predicted

If the EMS is not strictly adhered to after completion of implementation, then the useful working life of the equipment will continue to be shortened to less than that which is normally anticipated

Too much reliance is made on the operator reporting defects without frequent inspections from the workshops' mechanical staff. There is nothing wrong in expecting the operator to report defects, but for this system to operate effectively, the operators must be trained in identifying defects and in preventive maintenance inspection. Even with fully trained operators, the mechanical staff must still make regular equipment inspections.

Personnel and management problems underlying this situation are discussed in section B2.

2. Procurement and Funding of Equipment

Most equipment procurement for the Ministry of Public Works is handled by the Equipment Directorate of Bina Marga - PALAN. Procurement is by tender process and the successful bidder/supplier usually delivers the equipment to one of the PALAN depots, where it enters the master inventory and is then distributed to the various provinces of Indonesia. There is a PALAN depot in Ujung Pandang. The PALAN depot for NTT is in Surabaya.

The Ministry of Home Affairs normally procure equipment that is being purchased with Inpres funds and planned for distribution to Pemda in the kabupatens. However, the kabupatens do purchase the equipment themselves by request to the Governor from the Bupati for funding from Inpres budgets.

Some Pemda equipment, vehicles and tools are purchased locally, (in the province) with funds from the kabupaten general account. These purchases are made by the chief of DPUK's staff with the approval of the bupati and the DPRD (kabupaten assembly).

a. Donor Provision of Equipment

Equipment is provided by donor agencies for the implementation of foreign funded projects.

Some of the foreign donor agencies are:

a)	USAID	-	United States Agency for International Development
b)	OECF	-	Overseas Economic Cooperation Fund (of Japan)
c)	IBRD	-	International Bank for Reconstruction and Development (World Bank)
d)	ILO	-	International Labor Organization

Equipment provided under project aid funds from these agencies is procured by the Ministry of Public Works (DPU) and distributed to the kabupatens via the Ministry of Public Works provincial office (Kanwil PU). Foreign aid equipment supplied by DPU for utilization in the kabupatens must be authorized by the DPU Directorate General of Bina Marga with a letter of authorization which is known as SPRIN.

Ownership of this equipment remains with DPU and the equipment is on loan to the kabupatens for use at their discretion. The kabupaten is responsible for the operation, maintenance and repair of the equipment. Records of utilization, condition monitoring and details of repair and maintenance are to be kept. Monthly reports of these details are required by the bupati and copies should be sent to the chief of Alkal (Provincial Public Works Depot) and to the Directorate of Equipment (PALAN).

Revenues from hire of donor-funded equipment is governed by regulations discussed in section IV.B, below. Revenues are channeled to the general revenues fund of the owner of the equipment.

b. Non - Donor Provided Equipment

Equipment owned by the DPU Directorate General of Bina Marga and purchased by Central government funds is non-donor equipment. This equipment is supplied to the kabupatens on request from the chief of DPUK and the bupati, when shortages of equipment in the kabupaten (due to unavailability/breakdowns of Pemda equipment) cause delays in project implementation.

Utilization of this equipment must be authorized by the Director General of Bina Marga and authority must be renewed annually. As above, the letter of authorization is known as SPRIN.

Other non-donor equipment is that which is owned by the kabupatens themselves. This equipment is purchased by the Ministry of Home Affairs and funded by Inpres/APBN or kabupaten budgets.

Kabupaten owned (Pemda) equipment, such as light vehicles, motorcycles, water pumps, generating sets, chainsaws and others can also be purchased locally (in the province) with funds from the kabupaten general account, with approval from the various heads of local government.

Income from hire of Pemda is deposited in the kabupaten general account and reports concerning utilization, condition monitoring, maintenance and repair, and availability should be prepared by the head of DPUK for submittal to the Bupati's office monthly. Record keeping is discussed in section II.B, below.

c. Ownership and Control of Equipment

The fleets in the kabupatens consist of equipment owned by various government entities:

a)	Pemda equipment	-	kabupaten owned
b)	Donor funded	-	Director General Bina Marga owned
c)	Non donor	-	Director General Bina Marga owned

The Pemda equipment is owned by the kabupaten and is controlled by the head of DPUK on behalf of the bupati. Responsibility for the management of the kabupaten equipment fleet should be with the chief of workshop (UPTD) reporting directly to the head of DPUK. However in most cases, contractors will approach the bupati or the head of DPUK directly to discuss hire of equipment without the chief of workshop (UPTD) being aware of the situation

The chief of workshop (UPTD) should be responsible for establishing hire agreements with the contractors, in accordance with the instructions and procedures for hiring of equipment outlined in Kepmen 585/KPTS/1988, Kepmen 167/KPTS/1991, and Kepmen 233/KPTS/1981. This documentation should then be approved by the head of DPUK or an approved officer on his behalf.

The donor funded equipment is owned by The Director General Bina Marga and assigned to the kabupatens to increase their effectiveness in the implementation of donor funded betterment and force account projects. This equipment is normally distributed by the Director General Bina Marga Procurement Agency PALAN, to the kabupatens via the Ministry of Public Works Provincial Office (Kanwil P.U.).

The equipment is controlled by the head of DPUK on behalf of the bupati, and the management of the equipment should be the responsibility of the chief of workshop (UPTD) reporting directly to the head of DPUK.

The donor funded equipment is authorized for use in the kabupatens by the Director General Bina Marga and this authorization is renewable annually, with the issuance of a new SPRIN.

Hire of the equipment is controlled by the kabupaten and hire rates applicable are established applying the guidelines as previously mentioned in this item.

Utilization of the donor funded equipment is monitored by PALAN as previously mentioned in this item.

Non Donor funded equipment is owned by the Director General Bina Marga and is originally assigned to the Provincial Dinas P.U. Depot (Alkal). Occasionally there is a re-assignment of this equipment to the kabupatens authorized by the Director General Bina Marga. Permission must be received by the kabupaten from the owner of equipment (Alkal or DPUP) each time the equipment is leased.

The chief of Alkal is responsible for the management of the provincial public works equipment then reports directly to the head of provincial public works (Kanwil). This unit also has a small fleet of equipment owned by the Director General Bina Marga but controlled by Provincial Public Works.

Records of utilization, condition monitoring, workshop activities reports on repairs and maintenance for all the equipment owned by the Director General Bina Marga are monitored by the Directorate of Procurement (PALAN).

In general all equipment in the kabupatens (regardless of ownership) being utilized on projects should be under the guidelines as discussed in ownership and control of equipment. The Ministry of Home Affairs Agency Bangda, usually adopts this procedures as they do not have their own equipment management and operations organization. The newly published draft of the DPUK equipment fleet management system has not been formalized yet. However, the bupatis often determine their own hire rates for equipment.

The effects of this fragmented system of ownership and responsibility are discussed in section IV.B, below.

3. Equipment Utilization

a. Availability and Equipment Needs

A machine is considered available when it is working on site or in a working condition on stand-by. It is not available only when it is broken down.

Availability is measured as a percentage. The breakdown time of a machine in hours is deducted from an established required period of working time, such as 10 hours per day or 200 hours per month. The remaining time, as a percentage of the 10 hours for a day or 200 hours for a month, (or whatever time period is being used), is the availability of the machine.

Availability of the DPUK equipment fleet can not be measured accurately or even approximately, because of the lack of equipment records, discussed in II/B/1/i, below.

Premium quality equipment having a working life of between 2,000 to 6,000 operating hours can be expected to give an availability of 65% to 75%, provided that it has been correctly maintained during the whole of its working life. Equipment needs for a project are normally calculated using an allowance for equipment availability being less than 100%, generally around 65% to 75%. With the present and previous insufficient equipment maintenance for the DPUK equipment fleets, it is unlikely that these figures can be achieved with the kabupaten equipment which has a potential working life within this range. Poor equipment availability will seriously effect project completion within the required contractual program.

For the year 1993/1994, the Rural Roads Maintenance System, (RRMS), consultants, STV/Lyon Associates, have prepared detailed plans for maintenance of the 1,198 kilometers of maintainable kabupaten roads. The quantities of equipment required for this program are shown on Table 22.

Comparing these quantities with the existing kabupaten fleets shows some equipment shortages, as shown on Table 23. These shortages consist mainly of backhoe loaders and asphalt sprayers. It may be possible to overcome apparent shortages in compaction equipment and transport by using acceptable alternative equipment.

The RRMS consultants, STV/Lyon Associates, also prepared detailed plans for maintenance of the total length of all kabupaten roads in the study area, for a comparison of equipment required if this was the total lengths of road to be maintained. The quantities of equipment required for this program are shown on Table 24. The shortages of equipment required for 100% maintainability are shown on Table 25.

Travers Morgan International, Ltd., the consultants for the equipment study for the Directorate General of Highways, funded by the ADB Tenth Roads (Sector) Project, conducted a nationwide survey of all private sector contractors' equipment, including persero contractors, and also all of Bina Marga's equipment in 1992. The results of this study showed that in South Sulawesi and NTT, Bina Marga and the private contractors equipment ownership is:

Owner	Equipment	South Sulawesi	NTT
Bina Marga	Heavy	78 units	124 units
	Light	190 units	163 units
Private Contractors	Heavy	134 units	211 units
	Light	242 units	317 units

This survey relied on each Provincial Bina Marga and all of the contractors completing and returning questionnaires. Discussions and inspections were restricted to a few selected Bina Marga depots and contractors, because of the amount of equipment involved.

The above figures, therefore, may not be absolutely accurate, particularly for the contractors' equipment. They may also include some scrap items of equipment, which, pending authorized write-off, will still appear on equipment inventories.

These figures also include equipment for new construction and rehabilitation, as well as equipment for hot asphalt surfacing, types of projects which require much larger amounts of equipment, as well as equipment of larger capacity, than are normally used for kabupaten roads maintenance.

The above equipment capacity can not automatically be considered as available to compensate for any equipment shortages in the kabupaten roads maintenance fleets. Most of Bina Marga's equipment will be assigned to national and provincial road projects as will much of the contractors' equipment. The contractors will also be executing projects other than road projects.

b. Project Types

There are currently four types of kabupaten road projects in the nine study kabupatens: routine maintenance, periodic maintenance, rehabilitation and new construction.

Routine maintenance consists of clearing drains and culverts, maintaining shoulders, cutting or clearing vegetation, minor grading of gravel roads and patching. There is not a large requirement for equipment in routine maintenance, although some is needed, particularly for grading and patching.

Periodic maintenance is the resurfacing of roads which still have base and sub-base in good condition and require no major reconstruction. The equipment requirement for periodic maintenance is higher than that for routine maintenance, but less than for rehabilitation.

Rehabilitation is the rebuilding of roads in which the base and sub-base have deteriorated making the road unmaintainable. Rehabilitation often includes reconstruction of the drains as

well. This type of project requires the greatest amount of equipment and can occupy a complete kabupaten equipment fleet.

Another type of project for which DPUK equipment is used is public service, such as emergency repairs of collapsed culverts or clearing roads of debris from landslides and floods. The motor grader at Sinjai has spent much of its time on public service work.

The main causes of road deterioration, assuming that the road was correctly constructed, is lack of maintenance and overloaded vehicles using the road. Overloading by itself can cause the failure of a maintained road.

Approximately 70% of the total length of kabupaten roads in the study are unmaintainable. Most of the DPUK equipment which is working on hire to contractors is working on rehabilitation projects.

The maintainable kabupaten roads are of three types of construction, Asphalt, Telford and Graded Gravel or Graded Earth. As a percentages of the total maintainable road length are;

Asphalt	58%
Telford	37%
Graded Only	5%

The equipment requirement for asphalt kabupaten road construction and maintenance, in addition to that for the other types of road construction and maintenance, is normally at least one asphalt sprayer and a compressor. The remaining equipment, rollers, graders, crushers, wheeled loaders and trucks are common to all types of road construction and maintenance.

The contractors own varying amounts of this equipment according to their size Some have the minimum requirements according to their classification, and hire much equipment from the DPUK, while some have relatively large fleets and hire very little, but on none of the projects visited was there a contractor who was not hiring anything from DPUK.

The classification of contractors and their minimum equipment requirements is discussed in Annex 2.

c. Equipment Users

Equipment users are primarily contractors for the vast majority of kabupaten development projects. DPUK also uses some of the equipment for force account, (swakelola), projects.

The private contractors engaged on these projects often have very little or no equipment themselves and rely on hiring equipment, either from the DPUK, Alkal, other private

contractors or hiring companies, (sometimes from a combination of all of these sources), to provide a sufficient equipment fleet for project execution.

DPUK is always the first preference of the contractors because of the low rates, followed by Alkal, whose rates are often nearly the same, with the private sector being the last resort because of its inherently high costs.

The contractors' first preference is to hire DPUK equipment because of the low hire rates charged by the kabupaten and the local availability. DPUK equipment is both physically near the project site and available for short term hire.

Equipment hired from Alkal is generally hired at the same rates as the DPUK equipment, with certain exceptions, based on standard Bina Marga rates. This equipment is not as readily available as DPUK equipment, as it is allocated to larger provincial and central government projects first, and available for hire to contractors on smaller kabupaten projects only if it is not in use Because budget cycles coincide for all levels of government, project demand by kabupatens rises at the same time as other demand.

Contractors are free to hire equipment from the private sector as well, but such hire is limited because hire rates for privately owned equipment are significantly higher than kabupaten owned rates, although they generally include all operational costs such as operator, fuel, maintenance and repair. (Comparisons between private and government hire rates are discussed in Appendix I).

Private equipment is not readily available in the kabupatens because of the relative lack of private contractors with surplus equipment to hire based outside the provincial capital. Most local firms which hire out equipment are contractors who have equipment for their own use and hire it out only when it is idle. This would tend to happen only during a low demand period when kabupaten projects are not scheduled.

Hiring equipment from a firm in Ujung Pandang or a kabupaten outside the project location involves payment for transportation costs. In addition, private firms are not as flexible as the DPUK in hire schedules. Most private companies have minimum hire periods such as an 8 hour day or a 200 hour month.

Private companies charge for hire for the duration of a hire contract, regardless of whether the contractor is making use of the machine or not. Private companies are not as willing as the DPUK to move equipment from one project to another on an ad hoc basis, depending on project delays.

Equipment utilization by the small contractors is not usually any better than by the DPUK's. Contractors who do not own heavy equipment do not normally employ staff who can effectively utilize this equipment.

Additionally, although the contractor is responsible for machine maintenance while he is hiring the equipment, he will usually be employing DPUK employees to operate and maintain the machine.

d. Hours of Use

Accurate records of actual hours worked on projects by machines, (rather than the numbers of days a machine is on a project), are not readily available. As discussed in II/A/1-b, there has been little maintenance of equipment records by the kabupatens prior to the start of EMS. However, evidence from field inspections of hour meters and project schedules suggest that equipment usage is less than the maximum economic level.

During the 8 or 10 hours working day of a project, a machine might work for only 1 or 2 hours of that time, or not even work at all. Field visits found idle equipment at the majority of sites. Out of 11 sites visited and 34 items of heavy equipment seen on site, only 11 items were actually working. On one site visited there were three machines which were officially off hire, but one machine was still working.

Most heavy equipment hire in the private sector is done on the basis of an 8 hour day or a 200 hour month, even though the hire rates may be quoted hourly. (This is one reason why equipment utilization is such an important factor in project planning and management).

The hour meters on the machines may be used for an indication of use, but these meters are primarily for timing routine preventive maintenance and recording the machine hours at a time of major repairs or overhauls These meters do not distinguish between when a piece of equipment is travelling to a job under its own power and when it is actually working. On older machines, these meters do not distinguish between engine idling time and machine working time. Nevertheless, maintaining weekly or even daily hour meter records would be a good practice for all of the Kabupaten equipment.

From Table I-10, it can be seen that the average hours worked per machine inspected with a working hour meter is approximately 400. The assumed economic minimum for hours worked per year by private hire companies is 2000. Please refer to Section IV of this annex for a discussion of the causes of low utilization.

e. Improper Use

Improper use of equipment is either improper operation of a machine while it is doing work it has been designed to do, such as riding the clutch of a truck, or using a machine to perform a task it was not designed to do, such as using a pneumatic tire roller to pull trucks.

Any improper use or wrong application of equipment will result in high incidence of avoidable breakdowns, a shortened useful working life of the machine and reduced availability during its shortened working life. Improper operation combined with wrong machine application will increase these problems.

Improper use arises mainly from three general causes: (a) the operator's lack of experience, (b) inadequate supervision, and (c) a shortage of suitable equipment. These problems are not isolated from each other.

a An inexperienced operator should be noticed by the supervisor and assisted by the supervisor in improving his operating skills, which in turn should lead to more efficient equipment utilization, higher equipment availability and a longer working life for the machine.

b. Poor supervision can come from several causes, the supervisor's lack of skill or practical experience, which is discussed in II/B/2, a lack of transportation for the supervisor preventing site visits, a preference by the supervisor to attend to office duties, or multiple assignments within the management structure preventing the supervisor from attending to all his duties satisfactorily.

c. A shortage of suitable equipment is often because of misuse of the correct equipment by an inexperienced operator as a result of inadequate supervision. This shortage then compels wrong application of equipment if a project is to completed. In such a case, good supervision is essential if machine damage is to be minimized.

Equipment shortages also occur through the lack of routine preventive maintenance leading to breakdowns, again through inadequate supervision, in this case of the maintenance personnel.

Correct use of equipment includes the correct method of transportation to the work site. There are no low loader trailers for transporting equipment in any of the Kabupaten workshops. One of the major causes of roller break downs, particularly steel wheeled rollers, is driving them, often at high speed, from one job site to another. A transporter vehicle may appear expensive, but is cost effective due to the high cost of repairs and loss of use of equipment damaged in this manner. It would be particularly effective in the Kabupaten hire applications because of the frequent number of equipment movements. However, to benefit fully from a transporter vehicle, it too would have to be properly maintained and used.

B. Equipment Maintenance in Kabupaten Government

1. Equipment Maintenance Program

a. Current Practices

Current equipment management and maintenance procedures are a combination of parts of the original procedures which were still in use prior to the start of the Equipment Management System (EMS) program, and parts of the EMS program which are now being implemented.

EMS was developed by STV/Lyon Associates from the guideline manuals for equipment maintenance compiled by PMU consultants Hoff and Overgaard. Introduction of EMS to the kabupatens began in April, 1992.

The main component of EMS, which is far from fully implemented at present, is equipment maintenance. At present most of the kabupatens operate no scheduled maintenance programs or keep any maintenance histories at all

Instead, the scheduled maintenance program depends on the memory of the operators for planning. Operators are kabupaten employees, paid by contractors. In addition, since the contractor is responsible for the cost of scheduled maintenance while a machine is on hire to him, the willingness of the contractor to pay for the scheduled maintenance is essential. Consequently, very little scheduled maintenance takes place.

There are some partial exceptions. Belu, Kupang, Takalar, Sidrap and Bone have been operating workshop diaries since September, 1992. At Belu, Kupang and Takalar the log books are kept reasonably up to date, although these are monitoring activities only, and not pre-planned schedules. Even with planned scheduling, there would still be the dependence on the willingness of the contractor to pay for servicing.

The operator is also relied on to perform regular inspections of the equipment and report to the workshops when any wear parts, such as tires or ground engaging tools, are approaching the time when they should be replaced, and also report when any minor defects develop with the machine so that they can be remedied cheaply before developing into expensive major repairs. Once again, these replacements and repairs are paid for by the hiring contractor.

This method assumes that the operators are adequately experienced in equipment inspection. From the evidence of site visits, they are either not noticing defects or not reporting them. If defects are being reported, then they are not being rectified. In some kabupaten there is also a limit to repair costs for which the hiring contractor is liable. Any costs above this limit are met by DPUK therefore it is in the hiring contractor's own interests to neglect minor repairs for which he is liable, allowing them to develop into major breakdowns for which he will not have to pay.

Another major component of EMS which is still far from fully implemented is workshop and equipment budgeting. The existing budgets are too low for effective equipment management. Budgeting is discussed in section II-C below.

Due to the lack of maintenance scheduling and limited budget, there is no workshop or financial planning for routine overhauls, and repairs are often only made when they are absolutely necessary to keep a machine operational, providing that the available budget can accommodate such repairs

Several machines were noticed during the site visits, both in the workshops and working on site, which were in urgent need of preventive maintenance and repairs for which no apparent provision had been made, such as motor grader cutting edges worn into the mold board, wheel loader buckets split and severely worn, and bulldozer sprocket segments loose.

b. EMS Procedures

The EMS is a condensed version of PMU consultants Hoff and Overgaard's equipment management guidelines, and comprises the same seven basic components of:

1 workshop and equipment operations/administration
2 warehouse management
3 equipment maintenance
4 workshop staffing
5 equipment utilization
6 workshop and equipment budgeting
7 equipment disposal

The EMS procedures are based on existing systems used in central and provincial public works. Training is provided in the use of the various components of the management system. Additionally, workshop facilities have been upgraded, with plans for further improvements, to allow full implementation of equipment maintenance.

c. Implementation of EMS Procedures

A status report was published in August, 1992, by the EMS consultants, with full details of the extent of implementation in each Kabupaten and also the problems being faced in completing implementation. At the time of writing, there has been no significant change in the situation. Quoting from the draft of this report, the status of implementation is;

"....., the Kabupatens:

- are using the stock control and issuing procedures of the EMS;
- are recording tool movements;

- are not using the recommended rental rate calculations or budget preparation procedures;
- are not effectively using scheduled and preventative maintenance components of the system;
- are not using equipment utilization and disposal sub-systems."

If the EMS is to succeed, then its operation must be effectively supervised by senior management who have a sound and thorough knowledge of basic equipment maintenance principals with the motivation and practical ability to inspect the equipment and ensure that all components of the EMS are being correctly carried out.

At present, senior management is under-staffed in most kabupatens, as are the workshops. This provides a reason for ineffective supervision and hence poor maintenance, with the budget usually providing another reason. However, if these two situations were rectified immediately, there would not necessarily be an immediate increase in effective supervision.

There appears generally to be a great reliance by supervisory staff on knowledge of management structures, systems and the duties of individual personnel being sufficient for effective maintenance supervision. There seems to be very little appreciation of the importance of occasionally visiting equipment and sites to ensure that subordinate staff are implementing maintenance practices.

There also seems to be the belief, in some kabupatens, that without certain types of sophisticated (and unnecessary) servicing equipment, routine maintenance is not practicably possible This indicates a lack of practical experience of routine maintenance, and this attitude was most prevalent in the less tidy workshops, where the broken or missing grease nipples on the machines would cause more problems in maintenance than the lack of a powered greasing unit. A simple grease gun is cheap to purchase, easy to maintain and cheap to replace when lost or damaged It is slower in operation than an air powered greasing unit, but for the volume of work in a kabupaten workshop, even when maintenance is being fully implemented, manually operated grease guns would still be sufficient.

The EMS program has management training components, some of which have already been implemented, a six day course on equipment management, (January to October, 1991), and a six day course on workshop management, (August to December, 1991).

A very useful transfer of technology could be achieved by rehabilitating such breakdowns as the Sinjai bulldozer, (it is otherwise in reasonable condition), to good working condition, providing mechanical training through the practical implementation of repair principles.

Effective implementation of the EMS will require long term workshop and on site training of the relevant DPUK personnel of all levels. Up to three years could be required. It must include the practical training of management in supervision and inspection, and not training in theories only.

Normal practical training of equipment mechanics takes four or five years. (Four years at PT Trakindo Utama or PT United Tractors). During this time, the trainees, (apprentices), are regularly monitored to assess their ability and progress, with unsatisfactory apprentices being transferred to alternative trades and eventually, if totally unsuitable, being removed from the training program.

Successful apprentices are given certificates at the end of their training. This training will have been a combination of class room theory, workshop practice and on site practical experience in repair and maintenance.

It is not unusual for the successful apprentices to stay with their training companies, particularly if they are nationwide companies, providing good after sales service, because of the attractive salaries and working conditions offered, with the possibilities of promotion. Within such companies, promotions are made over a number of years, according to ability and vacancies, from mechanics to senior mechanics, foremen, specialists, supervisors, branch managers and upwards, ensuring that senior staff have a sound practical knowledge of maintenance and repair, understand the necessity for supervision, and are both willing and capable of making site visits and practical equipment inspections

Many kabupatens, often because of circumstances dictated by budgets and location, employ mechanics who have received no formal training. To fully upgrade such personnel could take up to three years and would certainly require at least one year, assuming that by now, they will have learned some fundamentals of maintenance and also some bad practices which will have to be rectified.

In addition, once they have been upgraded, mechanics would be more able to search for a higher paying position in the private sector, if they have not been hired as permanent civil servants. In fact, this situation is already reported in the kabupatens, where temporary staff find other employment after a certain amount of experience in the kabupaten workshop.

2. Equipment Maintenance Personnel

a. Positions Filled and Unfilled

Referring to STV/Lyon Associates' EMS Status Report, Draft, of August 1992, there appears to be a general shortage of workshop staff, particularly at the skilled artisan levels, if the actual staffing is compared with requirements, as determined by the report.

Many people in the Kabupaten Workshop staff, both temporary and permanent, have more than one job. On the permanent staff level, it is not uncommon for one person to be chief of two sub-sections, sometimes with these two positions being in two different locations, which causes considerable disruption to the daily operation of the workshops. They are unable to

devote time to field supervision or their duties may require them to spend time in PU office rather than the workshop.

With the temporary staff, it is not uncommon for the mechanics and helpers to be operators and drivers also. This situation allows them to work as operators or drivers while a machine is working, (and so be paid for by the contractor), and also work as members of the workshop staff when the machines are not working.

Although this system allows something approaching full time employment for the temporary staff during the period when equipment is being used, it means that when most of the machines are working, there would be insufficient maintenance staff to effectively service the machines, if the budgets allowed such servicing. No cumulative records of employee hours are kept for temporary employees, so it is difficult to determine actual time worked.

b. Availability of Workers and Turnover

From discussions with the Kabupaten Workshop management, turnover of temporary employees appears to be high, causing difficulties in establishing a full complement of skilled labor.

This problem is directly related to salaries, as temporary workers, once they feel that they have gained sufficient experience, often leave for the private sector, where salaries are higher. In addition, temporary operators and mechanics are paid only when they are actually working, which is primarily during the six to nine months of a project duration.

The availability of skilled workers is sometimes a problem for private sector contractors and workshops. There does seem to be a shortage of suitably skilled local personnel and most of the skilled personnel are imported from Java or Sumatra, the traditional sources of skilled labor in Indonesia. This results in a relatively high cost for this labor, costs which are beyond the GOI budgets. Some local contractors have commented on the difficulty of locating such skilled labor, even though they are prepared to pay the salaries required.

c. Skill Levels

The general standard of skill levels for the workshop staff varies from low to average. Permanent staff usually have had some formal training through local government channels. Temporary staff often have had no formal training and use their employment in the Kabupaten workshop as a means to further their experience to a level at which they feel they can transfer to the private sector for a higher salary as described in sub-chapter ii) above.

There are inherent restraints on the potential for skill development and for staff to demonstrate their existing skill levels to a maximum. The lack of sufficient funding for

routine preventive maintenance prevents the workshop staff from developing into an efficient and effective maintenance organization. This in turn encourages bad working practices and negative attitudes resulting in unmotivated staff, particularly the permanent staff.

The lack of specialized skills does not present any problems. At the Kabupaten workshop level there is no justification for employing expensive specialized labor with its associated expensive facilities These are be provided by the equipment dealers, and effective preventive maintenance of the equipment will keep the incidents of such specialist requirements low. Effective preventive maintenance should also keep the incidents of all breakdowns low and result in low operating costs with high machine availability.

d. Staff Hiring Practices

Generally, the workshop staff, down to the level of Chief of Sub-Section, are all permanent staff, and in most cases there is at least one permanent mechanic.

The insufficient budget does not allow for competitive salaries for the temporary staff, even though their rates of pay will be higher than the permanent staff of equivalent positions. The comparatively low rate of pay does not attract highly skilled personnel with a consequent detrimental effect on equipment working life and availability.

The hiring of permanent staff is restricted by the limits imposed by GOI on the numbers of permanent staff. This results in senior positions, usually all held by permanent staff, often being occupied by inadequately qualified or experienced personnel. When this situation occurs through senior staff holding more than one position, the position which that staff member is least suited for will be neglected the most, sometimes totally.

Temporary staff are not civil servants and are paid only when they work. Temporary staff includes administrative, mechanical and operator personnel. Some of the kabupatens maintenance budgets include salaries for this staff but most do not. (Of the equipment maintenance budgets made available to the study team, only Belu included a category for staff salaries. Apparently Takalar pays administrative staff out of this budget, but the team were not provided with a copy of the budget. These budgets need to be renewed each fiscal year on a project basis, since the equipment maintenance budget is from development funds). All Kabupatens require contractors to pay operators from the kabupaten during their hire period, and for the mechanics when maintenance and repair are required. There are no records available regarding these costs.

The lack of experience in the senior, supervisory staff often results in an inability to check skills and qualifications, if there is an opportunity to screen prospective employees.

The lack of experience in the senior staff, coupled with the lack of motivation, has further detrimental effects on the operation, maintenance and hence, the availability of the equipment.

Supervisors often can not identify misuse and poor operation of equipment and so can not rectify the situation or assist operators or mechanics in improving their skills.

It is impractical for the Kabupatens or a private contractors to assume that they will always be able to employ experienced operators and mechanics. It should be part of the relevant supervisor's duties to help improve operators and mechanics skills and also to ensure correct equipment maintenance, operation and application.

3. Parts

a. Availability

Most of the stores in the Kabupaten workshops keep basic stocks of vehicle spare parts as these represent the fastest moving spares. The most commonly used spare parts for most of the Japanese trucks are usually available locally and if not, can be obtained from Ujung Pandang or Kupang.

Komatsu and Caterpillar fast moving spare parts can be obtained from Ujung Pandang for South Sulawesi, although if these parts are not available in Ujung Pandang, then deliveries can be delayed, particularly if the parts are not in Indonesia.

The dealers for Caterpillar and Komatsu have recently established offices in Kupang. These are at present small establishments, retaining a mechanic and fast moving spare parts only. The Caterpillar and Komatsu major depots for NTT are in Surabaya and any spares not available from Kupang must come from Surabaya.

Both Caterpillar and Komatsu, through their respective dealers, operate a system of 72 hours delivery of any parts in Indonesia which can be reasonably air-freighted to any of their dealers' major depots, provided that the customer pays for the air freight. Under this system, if the dealer does not supply the spare part within 72 hours, the customer does not have to pay for the part when it is finally delivered. This service is not yet available to Caterpillar or Komatsu owners in NTT.

Both Caterpillar and Komatsu carry out extensive research into parts usage of their machines, for various applications in different locations, working under their routine maintenance recommendations, and carry what they estimate to be sufficient stocks of spare parts to support their machines in any territory through their dealer network.

Neglecting maintenance frequently results in breakdowns requiring parts which are often not available from the dealers' local depots and sometimes not available from their national stores network. This will result in prolonged downtime from the extended deliveries.

A significant part of the kabupaten fleet consists of makes other than Caterpillar or Komatsu. For other machinery, including Barata, parts must come from Surabaya, if they are in Indonesia, which will mean delivery times of one to three months, unless air freight is used, which increases the cost. There are also size and weight limitations to air freight.

b. Procurement and Stock Control System

The Keputusan Presiden No. 29/1984 procurement system is still in use, with more detailed implementation guidelines issued by Alkal in the form of Kepmen In South Sulawesi, all purchases and invoice values above Rp 1 Million must be authorized by the Provincial Governor. This system is very similar to the EMS recommendations on procurement, but there are institutional restrictions on the implementation of parts of the EMS at present, including procurement.

There are slight variations in the details of the procurement systems between the different kabupatens, for instance in Takalar, although the system is basically direct purchase, three or four different quotations are required prior to purchase whenever this is possible, whereas in Pinrang one quotation only is required.

In Jeneponto, documentation of purchases for parts to be used in the workshop is differentiated from purchases of outside work. The workshop purchases are documented in a system very similar to the EMS recommendations, but outside purchase documentation is kept by the Pimpro only and is not readily available in the normal procurement records

The stock control system for parts already in the workshop stores follows the EMS recommendations, this being one part of EMS which generally has been successfully implemented.

c. Costs and Budgeting

The budgets for spare parts are included in the equipment maintenance and repair budgets, which come from two sources, the Bupati's budget for Pemda equipment and IPJK funds, (USAID), for the foreign equipment. The equipment maintenance and repair budget also includes workshop maintenance, workshop utilities, fuel and lubricants.

A sample of equipment maintenance budgets show the actual amounts for spare parts in 1992/1993 were:

Jeneponto	-	Rp 45,000,000
Pinrang	-	Rp 22,500,000
Belu	-	Rp 75,000,000
Kupang	-	Rp 45,400,000

It must be remembered that contractors are responsible for repairs during hire period, and these repairs include the cost of spare parts.

As discussed above in II/B/1/a, above, there is no documentation on what is actually spent by the contractors on spare parts, but physical inspections of machines on site suggest that it is very little.

4. Facilities

a. Workshop - Structures

Two of the kabupatens, Jeneponto and Pinrang, have two workshops, one workshop was built with OECF assistance in the early 1980s, one built with USAID assistance during the RRMS project.

Eight of the kabupatens were supplied with a new workshop under the OECF funded program dating back to the early nineteen eighties, and the workshop in kabupaten Kupang was built to the same design as the workshops built under the IBRD RRI/2 program. Some of the workshop facilities were under utilized it seems, and possibly run down through a lack of routine maintenance.

The OECF workshop in Pinrang is currently being used to store a scrap Bulldozer and aggregates produced by the kabupaten's stone crusher, which is being hired out, but located on the old workshop site. This workshop facility appears as though it has never been maintained, and is in a run-down condition.

The OECF funded workshop in Jeneponto has been abandoned since the new USAID funded workshop was built.

The USAID RRMS program phase I allowed for the upgrading and renovation of six kabupaten workshops and for the new construction of three workshop facilities in Jeneponto, Pinrang and Sinjai. Phase I of the workshop construction/renovation has been completed and phase II is planned at a later date.

All the kabupaten workshops, six upgraded and three newly built, in the USAID program phase I, appear to be in reasonable condition. There is, however, no indication of any routine maintenance taking place. If routine maintenance schedules are not implemented, the condition of the structures will deteriorate very quickly.

Phase II of the USAID RRMS workshop construction/renovation program planning, will provide for the completion of access roads and equipment parking area, the installation of electricity service, security guard houses and perimeter fencing and an oil storage facility in all kabupatens.

There are some noticeable shortages in the workshops, such as:

1) Heavy duty workbenches for the mechanics

2) Heavy duty steel welders bench

3) Installation of machine tools and equipment

4) Complete fire safety and first aid equipment.

The items mentioned are some examples only and it is not known whether such items are included in phase II of the program or not, nor is it known if the kabupatens have their own budget to provide for shortages such as the items above.

In the nine kabupatens the EMS workshop management and administration systems are in various stages of implementation. Without personnel being permanently appointed to a particular position with effective supervision and guidelines from management, correct paperwork will not be produced in order for DURP's to be prepared satisfactorily. In turn the workshops will not be able to function as a well-utilized facility.

b. Utilization of Workshops

The six upgraded and three newly built workshops that were supplied in the USAID loan agreement phase I are being utilized to some degree, with the exception of the workshop in Bulukumba.

The Bulukumba workshop is located ± 1 km from the head of DPUK office but is built in the middle of a rice paddy without an access road, (± 100 meters) hard stand paving and parking areas adjacent to the workshop. The kabupaten intends to commence utilizing this workshop in the near future

The workshop facility supplied in all kabupatens is a main component required for the implementation of the EMS program, and until the workshops are staffed by sufficient permanent personnel, to fill all position as outlined in the organization structure chart the workshop will never be fully functional.

Eight of the kabupatens are using the workshops, for the maintenance and repairs to the kabupaten equipment and vehicles. On some occasions, repairs are carried out on private vehicles which would indicate, (in normal circumstances), the workshop was fully utilized to the point all kabupaten equipment was 100% available for utilization and mechanics were idle.

Of the workshops visited during this study there was only one with any durable workshop benches for the mechanics to works on. Not all tools and equipment supplied by the donor agencies have been set up and being used correctly in all kabupatens. The hand tools that were supplied require either air or electricity to drive them for which compressors and a generating set were supplied. It is expected that the workshops will be fully commissioned at the completion of the USAID Phase II construction/renovation of workshops and in turn achieve a more acceptable level of utilization.

Many of the workshops do not have full time permanent staff assigned to the positions as detailed in the official organizational chart, hanging on the workshop office wall. Discussion with the workshop personnel reveal that the permanent staff that are assigned to the workshop, also have other responsibilities either in DPUK or with other government offices.

This would account for the frequent absences of permanent staff members whom are supposed to be managing the workshop activities. A typical second job is the responsibility of supervising construction projects which requires travel away from the workshop.

Another aspect of under utilization of the workshops is caused by the lack of sufficient funding to operate and maintain the workshop and the equipment. Not all kabupatens are following the EMS procedures for calculating the annual equipment budget correctly and often find their budget calculation was not sufficient to keep the workshop and the equipment operating through the construction season.

If the EMS program does not receive active support and monitoring from upper level management, the workshop will never function as intended and achieve an acceptable level of utilization. Table 13, Workshop Utilization, shows current workshop utilization by kabupaten. The percentages show in the table reflect the amount of maintenance and repairs done, either in the workshop or in the field. It not meant to imply that maintenance in the field is done 100 percent in accordance with manufacturers recommendations.

c. Management of Workshops

The existing kabupaten workshop management structure is shown on Table 20. Provided that is correctly staffed, this structure is satisfactory for effective equipment management and operation, assuming that sufficient facilities and budgets are available.

The Chief of Workshops and Equipment is finally responsible for the management of the workshops and the equipment fleet through the three sub-sections and their staff. This means that the Chief of Workshops and Equipment must have both sound theoretical knowledge and proven practical experience of the management of these three sub-sections in order to be able to supervise them effectively.

Effective supervision requires continuous monitoring and evaluation of performance, identifying any deficiencies in performance and implementing solutions to these deficiencies. This can only be done by regular physical checks both on site and in the workshops to ensure that operation, maintenance and repairs are being properly carried out. Paperwork systems are an important part of the monitoring process, but only if they are regular and accurate.

In all kabupatens, the EMS stock control systems are being fully implemented. The extent to which the paperwork systems, either EMS or alternatives, for equipment utilization and maintenance histories are maintained varies between the kabupatens, but in none of the kabupatens visited are these systems fully maintained, and in some kabupatens, Sinjai, Sidrap and Bulukumba, there were no records of maintenance or utilization available at the time of visiting these workshops.

In many of the kabupatens, one person occupies more than one management position. It may be argued that, if the various offices are not operating at full capacity, and provided that experience and training is compatible, such a situation is not too harmful However, whether the offices are operating at full capacity or not, this situation provides excuses for not attending fully to some management functions, such as ensuring service records are kept or visiting the sites to check equipment maintenance and operation, particularly if the different positions require occupancy of offices which are not near to each other.

As discussed in II/A, the condition of the equipment as shown on the monthly reports sometimes varies from that observed during site and workshop visits. This may result from a lack of physical inspections of the equipment, particularly on site, a lack of attention to accurate record keeping, a lack of experience in equipment maintenance or a combination of all of these.

The lack of funds is often cited as the main reason for poor equipment and workshop management. While this situation exists with management personnel occupying more than one position, there will always be excuses for poor workshop and equipment management, which can be used to hide a lack of training or experience.

d. Equipment and Tools

All the workshops completed under the USAID RRMS Phase I construction/renovation program were outfitted with a standard set of workshop equipment and tools, with the intention the kabupaten would be self sufficient in the maintenance and repair of their own equipment up to and including "fourth level maintenance". Refer to DPUK Equipment Fleet Management System (EMS).

The kabupaten workshops do not have the equipment for machining of components (crankshafts, cylinder blocks, cylinder heads, transmission and final drive cases etc). Nor do they have the facilities to repair fuel injection pumps.

In most of the kabupatens there are machine shops that are quite capable of performing repairs to most equipment components. Major components requiring machining, specialized welding, etc., are sent to Ujung Pandang in South Sulawesi or to Kupang in NTT.

Fuel injection pump repair facilities are not available in the kabupatens. Public and private sector must send defective pump units to Ujung Pandang in South Sulawesi for repair. Defective injection pumps from NTT are usually sent to Surabaya for repair. Caterpillar and Komatsu fuel injection pumps have to be sent to the dealers for repair as the manufacturers do not make the required tooling and specifications available to any workshops other than their own dealers' facilities

None of the kabupaten workshops have completely installed the equipment that was supplied to them, e.g. drill presses, power hacksaws, and generating sets are not anchored properly, battery charging equipment and welding machines are not centralized in a safe place etc. These deficiencies may be due to a number of reasons, but again the lack of skills and experience come to mind Hopefully, phase II of the workshop construction/renovation program and future training for workshop management and mechanical staff will solve the problem.

The tool rooms have been well set out in all but one kabupaten (Bulukumba). Shelving and shadow boards are well laid out and tools are easily identifiable. An inventory of the workshop equipment and tools supplied was not available for review in all kabupatens, though on observation the equipment and tools seen would appear to be sufficient for the workshop mechanics to perform all levels of maintenance up to level four.

Undercarriage and final drive repairs are an exception, as the kabupatens were not supplied with this specialized equipment. In theory, the kabupaten workshops should be able to seek assistance from the provincial and regional workshops for track press equipment, but they do not have the welding equipment to do idlers, rollers, and rebuild chain rails etc. These repairs can be done by PT. Trakindo Utama or PT United Tractors.

Power and hand tools are kept in the tool room located on their respective shadow boards or shelve for ease of identification. A master tool ledger is kept giving the description, replacement cost and general condition of the tool A daily ledger is kept detailing all tools checked out, by whom and signed for, and when returned the condition is recorded and the tool is signed back into the tool room by the tool store keeper. The tool store is kept under lock and key when the tool store keeper is not in the tool store.

e. Supplies

A fully functional and well-utilized workshop must have easy access to fuel, lube oil, grease, supplies and consumables.

The kabupaten workshops have varying stocks of fuel, oil and consumables supplies, as can be seen from the 92/93 annual budget from each kabupaten, for equipment and workshop operations and maintenance. Previous experience shows that most kabupatens have used all the consumables and sometimes the fuel and lube oil supplies prior to the end of the fiscal year. If equipment repair schedules were followed correctly the workshop should be utilized all year round, requiring a constant flow of fuel, lube oil supplies and consumables 12 months of the year

Supplies purchasing procedures should normally follow the same procedures for purchasing spare parts whereas lead times have to be taken into account (time for purchase order to reach supplier and item to be supplied reaches the warehouse), to ensure supplies and consumables are actually in stock when required.

Fuel supplies are irregular at times in the Eastern areas of Indonesia due to the wet season, e.g. December through March, but good planning will normally ensure a constant supply of fuel is available. The kabupaten workshops are scheduled to receive fuel storage tanks during Phase II of the USAID workshop construction and renovation program, this should ensure a sufficient supply of fuel at the kabupaten workshop.

Supplies and consumables for normal daily use are readily available in Ujung Pandang and Kupang, e.g lube oil, brake fluid, battery water, files, hacksaw blades and sand paper. These would be purchased under normal procedures. Items such as Oxygen/Acetylene or carbide, welding electrodes, etc., may have to be brought from Surabaya during the annual wet season the planning for purchase and delivery to the workshop.

Welding electrodes are expensive and, if allowed to get damp, can be rendered useless. They should be stored in a dry place on a warehouse shelf. Carbide will also deteriorate if allowed to get damp, and when damp will give off a potentially dangerous gas.

Supplies and consumables received by the warehouse must first be entered onto a consumables stockcard where information related to the items are recorded, such as part numbers, description and where it is located in the warehouse.

C. Cost and Budgeting of Equipment Maintenance

1. Current Budget and Budget Needs

a. Actual Budgets

The only formal source of funds for equipment maintenance are contained in the IPJK budget allocations for workshop operations. All other expenditures for maintenance are made by contractors under the terms of hire agreements.

The 92/93 IPJK equipment maintenance budgets for each kabupaten are listed below. See Table 17, Kabupaten Equipment Maintenance Budgets, for a review of past years' maintenance budgets.

South Sulawesi

1.	Bone	Rp 53.868 million
2.	Bulukumba	Rp 65.386 million
3.	Jeneponto	Rp 75.000 million
4.	Pinrang	Rp 65.952 million
5.	Sidrap	Rp 69.150 million
6.	Sinjai	Rp 75.000 million
7.	Takalar	Rp 50.000 million

Nusa Tenggara Timur

8.	Belu	Rp 130.000 million
9.	Kupang	Rp 75.000 million

These budgets are lower than the estimated equipment maintenance needs determined by different sources. The IBRD-funded Rural Roads II program estimated equipment maintenance costs for a standard kabupaten fleet (applying to 76 kabupatens throughout Indonesia) to be Rp. 350 million in FY 1991/92. This figure applies to a fleet operating at 100% capacity. The fleets in the study kabupatens are operating well below full capacity, and are of different composition, as described in section A, above.

Based on an analysis of equipment maintenance needs based on current equipment in the kabupatens, the study team estimates a requirement of Rp. 1,703 million for all nine kabupatens An additional Rp. 93 million would be necessary to fund maintenance for additional equipment required to execute the RRMS consultants FY 1993/94 program for existing maintainable roads. This would bring maintenance costs to Rp. 1,796 million. To carry out a program to maintain all kabupaten roads in the study area, additional equipment would be necessary and the total maintenance costs would rise to Rp. 2,154 million.

These estimates include funds to cover all aspects of workshop operation. Kabupaten budgets vary in their composition, and not all kabupatens include all categories of workshop operation in their budgets.

Sample Kabupaten Maintenance Budgets
(thousands of rupiah)

Budget Item	Jeneponto	Pinrang	Kupang	Belu
Workshop operations	6,000			40,000
Utilities	12,000		3,440	
Fuel, oil, grease	12,000	8,420	13,400	15,000
Spare parts	45,000	22,457	31,020	75,000
Spare parts consumables		7,365		
Tools and equipment		2.105	1,000	
Motor vehicle tax		2,105	2,500	
Salaries and wages			17,640	
Administrative expenses			6,000	
Purchase of PU truck		23,000		
T o t a l	75,000	65,952	75,000	130,000

According to current regulations, additional funds are available for kabupaten workshop operations and maintenance in the Inpres/IPJK Dati II budget item *biaya umum* (general use funds), but there are probably other calls upon these funds No kabupatens indicated that they intended to use these funds for workshop operations and maintenance.

b. Calculation of Budget Needs

At present, the annual equipment maintenance funds vary from 50 to 75 million rupiah according to the kabupatens, and is not enough to ensure adequate maintenance of the equipment.

The EMS consultants have given their recommendations on equipment maintenance budgeting to the kabupatens and worked with them to develop budgets, but so far, only one kabupaten, Belu, has actually implemented this budgeting method.

For the purpose of this study, estimates of equipment maintenance costs were prepared for the equipment required according to the RRMS consultants' program for FY 92/93. These costs are shown on Tables 26 and 27. There are two tables because of the apparent equipment shortages in the DPUK equipment fleets discussed in A3.

Estimates of equipment maintenance costs were also made for a program prepared by the RRMS consultants assuming that 100% of the kabupaten roads in the study area were maintainable. These costs are shown on Table 28.

The calculations for arriving at these equipment maintenance cost estimates were made as follows:

a. From Table 10, the average hours worked per year by each machine was calculated to be approximately 400.

b. The ages of the machines were taken from the kabupaten monthly equipment schedules, summarized in Tables 1 to 9.

c. From this information, the average hours worked by each machine, was calculated to be 400 hours per year.

The repair cost factors, (rcf's), were taken from the Kriteria Pemeliharaan Peralatan, published by DPU in February 1983, Bab V, outlines for estimating equipment repair costs based on a machine working 2,000 hours per year, (10,000 hours in 5 years). These rcf's are a percentage of the current machine price, shown below.

Year 1 (2,000 hours) = 6%
Year 2 (4,000 hours) = 12%
Year 3 (6,000 hours) = 42%
Year 4 (8,000 hours) = 12%
Year 5 (10,000 hours) = 18%

These rcf's were then applied to the total estimated hours worked of each machine. For example, a 1980 machine was assumed to have worked 12 x 400 hours = 4,800 hours, therefore in year 3, with an rcf of 42%.

The cost of the equipment was taken from Keputusan Menteri Perkerjaan Umum 167/KPTS/1991 and increased by 7% to allow for inflation and transportation to South Sulawesi or NTT.

The estimate of repairs shown on Tables 26, 27 and 28 was then calculated as;

price x rcf x adjusted quantities of each machine.

The machine quantities were adjusted up to whole numbers from STV/Lyon Associates' calculation of equipment needs for their 1993/1994 road maintenance program, and also the 100% maintainable program.

For Tables 27 and 28, the equipment maintenance costs were assumed to be for new equipment in its first year of working life, and therefore with an rcf = 6%.

The quantity of additional equipment required for the 1993/1994 maintenance program might be reduced by using alternative compaction equipment and transport vehicles, but, according to the RRMS consultants program for road maintenance in 1993/1994, there are definite shortages of backhoe loaders, asphalt sprayers and concrete mixers.

As discussed in A3, a comparison between the RRMS consultants' equipment requirements for their FY 92/93 road maintenance program and the DPUK equipment fleets shows some equipment shortages, as shown on Table 23.

There are understandably greater shortages in comparisons of fleets and equipment requirements for the estimated program for 100% maintainable roads, prepared by the RRMS consultants, as shown on Table 24. Estimated costs for the purchase of these additional quantities of equipment are shown on Tables 29 and 30. It may be possible to overcome some of the apparent shortages in compaction equipment and transport by using acceptable alternative equipment.

2. Budgeting and Funding Process

a. Government Sources of Funds

Kabupaten maintenance budgets are provided through IPJK grants. Amounts and deficiencies are discussed above. The study team received indications that one kabupaten (Pinrang) allocates APBD II funds for maintenance of kabupaten-owned equipment, but documentation for this was not available. Other kabupatens allocate only IPJK funds for maintenance.

b. Other sources of funds

In accordance with existing government regulations, the hirer of government-owned equipment is responsible for all maintenance and most repairs during the hire period. Kabupatens are allowed to require the hirer to pay for repair levels I through IV, which would include all repairs outside of major overhauls. Kabupatens are allowed to lower the requirement to all repairs up to and including repair level III, and to charge larger hire rates. Both approaches were used in the kabupatens.

This relieves the kabupatens from a significant amount of cost, particularly due to the fact that even repairs not performed during the hire period are paid for by contractors. This generally occurs when an inoperable machine is repaired prior to being hired by a contractor. Under the EMS system, which is coming into effect in the study kabupatens (see section B.1, above), records are to be kept of all maintenance and repair to kabupaten equipment. In

practice, this information is not kept completely or accurately, nor is it aggregated in order to determine actual maintenance costs.

c. Planning and Budgeting

The lack of complete information regarding actual expenditures for equipment maintenance is reflected in the inadequate kabupaten equipment maintenance budgets, as well as in the variability between kabupatens in this regard.

EMS has introduced a budget planning system for the kabupatens, but only kabupaten Belu has followed it for this fiscal year. This system may rationalize budget planning to some degree as it is implemented more faithfully in the future, but constraints to effective budgeting will remain:

i. the lack of accurate cost data mentioned above

ii. dependence on annual development grants for funding

iii. late release of funds, resulting in periods of no maintenance

iv. lack of skills in managerial and technical areas resulting in inability to plan and implement effective maintenance programs

II. CURRENT KABUPATEN EQUIPMENT HIRE PRACTICES

A. Hiring Regulations - Legal Framework

There are a number of hiring regulations governing the hire of government owned equipment with different rules applying according to the government Agency which owns it.

The majority of equipment in the kabupatens is owned by the Ministry of Public Works and the hire rates are regulated by Ministerial Decree, KepMen PU 585/1988. This comprises Implementation Guidelines for all aspects of equipment hire including formulae for calculating hire rates, standard purchase prices for each item of equipment, standard terms and conditions for the hire agreement, requirements for bank guarantees, control documentation governing movements of equipment etc.

Subsequently, KepMen PU 167/1991 updated the purchase price of the equipment to be used in the formulae set out for calculation of hire rates in 585/1988.

The procedures and rates set out in these decrees apply to equipment which is:

- owned by Dep PU, DG Bina Marga (such as APBN projects)
- owned by Dep PU Kanwil
- supplied under finance provided by OECF.

The rates are also used by some kabupaten to regulate hire of equipment provided by USAID.

The kabupaten use KepMen 585 hire agreements and procedures to regulate the hiring of their own equipment. The setting of hire rates is usually governed by local legislation (Peraturan Daerah, or Perda) as discussed below in section C.

B. Contractual Responsibility and Liability

Table 14 summarizes the respective responsibilities and liabilities of the kabupaten and the owner.

1. Operation

Most kabupaten try to provide one of their own employees as operator but this is to the contractor's cost.

This concept accords with normal practice in the private sector where equipment owners prefer to supply their own operator on the basis that they know his level of skill and diligence

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in both machine operation and in its routine maintenance and that he has a longer term interest in the welfare of the machine for which he is responsible.

The hire agreement must state the arrangements for supplying and paying for the operator.

2. Routine maintenance

Routine maintenance is usually carried out by the operator himself. The cost is always borne by the hirer.

3. Repairs

KepMen 585/1988 contains two sets of formulae for calculating hire charges as follows:

Lampiran No. 5 states:
Maintenance and repairs levels I, II and III will be paid by the hirer.

Lampiran No. 6 states:
Maintenance and repairs levels I, II, III and IV will be paid by the hirer.

Level V, also called Klasifikasi V, is the once-only, mid-life major overhaul which every item should undergo. Only the eight Bina Marga and two Pengairan Base Workshops are authorized to carry out this overhaul in respect of DPU owned equipment.

The Peraturan Daerah follow a similar principle with only Klasifikasi V being the responsibility of the Kabupaten although it was noted that in one kabupaten the alternative basis was used with the kabupaten taking responsibility also for klasifikasi IV.

4. Transportation

All hire agreements specify that the contractor is responsible for the cost of transportation.

Few low loaders have been found among the fleets of those contractors interviewed during the study. Most of them complain that to transport the equipment which they hire, they must hire low loaders, usually from DPU (ALKAL or PALAN) and that the cost is high.

Some heavy equipment has been seen being transported on ordinary flat bed trucks. Another alternative is to move equipment under its own power but this should be strongly discouraged as it frequently leads to damage through operators travelling at greater speeds than that for which the equipment was designed.

It is not an option for track laying machines except over short distances as they are designed to be operated with frequent changes from forward to reverse, thus equalizing wear on the moving parts. Nor should they be driven along public roads.

The problems of transportation affect not only mobilization and demobilization but also inhibits proper repairs, with even major repair work being done on site rather than in the workshop to save on transportation costs.

C. Hire Revenues

1. Current Hire Rates

Table 15 lists the bases used to determine hire rates for each of the categories of equipment.

Current hire rates for DPU equipment must be calculated in accordance with the formulae given in KepMen 585/1988. These are based on:

- Amortization of the original cost of the machine calculated on the reducing balance basis

- A Capital Recovery Factor (CRF) to represent the cost of capital

As stated in A. above, since the contractor is not liable for the cost of the major overhaul (Level V in the DPU Manual), it must be assumed that these rates include that cost but checks carried out suggest that they do not do so.

These fixed costs are spread over an assumed utilization which for most types of machine is 2,000 hours per year for five years giving a working life of 10,000 hours.

The use of the reducing balance basis for writing off the original cost of the machine results in a hire rate which falls rapidly as the machine gets older. For example, the hire rates for a bulldozer are:

Year one	-	Rp 39,029
Year two	-	Rp 29,736
Year three	-	Rp 21,187
Year four	-	Rp 13,381
Years five and subsequent	-	Rp 6,319

The logic is that the hirer, who is responsible for repairs, will incur few costs in the early years when the machine is new, and more in later years.

However, use of such a basis has severe implications for the overall hire revenue generated if actual hours of utilization are less than the standard 2,000 per annum. While fewer hours of operation per year will extend the years of life achievable, the revenue lost in the first year (at Rp 39,029 in the case of a bulldozer) will never be made good in years six onwards at Rp 6,319.

Equipment owned by the government at provincial or local level is usually hired at rates set by the relevant level of local government in the form of a Peraturan Daerah (Perda). These are issued by Provincial government (Tingkat I) to regulate the hire of provincially-owned equipment and by Kabupatens themselves to regulate that which they own

A Perda issued by Local Government (Tingkat II) is also used by some kabupaten to regulate the hire of equipment which has been provided by USAID.

In certain kabupaten, the Perda stipulates hire rates for Rollers at a rate per area of road rolled rather than per hour of machine hire. This has the effect of transferring all risks relating to output per hour from the contractor to the owner even where the poor output is the fault of the contractor.

2. Collection, storage and allocation revenues

a. General

The present government budgeting regulations do not allow the agency which collects the hire revenue to retain any part of it to meet the costs of operating the equipment which is on hire.

This rigid principle of no offset between State Revenues and State Expenditures is stipulated by Keppres 29/1984 Article 4 (5) and applies to all GOI agencies and work units including all the kabupaten.

The ultimate beneficiary of hire revenues differs according to the Agency which owns the equipment. The general rules are as follows:

-Revenues from equipment owned by Bina Marga, by Kanwil or any which was originally funded by OECF or APBN must be paid into Kas Negara where they form part of the central government general budget revenues.

-Revenues from equipment which was originally funded by APBD, by USAID and or by Inpres must be paid into Kas Daerah (Tingkat II) where they form part of the local government (Tingkat II) general budget revenues

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-In the NTT kabupaten, equipment was being hired which belonged to the Provincial government. These revenues must be paid into Kas Daerah (Tingkat I) where they form part of the provincial government (Tingkat I) general budget revenues.

A summary of allocation of revenues is contained in Table 16.

It must be stressed that, whichever level of government benefits, the income is in every case treated as current budget revenue. There is no budgeting mechanism whereby any part can be stored and carried forward to a future year to meet costs of either the major repair or the eventual replacement.

Such a system cannot be self-sustainable. Funds are not available for major overhauls - which are currently being deferred indefinitely - and replacement equipment will continue to rely on donor support.

b. Revenue targets

In some kabupaten (eg.Takalar) the local DPRD establishes annual targets for the revenues to be raised from the hire of APBD II equipment. Such targets appear to be set based more on the income required by the kabupaten for its general budget purposes than as a realistic assessment of what the market can generate although reference is made to the sums raised in the previous budget year

The same figures are then used to determine the amount of the equipment maintenance budget. However, while the revenues are paid into Kas Daerah for credit to kabupaten general revenue, the latter is requested from and allocated through the IPJK grant program.

The rationale behind this arrangement is to allocate the same amount as additional funds to kabupaten (APBD II) funded road projects to offset the value of road projects which would have been funded through IPJK had the equipment maintenance not been budgeted through IPJK.

c. Disadvantages

One of the greatest disadvantages of the different channelling of revenues and costs is that those who are responsible for managing the equipment are denied any direct financial interest in its successful utilization and are not motivated to increase hire revenue.

Indeed it may be said that there is a 'negative' motivation since the greater the number of hours worked by the equipment, the higher will be the repair and other variable costs. This places a burden on the owner agency to find the additional finance needed to carry them out while others have benefitted from the additional revenue.

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D. Execution of Hire Agreements

1. Allocation of Equipment for Hire

Equipment is hired to those contractors who are engaged on Kabupaten road projects and who do not have their own machines available.

Hiring agreements are in all cases formally drawn up in accordance with government standards which are prescribed in KepMen 585/1988 and in Peraturan Daerah.

Hire agreements (other than those for rollers in a few kabupatens) are always for a specific period of time. It appears that for various reasons, the equipment may remain on site after expiry of the agreed period, often without further payment being sought. The reason given is that "the contractor was not using it" but this cannot be verified and nor is the logic behind it entirely clear.

Equipment is also used on two types of activity for which no hire revenue is generated:

-Swakelola, or force account construction projects carried out by the government

-Projects initiated by local government for the benefit of the community but for which no budget funds have been allocated.

2. Monitoring by Kabupaten

Each kabupaten has some system which keeps track of where its equipment is. With the small number of items involved, the records themselves may be very simple such as a white board.

In discussions with staff in the kabupatens, no difficulty was found in identifying the whereabouts of any item of equipment but these simple, informal systems do not lend themselves to any sort of audit. They would not be suitable for a Hire Unit which needs to accumulate data on equipment utilization.

There are standard procedures and documentation prescribed in various decrees and Manuals for controlling the movement of equipment (Berita Acara etc). These are not used by all the kabupaten in the project study area.

There do not appear to be any formal records of repairs carried out to equipment. Since the cost is almost invariably borne by the contractor - who may use non-GOI repair facilities - such records would be difficult to maintain accurately. However, there is an obvious danger that the contractors may not be carrying out all the scheduled maintenance and repairs due, preferring to pass on the machine (and the cost) to the next hirer, or to the kabupaten if there is no immediately following hirer to accept liability.

3. Enforcement of responsibility and liability

The principal forms of enforcement are:

-repossession of the equipment

-calling the bank guarantee

- plus the more general threat that the contractor will not be invited to bid on future projects.

4. Bank Guarantees and Bonds

The kabupaten normally requires a bank guarantee to support each hire agreement. This principle, and the amount of the guarantee are both stipulated in KepMen 545/1988.

III. DEFICIENCIES IN PRESENT KABUPATEN EQUIPMENT MAINTENANCE SYSTEM

A. ROOT CAUSES OF MAINTENANCE DEFICIENCIES

Two fundamental constraints to efficient equipment maintenance, limited markets and uneven demand, are related to each other, and present enormous obstacles to sustainable improvement of the equipment maintenance system in the kabupaten.

1. Limited Markets

There is little market for equipment hire in any of the pilot area kabupatens other than that provided by government projects. These are virtually all awarded by Dinas PU Tingkat II. Some equipment hire would occur for projects awarded by Dinas PU Tingkat I, through the Inpres Dati I program, but total Inpres Dati I project allocations for the study kabupatens accounted for only a small percentage of total government spending

The bulk of kabupaten road projects for which equipment would be used is funded through two block grant programs, Inpres Dati II and Inpres Peningkatan Jalan Kabupaten (IPJK). Budgets for these two programs in the seven South Sulawesi project kabupatens for FY 1992/93 totalled Rp 28 billion, an average of Rp. 4 billion per kabupaten. Actual expenditures for FY 1991/92 were less than Rp. 15 billion. This difference reflects a 66% increase in Inpres Dati II funding during the period, a 32% increase in IPJK funding, and a 63% rate of expenditure for IPJK funds in FY 1991/92. Inpres Dati II expenditures were nearly 100% of budget

Of these budgets, the major part is paid for purchase of construction materials, and only a small part is spent on the provision of equipment. A survey of actual equipment costs in road projects would be required to calculate the portion of project funds spent on equipment, and therefore produce a fairly accurate estimate of the size of the market.

Determination of actual and estimated equipment costs are discussed in section C, below. Expenditures on equipment are divided between contractors using their own equipment and those hiring equipment from the kabupatens or other sources. There is no information available regarding the share of the market between these two categories.

The limited market for equipment has been identified as a major factor which deters private sector interests from entering the equipment hire market and which discourages contractors from owning their own equipment.

2. Uneven Demand

The government fiscal year starts on 1 April. Kabupaten road projects are primarily funded with Inpres block grant funds which are allocated annually and must be expended before the end of the fiscal year.

There is always a delay in obtaining confirmation of Inpres project allocations for the new fiscal year and it is usually July or August before the Agency concerned is in a position to award construction contracts. The result is that there is no work for construction equipment from April to July and the working year is reduced to a maximum of eight months.

In practice, the position is worse than this for two reasons:

a. The contract award procedures themselves require a period of one or more months, depending upon size and funding sources so that the contractor may not be able to mobilize and start utilizing equipment until October.

b. The rains begin in November/December in most parts of Indonesia and between then and February any construction contracts involving equipment utilization.

Equipment is therefore likely to achieve an annual utilization rate far below that of which it is capable from a purely mechanical point of view. Demand for equipment is very low for several months a year, and very high, vis a vis equipment resources, during other months.

Larger contractors may undertake larger infrastructure development projects implemented by the national government agencies, which can help overcome the uneven demand. However, unless these larger projects enjoy multi-year funding, they are subject to the same budgetary cycle problems as the kabupaten funds. Most of these larger contractors are the state owned contractors (BUMN) Contractors that work on kabupaten projects are generally not qualified to bid for such large contracts, and thus require equipment only during certain months of the year.

In combination with the already limited market for equipment in the project areas, this uneven demand prevents utilization of equipment from being high enough to justify a contractor purchasing his own equipment for use on kabupaten road projects. In addition, it would be unprofitable for privates businesses to purchase equipment to hire out to others, since income could be generated during only part of each year.

3. Fragmentation Resulting from Root Causes

Attempts by the government and foreign donors to deal with limited markets and uneven demand have resulted in fragmentation of responsibility for equipment maintenance. No one

unit has responsibility for the total control of any item and no one therefore works within a system of incentives for its successful operation in either technical or financial terms. Furthermore, the responsibilities as currently allocated in this fragmentary way often encourage those concerned to take action which is in their own short term interests but which conflicts with the best interests of the equipment fleets in the longer term.

Limited markets and uneven demand restrict the interest and ability of the private sector to purchase equipment, both for hire and for contractors' own use. This is has resulted in a shortage of equipment which is required for road maintenance in the kabupatens. The government has responded to this shortage by providing equipment available for hire to contractors and for use by the kabupatens on force account projects.

Due to limited government resources, donors have assisted in providing equipment to the kabupatens, in the absence of adequate privately owned equipment. Funding mechanisms and government policies combine to result in difficulties in providing appropriate equipment resources in various kabupatens as well as fragmentation of ownership and responsibility for equipment. Expenditures for equipment are not tied to such variables as equipment hire or cost of equipment Revenues from equipment are not paid into the same account which provides for equipment-related expenditures No provisions are made for maintaining accounts for total cost of equipment. Various parties are responsible for financial and administrative duties related to equipment, as presented in the following list:

DPU procures and owns most of the equipment in kabupatens; gives permission to DPUK to hire DPU equipment

Donor (USAID, OECF)provides loans or grants for equipment to be purchased by DPU

Ministry of Finance responsible for repayment of loans for equipment purchase

DPUP manages ALKAL workshops in provincial capitals, available for major repairs and overhauls of DPUK equipment; in NTT, owns some of the equipment in kabupatens; gives permission to DPUK to hire DPUP equipment

DPUK responsible for hiring out and maintaining equipment, regardless of owner; requires permission from owner to hire equipment; performs but generally does not pay for repairs and maintenance; provides but does not pay wages for operators and mechanics; receives Inpres funds for maintenance

Equipment Hirer pays for maintenance and repair; pays wages of operators and mechanics; pays for hire of equipment

Kas Negara receives hire revenues for DPU-owned equipment

Kas Daerah Tk. I receives hire revenues for DPUP-owned equipment

Kas Daerah Tk. II receives hire revenues for DPUK-owned equipment

Fragmentation also means that no comprehensive records are available anywhere to show:

a. Utilization rates achieved
b. Total operating costs
c. Repairs history

a. Utilization Rates Achieved

Nearly all hire agreements are set for periods of days/months, irrespective of the number of hours worked. Although the contractors are probably aware of the hours of work obtained, they are under no obligation to disclose this to the owner.

The only true record of utilization will be the hour meter fitted to the machine. Many hour meters on machines inspected are broken. Many types of equipment, such as dump trucks and asphalt sprayers have no meters. Information from hour meters is not recorded by any of the kabupaten visited and there is therefore no published record of cumulative hours.

b. Total Operating Costs

Under the current fragmented system, many operating costs, including maintenance and repair costs, are hidden and therefore not recorded. It is not possible for the kabupaten or the study team to determine actual costs of operating and maintaining the current fleet or individual machines.

c. Repair History

Every machine should have a file containing data of its history from original purchase until final scrapping. This technical data supplements the financial data provided by (b) above. It is required for planning and budgeting of maintenance. Records of repair history have not been kept in the past. The recently introduced EMS procedures include the documenting of repairs but this will not overcome the problem of repairs history prior to implementation of the EMS.

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B. ASPECTS OF FRAGMENTATION

1. Donor Provision of Equipment

For many years donor agencies have helped provide new equipment for infrastructure development projects which they finance, in the interests of successful project implementation. They are not generally prepared to provide finance for the ongoing maintenance and repair of the equipment nor to provide spare parts beyond an initial inventory which will not extend beyond the duration of the project concerned.

The result of this policy has been to build up ever-increasing fleets of equipment which GOI cannot maintain or repair within current budgets. Kabupatens allocate a certain amount of their annual roads (IPJK) budget for equipment maintenance. The amount of funding varies between kabupatens, but is never sufficient to cover all maintenance and repair costs. Government policy shifts liability for these costs to the contractors who hire the equipment, as discussed in section B-8, below.

A further disadvantage of donor funding for equipment purchase is the failure to highlight replacement cost. A commercial equipment hire unit would calculate hire rates which were geared to the replacement of the machine at the end of its working life at the then replacement cost. Replacement cost is always higher than historical cost, not only due to inflation but also to technological improvements in the machine specification. No financial provision are made for future replacement of equipment.

Donor provision of equipment also results in problems of equipment resources and ownership.

2. Equipment Resources and Ownership

Standardization of equipment fleets in the kabupaten has led to fleets which are either excessive related to overall needs or in some cases unbalanced when related to a particular project. In addition, down provision can mean delays in obtaining new equipment, as well as loss of control by the local government over the composition of the equipment fleet in the kabupaten.

More importantly, due to the provision of equipment funded by donors through the central government, much of the equipment hired out by the kabupatens is not technically owned by them but by the Department of Public Works. Equipment provided by donors and the central government is owned by the central government. In NTT, the kabupatens also have equipment provided by the province. Very little of the equipment in the kabupatens is actually under kabupaten ownership. Lack of ownership removes one incentive for proper maintenance and utilization.

Regulations stipulate that the kabupaten must obtain the permission of the owning Agency before hiring their equipment, even though the hire rates are already prescribed in the legislation. This requirement adds an extra administrative step to every hire contract. It leaves open the possibility that the kabupatens may not be able to allocate equipment as they see fit, although there is no evidence found during the study to indicate that their allocation of equipment is in fact so limited

This fragmentation of owners and users results in a gap between equipment-related revenues and expenditures. Because kabupatens are responsible for maintaining equipment they do not own, maintenance budgets are provided through Inpres grants, rather than from kabupaten revenues.

3. Revenue - Expenditure Gap

Fragmentation of responsibilities is also demonstrated in financial arrangements.

The regulations for the Implementation of the State Budget (Keppres 29/1984 Article 4 (5) stipulate that all revenue earned by a Government Agency must be banked intact for credit to Budget Revenues (Central, Provincial or Local according to its source). The revenues cannot be retained by the agency concerned to be used to meet its expenditure, even though such expenditure is directly related to the income.

Ownership of most of the equipment operated by the kabupaten remains with central government agencies and hire revenue therefrom is channelled outside the kabupaten to central government accounts (Kas Negara). Other items are owned by provincial government and the income from hiring is paid into provincial government accounts.

The problems with this channelling of revenues are twofold First, revenues are not retained at the kabupaten level except for the few pieces of equipment that are actually owned by the kabupaten. Second, at whichever level they are received, funds are always treated as general revenues rather than being channelled to particular agencies or particular uses.

Thus no funds whatsoever are being accumulated by anyone towards the cost of major overhauls or to finance eventual replacement. The former are being deferred indefinitely and the latter will continue to be dependent upon donor support.

Because of these problems in collecting and channelling revenues, kabupatens need to obtain funds for operation and maintenance of equipment from other sources. The most visible source of GOI funds is the annual maintenance budget, discussed in section 7 below.

Due to the inadequacy and undependability of this funding source, and in accordance with Kepmen 585/167 regulations, costs for maintenance and repair during the hire period are made the responsibility of the equipment hirer (contractor). His main concern is to complete

his own project. He has no long term interest in the proper care of the equipment and he will only carry out such repairs as are absolutely necessary during his hire period.

This fragmentation of revenues and expenditures has also removed any incentive to determine economic hire rates.

4. Low Hire Rates

Existing hire rates for equipment in the kabupaten are set by reference to formulae contained in KepMen 585/1988 and KepMen 167/1991, and are all far too low for the following reasons:

a. The assumption of 2,000 hours hire revenue per annum is far in excess of that actually being achieved.

b. The assumed 10% residual value for the equipment at the end of its economic working life is unrealistic.

c. No provision is included in the hire rates for the cost of the mid-life major overhaul (repair level V).

d. No provision is made in the hire rates for the inevitability that the machine which will eventually be purchased to replace that being hired will be more expensive due to technological development, exchange rate movements and inflation.

The effect of these factors is as follows:

a. 2,000 hours utilization

Whenever actual hours hired fall below 2,000 pa, hire revenue will be not be enough to meet the fixed costs of depreciation and interest on capital. Machines inspected in the pilot project area suggest that the true hours hired per year is only around 500 - 800, thus meeting only some 25% - 30% of the costs which the formulae in KepMen 585/1988 seek to cover.

It may be argued that revenue lost in the early years can be made good in later years since the working life of the machine life will be extended beyond the five years set in the formula. There are two reasons why this is not so:

The hire rate formulae in KepMen 585/1988 set far higher hire rates in the early years. For example, a bulldozer which is hired at Rp 39,029 in the first year of its life will generate only Rp 6,319 per hour in the fifth and subsequent years. Therefore, revenue lost in the first year will never be made good in later years at the lower rates

Manufacturers only guarantee spare part availability for ten years. A working life in excess of this cannot be counted upon, however few hours are worked.

b. 10% Residual Value

In reality, all equipment is operated until some major breakdown occurs and the kabupaten and/or Public Works considers that it would not be economic to repair it. No private sector company is interested in purchasing the machine when it has reached this condition, partly because the same economic equation applies, partly because kabupaten equipment is not noted for its good maintenance history. The machine is therefore scrapped.

In some countries, and possibly in more highly developed provinces of Indonesia such as in Java, there can be a market for scrap steel and a machine in non-working order might have a sale value. However, in the pilot project provinces, this does not apply and machines are simply abandoned No residual value should be forecast

c. Mid-life major overhaul

Although KepMen 585/1988 clearly states that the hire rate formulae are based on Public Works bearing the cost of the Klasifikasi overhaul, the formula does not appear to include any money to cover it and it must be assumed that Bina Marga have budget allocations elsewhere to cover the cost.

d. Replacement cost

An equipment hire agency should generate and store enough surplus revenue to meet the cost of replacement of each machine as its economic working life comes to an end. Replacement cost is always higher than the cost of the original machine for many reasons.

Unless funds are stored, the only way to meet the cost of the replacement machine is to inject more capital which means, in the context of GOI terms, continuing donor support.

5. Contract Prices

Under Unit Rate contracts, the contractors receive income for the use of equipment on their projects based upon a measure of the production which it is capable of achieving at maximum utilization, rather than upon the number of hours which it has spent on the project. Rates for each activity are expressed in terms of production volume, such as square or cubic meters.

DPU has calculated standard prices for most activities for inclusion in Owner's Estimates, these being the amounts which it will pay for each unit of production. These figures are known to, and used by, the contractors in preparing their tenders. Lump Sum contracts, although they do not express a rate for each activity, are estimated on the same basis.

The calculation of standard prices is based on:

i. The cost per hour of a machine
ii. Its hourly productive capacity

The former are considerably in excess of the equipment hire rates currently charged by DPU and the local governments. Conversely, the hourly production actually achieved is believed to be far below that assumed in the rates. This is mainly due to long periods during which the equipment stands idle, reasons for which include:

i. Mismatched fleets, with some items standing idle while another machine completes a preceding process

ii. Poor quality contractor site management

iii. delays caused by the project owner's mistakes

iv. Force Majeure (rain etc.)

A further contributory cause is that equipment, although working, is not achieving the standard output. This may be due to an inexperienced operator or to the material being different from that specified. The result is that calculations of equipment costs paid to contractors are not related to actual hire rates. Calculating true equipment costs is not possible, nor is calculation of actual equipment utilization.

6. Utilization

There are two major constraints on the demand for equipment, which result in low utilization.

i. There is virtually no demand outside the public works sector, of which the largest element is kabupaten roads.

ii. Uneven demand causes a period for several months annually, during which little construction work takes place.

In addition to the problems of limited market and uneven demand, several other factors limit utilization of equipment:

i. Road projects do not normally allow machines to operate continuously during the working day. There are frequent idle periods while a machine on one operation waits for a preceding operation to be completed. It is quite usual to have a stone crusher, a wheel loader, several dump trucks, a grader, an asphalt sprayer and a roller all working inter-dependently with each other, with the speed of implementation of the project restricted to the output of the slowest process.

Delays are caused partly by poor supervision of the project by the contractor, and partly by mismatched fleets (eg insufficient asphalt sprayers to allow effective utilization of dump trucks and rollers).

ii. Working hours are restricted by public holidays and other factors. In particular, where the owner of the equipment (GOI) provides the operator, he will expect to work standard government hours with (for example) only a short input on Friday. His hours may differ from those normally worked by the contractors staff. Calculation of hire rates, both in bills of quantity and hire contracts, are based on working days of seven hours. Private sector equipment hirers calculate rates based on eight hour days.

iii. Down time for repairs must be taken into account. Since these are the contractor's responsibility, they will usually occur during the periods when the machine is on hire.

iv. Poor technical skills amongst operators mean that equipment breaks down more often. Lack of skill among mechanics means that it takes longer to put back into working order.

v. Lack of management skills among both kabupaten staff and contractors' site personnel also results in lack of proper monitoring and guidance, and leads to poor utilization.

vi. The difference between the method of calculating payment to a contractor for work done by equipment (see above) and the basis for calculating its actual cost to him makes it difficult to identify how much under-utilization is occurring. In addition, low hire rates do not provide incentives to contractors to improve utilization rates.

vii. The channelling of funds whereby the kabupatens receives none of the hire revenue means that they have no incentive to maximize utilization. Indeed, there is a negative incentive since additional periods worked by the machine will increase the operating costs which the kabupatens (or the hirer) bears with no corresponding increase in the income to the kabupaten.

Overall, actual annual machine utilization for equipment operated by the kabupatens is calculated to be in the range of 500 to 900 hours per year, or even less. This was borne out by the inspection of hour meters on machines in every kabupaten visited. These were mostly supplied ten years ago under OECF funding and had recorded between 316 and 9,000 hours. The average for the 34 machines seen was 400 hours per annum.

7. Maintenance Budget

As discussed above, revenues from equipment hire and expenditures from maintenance are not associated, both in terms of determination of amounts and in channelling to and from the same entity. Specifically, expenditure needs for equipment maintenance are not tied to such variables as equipment hire or cost of equipment. Rather than generating funds for maintenance of equipment, kabupatens are dependent upon central government grants for equipment maintenance budgets. This results in an inability to adequately fund equipment maintenance.

In order to overcome this constraint, and in accordance with Kepmen 585, all maintenance and repair costs, except for major overhaul (repair level V) are borne by the hirer. This is discussed in the following section.

With inadequate maintenance budgets, kabupatens are unable to invest in the necessary resources for human resource development. In addition, levels of staffing in the kabupaten workshops are inadequate, for both management and technical positions. Resulting problems as they affect equipment maintenance are discussed in the following three sections.

Although the contractor is responsible for the implementation and cost of repairs during the hire period, there will be times when for one reason or another, these have been neglected and the owner, GOI, finds that it must carry out repairs at its own cost before the machine can be hired out again. The budgets for spare parts are such that a major repair may have to wait until the next budget year before sufficient funds can be earmarked. Several examples were seen where a heavy machine had been idle for more than one year apparently for this reason.

8. Repair Liability

In order to overcome maintenance budget constraint, the procedure adopted under Kepmen 585/1988 has been to make the hirer responsible for all maintenance and repair costs, except for the one major mid-life overhaul (repair level V).

This solution suffers from several disadvantages:

i. The hirer has little interest in the longer-term welfare of the equipment. Rather than carry out proper scheduled maintenance and repair at manufacturer's recommended intervals. he will tend to carry out only the very minimum level of repair necessary to enable the machine to complete his project, and he may economize even on this by using sub-standard, non-genuine parts. This approach to maintenance and repairs often causes the machine to break down again shortly after but it will by then probably be on another project and be the responsibility of another contractor.

ii. There are great difficulties in maintaining accurate records of maintenance and repair as required under the EMS. These records would be valuable in monitoring the lifetime costs of each machine, a key figure needed by management when formulating policies for replacement. Without these data, it is impossible to set accurate hire rates which would include owner liability for maintenance.

iii. A risk to the contractor in hiring kabupaten equipment is that he is responsible for all repairs during his contract for hire. According to regulations, machines are to be inspected and released to hirers in good condition, but low technical skills and administrative problems make this unusual in practice. Additionally, due to this policy of contractor liability, equipment is often returned in a condition necessitating maintenance or repair, with the kabupaten unable to carry out the repairs because of low budgets. Even allowing for adequate budgets would leave the kabupatens in the position of providing repairs in this instance for which they are not contractually responsible.

iv. The division of responsibility for the operation and cost of equipment between equipment owners and hirers results in a poor understanding by both parties of the true cost of owning and operating equipment.

9. Technical Skills

Section II of this annex details the deficiencies in technical skills found in the kabupatens. While this lack of skill in part reflects the more general problem of availability of skilled mechanics and operators which is experienced by the public and private sector in the study areas, it is more specifically the result of low maintenance budgets and poor management skills in the kabupatens.

Kabupaten maintenance budgets are low, and generally do not provide for salaries for workshop staff. The cost of mechanics and operators is generally the responsibility of the hirer, even though these personnel are provided by the kabupatens. Mechanics and operators work, therefore, only when equipment is hired. There is no budget for the kabupaten to pay wages to mechanics to perform maintenance and repair independent of what is paid for by the

hirer. Therefore, even maintenance needs identified by the kabupaten upon return of equipment are not carried out, except by agreement with the previous or next contractor to hire the machine.

Technical assistance is provided in the study areas to improve the skills of mechanics, but is not sufficient to raise overall skill levels. Long-term investment in training would be required, and personnel selected for training would need to have a minimum level of capabilities to benefit from training. Even with adequate budgets for long-term training, results would be disappointing due to personnel policy constraints. These personnel policies can be directly attributable to budgetary constraints.

Individuals often serve as both mechanics and operators. This would necessitate training in both areas. Most kabupaten mechanics and operators are not permanent civil servants, rather they work on a daily basis at low wages. If they improve their skill levels through training, they are free to leave the kabupaten workshop following effective training and seek a job in the private sector with higher pay This has indeed been the experience even in the private sector where certain contractors have pay scales which are not as high as those available elsewhere.

10. Management Skills

Technical skills are generally not developed through experience in the workshop due to the frequent inability of workshop management to provide guidance and informal on-the-job training. This inability to provide technical assistance is due to several factors. Although some workshop managers are experienced as mechanics or educated in relevant fields, many are not, and would not be able to provide sufficient guidance under any conditions. Even for those technically able, personnel policies, budget constraints and administrative procedures hinder effective informal training. These personnel policies can be directly attributable to budgetary constraints.

Many workshop managers hold more positions in addition to that of head of the Equipment Subsection in Public Works, and must devote time to these other duties. If an employee is more skilled in another area, finds job duties more congenial or receives greater rewards, he will tend to devote more time to his other job than to workshop duties.

Budget constraints prevent adequate monitoring of project-site operations, where many repairs take place, and where much maintenance should take place. Inadequate monitoring, aggravated by inability to perform proper monitoring of equipment utilization and maintenance, results in inadequate and improper utilization by the hirer.

Administrative procedures place an emphasis on record keeping, so that skilled and ambitious managers develop capabilities in this area rather than in technical matters.

With little prospect of achieving a reasonable level of utilization, no financial incentive to maximize revenues, and inadequate budgets to carry out maintenance, repairs and monitoring, it is inevitable that the motivation on the part of the kabupaten staff will suffer, among mechanics, operators and management. Staff without the technical capabilities to perform their job duties fully do not have incentives to carry them out. The end result of this lack of incentives are poor utilization and maintenance deficiencies.

11. Maintenance Deficiencies

Maintenance deficiencies have been identified in section II of this annex. Although there are variations between kabupatens in the study area, all kabupatens experience deficiencies in the areas of routine maintenance and repair, with a large percentage of their fleet in poor condition or inoperable.

Causes of these deficiencies, as discussed above, include poor utilization, insufficient maintenance budgets, policies regarding repair liability, inadequate technical skills and management skill, and lack of incentives to provide adequate maintenance. These factors result from the fragmentation of responsibility for equipment maintenance.

APPENDIX 1

KABUPATEN VISIT REPORTS

BONE

The team visited this Kabupaten on November 19, 1992. The head of DPUK was not available for the meeting as he was in Ujung Pandang on business.

Staff attending the meeting were:

Mr. Mudjetaba	-	Assistant head of DPUK
Mr. Ali	-	Chief of Equipment Section
Mr. Salaruddin	-	Chief of Operation Section
Mr. Gunaryo Gunawan	-	District Engineer-STV/Lyon - Bone

The position of Chief of workshop has not been formally filled yet.

The workshop structure was originally built under the OECF loan program and upgraded under the USAID program phase I. The facility is in good condition and reasonably well kept. There are some shortcomings (no proper workbenches, etc), however, it is assumed this will be rectified during the scheduled phase II program.

Equipment maintenance is again a problem in this Kabupaten. Equipment and light vehicles as sighted, are not in a good maintained condition as in some cases are reported as such Some spare parts seem to be available, as two units of Three Wheel Rollers undergoing repair at the time the team visited the workshop. It would appear the lack of funds, possibly weak management, with no scheduled maintenance program in effect would be the main factors.

Administration activities at the workshop are nominal, and records of equipment utilization and hire details were not complete and readily available. No Workshop activity records detailing equipment repaired in the workshop or in the field, nor any records of maintenance performed on the equipment were available.

Warehouse facility, spare parts stock inventory, replenishment of some moving parts and consumables is an unknown factor at this time as records were not available. However, the tool room was very well laid out, with tools easily identifiable and tool check out and check in records were being kept.

The annual 92/93 Inpres/IPJK Budget for the maintenance and repair of OECF and USAID equipment was said to be Rp 50 million though DURP was not available for review of budget breakdown. The Pemda Dati II IPJK budget details for equipment maintenance and repair were not clearly known by workshop staff.

There are two long term mechanics as full-time permanent Pemda employees and one mechanic, also a long term permanent Pemda employee though he fills in as equipment operator as required. The Chief of Operations - Mr. Salahuddin indicated there were not enough full time Pemda personnel available to run the workshop facility.

Contractors are able to hire equipment in Ujung Pandang or from Bina Marga and Pemda when available. Hire rates for USAID/OECF equipment are calculated using the Bina Marga standard calculation, while Pemda equipment hire rates are determined by the Kabupaten head of DPUK.

Some equipment hire contracts are established for a three month period. However, the contractor may only utilize the equipment for one or two week intervals, demobilize and mobilize them again for the three month period.

The Kabupaten indicated at this time when equipment was not available, the common practice is to use female hand labor, though it appears this labor source is not available during the months of August to December allegedly due to the harvesting/planting season.

Current projects being executed during fiscal 92/93;

USAID	-	3 projects
APBN/IPJK	-	4 projects - August start
Inpres Dati II	-	8 links - routine maintenance - August start

Equipment being utilized on Inpres Dati II projects:

- 1 x compressor
- 1 x Hand Tamper
- 1 x Three Wheel Roller
- 1 x Asphalt Sprayer

BULUKUMBA

This kabupaten was visited on Monday, November 23, 1992. The head of DPUK - Ir. Mr. Riefad Suaib was not available at the time as he was in Ujung Pandang on business.

Mr Makmur M. - chief of workshop and equipment section was located and he invited Mr. Bambang - chief of program section to join the meeting.

The workshop organization structure exists on paper only, and there is still not any officially appointed (KaUPTD) - chief of workshop.

The new Bulukumba workshop built under the USAID program phase I, has not to date been utilized. This facility is in new condition and has been well kept. All woormally filled yet.

The workshop structure was originally built under the OECF loan program and upgraded under the USAID program phase I. The facility is in good condition and reasonably well kept. There are some shortcomings (no proper workbenches, etc), however, it is assumed this will be rectified during the scheduled phase II program.

Equipment maintenance is again a problem in this Kabupaten. Equipment and light vehicles as sighted, are not in a good maintained condition as in some cases are reported as such. Some spare parts seem to be available, as two units of Three Wheel Rollers undergoing repair at the time the team visited the workshop. It would appear the lack of funds, possibly weak management, with no scheduled maintenance program in effect would be the main factors.

Administration activities at the workshop are nominal, and records of equipment utilization and hire details were not complete and readily available. No Workshop activity records detailing equipment repaired in the workshopy
by Pemda and the contractor.

Preventative maintenance appears to be left to the discretion of the operators and contractors, with the belief that if the equipment is not being used, it does not need routine maintenance. There is no schedule or records kept and this possibly also applies to the operators daily log, and in turn, it would be fair to assume monthly reporting of equipment utilization and availability does not exist.

Administration affairs for the workshop are allegedly taken care of at the DPUK office. However, records on hire contracts, mechanics activities, repair and maintenance of equipment etc., are not available.

Warehousing activities are not existent at this time. Spare parts supplied with the USAID equipment have been used and not replenished and when stocks are depleted equipment will again be out of service awaiting spare parts.

The annual 92/93 Inpres/IPJK budget for the maintenance and repair of USAID equipment was established as Rp 65.3 million though a copy of the DURP was not available for review of the budget breakdown.

Details of the Pemda Dati II IPJK budget for repair and maintenance of Pemda equipment was said to be zero, however. DURP was not sighted.

Current permanent workshop personnel are:

Mr. Makmur M.	- chief of workshop and equipment
Mr. Ali	- chief of equipment and operations - subsection
Mr. Yeneng Usman	- chief of administration and warehouse - subsection
Mr. M. Yusuf	- chief of workshop - subsection/mechanic

There is no private equipment hire company in Bulukumba.

Contractors will normally hire equipment from Dinas P.U. or from Pemda if available in the Kabupaten. However, if equipment is not available in Bulukumba, the contractors will hire from Ujung Pandang.

JENEPONTO

The study team visited this kabupaten on Monday November 9, 1992. The bupati was out of his office on kabupaten business and the head of DPU.K was in Ujung Pandang attending a course.

The head of BAPPEDA, H. Tan Malaka Guntur, conducted the meeting and the purpose of the equipment study was explained and privatization was discussed.

He was not too favorable with the idea of the kabupaten giving up ownership of their equipment, but would possibly concede to contract management of kabupaten equipment maintenance and hiring. However, the indication was the system would have constraints until Bina Marga equipment was non existent.

Gapensi claim that there is only 30 percent of the equipment requirements available in South Sulawesi for projects planned and private equipment hire companies are reluctant to compete with Bina Marga equipment hire rates.

The workshop structure was built under the USAID Program phase I, replacing the original workshop that was built under OECF funding in the early nineteen eighties and was apparently abandoned due to the workshop location.

The workshop structure is in good condition though good housekeeping practices are not existent. There were no workshop benches for mechanics to do repairs, or cleaning trays for parts. Phase II of the construction/renovation program is expected to overcome the shortcomings with the facility.

Most of the equipment at the workshop at the time of the visit were dump trucks. There were fourteen of these dump trucks supplied under the OECF funded program eleven years ago, with five units still running, but not in very good condition.

Other equipment sighted was not being well maintained and costly repairs will have to be executed in the very near future. The same problem exist whereas no attention is given to broken or missing grease nipples, and in most cases are easily accessible. The immediate impression was preventative maintenance is left to the operator and/or contractor and defects are probably not reported or possibly ignored.

Workshop organization structure is in place but again not formalized, hence no one person is responsible for any decision making. The workshop management personnel are permanent employees, but the mechanics are only temporary staff.

Day-to-day administration is in place and the EMS standard documentation procedures for equipment management and operations is being implemented.

The total annual 92/93 Inpres/IPJK budget for the operations and maintenance of OECF and USAID equipment was Rp 75,000,000.00.

Workshop	Rp 6,000,000
Utilities	Rp 12,000,000
Fuel, lube oil	Rp 12,000,000
Spare parts	Rp 45,000,000

Contractors are able to hire equipment from Bina Marga or Pemda subject to availability. Hire rates for USAID and OECF equipment are calculated using the standard Bina Marga formula, while Pemda hire rates are determined by the kabupaten.

Some examples of hire rates:

Equipment	Private Rate (Rp)	DPUK Rate (Rp)
Wheel Loader	400,000/day (includes fuel and operator)	74,000/day (7 hrs)
Excavator	55,000/hr or 400,000/day (8 hrs)	
Bulldozer	85,000/hr or 680,000/day (8 hrs)	93,000/day (7 hrs)
Motor Grader		80,000/day (7 hrs)
Tire Roller		64,500/day (7 hrs)
Dump Truck	100,000/day (includes fuel, oil and driver)	14,716/day (7 hrs)
Stone Crusher 30T/hr		139,274/day (7 hrs)

The private sector equipment hire rates are on an all-in basis, e.g., including fuel, lube oil and operator.

The hire rates for P.U. equipment do not include cost of fuel, lube oils and operators. The kabupaten supply the operator for equipment on hire to contractors; and operators salary is paid by the contractor/hirer.

PINRANG

This Kabupaten was visited on November 16 and 17 1992. Mr. Simon Menggoe - Chief of Section, Equipment, was available on the first visit as the Head of DPUK was on business in Ujung Pandang.

Mr. Simon indicated he was acting chief of workshop-(KaUPTD) as the person to fill this position has not been formally appointed, as yet. Mr. Simon also holds other positions . It is estimated that he spends 50 percent of his time on workshop activities.

The workshop structure was built under the USAID funding Phase I and is in good condition. There are no work benches, washing trays or drip trays. The generator room is actually too small and should be relocated (PLN power, meter and panel is opposite side of the building). Currently there is no power in the workshop, excepting for a mobile welding set.

There is a second workshop in Pinrang, 7 km from the current workshop, which was originally built under OECF funding but it is now abandoned as far as a service and repair facility is concerned. It is being used to store stone aggregate produced by the kabupaten's stone crusher, which is being hired out but located on the old workshop site.

In general, equipment sighted is not well maintained, and equipment condition is wrongly reported, (if it starts and moves, it is good and classified as "baik"). Repairs are mostly on a temporary basis, without diagnosis of the root of the problem, hence, repeated repair is necessary to the same component failure.

Workshop organizational structure as seen for OECF and USAID is basically the same as approved by Bangda on a nationwide scale including RRI and RRII IBRD.

On observation, the structure is not formally in place, there is no permanent chief of workshop responsible for the management and supervision of the daily activities of personnel assigned to the workshop. Those personnel that are assigned to the workshop have other duties to perform, hence decisions are not made when required.

This shortfall also effects administration affairs in general, which leaves much to the imagination. Maintenance and repair records, equipment history records, workshop activity records and warehouse records are not readily available for review.

On/off hire inspection reports are apparently prepared by workshop and contractors staff. However, the old system of "baik, rusak ringan" terms are used, instead of agreed percentages of wear, i.e. (cutting edges, tires undercarriage, etc).

Annual budget (DURP) for 1992/93 covering OECF/USAID equipment was sighted for the total amount of Rp 65 million. However personnel salaries were not included for workshop

staff. Pemda Dati II IPJK Budget for equipment maintenance is, as always not sufficient for the needs.

Income from hire is still not proportioned correctly prior to the funds being deposited in Kas Negara in the case of OECF equipment and to Kas Daerah for USAID and Pemda equipment. The equipment maintenance funds which are included in the calculation of the hire rates, are not readily available for maintenance of the equipment.

A Mr. Danial, mechanic and temporary employee, appears to be the main stay behind the maintenance and repair section of the workshop. He also spend some of his time as an operator.

It appears he performs repairs to the Kabupaten equipment on a job per cost basis, sometimes bidding against two other parties for the job repair. This system is approved by the KaDPUK.

Mr. Noce Rumlawan - KaDPUK explained he was currently promoting a new system with local government (possibly a Koperasi PU) to overcome revolving cash problems.

SIDRAP

The workshop was rebuilt at its present site under the USAID grant, although the fleet is a combination of Pemda, OECF and USAID equipment.

Three mechanics recently left for better salaries leaving a mechanical staff of three, none of whom have had any formal training as mechanics.

Most of the workshop staff, both permanent and temporary, perform more than one task, with the resultant problem that with a senior staff member being absent while performing another duty elsewhere, facilities such as the store, tool room or workshop office may be locked and unusable during these absences.

No records of hours worked by the machines are kept by the workshop for servicing or any other purposes. Many of the machines' hour meters are broken and there is no incentive to replace them. A daily workshop activity logbook was started in September 1992 under the EMS and is still in use, but no hour meter or odometer readings are entered into it. At the time of the visit, no services had been recorded in this book since its inception.

The workshop staff perform what repairs they can as well as they can within the budget limitations. A cylinder head had been machined in Ujung Pandang and was waiting to be refitted to the wheel loader, and an engine was being overhauled for a roller.

A motor grader in the workshop was said to have been broken down for over one year waiting for hydraulic hoses. These hoses can be easily made up at the dealer's workshop in Ujung Pandang The same motor grader was also in need of many other repairs which there were no plans to carry out.

A particular problem in maintaining the equipment commented on by the workshop staff was the equipment being "loaned" to contractors for short periods, three or four hours, but not actually returning to the workshop for two or three weeks, or sometimes, one or two months.

Three dump trucks have been cannibalized since coming into the workshops in 1989 for engine overhauls, and another dump truck has been in the workshop since 1990 waiting for an engine overhaul. Cannibalization of this latter truck has not yet begun. The reason given for why the engine overhauls had not been carried out was that there were more vehicles than drivers.

SINJAI

Sinjai has received no OECF assistance, all equipment and facilities have been provided through USAID and Pemda budgets.

Much of the equipment appears to have had little use and is generally in relatively good condition, although some of the older equipment had grease nipples broken or missing and the fuel filter on the Royal 90 motor grader had been over tightened when fitted, indicating a lack of attention to simple routine maintenance.

There is a Barata MTD.80 bulldozer, with less than 1,000 hours on its hour meter, which has been broken down for approximately three years with a transmission problem which none of the workshop staff appear to able to rectify. Barata's own mechanic could not repair this transmission when he assisted in presenting a six day transmission maintenance training course at the workshop, given as part of the EMS implementation.

If the workshop staff realize that such a repair is beyond their experience, then they are acting correctly in not removing and dismantling the transmission. Such a repair could be considered the work of a specialist mechanic who would normally be provided by the equipment manufacturers or their dealers, at a cost if the machine was out of warranty.

At the time of visiting the workshop, much of the equipment was on standby although most of the rollers were still working on projects. One of the dump trucks was being repainted although no mechanical repairs were being made to this vehicle.

The workshop and stores are very tidy and well kept All of the personnel spoken to during the visit to this workshop seemed very enthusiastic to keep everything in good order, but despite this, there are no records kept of equipment maintenance or history.

Although this workshop does not have a trailer, the workshop staff said that they use a truck for moving their rollers when they are to travel any distance, which is probably why there is a relatively high availability of rollers, even the older ones, in reasonably good condition.

TAKALAR

The old OECF workshop has been refurbished through USAID and the equipment fleet consists of OECF. USAID and Pemda funded equipment.

Much of the heavy equipment is from OECF and despite its relatively low working hours for its age, approximately 4,000 hours in twelve years, many items, although still working, are in need of many repairs, some major if they are to be expected to provide another 6,000 hours of useful service.

The bull dozer,(OECF supplied), has been broken down for several months with a failed track idler. The machine was on hire to a contractor at the time of the breakdown, making the contractor responsible for repair costs, but the contractor can not afford the cost of the repair.

The work room, for engine and gearbox overhauls, is also used as a general store for tools and workshop equipment, with only the USAID supplied tooling being locked in the provided tool store. This seems to be for convenience, because the OECF tools are still in use and the USAID tools locked in the tool store for security.

This work room is now very cluttered and untidy. At least one engine, which has been dismantled prior to overhaul, is stored in this room with all of the other workshop equipment and in a situation like this, parts can easily be lost.

The present Chief of DPUK is seconded from Bina Marga and so is familiar with the Bina Marga system for keeping equipment records. However, he arrived at Takalar only a few months ago and has not yet been able to implement all of the recording systems or bring existing lapsed systems up to date

There is not yet a preventive maintenance schedule, only histories of maintenance, recorded on the service cards, in the log books and in the workshop daily activity logbook. The most accurate records are the workshop daily activity logbook and the heavy equipment logbooks. All existing heavy files are up to date but not the vehicle files.

BELU

At the time of visiting the Belu DPUK workshop at Atambua, (December 2nd, 1992), DPUK were celebrating their founding day and some senior members of the workshop personnel were not available for discussions or to provide access to documents.

The workshop was originally built through OECF funding and is used for the maintenance of all PU equipment in the kabupaten, not just the DPUK fleet. The equipment fleet is the largest in the study kabupatens.

The equipment is hired out to contractors to make up shortages in their own fleets. At the time of visiting Belu, all of the contractors engaged in road work had equipment fleets of their own but were hiring additional equipment from DPUK. Additionally, DPUK were executing two *Swakelola* projects.

Monthly equipment reports showing hours worked and repair costs are prepared, but workshop reports could not be inspected because the head of sub-section workshop was not available.

Although much effort is made to maintain equipment records, there is an acknowledged lack of skilled mechanics which causes prolonged repair down times.

The workshop itself is not very well maintained. It is untidy with eight engines removed from equipment laying around the workshop in various states of disassembly as well as other partly dismantled equipment. There was no evidence of any breakdown identification system being in use, such as the EMS recommendation which is being implemented in Jeneponto.

Routine maintenance and servicing, which is said to be planned and performed regularly could not be checked because of records being locked up. The items of equipment inspected on site appeared generally to have been relatively well looked after compared to some kabupatens, (such as Takalar and Sidrap), although there were obvious signs of poor maintenance which may due to the lack of skills, experience or even training rather than deliberate neglect.

The EMS consultant, STV/Lyon Associates, circulated a questionnaire to all of the kabupaten workshops in November as part of their monitoring of workshop performance and capabilities. In answer to the question regarding repairs to transmissions, hydraulics and other major units, Belu said that engines could not be overhauled in the DPUK workshop.

No reason was given for this, it is probably due to lack of skills, although in Belu all of the DPUK workshop mechanics are permanent staff and so should have access to some training. Additionally, the Chief of Workshops/Equipment was promoted from a workshop mechanic. However, if there is an acknowledged lack of sufficient skills to overhaul an engine, then the workshop staff are correct in not attempting to perform work which they know is beyond

their capabilities. It would explain why so many engines are laying around the workshop, although it does not excuse the untidy storage of them.

In many of the other kabupatens, such a lack of skills would not present a problem because outside workshops are available which can augment this deficiency if necessary. In Belu though, there are no other workshops. The contractors spoken to agreed that the Belu DPUK workshop was the best facility in the kabupaten, even though engine overhauls can not be performed there.

The concept of the Alkal workshops is that they assist in situations like this by providing skilled labor to either perform the overhaul, or preferably, assist the DPUK workshop staff in performing the overhaul thereby developing their skills. So far this assistance has failed to materialize, although no reasons for this were forthcoming.

Engine overhaul training has not yet been addressed by the EMS consultant's team according to their draft report of August, 1992. Some useful practical training could be organized in engine overhauls for Belu through the EMS, and also for Kupang, where a similar situation exists.

KUPANG

The team visited the kabupaten of Kupang on Monday November 30, 1992 and met the Ka DPUK, Ir. Piter Djami Rebo. The purpose of the team to conduct a study of equipment maintenance and repair procedures in the kabupatens of Kupang and Belu during the period of Monday November 30 through December 5, 1992 was explained.

The Kupang workshop design and construction is similar to the IBRD Rural Roads program, and workshop has been well kept, is clean, tidy and in good condition. Workshop routine maintenance should commence this year as there are noticeable defects appearing in the structure paintwork Workshop tools and equipment were jointly funded by IBRD and USAID and have been set out as recommended by previous and current consultants

A point worthy of mention is that this is the only kabupaten workshop in the RRMS study area, that is equipped with the recommended standard workshop benches and have the bench vices and wheel grinders mounted correctly.

The DPUK equipment and workshop organizational structure is still not formally in place and the current chief of workshop Mr A.L (Alex) Tukapenu is not able to manage his own budget for the workshop and equipment operations and maintenance as the budget is controlled by the project manager in bendaharawan. This system does not give any incentive to the chief of workshop to run a well managed operation as he is not directly responsible.

Administration in general is in order, with equipment maintenance and repair records in place, though one did reach the opinion there was a shortage of administration staff as some records were only pencilled in.

Warehouse and tool store layout, shelving, bins and tool identification boards are well established. The standard procedures as provided in the EMS guidelines are being implemented, however one possible cause for alarm was discovered in the spare parts stock cards. There was only one issue of an engine oil filter for the two units of Caterpillar/Royal 90 T motor graders in a two year period.

There could well be an explanation for this problem, e.g. the contractor having the equipment on hire is changing the oil filter at the scheduled oil change. However, the Caterpillar/Royal 90 T motor grader inspected on the kabupaten swakelola project on the island of Simau, had 1536 service meter hours and had never had the oil filter changed since new.

This was obvious by the factory painted oil filter still on the engine, supported by the operator as he conceded the oil filter on the engine could not be removed as the special tool was not available. The operator was in possession of a replacement oil filter that had been new, but removed from its original packing and kept in the tool compartment. The filter was already in a rusty condition.

Preventative maintenance is another weak point with this kabupaten. Vehicles and equipment that are in close proximity of the workshop area are receiving some attention. Equipment on hire to projects are supposed to be serviced by the contractors. However, there is a lack of supervision of contractors maintenance procedures by the owner of the equipment, hence a lackadaisical attitude to the importance of preventative maintenance.

Equipment sighted in the field was being greased. but not in the right places. Important high wear grease points had not been greased possibly since new, e.g. all motor graders did not have the front axing oscillating pin greased, wheel loaders did not have all bucket pins greased properly, bulldozers did not have all trunnion points greased correctly, and one machine had 2072 hours on the service meter and the trunnion grease zerks were completely burred over and rusty.

The kabupaten workshop has two permanent mechanics, which if considering the size of the equipment fleet one would think this is not enough, however as a lot of the equipment is on hire (repaired by contractors) and some of the fleet is quite new, the two mechanics probably suffice However, a mechanic is immediately required in the field to repair the many defects and perform the many preventative maintenance tasks that exist.

Another shortcoming observed was that the daily operation logbooks, supposedly kept by the operators and filled in daily, were not available. One logbook showed a entry of September which was two months old, but details of equipment defects were not noted.

The operator claimed his supervisor from the workshop did not normally visit the location and it was difficult to report breakdowns, submit logbooks, etc.

In conclusion, the obvious signs of poor maintenance may well be due to the lack of skills, or possibly training is not being absorbed.

ANNEX ONE

TABLES

Table I–1
EQUIPMENT LIST – KABUPATEN BONE

		Type	Fleet No	Make/Model	Owner/Source	Year	Condition
1	Motorcycle	L	DD 955 W	Honda Win	DPU, USaid	1988	G
2	Motorcycle	L	DD. 956 W	Honda Win	DPU, USaid	1988	G
3	Pick – up	L	DD. 600 W	Chevrolet Luv	DPU, USaid	1988	G
4	Pick – up	L	DD. 601 W	Mitsubishi Colt	DPU, USaid	1988	G
5	Flat Bed Truck	L	DD. 610 W	Toyota Dyna Rino	DPU, USaid	1990	G
6	Water Tank Truck	L	DD. 611 W	Isuzu	DPU, USaid	1990	G
7	Asphalt Sprayer	L	AE/150/231	Sakai Sakti SAS 200	DPU, OECF	1989	G
8	Mini Vib Roller	L	AE/086/441	Barata MGD1000	DPU, OECF	1985	G
9	Tandem Vib Roller	H	–	Barata MGD.7	DPU, USaid	1989	G
10	Dump Truck	L	AE/212/14 R	Toyota Dyna	DPU, OECF	1980	F
11	Dump Truck	L	AE/212/15 R	Toyota Dyna	DPU, OECF	1980	F
12	Dump Truck	L	AE/212/17 R	Toyota Dyna	DPU, OECF	1980	P
13	Dump Truck	L	AE/212/69 R	Toyota Dyna	DPU, OECF	1980	G
14	Dump Truck	L	AE/212/78 R	Toyota Dyna	DPU, OECF	1980	F
15	Dump Truck	L	AE/212/80 R	Toyota Dyna	DPU, OECF	1980	F
16	Dump Truck	L	AE/212/82 R	Toyota Dyna	DPU, OECF	1980	G
17	Dump Truck	L	AE/212/89 R	Toyota Dyna	DPU, OECF	1980	P
18	Dump Truck	L	AE/212/91 R	Toyota Dyna	DPU, OECF	1980	G
19	Dump Truck	L	AE/212/92 R	Toyota Dyna	DPU, OECF	1980	P
20	Dump Truck	L	AE/212/93 R	Toyota Dyna	DPU, OECF	1980	G
21	Dump Truck	L	AE/212/94 R	Toyota Dyna	DPU, OECF	1980	P
22	Dump Truck	L	AE/212/96 R	Toyota Dyna	DPU, OECF	1980	G
23	Dump Truck	L	AE/212/98 R	Toyota Dyna	DPU, OECF	1980	P
24	Compressor	L	AE/301/038	Airman	DPU, OECF	1980	G
25	Stone Crusher	H	AE/032/058		DPU, OECF	1980	F
26	Bull Dozer	H	AE/011/124	Komatsu	DPU, OECF	1980	F
27	Wheel Loader	H	AE/052/193	Kobelco	DPU, OECF	1980	G
28	Motor Grader	H	AE/010/249	Komatsu	DPU, OECF	1980	G
29	Motor Grader	H	AE/010/250	Komatsu	DPU, OECF	1980	G
30	Tire Roller	H	AE/084/426	Kawasaki	DPU, OECF	1980	G
31	Tire Roller	H	AE/084/427	Kawasaki	DPU, OECF	1980	G
32	Roller	H		Barata 8T	Pemda	?	P
33	Roller	H		Barata 8T	Pemda	?	F
34	Roller	H		Barata 6T	Pemda	?	G
35	Roller	H		Barata 6T	Pemda	?	G
36	Roller	L		Barata 2.5T	Pemda	?	P
37	Roller	L		Barata 2.5T	Pemda	?	P

L = Light Equipment including Vehicles
H = Heavy Equipment

NOTE:
G = GOOD
F = FAIR
P = POOR
S = SCRAP

Table I–2
Equipment List – Kabupaten Bulukumba

	Description	Type	Fleet No	Make/Model	Owner/Source	Year	Condition
1	Mini Roller	L	08.01.07.02	Barata	Pemda	1982	P
2	Mini Roller	L	08.01.07.01	Barata	Pemda	1977	S
3	3 Wheel Roller	H	08.01.07.01	Barata	Pemda	1983	S
4	Tandem Roller	H	08.01.07.02	Barata MG6	Pemda	1984	P
5	Tandem Roller	H	08.01.07.02	Barata MG6	Pemda	1986	S
6	Motorcycle	L	09.01.05.01	Honda CB 100	Pemda	1980	G
7	Motorcycle	L	09.01.05.01	Honda CB 100	Pemda	1980	G
8	Stamper	L	08.01.07.09	Barata	Pemda	1983	?
9	Truck	L	08.01.05.03	Mitsubishi L 300	Pemda	1983	G
10	Asphalt Sprayer	L	08.01.06.03	Honda BGP 3X	Pemda	1985	F
11	Pick–up	L	09.01.07.03	Toyota Hi Ace	Pemda	1985	F
12	Concrete Mixer	L	08.01.07.03	Yanmar	Pemda	1985	F
13	Compressor	L	08.03.03	Honda	Pemda	1989	?
14	Pick Up	L	09.01.03.03	Toyota Kijang	Pemda	1986	G
15	Bulldozer	H	08.01.02.03	Barata	Pemda	1986	S
16	Compressor	L	08.03.03		Pemda	1989	G
17	Lawn Mower	L	02.03.03	Honda	DPU, USAID	1989	G
18	Generator	L	01.02.02.02	Honda	DPU, USAID	1989	G
19	Motorcycle	L	09.01.05.02	Yamaha 100 cc	DPU, USAID	1989	G
20	Motorcycle	L	09.01.05.02	Yamaha 100 cc	DPU, USAID	1991	G
21	Motorcycle	L	08.01.05.02	Honda MCB 100	DPU, USAID	1991	G
22	Motorcycle	L	08.01.05.02	Honda MCB 100	DPU, USAID	1991	G
23	Dump Truck	L	08.01.05.03	Mitsubishi	DPU, USAID	1988	G
24	Dump Truck	L	08.01.05.03	Mitsubishi	DPU, USAID	1988	G
25	Dump Truck	L	08.01.05.03	Mitsubishi	DPU, USAID	1988	G
26	Dump Truck	L	08.01.05.03	Mitsubishi	DPU, USAID	1988	G
27	Motorcycle	L	09.01.05.01	Honda Win 100	DPU, USAID	1988	G
28	Motorcycle	L	09.01.05.01	Honda Win 100	DPU, USAID	1988	G
29	Asphalt Sprayer	L	08.01.05.03	Sakai 200	DPU, USAID	1988	G
30	Pedestrian Vibrol	L	08.01.00.04	Barata MG 1000	DPU, USAID	1988	G
31	Motor Grader	H	08.01.09.01	Royal GNI 509	DPU, USAID	1989	G
32	Wheel Loader	H	08.01.09.02	Barata MWL 100	DPU, USAID	1989	G
33	Tandem Vib. Roller	H	08.01.07.02	Barata MGB 7	DPU, USAID	1989	G
34	Pick–up	L	09.01.03.03	Mitsubishi L 300	DPU, USAID	1989	G
35	Pick–up	L	09.01.03.02	Chevrolet	DPU, USAID	1989	G
36	Water Tank Truck	L	09.01.03.02	Isuzu KPS 3000	DPU, USAID	1989	G
37	Flat Bed Truck	L	08.01.05.03	Toyota Dyna	DPU, USAID	1989	G
38	Motorcycle	L	09.01.05.02	Suzuki 100 cc	DPU, USAID	1992	G
39	Motorcycle	L	09.01.05 02	Honda Win 100	DPU, USAID	1992	G
40	Motorcycle	L	09.01.05.02	Suzuki RC 100	DPU, USAID	1992	G

L = Light Equipment including Vehicles
H = Heavy Equipment

G = GOOD
F = FAIR
P = POOR
S = SCRAP

Table I–3
Equipment List – Kabupaten Jeneponto

	Description	Type	Fleet No	Make/Model	Owner/Source	Year	Condition
1	Bull Dozer	H	AE/001/130	Komatsu D50–16	DPU, OECF	1980	G
2	Motor Grader	H	AE/010/260	Komatsu G31–RC3	DPU, OECF	1980	G
3	Wheel Loader	H	AE/052/203	Kobelco LK300	DPU, OECF	1980	F
4	Tire Roller	H	AE/084/436	Kawasaki KR20 C	DPU, OECF	1980	F
5	Stone Crusher	H	AE/032/060	M i n y u	DPU, OECF	1980	G
6	Dump Truck	L	AE/212/25 R	Toyota Dyna BU30	DPU, OECF	1980	P
7	Dump Truck	L	AE/212/28	Toyota Dyna	DPU, OECF	1980	P
8	Dump Truck	L	AE/212/29 R	Toyota Dyna	DPU, OECF	1980	G
9	Dump Truck	L	AE/212/30 R	Toyota Dyna	DPU, OECF	1980	F
10	Dump Truck	L	AE/212/31 R	Toyota Dyna	DPU, OECF	1980	F
11	Dump Truck	L	AE/212/32 R	Toyota Dyna	DPU, OECF	1980	F
12	Dump Truck	L	AE/212/62 R	Toyota Dyna	DPU, OECF	1980	F
13	Dump Truck	L	AE/212/65 R	Toyota Dyna	DPU, OECF	1980	P
14	Dump Truck	L	AE/212/68 R	Toyota Dyna	DPU, OECF	1980	G
15	Dump Truck	L	DD. 613 G	Toyota Dyna	Pemda Tk. II		G
16	Tandem Roller	H	–	Barata	Pemda Tk. II		G
17	Tandem Roller	H	–	Barata MGB–6	Pemda Tk II		G
18	Tandem Roller	H	–	Barata MGB–7	DPU, USAID	1988	G
19	Mini Roller	L	AE/086/229	Barata 1000	DPU, USAID	1988	F
20	Hand Compactor	L	–	-	DPU, USAID	1988	G
21	Flat Bed Truck	L	DD. 610 G	Toyota Rino	DPU, USAID	1988	G
22	Water Tank Truck	L	DD. 609 G	Isuzu	DPU, USAID	1988	G
23	Pick –up Utility	L	DD. 11 G	Mitsubishi	DPU, USAID	1988	G
24	Pick–up Chev	L	DD. 631 G	Chevrolet	DPU, USAID	1988	G
25	Motorcycle	L	DD. 795 G	Honda Win 100 cc	DPU, USAID	1988	G
26	Motorcycle	L	DD. 796 G	Honda Win 100 cc	DPU, USAID	1989	G
27	Motorcycle	L	DD. 797 G	Honda Win 100 cc	DPU		G
28	Motorcycle	L	DD. 800 G	Honda Win 100 cc	DPU		G
29	Asphalt Sprayer	L					

L = Light Equipment including Vehicles
H = Heavy Equipment

G = GOOD
F = FAIR
P = POOR
S = SCRAP

Table I–4
Equipment List – Kabupaten Pinrang

	Description	Type	Fleet No	Make/Model	Owner/Source	Year	Condition
1	Dump Truck	L	AE/212/11R	Toyota Dyna BU30	DPU, OCEF	1981	F
2	Dump Truck	L	AE/212/11R	Toyota Dyna BU30	DPU, OCEF	1981	S
3	Dump Truck	L	AE/212/11R	Toyota Dyna BU30	DPU, OCEF	1981	S
4	Dump Truck	L	AE/212/11R	Toyota Dyna BU30	DPU, OCEF	1981	G
5	Dump Truck	L	AE/212/11R	Toyota Dyna BU30	DPU, OCEF	1981	G
6	Dump Truck	L	AE/212/11R	Toyota Dyna BU30	DPU, OCEF	1981	S
7	Dump Truck	L	AE/212/11R	Toyota Dyna BU30	DPU, OCEF	1981	G
8	Dump Truck	L	AE/212/11R	Toyota Dyna BU30	DPU, OCEF	1981	G
9	Dump Truck	L	AE/212/11R	Toyota Dyna BU30	DPU, OCEF	1981	G
10	Dump Truck	L	AE/212/11R	Toyota Dyna BU30	DPU, OCEF	1981	G
11	Dump Truck	L	AE/212/11R	Toyota Dyna BU30	DPU, OCEF	1981	?
12	Bull Dozer	H	AE/001/126	Komatsu D–50A	DPU, OCEF	1981	S
13	Grader	H	AE/010/254	Komatsu GD–31	DPU, OCEF	1981	G
14	Grader	H	AE/010/255	Komatsu GD–31	DPU, OCEF	1981	G
15	Wheel Loader	H	AE/052/196	Kobelco LK–300	DPU, OCEF	1981	G
16	Wheel Loader	H	AE/052/197	Kobelco LK–300	DPU, OCEF	1981	G
17	Tyre Roller	H	AE/084/430	Kawasaki KR–20	DPU, OCEF	1981	G
18	Tyre Roller	H	AE/084/431	Kawasaki KR–20	DPU, OCEF	1981	P
19	Stone Crusher	H	AE/032/047	Minyu FDR 250	DPU, OCEF	1981	G
20	Compressor	L	AE/301/043	Airman	DPU, OCEF	1981	F
21	Concrete Mixer	L	AE/252/047	Gold Star	DPU, OCEF	1981	P
22	Motor Cycle	L	DD.929 N	Suzuki 80cc	DPU, OCEF	1984	F
23	Mini Vib Roller	L	?	Barata	DPU, USaid	1988	F
24	Asphalt Sprayer	L	?	Sakai Sakti	DPU, USaid	1988	F
25	Pick Up	L	DD.620N	Mitsubishi	DPU, USaid	1988	G
26	Pick Up	L	DD.627N	Chevrolet	DPU, USaid	1988	P
27	Flat Bed Truck	L	DD,631N	Totota Rino	DPU, USaid	1988	G
28	Water Tank Truck	L	DD.631N	Isuzu	DPU, USaid	1988	G
29	Tandem Roller	L	?	Barata MGB 1000	DPU, USaid	1988	G
30	Motor Cycle	L	DD.932N	Honda Win	DPU, USaid	1988	G
31	Motor Cycle	L	DD.933N	Honda Win	DPU, USaid	1988	G
32	3 Pt Roller	H	?	Barata 8ton	DPU	1974	S
33	3 Pt Roller	H	?	Barata 8ton	DPU	1974	F
34	3 Pt Roller	H	?	Barata 8ton	DPU	1974	G
35	3 Pt Roller	H	?	Barata 8ton	DPU	1983	F
36	Stone Crusher	H	?	Barata	DPU	1979	S
37	Mobil truck	L	?	Toyota	DPU	1980	F
38	Dump Truck	L	?	Toyota	DPU	1960	G
39	Walls Mini Roller	L	?	Barata	DPU	1981	S
40	Walls Mini Roller	L	?	Barata	DPU	1982	F
41	Walls Mini Roller	L	?	Barata	DPU	1983	G
42	Tandem Roller	H	?	Barata 6ton	DPU	1984	F
43	Pick Up	L	DD.610N	Toyota	DPU	1985	G
44	Dump Truck	L		Isuzu	DPU	1991	G

L = Light Equipment including Vehicles
H = Heavy Equipment

G = GOOD
F = FAIR
P = POOR
S = SCRAP

Table I–5
Equipment List – Kabupaten Sidrap

	Description	Type	Fleet No	Make/Model	Owner/Source	Year	Condition
1	Motor Grader	H	AE/010/252	Komatsu 4D130–1 A	DPU, OECF	1981	G
2	Wheel Loader	H	AE/052/194	Mitsubishi 6DR5 PC	DPU, OECF	1981	P
3	Tire Roller	H	AE/084/429	Isuzu DA–120	DPU, OECF	1981	F
4	Dump Truck	L	AE/212/45 R	Toyota – B	DPU, OECF	1981	G
5	Dump Truck	L	AE/212/46 R	Toyota – B	DPU, OECF	1981	G
6	Dump Truck	L	AE/212/47 R	Toyota – B	DPU, OECF	1981	F
7	Dump Truck	L	AE/212/48 R	Toyota – B	DPU, OECF	1981	F
8	Dump Truck	L	AE/212/49 R	Toyota – B	DPU, OECF	1981	P
9	Dump Truck	L	AE/212/50 R	Toyota – B	DPU, OECF	1981	G
10	Dump Truck	L	AE/212/51 R	Toyota – B	DPU, OECF	1981	P
11	Dump Truck	L	AE/212/52 R	Toyota – B	DPU, OECF	1981	P
12	Dump Truck	L	AE/212/53 R	Toyota - B	DPU, OECF	1981	P
13	Stone Crusher	H	AE/023/057	Minyu GS	DPU, OECF	1981	F
14	Bull Dozer	H	AE/001/128	Komatsu 4D130–1	DPU, OECF	1981	G
15	Motor Grader	H	AE/010/253	Komatsu GD 31 RC	DPU, OECF	1981	G
16	Wheel Loader	H	AE/052/195	Kobelco LK 300	DPU, OECF	1981	G
17	Tire Roller	H	AE/084/428	Kawasaki KR 20 C	DPU, OECF	1981	G
18	Dump Truck	L	AE/212/04 R	Toyota Dyna BU–30	DPU, OECF	1981	G
19	Dump Truck	L	AE/212/05 R	Toyota Dyna BU–30	DPU, OECF	1981	G
20	Dump Truck	L	AE/212/07 R	Toyota Dyna BU–30	DPU, OECF	1981	P
21	Dump Truck	L	AE/212/06 R	Toyota Dyna BU–30	DPU, OECF	1981	F
22	Dump Truck	L	AE/212/08 R	Toyota Dyna BU–30	DPU, OECF	1981	P
23	Concrete Mixer	L	AE/252/046	Golden Star, Mistsubishi	DPU, OECF	1981	F
24	Air Compressor	L	AE/301/039	Air Man, Isuzu	DPU, OECF	1981	F
25	Pick–up	L	DD. 629 M	Mitsubishi L 300	DPU, USAID	1989	G
26	Pick–up	L	DD. 637 M	Chevrolet KBD 26 UA	DPU, USAID	1989	G
27	Flat Bed Truck	L	DD. 638 M	Toyota Dyna	DPU, USAID	1989	G
28	Motorcycle	L	DD. 895 M	Honda Win	DPU, USAID	1989	G
29	Motorcycle	L	DD. 894 M	Honda Win	DPU, USAID	1989	G
30	Asphalt Sprayer	L	AE/150/232	Sakai, SAS 200 L	DPU, USAID	1989	F
31	Hand Vib. Roller	L	AE/066/442	Barata MGD 1000	DPU, USAID	1989	F
32	Tandem Vib. Roller	H	–	Barata MGB 7	DPU, USAID	1989	G
33	Water Tank Truck	L	DD. 636 M	Isuzu Diesel TLD 66	DPU, USAID	1989	G

L = Light Equipment including Vehicles
H = Heavy Equipment

G = GOOD
F = FAIR
P = POOR
S = SCRAP

Table I–6
Equipment List – Kabupaten Sinjai

	Description	Type	Fleet No	Make/Model	Owner/Source	Year	Condition
1	Roller	H	01 Sj	Barata MV 6	APBD TK. I	1974	F
2	Roller	H	02 Sj	Barata MV 6	APBD TK. I	1975	P
3	Roller	H	03 Sj	Barata MV 6	APBD TK. I	1976	F
4	Roller	H	04 Sj	Barata MV 6	APBD TK. I	1977	F
5	Stone Crusher	H	05 Sj	Barata DDF.I	APBD TK. I	1979	F
6	Roller	H	06 Sj	Barata MGB.I	APBD TK. I	1980	F
7	Roller	H	07 Sj	Barata MGB.I	APBD TK. I	1981	F
8	Roller	H	08 Sj	Barata MGB.I	APBD TK. I	1982	F
9	Roller	H	09 Sj	Barata MG.6	APBD TK. I	1983	G
10	Vibroller Tandem	H	10 Sj	Barata MGT.6	APBD TK. I	1985	F
11	Vibroller Tandem	H	–	Barata MGB.7	DPU, USAID	1989	G
12	Vibroller Hand	L	–	Barata MGD.1000	DPU, USAID	1989	G
13	Asphalt Sprayer	L	–	Sakai SAS 200 L	DPU, USAID	1989	F
14	Bull Dozer	H	–	Barata MTD.80	APBD TK. I	1987	P
15	Wheel Loader	H	–	Barata MWL 100	DPU, USAID	1989	F
16	Motor Grader	H	–	Royal Cat 90 T	DPU, USAID	1989	G
17	Dump Truck	L	DD. 606 Z	Nissan	APBD TK. I	1970	F
18	Dump Truck	L	DD. 609 Z	Mitsubishi FE 114 Colt	DPU, USAID	1988	G
19	Dump Truck	L	DD. 610 Z	Mitsubishi FE 114 Colt	DPU, USAID	1988	G
20	Dump Truck	L	DD. 611 Z	Mitsubishi FE 114 Colt	DPU, USAID	1988	G
21	Dump Truck	L	DD. 612 Z	Mitsubishi FE 114 Colt	DPU, USAID	1988	G
22	Water Tank Truck	L	DD. 615 Z	Isuzu LTD 56	DPU, USAID	1989	G
23	Flat Bed truck	L	DD. 617 Z	Toyota Rino BY. 43	DPU, USAID	1989	G
24	Motorcycle	L	DD. 645 Z	Honda Win 100	DPU, USAID	1988	F
25	Motorcycle	L	DD. 646 Z	Honda Win 100	DPU, USAID	1988	F
26	Pick–up	L	DD. 17 Z	Mitsubishi Colt	APBD TK. II	1987	F
27	Pick–up	L	DD. 115 Z	Mitsubishi L 300	DPU, USAID	1989	G
28	Pick–up	L	DD. 614 Z	Chevrolet Luv	DPU, USAID	1989	G
29	Motorcycle	L	DD. 772 Z	Honda GL PRO	DPU, USAID	1989	G
30	Motorcycle	L	DD. 781 Z	Honda Federal	DPU, USAID	1989	G
31	Jeep	L	–	Isuzu ST Wagon	DPU, USAID	1989	G

L = Light Equipment including Vehicles
H = Heavy Equipment

G = GOOD
F = FAIR
P = POOR
S = SCRAP

Table I–7
Equipment List – Kabupaten Takalar

	Description	Type	Fleet No	Make/Model	Owner/Source	Year	Condition
1	Bull Dozer	H	AE/001/123	Komatsu D50–A	DPU, OECF	1980	F
2	Loader	H	AE/052/191	Kobelco LK	DPU, OECF	1980	F
3	Grader	H	AE/010/247	Komatsu 300	DPU, OECF	1980	G
4	Tyre roller	H	AE/084/424	Kawasaki	DPU, OECF	1980	G
5	Dump Truck	L	AE/212/00 R	Dyna/BU.30	DPU, OECF	1980	G
6	Dump Truck	L	AE/212/02 R	Dyna/BJ.30	DPU, OECF	1980	G
7	Dump Truck	L	AE/212/03 R	Dyna/DU./30	DPU, OECF	1980	G
8	Dump Truck	L	AE/212/24 R	Dyna/BU.30	DPU, OECF	1980	G
9	Dump Truck	L	AE/212/54 R	Dyna/BU.30	DPU, OECF	1980	P
10	Dump Truck	L	AE/212/55 R	Dyna/BU.30	DPU, OECF	1980	S
11	Dump Truck	L	AE/212/57 R	Dyna/BU.30	DPU, OECF	1980	P
12	Dump Truck	L	AE/212/58 R	Dyna/BU.30	DPU, OECF	1980	P
13	Pedestrian Roller	L	–	Barata	Pemda Tk II	1980	G
14	Pedestrian Roller	L	–	Barata	Pemda Tk. II	1982	P
15	Pedestrian Roller	L	–	Barata	Pemda Tk. II	1982	F
16	Motor Roller	H	01	Barata	Pemda Tk. II	1973	F
17	Motor Roller	H	02	Barata	Pemda Tk. II	1975	P
18	Motor Roller	H	04	Barata	Pemda Tk. II	1977	G
19	Motor Roller	H	05	Barata	Pemda Tk. II	1983	F
20	Compactor	L	00	Barata	Pemda Tk. II	1982	S
21	Compactor	L	01	Barata	Pemda Tk. II	1983	S
22	Compactor	L	02	Barata	Pemda Tk. II	1983	S
23	Compactor	L	03	Barata	Pemda Tk. II	1983	S
24	Asphalt Sprayer	L	–	Barata	DPU, OECF	1984	G
25	Compressor	L	–	Barata	DPU, OECF	1986	G
26	Motorcycle	L	DD. 1703 C	Honda Win 100 cc	DPU, USAID	1989	G
27	Motorcycle	L	DD. 1104 C	Honda Win 100 cc	DPU, USAID	1989	G
28	Pick–up	L	DD. 9 C	Mitsubishi	DPU, USAID	1989	G
29	Pick–up	L	DD 24 C	Mitsubishi	DPU, USAID	1989	G
30	Asphalt Sprayer	L	AE/150/228	Salmi AS 200	DPU, USAID	1989	G
31	Vibrator Roller	L	AE/086/436	MGB 1000	DPU, USAID	1989	G
32	Concrete Mixer	L	–	Yanmar TB 50	DPU, USAID	1989	G
33	Dump Truck	L	DD. 296 C	Mitsubishi	DPU, USAID	1989	G
34	Dump Truck	L	DD. 297 C	Mitsubishi	DPU, USAID	1989	G
35	Dump Truck	L	DD 298 C	Mitsubishi	DPU, USAID	1989	G
36	Dump Truck	L	DD 299 C	Mitsubishi	DPU, USAID	1989	G
37	Motor Grader	H	AE/010/401	Royce	DPU, USAID	1989	G
38	Motor Roller	H	AE/010/63	Barata	DPU, USAID	1989	G
39	Motor Roller	H	AE/010/66	Barata	DPU, USAID	1989	G
40	Pick–up	L	DD. 35 C	Chevrolet	DPU, USAID	1989	G
41	Pick–up	L	DD. 36	Chevrolet	DPU, USAID	1989	G
42	Water Tank Truck	L	DD. 306 C	Isuzu	DPU, USAID	1989	G
43	Water Tank Truck	L	DD. 307 C	Isuzu	DPU, USAID	1989	G
44	Flat Bed Truck	L	DD. 02 C	Toyota Dyna Rino	DPU, USAID	1989	G
45	Flat Bed Truck	L	DD. 308 C	Toyota Dyna Rino	DPU, USAID	1989	G
46	Loader	H	AE/032/441	Cast.680 A	DPU, USAID	1989	G

L= Light Equipment including Vehicles
H = Heavy Equipment

G = GOOD
F = FAIR
P = POOR
S = SCRAP

Table I–8a
Equipment List, Kabupaten Belu

	Description	Type	Fleet No	Make/Model	Owner/Source	Year	Condition
1	Bull Dozer	H	AE/001/113	Komatsu D 50 A	DPU, OECF	1981	G
2	Bull Dozer	H	AE/001/114	Komatsu D 50 A	DPU, OECF	1981	G
3	Bull Dozer	H	5300/003/002	Caterpillar D6C	DPU, NTT	1976	S
4	Motor Grader	H	AE/010/238	Komatsu GD31 RC3A	DPU, OECF	1980	G
5	Motor Grader	H	AE/010/239	Komatsu GD31 RC3A	DPU, OECF	1980	G
6	Wheel Loader	H	AE/052/184	Kobelco LK 300	DPU, OECF	1980	G
7	Wheel Loader	H	AE/052/185	Kobelco LK 300	DPU, OECF	1980	G
8	Tandem Roller	H	44/086/D32	Taykioko TR	DPU, NTT	1983	P
9	Ped. Vibrol	L		Barata MGB1000	DPU, USAID	1989	G
10	Vibrating Plate	L		Barata MP100	DPU, USAID	1989	G
11	Vibrating Plate	L	08010709001	Barata MP100	DPU, NTT	1982	F
12	Vibrating Plate	L	08010709001	Barata MP100	DPU, NTT	1982	G
13	Vibrating Plate	L	08010709001	Barata MP100	DPU, NTT	1983	G
14	Vibrating Plate	L	08010709001	Barata MP100	DPU, NTT	1983	G
15	Asphalt Sprayer	L		Sakai 800	DPU, USAID	1989	G
16	Asphalt Sprayer	L	12.1604058406	Hotta	DPU, OECF	1984	P
17	Water Tank Truck	L		Isuzu TLD56	DPU, USAID	1989	G
18	Water Tank Truck	L		Isuzu TLD56	DPU, NTT	1990	G
19	Dump Truck	L	AE/212/493	Isuzu TLD 54	DPU NTT	1980	P
20	Dump Truck	L	AE/212/58 N	Toyota BU. 30	DPU, OECF	1980	G
21	Dump Truck	L	AE/212/59 N	Toyota BU. 30	DPU, OECF	1980	G
22	Dump Truck	L	AE/212/60 N	Toyota BU. 30	DPU, OECF	1980	F
23	Dump Truck	L	AE/212/61 N	Toyota BU. 30	DPU, OECF	1980	P
24	Dump Truck	L	AE/212/62 N	Toyota BU. 30	DPU, OECF	1980	G
25	Dump Truck	L	AE/212/63 N	Toyota BU. 30	DPU, OECF	1980	G
26	Dump Truck	L	AE/212/64 N	Toyota BU. 30	DPU, OECF	1980	P
27	Dump Truck	L	AE/212/65 N	Toyota BU. 30	DPU, OECF	1980	G
28	Dump Truck	L	AE/212/66 N	Toyota BU. 30	DPU, OECF	1980	F
29	Dump Truck	L	AE/212/67 N	Toyota BU. 30	DPU, OECF	1980	P
30	Dump Truck	L	AE/212/68 N	Toyota BU. 30	DPU, OECF	1980	G
31	Dump Truck	L	AE/212/69 N	Toyota BU. 30	DPU, OECF	1980	G
32	Dump Truck	L	AE/212/70 N	Toyota BU. 30	DPU, OECF	1980	P
33	Dump Truck	L	AE/212/71 N	Toyota BU 30	DPU, OECF	1980	G
34	Dump Truck	L	AE/212/72 N	Toyota BU. 30	DPU, OECF	1980	G
35	Dump Truck	L	AE/212/73 N	Toyota BU. 30	DPU, OECF	1980	G
36	Dump Truck	L	AE/212/74 N	Toyota BU. 30	DPU, OECF	1980	P
37	Dump Truck	L	AE/212/75 N	Toyota BU. 30	DPU, OECF	1980	G
38	Dump Truck	L	AE/212/76 N	Toyota BU. 30	DPU, OECF	1980	G
39	Dump Truck	L	AE/212/77 N	Toyota BU. 30	DPU, OECF	1980	P
40	Dump Truck	L	B8232	Isuzu TLD56	DPU, USAID	1991	G
41	Dump Truck	L	B8229	Isuzu TLD56	DPU, USAID	1991	G
42	Flat Bed Truck	L		Isuzu TLD56	DPU, USAID	1989	G
43	Concrete Mixer	L	44/252/006	Yanmar	DPU, OECF	1980	F
44	Concrete Mixer	L	AE/252/031	Mitsu NM90H	DPU, OECF	1982	G
45	Air Compressor	L	AE/301/031	Hokuetzu PDR–250	DPU, NTT	1982	F
46	Motor Cycle	L		Honda Win 100	DPU, USAID	1989	G
47	Motor Cycle	L		Honda Win 100	DPU, USAID	1989	G
48	Motor Cycle	L	DH 250 AA	Suzuki 100S	DPU, NTT	1982	G
49	Motor Cycle	L	DH 251 AA	Yamaha DT	DPU, NTT	1984	G
50	Motor Cycle	L	DH 1520 AA	Honda MCB	DPU, NTT	1984	G
51	Pick Up	L		Chev Luv	DPU, USAID	1989	G
52	Pick Up	L		Chev Luv	DPU, USAID	1989	G
53	Jeep	L	44/223/021	Toyota Hardtop	DPU, OECF	1974	F
54	Tire Roller	H	44/084/137	Sakai TS 7409	DPU, NTT	1982	G

Table I–8b
Equipment List, Kabupaten Belu

	Description	Type	Fleet No	Make/Model	Owner/Source	Year	Condition
55	Tire Roller	H	44/084/387	Sakai TS 7409	DPU, NTT	1982	F
56	Three Wheel Roller	H	AP/082/054	Barata MG 6	Bina Marga	1984	G
57	Three Wheel Roller	H	44/082/003	Barata MV6P	DPU, OECF	1973	G
58	Three Wheel Roller	H	AE/082/195	Barata MG 6	DPU, OECF	1982	G
59	Three Wheel Roller	H	AE/082/196	Barata MG 6	OECF	1982	G
60	Excavator	H	5300/042/001	Poclain	DPU NTT	1976	F
61	Stone Crusher	H	44/030/011	Golden Star	DPU NTT	1986	G
62	Stone Crusher	H	AE/032/044	Minyu 6 BD	OECF	1980	P
63	Hand Hammer	L	AE/361/063	Yamamoto–14 JH	OECF	1980	G
64	Hand Hammer	L	AE/361/064	Yamamoto–14 JH	OECF	1980	G
65	Hand Hammer	L	AE/361/065	Yamamoto–14 JH	OECF	1980	G

L = Light Equipment including Vehicles
H = Heavy Equipment

Note : G = GOOD
F = FAIR
P = POOR
S = SCRAP

Table I–9a
Equipment List – Kabupaten Kupang

	Description	Type	Fleet No	Make/Model	Owner/Source	Year	Condition
1	Bull Dozer	H		Fiat Allis FD 9	DPU, USAID	1988	G
2	Motor Grader	H	AE/010/093	Komatsu GD3 1RC	DPU, APBN	1960	F
3	Motor Grader	H	AE/010/404	Royal 90T	DPU, USAID	1988	G
4	Motor Grader	H	AE/010/405	Royal 90T	DPU, USAID	1988	G
5	Wheel Loader	H	AE/052/445	Barata MWL 100	DPU, USAID	1989	F
6	Wheel Loader	H	AE/052/047	Kobelco LK300	DPU, USAID	1980	F
7	Backhoe Loader	H	AE/052/442	Case 630L	DPU, USAID	1991	F
8	Tandem Roller	H		Barata MGB7	DPU, USAID	1988	G
9	Tandem Roller	H	08 01 07 02 001	Barata MGT 6	DPUK, APBD II	1984	G
10	Pedestrian Vibrol	L	AE/086/445	Barata MGB 1000	DPU, USAID	1985	F
11	Pedestrian Vibrol	L	08 01 07 04 001	Barata MGB – 1	DPUK, APBD II	1980	P
12	Pedestrian Vibrol	L	08 01 07 04 002	Barata MGB – 1	DPUK, APBD II	1980	G
13	Pedestrian Vibrol	L	08 01 07 04 003	Barata MGB – 1	DPUK, APBD II	1981	P
14	Vibrating Plate	L	08 01 07 09 001	Barata MP – 100	DPUK, APBD II	1982	P
15	Vibrating Plate	L	08 01 07 09 002	Barata MP – 100	DPUK, APBD II	1982	P
16	Vibrating Plate	L	08 01 07 09 003	Barata MP – 100	DPUK, APBD II	1982	P
17	Vibrating Plate	L	08 01 07 09 004	Barata MP – 100	DPUK, APBD II	1982	P
18	Vibrating Plate	L	PR/088/0117/4408/01	Barata MP 100	DPU, OECF	1992	G
19	Vibrating Rammer	L	PR/088/0283/4408/01	Taikoku TV80	DPU, OECF	1992	G
20	Vibrating Rammer	L	PR/088/0284/4408/01	Taikoku TV80	DPU, OECF	1992	G
21	Asphalt Sprayer	L	AE/150/235	Sakai SAS200	DPU, USAID		G
22	Water Tank Truck	L	44/212/D27	Isuzu TLD56GD	DPU, USAID	1989	G
23	Water Tank Truck	L	44/212/D28	Isuzu TLD56GD	DPU, USAID	1989	G
24	Water Tank Truck	L	44/182/D03	Isuzu, TLD 54	DPUP, ABPD I	1980	P
25	Water Tank Truck	L	44/182/D04	Isuzu TLD 54	DPUP, ABPD I	1980	G
26	Water Tank Truck	L	44/182/D23	Toyota Dyna BU 30	DPUP, ABPD I	1980	F
27	Water Tank Truck	L	44/182/D02	Isuzu TLD 54	DPUP, ABPD I	1980	F
28	Dump Truck	L	AE/212/57 L	Toyota BU 30QRT	DPU, APBN	1980	P
29	Dump Truck	L	AE/212/58 L	Toyota BU 30QRT	DPU, APBN	1980	F
30	Dump Truck	L	AE/212/59 L	Toyota BU 30QRT	DPU, APBN	1980	F
31	Dump Truck	L	AE/212/21 S	Toyota BU 30QRT	DPU, APBN	1980	F
32	Dump Truck	L	AE/212/00 L	Isuzu TLD 54	DPU, APBN	1980	F
33	Dump Truck	L	44/212/D23	Colt Diesel 100PS	DPU, USAID	1988	G
34	Dump Truck	L	44/212/D24	Colt Diesel 100PS	DPU, USAID	1988	G
35	Dump Truck	L	44/212/D19	Isuzu TLD56GD	DPU, USAID	1989	G
36	Dump Truck	L	44/212/D21	Isuzu TLD56GD	DPU, USAID	1989	G
37	Dump Truck	L	44/212/D20	Isuzu TLD56GD	DPU, USAID	1989	G
38	Dump Truck	L	44/212/D22	Isuzu TLD56GD	DPU, USAID	1989	F
39	Dump Truck	L		Isuzu TLD56GD	DPU, USAID	1992	G
40	Dump Truck	L		Isuzu TLD56GD	DPU, USAID	1992	G
41	Dump Truck	L	PR/212/0101/4408/01	Isuzu TLD56GD	DPU, OECF	1992	G
42	Flat Bed Truck	L	44/212/D06	Toyota Dyna Rino	DPU, USAID	1989	G
43	Flat Bed Truck	L	44/212/D07	Toyota Dyna Rino	DPU, USAID	1989	G
44	Flat Bed Truck	L	44/182/D04	Toyota Dyna BU 30	DPUP, APBD I	1980	F
45	Flat Bed Truck	L	09010301001	Dodge Fargo	DPUK, APBD II	1970	P
46	Flat Bed c/w Crane	L	PR/221/0065/4408/01	Isuzu TLD65GD	DPU, OECF	1992	G
47	Concrete Mixer	L		Golden Star	DPU, USAID	1988	G
48	Concrete Mixer	L	PR/252/0188/4408/01		DPU, USAID	1992	G
49	Motor Cycle	L		Honda Win 100	DPU, USAID	1998	G
50	Motor Cycle	L		Honda Win 100	DPU, USAID	1998	G
51	Pick Up	L	44/212/D11	Colt Diesel L300	DPU, USAID	1988	G
52	Pick Up	L	44/212/D10	Colt Diesel L300	DPU, USAID	1989	G

Table I–9b
Equipment List – Kabupaten Kupang

	Type	Type	Fleet No	Make/Model	Owner/Source	Year	Condition
53	Pick Up	L	44/212/D13	Chev Luv	DPU, USAID	1989	G
54	Pick Up	L	44/212/D14	Chev Luv	DPU, USAID	1989	G
55	Pick Up	L	AE/222/123	Mitsubishi T 120	DPU, APBN	1980	G
56	Pick Up	L		Toyota	DPU, APBN	1980	G
57	Pick Up	L	PR/222/0065/4408/01	Isuzu Panther	DPU, OECF	1992	G
58	Jeep	L		CJ 7	DPUK, APBD II	1986	G
59	Tire Roller	H	AE/084/052	Sakai TS–7409	DPU, APBN	1980	F
60	Road Roller	H	44/082/025	Barata MV6P	DPU, APBN	1969	P
61	Road Roller	H	44/082/047	Perkins IM 033	DPU, USAID	1984	G
62	Road Roller	H	44/082/048	Barata MG6	DPU, USAID	1984	G
63	Road Roller	H	08 01 07 01 001	Barata MV 6V	DPUK, APBD II	1971	G
64	Road Roller	H	08 01 07 01 002	Barata MV 6V	DPUK, APBD II	1971	P
65	Road Roller	H	08 01 07 01 003	Barata MV 6V	DPUK, APBD II	1975	G
66	Road Roller	H	08 01 07 01 004	Barata MV 6V	DPUK, APBD II	1977	P
67	Road Roller	H	08 01 07 01 005	Barata MG 6	DPUK, APBD II	1983	G
68	Vibrator Roller	L	44/086/D03	Taikyoku, TR 800	DPUP, APBD I	1979	G
69	Vibrator Roller	L	44/086/D19	Taikyoku, TR 850	DPUP, APBD I	1980	G
70	Vibrator Roller	L	44/086/D28	Taikyoku, TR 850	DPUP, APBD I	1980	G
71	Vibrator Roller	L	44/086/D31	Taikyoku, TR 850	DPUP, APBD I	1980	G
72	Stone Crusher	H		Golden Star	DPU, USAID	1988	G
73	Stone Crusher	H	08 01 08 03 001	Fagram	DPUK, APBD II	1972	F
74	Stone Crusher	H	08 01 08 03 002	Fagram	DPUK, APBD II	1978	F

L = Light Equipment including Vehicles
H = Heavy Equipment

G = GOOD
F = FAIR
P = POOR
S = SCRAP

Table I–10
Field Inspections of Equipment

				Hour Meter			Condition		
Date	Machine Type	Fleet Number	Kabupaten	Reading	Year	Avge	Actual	Reported	Remarks
2–11–92	Grader	AE/010/247	Takalar	3800	1980	317	P	G	
2–11–92	Tyre Roller	AE/084/424	Takalar	3100	1980	258	F	G	
2–11–92	Tandem Roller	05	Takalar	1850	1983	206	F	G	
9–11–92	Bulldozer	AE/001/130	Jeneponto	5200	1981	473	P	G	
9–11–92	Grader	AE/010/260	Jeneponto	5700	1981	518	P	G	
9–11–92	Tyre Roller	AE/084/436	Jeneponto	3000	1981	273	P	G	
9–11–92	Wheeled Loader	AE/052/203	Jeneponto	6300	1981	573	P	G	
9–11–92	Stone Crusher	AE/032/060	Jeneponto	0	1981	0	P	G	No Hour Meter Fitted
16–11–92	Grader	AE/010/252	Sidrap	0	1981	0	P	G	Hour Meter not Working
16–11–92	Grader	AE/010/253	Sidrap	8963	1981	815	P	#1	Broken Down 1 Year
16–11–92	Tyre Roller	AE/084/428	Sidrap	3800	1981	345	P	G	Broken Down 1 Month
16–11–92	Grader	AE/010/254	Pinrang	5910	1981	537	F	G	
16–11–92	Stone Crusher	AE/032/047	Pinrang	0	1981	0	P	G	No Meter Fitted
16–11–92	Tyre Roller	AE/084/430	Pinrang	0	1981	0	F	G	Hour Meter not Working
19–11–92	Tyre Roller	AE/084/426	Bone	1441	1981	131	F	G	
19–11–92	Tyre Roller	AE/084/426	Bone	1995	1981	181	F	G	
19–11–92	Stone Crusher	AE/032/058	Bone	0	1981	0	P	F	No Meter Fitted
19–11–92	Wheeled Loader	AE/052/193	Bone	7366	1981	670	F	G	
19–11–92	Grader	–	Sinjai	1100	1989	367	G	G	Stand By
19–11–92	Bulldozer	–	Sinjai	925	1989	308	F	#2	Broken Down 3 Years
19–11–92	Wheeled Loader	–	Sinjai	1370	1989	457	F	F	Stand By
19–11–92	3 Wheel Roller	09 SJ	Sinjai	0	1983	0	F	F	Hour Meter not Working
23–11–92	Bull Dozer	08 01 02 03	Bulukumba	0	1986	0	S	S	Hour Meter not Working
23–11–92	Motor Grader	08 01 09 01	Bulukumba	0	1989	0	F	G	Hour Meter not Working
23–11–92	Tandem Roller	08 01 07 02	Bulukumba	0	1989	0	F	G	Hour Meter not Working
23–11–92	Water Tank Truck	09 01 03 02	Bulukumba	0	1989	0	F	G	Hour Meter not Working
2–12–92	Motor Grader	AE/010/238	Belu	5726	1980	477	F	G	Mold Board badly worn
2–12–92	Excavator	5300/042/001	Belu	1462	1976	0	P	F	Hour Meter not Working
2–12–92	Stone Crusher	44/032/011	Belu	0	1986	0	P	G	
2–12–92	Tire Roller	AE/084/187	Belu	316	1982	32	F	G	
2–12–92	Wheel Loader	AE/052/445	Kupang	991	1989	330	F	F	
2–12–92	Motor Grader	AE/010/405	Kupang	1536	1988	307	P	G	
2–12–92	Wheel Loader	AE/052/047	Kupang	7478	1980	623	P	F	
2–12–92	Bull Dozer	–	Kupang	2072	1988	518	G	G	

#1 Reported as Under Repair. This machines is in poor condition and will need more than the currently planned repairs to restore it to good working condition.

#2 Reported as Minor Breakdown This machine has been broken down for approximately 3 years without yet being repaired

Table I–11
Skill Level in Kabupaten Workshop

Mechanics, Helpers, Experience and Qualifications

Kabupaten	Mechanics		Helpers		Experience, yrs		Qualifications	Other Details
	perm	temp	perm	temp	pres	prev		
Bone	1				7	unk		
	1				10	unk		
	1				10	unk		Equipment Operator
		1			10	unk		Equipment Operator
Bulukumba	1							Chief of Workshop
Jeneponto		1			2	unk		
		1			2	unk		
		1			1	unk		
Pinrang		1			5	yes		
		1			3	yes		
Sidrap		1			7	none		
		1			7	none		
		1			2	none		
Sinjai		1			20	unk		
			1		8	unk		Grader Operator
					5	unk		Tandem Roller Operator
				1	0.8	unk		
Takalar	1				10	unk	OECF cert	Flat Bed Truck Driver
		1			10	unk	OECF cert	
		1			10	unk	OECF cert	
				1	4	none		
Belu	1				5	2		
	1				7	1		
	1				1	none		
		1			3	2		
		1			3	none		
		1			2	none		
		1			1	none		
Kupang	1				12	2		
	1				8	none		
	1				19	none		
	1				18	none		
	1				18	none		
	1				12	none		
	1				18	none		

Table I–12
Mechanics and Fleet Size

Maintainable Lengths of Kabupaten Roads, Equipment and Personnel Summary

	Type of Road Surface in Kilometers				Equipment		Personnel				
Kabupaten	Asphalt	Telford	Other	Total	Heavy	Light	Staff	Mechanics	Helpers	Operators	Drivers
Bone	203	127	10	340	3	27	5	*4	0	*9	5
Bulkumba	93	0	2	95	3	11	*3	*1	0	4	6
Jeneponto	129	25	8	162	3	14	8	3	0	9	8
Pinrang	108	74	0	182	5	26	9	2	5	8	8
Sidrap	45	35	0	80	4	9	4	3	0	5	11
Sinjai	104	86	56	246	4	16	4	1	*3	*5	4
Takalar	117	21	14	152	4	12	6	*3	1	8	*10
Belu	87	60	0	147	4	16	9	7	0	10	13
Kupang	140	229	0	369	4	27	3	7	0	9	10

* personnel occupying more than one position

Table I–13

WORKSHOP UTILIZATION
by percentage comparison to Field work

Kabupaten	Preventive Maintenance				Repairs			
	Workshop		Field		Workshop		Field	
	LE	HE	LE	HE	LE	HE	LE	HE
Bone	90	10	10	90	90	80	10	20
Bulukumba	0	0	100	100	0	0	100	100
Jeneponto	80	10	20	90	80	20	20	80
Pinrang	60	5	40	95	60	5	40	95
Sidrap	50	50	50	50	75	75	25	25
Sinjai	10	20	90	80	70	75	30	25
Takalar	97	25	3	75	97	75	3	25
Belu	79	10	21	90	80	37	20	63
Kupang	20	20	80	80	55	45	45	55

LE = Light Equipment includung vehicles
HE = Heavy Equipment

Based on EMS consultant's Survey of 11/92

TABLE I-14

RESPONSIBILITIES AND LIABILITIES FOR HIRED EQUIPMENT

RESPONSIBILITY	OWNER (Kabupaten)	HIRER (Contractor)
Transportation		fully responsible
Operational Costs		fully responsible
Maintenance Levels I, II, III, IV *	directs	performs and pays for
Major Repairs, caused by hirer's negligence	determines need	fully responsible for cost
Repair of equipment returned in less than good condition	determines need; orders or contracts repair	fully responsible for cost
Loss of Equipment, caused by hirer's negligence		fully responsible
Operator	attempts to provide qualified operator to hirer	responsible for management and payment of wages
Mechanic	attempts to provide qualified mechanic to hirer	responsible for management and payment of wages
Daily Utilization Reports	inspects and approves	prepares
Monitoring of Equipment Use	monitors	pays for costs of monitoring
Insurance for equipment and operator	claimant for insurance settlements	fully responsible for insuring
Tax and fees for processing hire agreement		responsible for cost
Fine for delayed use of equipment		pays fine
Cancellation of contract due to deficiencies in hirer's qualifications or performance	fully enabled to cancel	
Bank Guarantee	returns to hirer upon satisfactory completion of contract	obtains from bank
Arbitration (in Pengadilan Negeri/government court)	selects one member of Arbitration Board	selects one member of Arbitration Board

* Levels I, II, III only in certain kabupatens. Sharing of costs for repairs often negotiated. Limits on contractor liability in some kabupatens.

Source: Kabupaten Hire Agreement

TABLE I–15

HIRE RATES DETERMINATION

Kabupatens use the following regulations to determine hire rates and to direct other aspects of equipment management.

HIRE RATES DETERMINED BY:	EQUIPMENT SOURCE						KABUPATEN
	OECF	USAID	APBD II	APBN BINA MARGA	APBN KANWIL	APBD I	
	Kepmen 585/167	Kepmen 585/167	Perda Tk. II	–	–	–	BONE
	Kepmen 585/167	Kepmen 585/167	Perda Tk. II	–	–	–	BULUKUMBA
	Kepmen 585/167	Perda Tk II	Perda Tk. II	–	–	–	JENEPONTO
	Kepmen 585/167	Perda Tk II	Perda Tk. II	–	–	–	PINRANG
	Kepmen 585/167	Perda Tk. II	Perda Tk. II	–	–	–	SIDRAP
	Kepmen 585/167	Perda Tk. II	Perda Tk. II	–	–	–	SINJAI
	Kepmen 585/167	Perda Tk. II	Perda Tk. II	–	–	–	TAKALAR
	Kepmen 585/167	Perda Tk. I	Perda Tk. II	Kepmen 585/167	Kepmen 585/167	Perda Tk. I	BELU
	Kepmen 585/167	Kepmen 585/167	Perda Tk. II	Kepmen 585/167	Kepmen 585/167	Perda Tk. I	KUPANG

TABLE I–16

HIRE REVENUES CHANNELLING

	EQUIPMENT SOURCE						KABUPATEN
	OECF	USAID	APBD II	APBN BINA MARGA	APBN KANWIL	APBD I	
HIRE REVENUES PAID TO:	Kas Negara	Kas Negara	Kas Daerah Tk. II	–	–	–	BONE
	Kas Negara	Kas Negara	Kas Daerah Tk. II	–	–	–	BULUKUMBA
	Kas Negara	Kas Daerah Tk. II	Kas Daerah Tk. II	–	–	–	JENEPONTO
	Kas Negara	Kas Daerah Tk. II	Kas Daerah Tk. II	–	–	–	PINRANG
	Kas Negara	Kas Daerah Tk. II	Kas Daerah Tk. II	–	–	–	SIDRAP
	Kas Negara	Kas Daerah Tk. II	Kas Daerah Tk. II	–	–	–	SINJAI
	Kas Negara	Kas Daerah Tk. II	Kas Daerah Tk. II	–	–	–	TAKALAR
	Kas Negara	Kas Daerah Tk. I	Kas Daerah Tk. II	Kas Negara	Kas Negara	Kas Daerah Tk. I	BELU
	Kas Negara	Kas Negara	Kas Daerah Tk. II	Kas Negara	Kas Negara	Kas Daerah Tk. I	KUPANG

CHART I–17

PUBLIC WORKS ORGANIZATION AT VARIOUS LEVELS OF GOVERNMENT

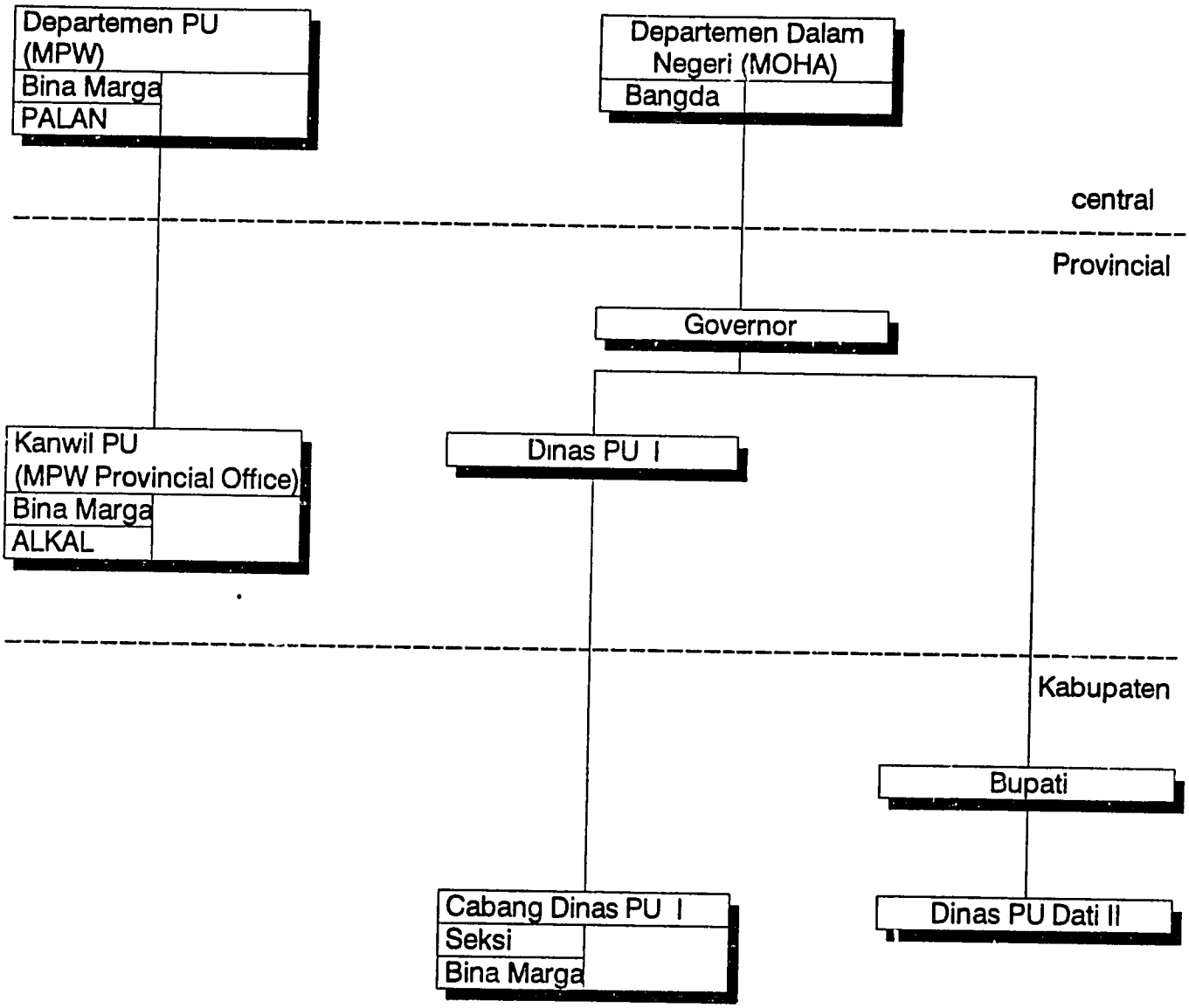
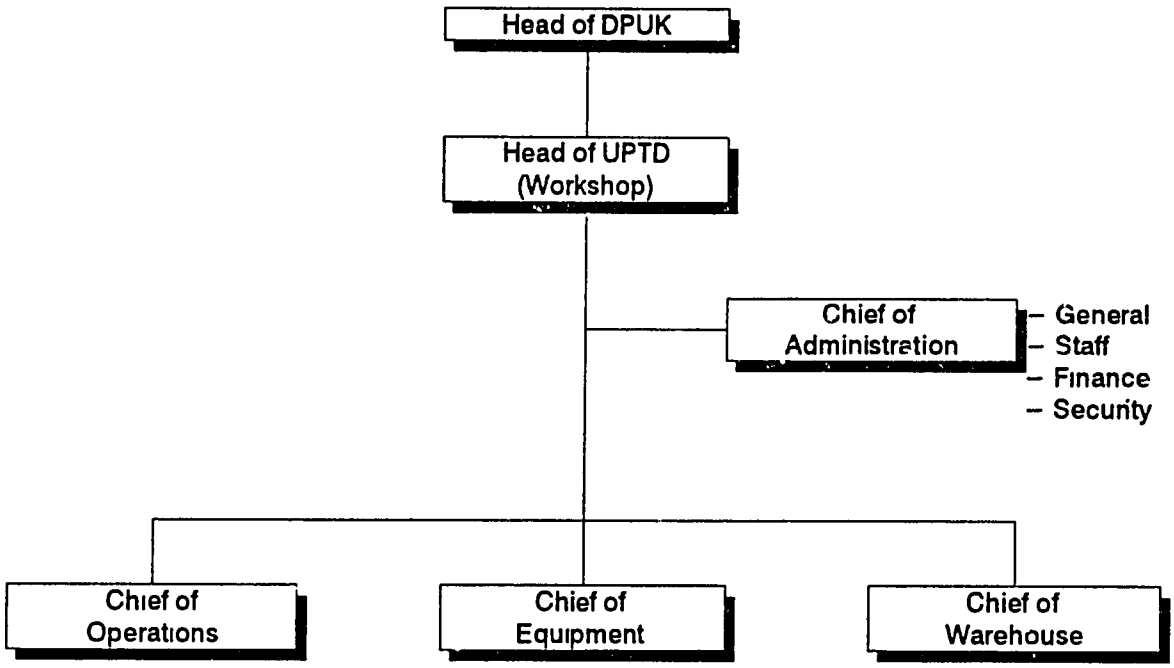


CHART I – 18

MANDATED
ORGANIZATIONAL STRUCTURE
OECF FUNDED PROJECT EQUIPMENT MANAGEMENT

UNIT PELAYANAN TEKNIK DAERAH



1. Administration of equipment, drivers and operators
2. Supervision of drivers and operators
3. Supervision of equipment for hire and swakelola
4. Supervision of quarry

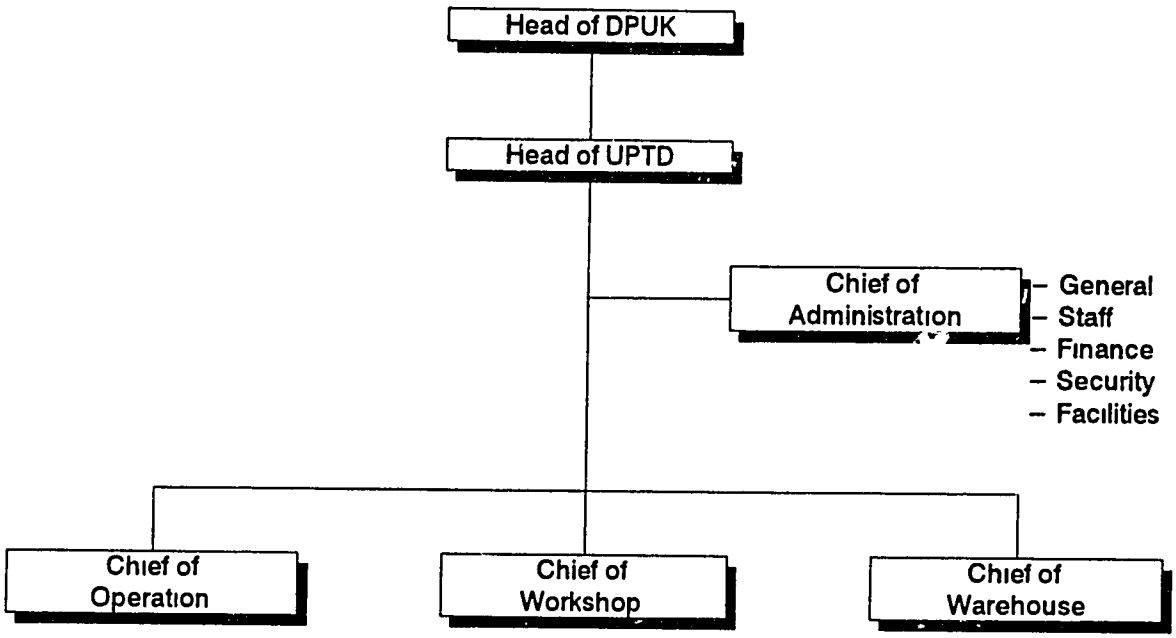
1. First mechanic
2. Second mechanic
3. Third mechanic
4. Mechanics assistant
5. Workshop administration
6. Warehouse administration
7. Tools administration

1. Parts and materials
2. Parts and materials storage
3. Parts and materials distribution
4. Warehouse administration

CHART I – 19

MANDATED ORGANIZATIONAL STRUCTURE OF USAID FUNDED PROJECT EQUIPMENT

UNIT PELAYANAN TEKNIK DAERAH



1. Administration of equipment operation, drivers and operators
2. Supervision of equipment, drivers and operators
3. Supervision of equipment for hire and swakelola
4. Supervision of quarry

1. Vehicles Repair unit
2. Heavy equipment Repair unit
3. Power supply unit
4. Welding unit
5. Workshop administration
6. Tools unit
7. Warehouse administration

1. Warehouse unit
2. Fuel and oil unit
3. Warehouse administration
4. Equipment storage

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CHART I – 20

ORGANIZATIONAL STRUCTURE OF DPUK

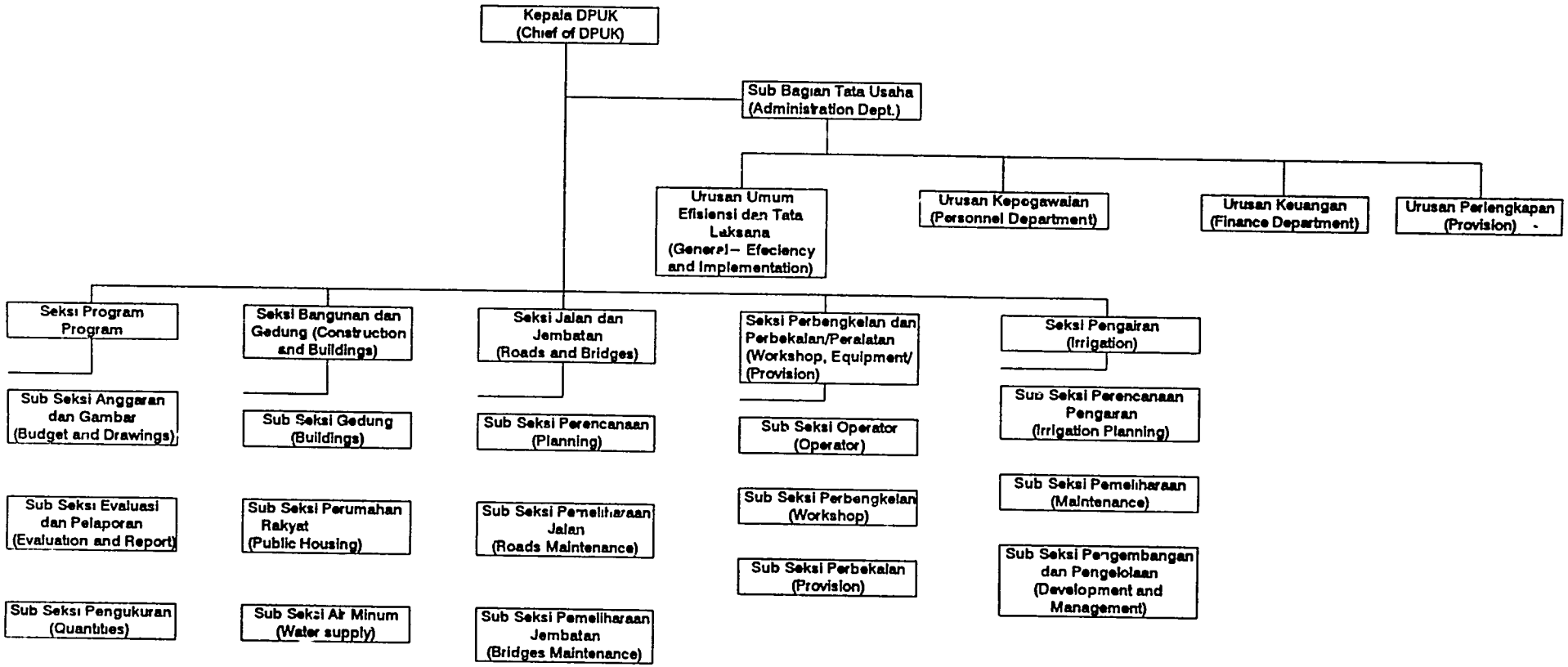

TABLE I-21

KABUPATEN EQUIPMENT MAINTENANCE BUDGETS

(thousands of Rupiah)

KABUPATEN	F.Y. 90/91	F.Y. 91/92	F.Y. 92/93
Bone	38,000	116,555	53,868
Bulukumba	46,289	75,680	65,386
Jeneponto	50,000	75,680	75,000
Pinrang	49,494	75,680	65,952
Sidrap	23,571	75,680	69,150
Sinjai	11,163	75,680	75,000
Takalar	78,398	75,680	50,000
Belu	50,000	75,680	130,000
Kupang	50,000	75,680	75,000
TOTAL	396,915	721,995	659,356

Source: IPJK budget allocations for maintenance

KABUPATEN EQUIPMENT MAINTENANCE BUDGETS COMPARED TO ESTIMATED NEEDS

(thousands of Rupiah)

KABUPATEN	BUDGET FY 92/93	NEEDS FY 93/94	SHORTFALL/(EXCESS)
Bone	53,868	273,000	219,132
Bulukumba	65,386	58,400	(6,986)
Jeneponto	75,000	214,000	139,000
Pinrang	65,952	366,000	300,048
Sidrap	69,150	211,000	141,850
Sinjai	75,000	106,000	31,000
Takalar	50,000	102,000	52,000
Belu	130,000	263,000	133,000
Kupang	75,000	104,000	29,000
TOTAL	659,356	1,697,400	1,038,044

Note: Total amount for needs differs slightly from Table I-26 due to rounding.

Table I–22
EQUIPMENT NEEDS FOR FY 93/94 RRMS PROGRAM

Tables I–22 through I–30 present calculations for projected equipment maintenance requirements, as discussed in section II–C–1–b.

	Bone		Bulukumba		Jeneponto		Pinrang		Sidrap		Sinjai		Takalar		Belu		Kupang		TOTAL
Equipment Type	Req	Adj	Req	Adj	Req	Adj	Req	Adj	Req	Adj	Req	Adj	Req	Adj	Req	Adj	Req	Adj	
Motor Grader	0.8	1	0.3	1	0.4	1	0.9	1	0.4	1	0.4	1	0.1	1	0.4	1	0.8	1	9
Wheel Loader	1	1	0.2	1	0.5	1	1.1	2	0.2	1	0.5	1	0.4	1	0.2	1	0.2	1	10
Backhoe Loader	0.4	1	0.2	1	0.2	1	0.4	1	0.1	1	0.2	1	0.1	1	0.3	1	0.6	1	9
Tandem Roller	0	0	0	0	0	0	0.5	1	0.1	1	0.1	1	0	1	0.1	1	0.3	1	6
Pedestrian Vibrol	2.6	3	0.7	1	0.7	1	2.4	3	0.5	1	1	1	0.5	1	1.4	2	2.8	3	16
Vibrating Plate	4.3	5	0.9	1	2	2	4.2	5	1	1	2.2	3	1.7	2	1.7	2	3.6	4	25
Towed Asp Sprayer	2.7	3	1.8	2	1.7	2	2.1	3	0.6	1	1.4	2	1.6	2	1.8	2	2.9	3	20
Water Truck	0	0	0	0	0	0	0.2	1	0	0	0	0	0	0	0	0	0.1	1	2
Dump Truck	8.8	9	2.1	3	4.4	5	8.4	9	3	3	4.3	5	3.5	4	3.2	4	6.1	7	49
Flat Bed Truck	0.2	1	0.7	1	0.1	1	0.1	1	0.1	1	0	1	0	0	1.1	2	1.9	2	10
Concrete Mixer	0.3	1	0	0	1.8	2	0.3	1	0.1	1	0.2	1	0.2	1	0	0	0	0	7
Motor Cycle	3.4	4	1.9	2	0.2	1	2.1	3	0.9	1	1.6	2	1.2	2	2.3	3	5.3	6	24

DPUK Equipment requirements for routine maintenance
using STV/Lyon Associates' Kabupaten Roads Maintenance program for 1993/1994.
This program does not include any rehabilitation.

Table I–23
PRESENT SHORTAGES IN DPUK FLEET FOR FY 93/94 RRMS PROGRAM

Tables I–22 through I–30 present calculations for projected equipment maintenance requirements, as discussed in section II–C–1–b.

	Bone				Bulukumba				Jeneponto				Pinrang				Sidrap			
Equipment Type	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff
Motor Grader	0 8	1	2	1	0 3	1	1	0	0 4	1	1	0	0 9	1	2	1	0 4	1	2	1
Wheel Loader	1	1	1	0	0 2	1	1	0	0 5	1	1	0	1 1	2	2	0	0 2	1	2	1
Backhoe Loader	0 4	1	0	−1	0 2	1	0	−1	0 2	1	0	−1	0 4	1	0	−1	0 1	1	0	−1
Tandem Roller	0	0	1	1	0	0	1	1	0	0	3	3	0.5	1	1	0	0 1	1	1	0
Pedestrian Vibrol	2 6	3	1	−2	0 7	1	2	1	0 7	1	1	0	2 4	3	2	−1	0 5	1	1	0
Vibrating Plate	4 3	5	0	−5	0 9	1	1	0	2	2	1	−1	4 2	5	0	5	1	1	0	−1
Towed Asp Sprayer	2 7	3	1	−2	1 8	2	2	0	1 7	2	1	−1	2 1	3	1	−2	0 6	1	1	0
Water Truck	0	0	1	1	0	0	1	1	0	0	1	1	0 2	1	1	0	0	0	1	1
Dump Truck	8 8	9	14	5	2 1	3	3	0	4 4	5	10	5	8 4	9	13	4	3	3	13	10
Flat Bed Truck	0 2	1	1	0	0 7	1	1	0	0 1	1	1	0	0 1	1	1	0	0.1	1	1	0
Concrete Mixer	0 3	1	0	−1	0	0	1	1	1 8	2	0	−2	0 3	1	1	0	0.1	1	1	0
Motor Cycle	3 4	4	2	−2	1 9	2	1	−1	0 2	1	4	3	2 1	3	3	0	0.9	1	2	1

Comparison of DPUK Equipment requirements with DPUK Equipment fleets for routine maintenance using STV/Lyon Associates' Kabupaten Roads Maintenance program for 1993/1994. This program does not include any rehabilitation.

	Sinjai				Takalar				Belu				Kupang			
Equipment Type	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff
Motor Grader	0 4	1	1	0	0 1	1	2	1	0 4	1	2	1	0 8	1	3	2
Wheel Loader	0 5	1	1	0	0 4	1	1	0	0 2	1	2	1	0 2	1	2	1
Backhoe Loader	0 2	1	0	−1	0 1	1	1	0	0 3	1	0	−1	0 6	1	1	0
Tandem Roller	0 1	1	2	1	0	1	5	4	0 1	1	1	0	0 3	1	2	1
Pedestrian Vibrol	1	1	1	0	0 5	1	1	0	1 4	2	1	−1	2 8	3	4	1
Vibrating Plate	2 2	3	0	−3	1.7	2	0	−2	1 7	2	5	3	3 6	4	5	1
Towed Asp Sprayer	1 4	2	1	−1	1 6	2	2	0	1 8	2	2	0	2 9	3	1	−2
Water Truck	0	0	1	1	0	0	2	2	0	0	2	2	0.1	1	6	5
Dump Truck	4 3	5	5	0	3 5	4	11	7	3 2	4	23	19	6 1	7	14	7
Flat Bed Truck	0	1	1	0	0	0	2	2	1 1	2	1	−1	1 9	2	5	3
Concrete Mixer	0 2	1	0	−1	0 2	1	1	0	0	0	2	2	0	0	2	2
Motor Cycle	1 6	2	4	2	1 2	2	2	0	2 3	3	5	2	5 3	6	2	−4

Heavy Equipment = Motor Grader, Wheel Loader, Backhoe Loader and Tandem Roller, Total Shortage = 7 units

Light Equipment = All other listed equipment, Total Shortage = 43 units

Table I–24
EQUIPMENT NEEDS FOR 100% MAINTAINABILITY

Tables I–22 through I–30 present calculations for projected equipment maintenance requirements, as discussed in section II–C–1–b.

	Bone		Bulukumba		Jeneponto		Pinrang		Sidrap		Sinjai		Takalar		Belu		Kupang		TOTAL
Equipment Type	Req	Adj	Req	Adj	Req	Adj	Req	Adj	Req	Adj	Req	Adj	Req	Adj	Req	Adj	Req	Adj	
Motor Grader	0.3	1	0.5	1	0.7	1	0.9	1	1.2	2	0.7	1	0.3	1	1.5	2	2.9	3	13
Wheel Loader	2 5	3	1.1	2	1 4	2	1.1	2	1	1	0.9	1	0.8	1	1.3	2	2.1	3	17
Backhoe Loader	1.1	2	0 5	1	0 6	1	0.4	1	0 5	1	0.4	1	0.3	1	0.6	1	1.1	2	11
Tandem Roller	0.2	1	0 2	1	0.3	1	0.5	1	0.6	1	0 4	1	0.1	1	0.8	1	1.7	2	10
Pedestrian Vibrol	6.1	7	2.4	3	3 2	4	2.4	3	2.8	3	2.4	3	1 2	2	3.7	4	6.7	7	36
Vibrating Plate	10.3	11	4 6	5	5 6	6	4.2	5	4.2	5	3 9	4	2.9	3	5 4	6	9.3	10	55
Towed Asp Sprayer	4.7	5	2.6	3	2.7	3	2.1	3	1.3	2	1.5	2	2 2	3	1.5	2	2.1	3	26
Water Truck	0.1	1	0 1	1	0.1	1	0 2	1	0 3	1	0 2	1	0	0	0.3	1	0.7	1	8
Dump Truck	20 2	21	9 2	10	11.1	12	8.4	9	8	8	7.5	8	5.9	6	10.3	11	17.8	18	103
Flat Bed Truck	0 2	1	0.1	1	0 1	1	0.1	1	0.1	1	0.1	1	0.1	1	0.1	1	0.2	1	9
Concrete Mixer	0.6	1	0 3	1	0.3	1	0.3	1	0.2	1	0.2	1	0.3	1	0.2	1	0.3	1	9
Motor Cycle	7.1	8	3.2	4	3 8	4	3.1	4	0.2	1	2.7	3	2.1	3	3.5	4	6.5	7	38

DPUK Equipment requirements for routine maintenance
using STV/Lyon Associates' projected program if 100% of Kabupaten Roads are maintainable.
No rehabilitation is included in this estimate.

Additional equipment for rehabilitation would be predominantly heavy equipment

Table I–25
ADDITIONAL EQUIPMENT REQUIREMENTS FOR 100% MAINTAINABILITY

Tables I–22 through I–30 present calculations for projected equipment maintenance requirements, as discussed in section II–C–1–b.

	Bone				Bulukumba				Jeneponto				Pinrang				Sidrap			
Equipment Type	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff
Motor Grader	0 8	1	2	1	0 5	1	1	0	0.7	1	1	0	0 9	1	2	1	1.2	2	2	0
Wheel Loader	2 5	3	1	−2	1 1	2	1	−1	1 4	2	1	−1	1 1	2	2	0	1	1	2	1
Backhoe Loader	1 1	2	0	−2	0 5	1	0	−1	0 6	1	0	−1	0 4	1	0	−1	0 5	1	0	−1
Tandem Roller	0 2	1	1	0	0 2	1	1	0	0 3	1	3	2	0 5	1	1	0	0 6	1	1	0
Pedestrian Vibrol	6 1	7	1	−6	2 4	3	2	−1	3 2	4	1	−3	2 4	3	2	−1	2 8	3	1	−2
Vibrating Plate	10 3	11	0	−11	4 6	5	1	−4	5 6	6	1	−5	4 2	5	0	−5	4 2	5	0	−5
Towed Asp Sprayer	4 7	5	1	−4	2 6	3	2	−1	2 7	3	1	−2	2 1	3	1	−2	1 3	2	1	−1
Water Truck	0 1	1	1	0	0 1	1	1	0	0 1	1	1	0	0 2	1	1	0	0 3	1	1	0
Dump Truck	20 2	21	14	−7	9 2	10	3	−7	11 1	12	10	−2	8 4	9	13	4	8	8	13	5
Flat Bed Truck	0 2	1	1	0	0 1	1	1	0	0 1	1	1	0	0.1	1	1	0	0 1	1	1	0
Concreto Mixer	0 6	1	0	−1	0 3	1	1	0	0 3	1	0	−1	0 3	1	1	0	[illegible]	1	1	0
Motor Cycle	7 1	8	2	−6	3 2	4	1	−3	3 8	4	4	0	3 1	4	3	−1	0 2	1	2	1

Comparison of DPUK Equipment requirements with DPUK Equipment fleets for routine maintenance using STV/Lyon Associates' projected program if 100% of Kabupaten Roads are maintainable. No rehabilitation is included in this estimate.

	Sinjai				Takalar				Bolu				Kupang			
Equipment Type	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff	Req	Adj	Fleet	Diff
Motor Grader	0 7	1	1	0	0 3	1	2	1	1 5	2	2	0	2 9	3	3	0
Wheel Loader	0 9	1	1	0	0 8	1	1	0	1 3	2	2	0	2 1	3	2	−1
Backhoe Loader	0 4	1	0	−1	0 3	1	1	0	0 6	1	0	−1	1 1	2	1	−1
Tandem Roller	0 4	1	2	1	0 1	1	5	4	0 8	1	1	0	1 7	2	2	0
Pedestrian Vibrol	2 4	3	1	−2	1 [illegible]	2	1	−1	3 7	4	1	−3	6 7	7	4	−3
Vibrating Plate	3 9	4	0	−4	2 9	3	0	−3	5 4	6	5	−1	9 3	10	5	−5
Towed Asp Sprayer	1 5	2	1	−1	2 2	3	2	−1	1 5	2	2	0	2 1	3	1	−2
Water Truck	0 2	1	1	0	0	0	2	2	0 3	1	2	1	0 7	1	6	5
Dump Truck	7 5	8	5	−3	5 9	6	11	5	10 3	11	23	12	17 8	18	14	−4
Flat Bed Truck	0 1	1	1	0	0 1	1	2	1	0 1	1	1	0	0 2	1	5	4
Concrete Mixer	0.2	1	0	−1	0 3	1	1	0	0 2	1	2	1	0 3	1	2	1
Motor Cycle	2 7	3	4	1	2 1	3	2	−1	3 5	4	5	1	6 5	7	2	−5

Heavy Equipment = Motor Grader, Wheel Loader, Backhoe Loader and Tandem Roller, Total Shortage = 14 units.

Light Equipment = All other listed equipment, Total Shortage = 121 units

Additional equipment for rehabilitation would be predominantly heavy equipment

Table I–26
ESTIMATED MAINTENANCE COSTS, EXISTING FLEET FY 93/94

Tables I–22 through I–30 present calculations for projected equipment maintenance requirements, as discussed in section II–C–1–b

	Bone					Bulukumba					Jeneponto					Pinrang					Sidrap				
Equipment Type	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost
Motor Grader	1980	180	0 42	1	75 6	1989	180	0 06	1	10 8	1980	180	0 42	1	75 6	1981	180	0 42	1	75 6	1981	180	0 42	1	75 6
Wheel Loader	1980	150	0 42	1	63	1989	150	0 06	1	9	1980	150	0 42	1	63	1981	150	0 42	2	126	1981	150	0 42	1	63
Backhoe Loader	new	100	0 06	0	0	new	100	0 06	0	0	new	100	0 06	0	0	new	100	0 06	0	0	new	100	0 06	0	0
Tandem Roller	1989	126	–	0	0	–	126	0	0	0	1988	126	0 12	0	0	1984	126	0 12	1	15 1	1989	126	0 12	1	15 1
Pedestrian Vibrol	1985	20	0 12	1	2 4	1988	20	0 12	1	2 4	1988	20	0 12	1	2 4	1988	20	0 12	2	4 8	1989	20	0 12	1	2 4
Vibrating Plate	new	3 2	0 06	0	0	1983	3 2	0 42	1	1 34	new	3 2	0 06	0	0	new	3 2	0.06	0	0	new	3 2	0 06	0	0
Towed Asp Sprayer	1989	43	0 12	1	5 16	1988	43	0 12	2	10 3	1989	43	0 06	1	2 58	1988	43	0 12	1	5 16	1989	43	0 12	1	5 16
Water Truck	–	36	–	0	0	–	36	0	0	0	1988	36	0	0	0	1988	36	0 12	1	4 32	1989	36	0 12	0	0
Dump Truck	1980	33	0 42	9	124	1988	33	0 12	3	11 8	1981	33	0 42	5	69 3	1981	33	0 42	9	124	1981	33	0 42	3	41 5
Flat Bed Truck	1990	30	0 06	1	1 8	1980	30	0 42	1	12 6	1989	30	0 06	1	1 8	1988	30	0.12	1	3 6	1989	30	0 06	1	1.8
Concrete Mixer	new	16	0 06	0	0	–	16	0	0	0	1981	16	0 42	0	0	1981	16	0 42	1	6 72	1981	16	0 42	1	6 72
Motor Cycle	1988	2 5	0 12	2	0 6	1992	2 5	0 06	1	0 15	1988	2 5	0 12	1	0 3	1988	2 5	0 12	3	0 9	1989	2 5	0 06	1	0 15
Total Cost					273					58 4					214					366					211.

year = year of equipment purchase price = current price of equipment rcf = repair cost factor Adj = adjusted quantities of equipment

	Sinjai					Takalar					Belu					Kupang					totals
Equipment Type	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	
Motor Grader	1989	180	0 06	1	10 8	1989	180	0 06	1	10 8	1980	180	0 42	1	75 6	1988	180	0 12	1	21 6	432
Wheel Loader	1989	150	0 06	1	9	1980	150	0 42	1	63	1980	150	0 42	1	63	1989	150	0 06	1	9	468
Backhoe Loader	new	100	0 06	0	0	1989	100	0 06	1	6	new	100	0 06	0	0	1991	100	0 06	1	6	12
Tandem Roller	1981	126	0 42	1	52 9	1989	126	0 06	1	7 56	1983	126	0 42	1	52 9	1988	126	0 12	1	15 1	159
Pedestrian Vibrol	1989	20	0 06	1	1 2	1989	20	0 06	1	1 2	1989	20	0 06	1	1 2	1982	20	0 42	3	25 2	43
Vibrating Plate	new	3 2	0 06	0	0	new	3 2	0 06	0	0	1982	3 2	0 42	2	2 68	1982	3 2	0 42	4	5 37	9
Towed Asp Sprayer	1988	43	0 12	2	10 3	1989	43	0 06	2	5 16	1986	43	0 12	2	10 3	1989	43	0 06	1	2 58	57
Water Truck	1989	36	0 06	0	0	–	36	0	0	0	–	36	0	0	0	1989	36	0 06	1	2 16	6
Dump Truck	1988	33	0 12	5	19 8	1989	33	0 06	4	7 92	1980	33	0 42	4	55 4	1989	33	0 06	7	13 8	469
Flat Bed Truck	1989	30	0 06	1	1 8	–	30	0	0	0	1989	30	0 06	1	1 8	1989	30	0 06	2	3 6	29
Concrete Mixer	new	16	0 06	0	0	1989	16	0 06	1	0 96	–	16	0	0	0	–	16	0	0	0	14
Motor Cycle	1989	2 5	0 06	2	0 3	1989	2 5	0 06	2	0 3	1984	2 5	0 12	3	0 9	1989	2 5	0 06	2	0 3	4
Total Cost					106					102					263					104	1703
																				Total in Millions Rp =	1703

Estimated equipment maintenance costs for existing equipment required to execute RRMS consultants' 1993/1994 program for existing maintainable roads

Additional quipment required to complete this program shown on Table 23

calculations made as described in Section II/C–1

Table I–27
EQUIPMENT MAINTENANCE COSTS, NEW EQUIPMENT FY 93/94

Tables I–22 through I–30 present calculations for projected equipment maintenance requirements, as discussed in section II–C–1–b

	Bone					Bulukumba					Jeneponto					Pinrang					Sidrap				
Equipment Type	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost
Motor Grader																									
Wheel Loader																									
Backhoe Loader	new	100	0.06	1	6	new	100	0 06	1	6	new	100	0 06	1	6	new	100	0 06	1	6	new	100	0 06	1	6
Tandem Roller																									
Pedestrian Vibrol	new	20	0 06	2	2 4											new	20	0 12	1	2 4					
Vibrating Plate	new	3 2	0 06	5	0 96						new	3 2	0 06	1	0 19	new	3 2	0 06	5	0 96	new	3 2	0 06	1	0 19
Towed Asp Sprayer	new	43	0 06	2	5 16						new	43	0 06	1	2 58	new	43	0 12	2	10 3					
Water Truck																									
Dump Truck																									
Flat Bed Truck																									
Concrete Mixer	new	16	0 06	1	0 96						new	16	0 42	2	13 4										
Motor Cycle	new	2 5	0 06	2	0 3	new	2 5	0 06	1	0 15															
Total Cost					15 7					6 15					22 2					19 6					6.19

	Sinjai					Takalar					Belu					Kupang					Total
Equipment Type	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	
Motor Grader																					0
Wheel Loader																					0
Backhoe Loader	new	100	0 06	1	6						new	100	0 06	1	6						42
Tandem Roller																					0
Pedestrian Vibrol											new	20	0 06	1	1 2						6
Vibrating Plate	new	3 2	0 06	3	0 57	new	3 2	0 06	2	0 38											3
Towed Asp Sprayer																new	43	0 06	2	5 16	23
Water Truck																					0
Dump Truck																					0
Flat Bed Truck											new	30	0 06	1	1 8						2
Concrete Mixer	new	16	0 06	1	0 96																15
Motor Cycle																new	2 5	0 06	4	0 6	1
Total Cost					7 53					0 38					9					5 76	93
																				Total in Millions Rp =	93

Estimated 1 years' maintenance costs for additional new equipment required to complete equipment fleet requirements to exercise RRMS consultant's 1993/1994 program for existing maintainable roads

calculations made as described in Section II/C–1

Table I–28
EQUIPMENT MAINTENANCE COSTS, 100% MAINTAINABILITY

Tables I–22 through I–30 present calculations for projected equipment maintenance requirements, as discussed in section II–C–1–b.

	Bone					Bulukumba					Jeneponto					Pinrang					Sidrap				
Equipment Type	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost
Motor Grader																									
Wheel Loader	new	150	0 06	2	18	new	150	0 06	1	9															
Backhoe Loader	new	100	0 06	2	12	new	100	0 06	1	106	new	100	0 06	1	106	new	100	0 06	1	106	new	100	0 06	1	106
Tandem Roller																									
Pedestrian Vibrol	new	20	0 06	6	7 2											new	20	0.12	1	22 4					
Vibrating Plate	new	3 2	0 06	11	2 11						new	3.2	0 06	1	3 39	new	3 2	0 06	5	4.16	new	3 2	0 06	1	3.39
Towed Asp Sprayer	new	43	0.06	4	10 3						new	43	0 06	1	45 5	new	43	0 12	2	53 3					
Water Truck																									
Dump Truck	new	33	0 06	7	13 8																				
Flat Bed Truck																									
Concrete Mixer	new	16	0 06	1	0 96						new	16	0 42	2	29 4										
Motor Cycle	new	2 5	0 06	6	0 9	new	2 5	0 06	1	2 65															
Total Cost					65 3					117					184					185					109.

	Sinjai					Takalar					Bolu					Kupang					Total
Equipment Type	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	year	price	rcf	Adj	cost	
Motor Grader																					0
Wheel Loader																					27
Backhoe Loader	new	100	0 06	1	106						new	100	0 06	1	106						646
Tandem Roller																					0
Pedestrian Vibrol											new	20	0 06	1	21 2						51
Vibrating Plate	new	3 2	0 06	3	3 77	new	3 2	0 06	2	3 58											20
Towed Asp Sprayer																new	43	0 06	2	48 1	157
Water Truck																					0
Dump Truck																					14
Flat Bed Truck											new	30	0 06	1	31 8						32
Concrete Mixer	new	16	0 06	1	16 9																47
Motor Cycle																new	2 5	0 06	4	3 1	7
Total Cost					126					3 58					159					51 2	1003
																				Total in Millions Rp =	1003

– timated equi, nent purchase and 1 years' maintenance costs for additional new equipment required to complete equipment fleet requirements execute RRM consultant's 1993/1994 program for existing maintainable roads

lculations made as described in Section II/C–1

Table I–29
PURCHASE COST OF NEW EQUIPMENT, FY 93/94

Tables I–22 through I–30 present calculations for projected equipment maintenance requirements, as discussed in section II–C–1–b

	Bone				Bulukumba				Jeneponto				Pinrang				Sidrap			
Equipment Type	year	price	Adj	cost	year	price	Adj	cost	year	price	Adj	cost	year	price	Adj	cost	year	price	Adj	cost
Motor Grader																				
Wheel Loader																				
Backhoe Loader	new	100	1	100	new	100	1	100	new	100	1	100	new	100	1	100	new	100	1	100
Tandem Roller																				
Pedestrian Vibrol	new	20	2	40									new	20	1	20				
Vibrating Plate	new	3 2	5	16					new	3 2	1	3.2	new	3 2	5	16	new	3 2	1	3.2
Towed Asp Sprayer	new	43	2	86					new	43	1	43	new	43	2	86				
Water Truck																				
Dump Truck																				
Flat Bed Truck																				
Concrete Mixer	new	16	1	16					new	16	2	32								
Motor Cycle	new	2 5	2	5	new	2 5	1	2 5												
Total Cost				263				102				178				222				103

	Sinjai				Takalar				Belu				Kupang				total eqpt shtge	Total costs
Equipment Type	year	price	Adj	cost	year	price	Adj	cost	year	price	Adj	cost	year	price	Adj	cost		
Motor Grader																	0	0
Wheel Loader																	0	0
Backhoe Loader	new	100	1	100					new	100	1	100					7	700
Tandem Roller																	0	0
Pedestrian Vibrol									new	20	1	20					4	80
Vibrating Plate	new	3 2	3	9.6	new	3 2	2	6 4									17	54
Towed Asp Sprayer	new	43	1	43									new	43	2	86	8	344
Water Truck																	0	0
Dump Truck																	0	0
Flat Bed Truck									new	30	1	30					1	30
Concrete Mixer	new	16	1	16													4	64
Motor Cycle													new	2 5	4	10	7	18
Total Cost				168				6 4				150				96		1290
																Gross Total		1290

Estimated equipment purchase costs for additional new equipment required to complete equipment fleet requirements to execute RRMS consultant's 1993/1994 program for existing maintainable roads

calculations made as described in Section II/C–1

Table I–30
PURCHASE COSTS OF NEW EQUIPMENT, 100% MAINTAINABILITY

Tables I–22 through I–30 present calculations for projected equipment maintenance requirements, as discussed in section II–C–1–b.

	Bone				Bulukumba				Jeneponto				Pinrang				Sidrap			
Equipment Type	year	price	Adj	cost	year	price	Adj	cost	year	price	Adj	cost	year	price	Adj	cost	year	price	Adj	cost
Motor Grader																				
Wheel Loader	new	150	2	300	new	150	1	150	new	150	1	150								
Backhoe Loader	new	100	2	200	new	100	1	100	new	100	1	100	new	100	1	100	new	100	1	100
Tandem Roller																				
Pedestrian Vibrol	new	20	6	120	new	20	1	20	new	20	3	60	new	20	1	20	new	20	2	40
Vibrating Plate	new	3 2	11	35 2	new	3 2	4	12 8	new	3 2	5	16	new	3 2	5	16	new	3 2	5	16
Towed Asp Sprayer	new	43	4	172	new	43	1	43	new	43	2	86	new	43	2	86	new	43	1	43
Water Truck																				
Dump Truck	new	33	7	231	new	33	7	231	new	33	2	66								
Flat Bed Truck																				
Concrete Mixer	new	16	1	16					new	16	1	16								
Motor Cycle	new	2 5	6	15	new	2 5	3	7 5					new	2 5	1	2 5				
Total Cost				1089				564				494				224				199

	Sinjai				Takalar				Belu				Kupang				total eqpt shtge	Total costs
Equipment Type	year	price	Adj	cost	year	price	Adj	cost	year	price	Adj	cost	year	price	Adj	cost		
Motor Grader																	0	0
Wheel Loader													new	150	1	150	5	750
Backhoe Loader	new	100	1	100					new	100	1	100	new	100	1	100	3	900
Tandem Roller																	0	0
Pedestrian Vibrol	new	20	2	40	new	20	1	20	new	20	3	60	new	20	3	60	22	440
Vibrating Plate	new	3 2	4	12 8	new	3 2	3	9 6	new	3 2	1	3 2	new	3 2	5	16	43	138
Towed Asp Sprayer	new	43	1	43	new	43	1	43					new	43	2	86	14	602
Water Truck																	0	0
Dump Truck	new	33	3	99									new	33	4	132	23	759
Flat Bed Truck																	0	0
Concrete Mixer	new	16	1	16													3	48
Motor Cycle					new	2 5	1	2 5					new	2 5	5	12.5	16	40
Total Cost				310				75 1				163				556		3677
																Gross Total		3677

Estimated equipment purchase costs for additional new equipment required to complete equipment fleet requirements to execute RRMS consultant's estimated program for 100% of roads being maintainable

calculations made as described in Section II/C–1

TABLE I-31

INPRES EXPENDITURES BY KABUPATEN
FY 1991/92

(Thousands of Rupiah)

KABUPATEN	INPRES DATI II	IPJK	TOTAL
BONE	1,300,158	1,823,739	3,123,897
BULUKUMBA	987,605	1,269,456	2,257,061
JENEPONTO	872,135	1,640,348	2,512,483
PINRANG	899,473	1,154,234	2,053,707
SIDRAP	699,220	865,503	1,564,723
SINJAI	630,000	1,071,607	1,701,607
TAKALAR	630,000	809,696	1,439,696
TOTAL	6,018,591	8,634,583	14,653,174

INPRES BUDGETS BY KABUPATEN
FY 1992/93

(Thousands of Rupiah)

KABUPATEN	INPRES DATI II	IPJK	TOTAL
BONE	3,084,306	2,893,435	5,977,741
BULUKUMBA	1,579,786	2,521,750	4,101,536
JENEPONTO	1,327,717	3,227,050	4,554,767
PINRANG	1,225,313	2,424,456	3,649,769
SIDRAP	946,249	2,404,918	3,351,167
SINJAI	825,163	2,492,350	3,317,513
TAKALAR	987,180	2,207,521	3,194,701
TOTAL	9,975,714	18,171,480	28,147,194

TABLE I–32
COMPARISON OF INPRES BUDGETS BY YEAR

(Thousands of Rupiah)

IPJK FY 1991/92 (1)			
KABUPATEN	BUDGET	EXPENDITURES	DIFFERENCE
Bone	3,316,989	1,823,739	1,493,250
Bulukumba	2,323,478	1,269,456	1,054,022
Jeneponto	1,811,808	1,640,348	171,460
Pinrang	1,380,860	1,154,234	226,626
Sidrap	2,425,808	865,503	1,560,305
Sinjai	1,085,970	1,071,607	14,363
Takalar	1,437,808	809,696	628,112
TOTAL	13,782,721	8,634,583	5,148,138
		63%	37%

IPJK BUDGET INCREASES			
KABUPATEN	FY 1991/92	FY 1992/93	INCREASE/(DECREASE)
Bone	3,316,989	2,893,435	(423,554)
Bulukumba	2,323,478	2,521,750	198,272
Jeneponto	1,811,808	3,227,050	1,415,242
Pinrang	1,380,860	2,424,456	1,043,596
Sidrap	2,425,808	2,404,918	(20,890)
Sinjai	1,085,970	2,492,350	1,406,380
Takalar	1,437,808	2,207,521	769,713
TOTAL	13,782,721	18,171,480	4,388,759
			32%

DATI II BUDGET INCREASES			
KABUPATEN	FY 1991/92	FY 1992/93	INCREASE/(DECREASE)
Bone	1,300,158	3,084,306	1,784,148
Bulukumba	987,605	1,579,786	592,181
Jeneponto	872,135	1,327,717	455,582
Pinrang	899,473	1,225,313	325,840
Sidrap	699,220	946,249	247,029
Sinjai	630,000	825,163	195,163
Takalar	630,000	987,180	357,180
TOTAL	6,018,591	9,975,714	3,957,123
			66%

(1) Inpres Dati II had 100% expenditure rate for 1991/92.

TABLE I–33

MAINTENANCE SYSTEMS DEFICIENCIES FLOWCHART

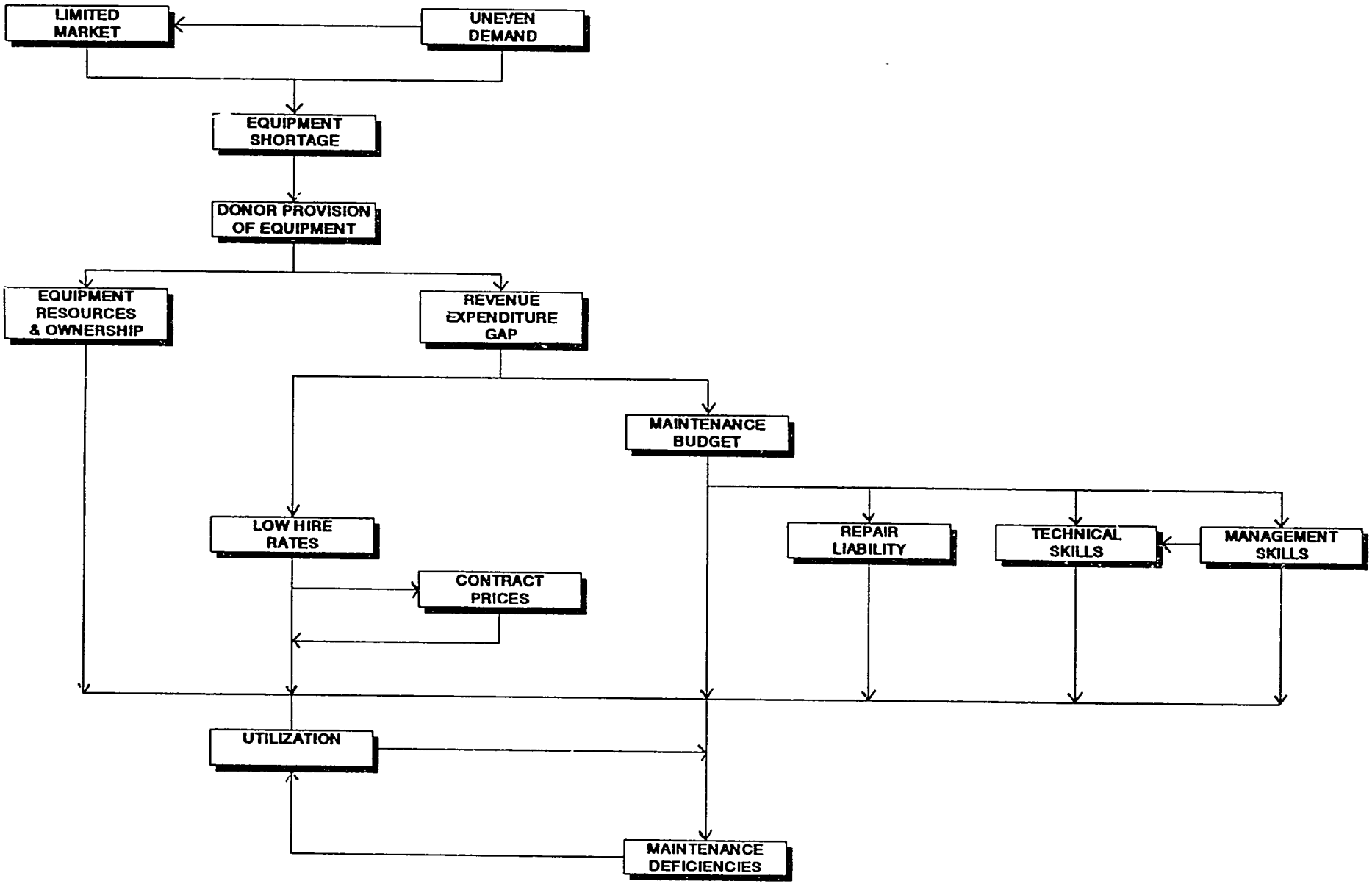

TABLE I–34

MAINTENANCE SYSTEMS DEFICIENCIES – CRITICAL AREAS

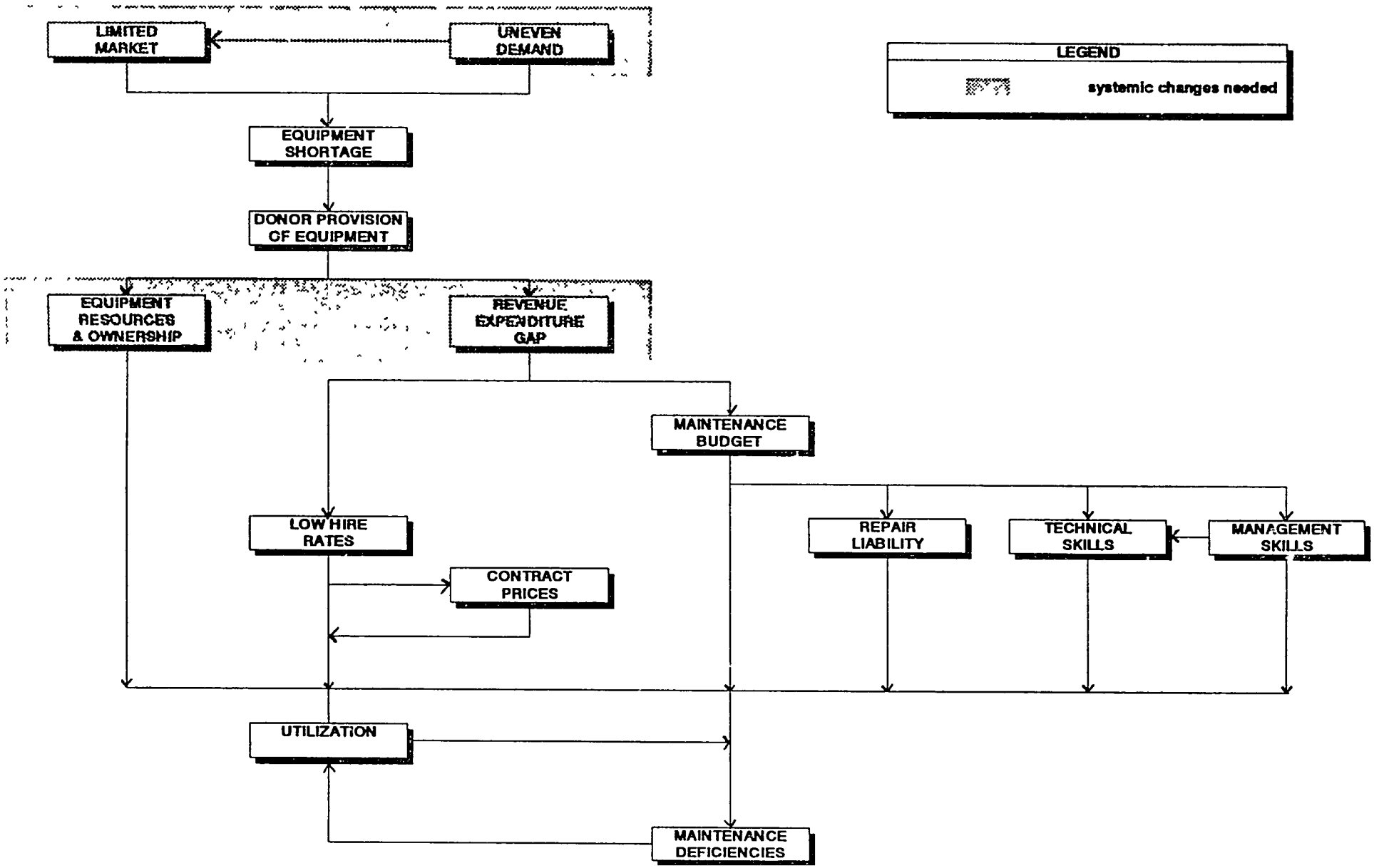

TABLE I-35
EQUIPMENT DEMAND AND PROJECT ACTIVITIES CYCLE

SOUTH SULAWESI							
	EQUIPMENT	PROJECT			OBSTACLES		
MONTH	DEMAND	USAID	INPRES	APBD II	FUNDING	RAIN	LABOR
APRIL	light	(from last FY)			//////////		
MAY	light				//////////		
JUNE	light				//////////		
JULY	light				//////////		
AUGUST	heavy						//////////
SEPTEMBER	heavy						//////////
OCTOBER	heavy					//////////	//////////
NOVEMBER	medium					//////////	//////////
DECEMBER	light					//////////	//////////
JANUARY	light					//////////	
FEBRUARY	light					//////////	
MARCH	light					//////////	

NTT							
	EQUIPMENT	PROJECT ACTIVITY			OBSTACLES		
MONTH	DEMAND	USAID	INPRES	APBD II	FUNDING	RAIN	LABOR
APRIL	light	(from last FY)			//////////		
MAY	light				//////////		
JUNE	light				//////////		
JULY	medium						
AUGUST	heavy						
SEPTEMBER	heavy						
OCTOBER	heavy						
NOVEMBER	heavy						
DECEMBER	medium					//////////	//////////
JANUARY	light					//////////	//////////
FEBRUARY	light					//////////	//////////
MARCH	light					//////////	//////////

ANNEX TWC

OPTIONS FOR THE IMPLEMENTATION OF PRIVATIZED EQUIPMENT MAINTENANCE

I. OVERALL EVALUATION OF PRIVATIZATION

A. Potential Merits, Advantages and Disadvantages

The essence of privatization, i.e., the transfer of activities from the government to the market sector, is the placing of ownership or control of assets in the hands of individuals who stand to gain personally when the value of these assets is increased, and to suffer personal loss when their value is decreased.

A further effect of privatization is to move responsibilities away from bureaucratic levels and towards market levels. For example, the current state of road maintenance equipment reflects not only the subjective preferences of those who buy, sell, lease or maintain the equipment, but also governmental attitudes tending to protect those using the equipment from having to bear its full costs. For better or worse, privatization of equipment maintenance might result in such equipment becoming more costly to some of the present users.

In some situations - for example when monopoly powers are transferred from the public to the private sector - privatization can give individuals power that is too great to be acceptable. Where possible, as in the case of telephones in New Zealand, this potential individual power can be mitigated by competition. For this reason it is important to associate competition with privatization. Thus, a 1989 report to the World Bank by Frank Allen (Private Sector Participation in Infrastructure in Indonesia) concluded that "the transfer of ownership to the private sector without encouraging greater competition is a weak instrument of economic reform."

Having regard to these considerations, our examination of the possibilities of privatizing the maintenance of road maintenance equipment considers the possibilities of doing so within a competitive framework, a framework that would encourage the development of competitive equipment maintenance services.

In cases where competition is not practicable (for example, where natural monopoly situations make competition prohibitively expensive) work can be 'contracted out" to private suppliers. To ensure that contracted out services are provided at minimal cost, it is necessary to specify them in detail, and to select a contractor by means of public bidding processes.

B. Benefits and Costs

The primary effect of competitive private provision, when compared to state provision, is the constant pressure in the private sector to gain customer support by reducing costs and improving service. Private monopolies also have incentives to reduce costs, but these incentives tend to be blunted by others, such as the advantages of a "quiet life" and the wish to be nice to those with whom one works.

A further benefit associated with privatization is the development of entrepreneurial and technical skills and attitudes that stimulate economic growth.

While privatization can bring benefits, it does not come without costs. The pressure to operate in a competitive environment does not suit everybody, and organizational changes can lead to dissatisfaction and even to job losses. Problems of this kind can often be overcome by compensation or reassignment.

A more fundamental difficulty is that, in situations of weak or irregular demand, as is found in the project areas, there may not be enough equipment maintenance work to support a viable private sector operation. In such cases, services could still be contracted out to private firms, but explicit subsidies may have to be offered to attract them

Another problem is that privatization of equipment maintenance would require higher budgets for equipment maintenance, which the kabupatens would have to allocate from limited funds. This is because most Kabupatens do not now pay the full costs of maintaining their equipment, since local contractors pay for equipment repair as part of formal and informal arrangements Nor do they pay for procurement or replacement of equipment which is provided by the central government and international donors. Such Kabupatens would not be able to pay the full costs of equipment maintenance without new funding sources.

C. Effects on Road Maintenance

If the costs of maintaining road maintenance equipment were to fall, and if in consequence road maintenance equipment were to become more readily available, would the maintenance of Kabupaten roads improve? Nor necessarily: The maintenance of Kabupaten roads is neglected for a number of reasons, of which the lack of equipment is only one As road maintenance equipment can be used for other tasks - road rehabilitation for example - the availability of the equipment may not always result in road maintenance itself being improved. Other changes may be required to bring this about.

The neglect of road maintenance may be influenced by institutional reasons. Aggregation and articulation of demands for road maintenance do not come directly from road users Those who are most interested in good roads - the road users - have no direct role in the decisions to allocate funds to road maintenance, while those who have a direct role in the funding decisions - the Kabupaten governments - have other interests to consider when allocating funds for maintenance. There is less prestige in road maintenance, so that compared to other activities such as new road construction and upgrading, it is not difficult for some hard-pressed officials to defer expenditures on maintenance.

II. PRIVATE SECTOR CAPABILITIES

A. Existing Private Sector Situation

1. Equipment Resources

Please refer to Appendix I at the end of this Annex, "Company Reports," for a description of individual companies surveyed.

For GOI road construction projects of contract value above Rp2M, all contractors must pre-qualify to minimum standards which are defined in Daftar Rekanan Mampu, (list of qualified contractors).

The DRM provides six classifications for contractors by contract value, for which the pre-qualification requirements increase with the contract values. Part of these requirements cover the minimum amount of equipment a contractor must own when pre-qualifying. The classifications are;

Class A	Contract Value above Rp1,000M
Class B1	Contract Value Rp200M - Rp1,000M
Class B2	Contract Value Rp100M - Rp200M
Class C1	Contract Value Rp50M - Rp100M
Class C2	Contract Value Rp20M - Rp50M
Class C3	Contract Value Rp2M - Rp20M

All class A contractors and most class B1 contractors have substantial equipment fleets, usually far in excess of the DRM minimum requirements.

The smaller contractors, class B2 to C3 inclusive, generally have equipment fleets much nearer in size to the DRM minimum requirements.

Accurate details of the quantities and condition of all of the contractors' equipment in South Sulawesi and NTT are not available, and the study time does not allow a detailed survey.

Two surveys have been conducted regarding equipment resources. The RRMS consultants conducted a survey in 1991 of the equipment owned by class B2 to C3 contractors in the study area, these being the contractors involved in the kabupaten roads maintenance projects. Travers Morgan International Ltd, the consultants for the equipment study for The Directorate General of Highways, funded by the ADB Tenth Roads (Sector) Project, conducted a nationwide survey of all private sector contractors' equipment, including the persero contractors, in 1992.

The results of these studies showed that in South Sulawesi and NTT, the private contractors' equipment ownership is;

		South Sulawesi	NTT
Private Contractors	Heavy Equipment	134 units	211 units
	Light Equipment	242 units	317 units

Both of these surveys relied on all of the contractors completing and returning questionnaires. Selected contractors were visited to verify to some extent the information in the returned questionnaires, but discussions with all of the contractors and inspections of all of their equipment fleets were not possible, because of the amount of equipment involved. The RRMS consultants were able to visit 20% of the contractors in their study area.

The above figures, therefore, may not be accurate. They may include some scrap items of equipment, which, pending authorized write-off, will still appear on equipment inventories.

These figures also include equipment for new construction and rehabilitation, as well as equipment for hot asphalt surfacing, types of projects which require much larger amounts of equipment, as well as equipment of larger capacity, than is normally used for kabupaten roads maintenance

The above equipment capacity can not automatically be considered as available to compensate for any equipment shortages in the kabupaten roads maintenance fleets. Most of Bina Marga's equipment will be assigned to national and provincial road projects as will much of the contractors' equipment. The contractors will also be executing projects other than road projects.

All of the companies that it was possible to interview during the limited time of the study were Class A contractors owning equipment fleets of between 50 to 150 items. They were also contractors who relied on road construction and maintenance projects for much of their work load, which was reflected in their equipment holdings of dump trucks, wheel loaders, graders, rollers, compactors, stone crushers, asphalt sprayers and bulldozers.

However, many of these contractors had also begun to expand their equipment fleets to enable them to execute other types of projects such as housing, irrigation and piped water supply. This was done mainly by complementing their existing fleets with additional excavator capacity.

2. Equipment Utilization

The private equipment owners, who in the study area are all private contractors, endeavor to achieve maximum equipment utilization, whenever possible, by engaging in more than one sector of construction activity.

The DRM pre-qualification standards and project value limits exclude the class A and B1 contractors from kabupaten road maintenance projects. These projects are limited to the smaller contractors, class B2 to C3, who may also carry out other small GOI projects, according to DRM limits, although they very rarely have the opportunity to operate in the private sector construction market.

The class A and B1 contractors, through the DRM standards, may execute kabupaten road rehabilitation projects, and also provincial and national road maintenance, betterment and construction projects. They are also eligible for other major central government projects. particularly the class A contractors, such as irrigation, harbor and airport construction projects.

In addition, many of the class A contractors work in the private sector, normally investing in housing or industrial development projects, for which they use their own equipment, generating monetary returns through the sale or rental of the developed estates. These activities take place in the provincial capitals (Ujung Pandang and Kupang) where the companies are based.

There are also government owned, national class A contractors, who normally work only on central government projects and were not contacted during this study because they are not involved with kabupaten road projects.

In both provinces in the study area, most of the contractors engage in any of the above alternatives to kabupaten road projects whenever they can, taking advantage of the opportunity for greater equipment utilization. Larger contractors are more able and likely to work on other projects. Contractors working on kabupaten projects tend to be heavily reliant on these projects alone.

The most adaptable types of equipment for the alternatives to any road projects such are trucks, concrete mixers, backhoe loaders, small bulldozers and small excavators. Crushers, and therefore wheel loaders, can also be used for these types of project if enough aggregate is required. The larger equipment is usually more specialized and so less applicable to alternative projects, and equipment such as rollers, asphalt sprayers and pavers have very restricted applications.

The private contractors, through working more hours per day with less machine down time resulting in greater production, generally achieve better equipment utilization than the DPUK during project execution. Being private contractors, there is a greater incentive to achieve efficient equipment operation through the profit motive and their greater flexibility for engaging staff, (resulting from their greater control of their budgets), assists them in achieving this.

All contractors that rely heavily on the GOI road construction and maintenance projects face the problems of low equipment utilization between projects.

The class A and B1 contractors have the benefit of longer project periods, usually more than twelve months, which provides the possibility for twelve months usage some years, although they may still face periods of idleness for their equipment at the end of the projects.

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The option of the private contractors to hire out their surplus equipment during the periods when they are not fully engaged on their own contracts varies considerably, but tends to be limited by the fact that demand is low for all contractors at the same time.

In South Sulawesi there is a greater readiness than in NTT of the larger contractors to hire out their equipment to other contractors or the public sector. At present, there is a potentially greater amount of alternative projects for larger contractors, primarily GOI irrigation projects. There is also a greater number of contractors with their own equipment to hire out to these projects, should the demand arise.

In NTT the contractors are generally quite reluctant to hire out their surplus equipment because of previously experienced bad debts and they are prepared to accept the reduced equipment utilization that this results in.

The most common supply of hire equipment, from contractors who do hire out their equipment, is bulk earth moving equipment, dump trucks, wheel loaders and excavators, although contractors who do hire out their equipment are normally prepared to hire out any of their equipment, depending on their surplus capacity.

The private contractors' hire rates are always higher than the public sector and have a different structure. The public sector will hire out a bare machine without fuel or maintenance, on an hourly basis, with the exception of rollers, which are hired out according to the area to be rolled. If mobilization of the equipment does not include specialized transport, it is normally included in the hire rate.

The private contractors hire out a machine, normally on a daily or monthly basis, with an operator and maintenance included in the hire rate. Fuel is still supplied by the renting company. Mobilization is an additional cost. Taking into account the differences in the private contractors' hire rate structure, their rates, which have the commercial basis of the machine not only earning its purchase price but also its maintenance and replacement cost, are still higher than the public sectors' rates.

As stated above, in NTT most contractors no longer hire out their surplus capacity when a demand arises because of payment problems. In South Sulawesi, payment does not appear to be such a problem, although there have been incidents of non-payment. The private contractors require prompt monthly payment and in a case of delayed payment, they will demobilize their equipment from the defaulting company.

3. Equipment Maintenance

Most of the private contractors interviewed during the study experience maintenance problems to some degree which varies with the contractor. Generally, because of their greater control over their own budgets and their often more flexible management structures, the private contractors

have less difficulties than the DPUK workshops in attracting skilled labor and financing repairs. They still experience difficulties with labor and parts though.

The standard of maintenance in the private sector varies considerably. Some contractors maintenance standards are equivalent to the DPUK's, some higher and some lower. Generally, the larger contractors pay more attention to equipment maintenance than the small contractors. One class A contractor interviewed is now experiencing great difficulties with machine availability, coupled with very high repair costs as a result of an earlier neglect of maintenance caused by the misconception that new equipment did not require maintenance.

Most of the contractors who neglect equipment maintenance are contractors with predominantly second hand equipment fleets, and their reason for poor maintenance is that the purchase cost of the equipment does not justify the expense of maintenance. Such contractors are definitely a minority, and a minority which appears to be reducing as the real costs of neglected maintenance and extended project completion times becomes apparent to them.

Most of the contractors keep maintenance records and implement routine maintenance of their equipment, although many do not adhere closely to the manufacturers' recommendations. Some of the contractors perform their routine maintenance on a regular time period, such as changing engine oils on the same day of every month rather than attempting to monitor hours worked or kilometers travelled to establish when services are due. This method may not be as accurate as monitoring hours worked, but it is reliable and simple to operate.

One contractor in NTT prefers to buy new equipment. The reduced requirement for repair maintenance is one of the advantages of purchasing new equipment, and this contractor was aware of the maintenance problems in NTT due mainly to the lack of a readily available supply of skilled labor. This contractor is also one of the contractors who carries out the routine maintenance of his equipment generally in accordance with the manufacturers' recommendations.

Some contractors, usually those who pay more attention to maintenance, also practice operating economies such as hard facing loader buckets and teeth, and welding worn grader cutting edges together to gain more use from them.

Very little hard facing was seen on any of the DPUK equipment. Bucket teeth cannot be rebuilt with hard facing if they are too far worn, and most DPUK grader cutting edges inspected were worn well down into the mold board, making the cutting edges unsalvageable as well as seriously damaging the grader's blade.

There are many small private workshops throughout the kabupatens who can perform equipment repairs and engine rebuilds. Bulukumba, at present, relies totally on such services and Pinrang employs private sector labor in its workshop. Most of the DPUK workshops use the specialist services of engine re-bore and crankshaft re-grinding private machine shops. Those which do not use these services are workshops which have not yet had the necessity to do so.

In Ujung Pandang, there are dealers' workshops for Mitsubishi, Toyota, Nissan, Caterpillar and Komatsu. These workshops offer full maintenance and repair facilities. The maintenance is offered on a contract basis, although none of the contractors spoken to use this service because of the assumed high costs involved. The real costs involved in using dealer maintenance and repair services with minimum expense, particularly for heavy equipment, are discussed in Appendix 1, PT Trakindo Utama and PT United Tractors

Kupang does not yet have such comprehensive equipment dealers' support facilities, although the Caterpillar and Komatsu dealers do have representative offices there and can provide mechanical services if requested to.

Manufacturer dealers' repair services are normally only used by both DPUK workshops and the private contractors as a last resort, again because of assumed high costs.

4. Personnel

Skilled and motivated personnel vital elements in equipment maintenance. Generally, because of their greater control over their own budgets and their often more flexible management structures, the private contractors have less difficulties than the DPUK workshops in attracting such personnel. They still experience difficulties in recruiting such labor though, particularly in NTT. Four class A contractors have commented on the difficulties of obtaining skilled labor which they can permanently engage instead of contracting from equipment dealers. One of these contractors cited the lack of skilled labor as one of the main reasons for his purchasing new machines. Another contractor said that even though he is prepared to pay the required market rate to attract imported skilled labor from Java or Sumatra, he has so far been unsuccessful in recruiting such labor.

One class A contractor interviewed, aware of the problem of recruiting local labor in Ujung Pandang, has been training his own mechanics and operators for the past ten years. He begun this internal training program by long term sub-contracting of expensive skilled labor from equipment dealers to train a nucleus of his own skilled workshop personnel. All of this contractor's workshop personnel are sent on periodic training courses with manufacturer's dealers to upgrade their skills. Another class A contractor in Ujung Pandang is now starting to train his own workshop personnel in skills using the same method.

In Ujung Pandang, many contractors ask for references and certificates when recruiting, sometimes testing applicants also. In Kupang this seldom happens, the contractors there accepting that very few, if any, of the local labor will have had any formal training.

This does not mean that able mechanics are not available locally. They are, but there are not many of them, most of them having little or no experience with heavy equipment because they have been working in small private workshops and have had no access to training. However,

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given adequate long term training and support, some are capable of developing into good heavy equipment mechanics.

Wages in the private sector are invariably superior to those of the public sector, although there is not the job security that civil servants enjoy. The private sector can therefore theoretically attract a higher standard of skilled labor than the public sector, although there is the case above of a contractor in Ujung Pandang who claims to be unable to recruit a satisfactorily skilled mechanic despite offering the market rate for such labor.

However, there does appear to be a reluctance by most of the private contractors to compete with the equipment dealers in salaries and conditions in permanently attracting these dealers' skilled labor, the majority of whom have had expensive, long term training.

Many of the private contractors spoken to in Ujung Pandang were content to make their own personal arrangements directly with the dealers' mechanics when they needed their services, forsaking the dealers' warranty for the savings involved.

There is competition for skilled personnel among the dealers themselves. The senior staff of the Hitachi dealership, (PT Hexindo), currently being established in Ujung Pandang, are all from PT United Tractors.

5. Spare Parts

The availability of spare parts affects the public and private sectors alike.

There is a better supply of spare parts for Japanese trucks in South Sulawesi than in NTT. Toyota and Isuzu parts are generally available to the same extent in Ujung Pandang and Kupang, but there are very few spares for trucks above 3.5 tons gross vehicle weight in Kupang.

The Caterpillar and Komatsu dealers' facilities in Kupang are much smaller than those in Ujung Pandang, causing the potential for a greater spare parts supply problems for these machines in NTT, but contractors in both provinces have cited problems with spare parts supply for Caterpillar and Komatsu, although to a much lesser extent than for other heavy equipment manufacturers.

For manufacturers other than Caterpillar and Komatsu, all spare parts for heavy equipment, in both South Sulawesi and NTT, must come from Surabaya. In this case, both the public and private sectors must accept longer delivery times, unless air freight is practical and the contractor is prepared to pay for it.

The private contractors' own stocks of spare parts varies with the degree of attention paid to maintenance. The contractors who are most concerned with implementing good maintenance are

usually the one carrying the largest stocks of spare parts. Many of the smaller class A and B1 contractors have much less spare parts in stock than the DPUK workshop stores.

Some of the private contractors have Eastern European equipment and are facing considerable difficulties in obtaining spare parts for this equipment for similar reasons to the DPUK's problems with their Yugoslavian origin Barata roller spare parts.

However, it is not only the Eastern European origin heavy equipment which causes problems in spare parts supply. Many of the contractors spoken to cited spare parts supply problems of long delivery times with the less common Japanese and USA made equipment. Some contractors said that they had resorted to fitting more easily obtainable spare parts, making whatever modifications were necessary, rather than wait for spare parts which may take up to six months to arrive or are totally unobtainable.

None of the contractors spoken to use after market spares to any great extent, and there are no dealers for such spare parts in either South Sulawesi or NTT.

6. Facilities

With exception of some of the larger class A contractors and the specialist machining and fabricating workshops, PT. Trakindo Utama, PT. United Tractors, the DPUK's workshop facilities are better than those in the private sector.

Table 1 shows private facilities in the study area. Machining, fabrication and limited maintenance facilities are available Ujung Pandang, Kupang, Bone and Sidrap. However, fully comprehensive maintenance facilities are only available in Ujung Pandang.

In Belu, the only workshop facility is that of the DPUK and in Jeneponto and Sidrap, private vehicles were being worked on in the DPUK workshops when they were visited.

It would greatly increase the utilization of the DPUK workshops if they were encouraged to accept more private sector work, provided that the private sector pay. It is very noticeable that while the private sector is prepared to pay for its own vehicles to be repaired, it is generally not so willing to pay for repairs to the DPUK's equipment while it is on hire to them.

B. Availability, Qualification and Interest of Providers

1. Qualifications Summary

Table 1, Existing Private Sector Activities, shows equipment related activities in the private sector for the study area.

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Table 2, Existing Candidates for privatization options shows potential involvement in privatization options for companies in the study area.

The most qualified providers of any of the privatization options are PT. Trakindo Utama and PT. United Tractors, dealers for Caterpillar and Komatsu products, respectively. In Ujung Pandang these two companies already have fully trained workshop staff, excellent facilities, a nation wide network of support facilities with further, international support facilities in Singapore.

An equipment maintenance service provided by either of these companies will ensure a high availability of equipment. However, these companies are only interested in the products for which they are the dealers in Indonesia, and the two companies are in direct competition with each other.

PT. Amarta Karya, as an existing state owned plant hire company with a newly established workshop in Ujung Pandang, is already in a position where it operates a plant hire fleet and an equipment maintenance workshop. However, as a state-owned company, it may well face similar staffing problems to those the DPUK's are already experiencing.

PT. Amarta Karya have no presence in Kupang at the present time.

The private contractors and workshops stay in business by profitable operation and therefore, theoretically, have the management potential to operate workshop or equipment maintenance enterprises profitably. Assuming that there are sufficient markets for these enterprises in the kabupatens to generate profits for efficiently managed operations

There is one company in Bone able to do a full range of repairs and machining. This company currently performs this work on its own equipment only.

In Bulukumba, with the workshop not yet operational, any repairs which are made are made by the contractor hiring the equipment. There are no alternative facilities.

In Jeneponto, there are no alternative facilities to the DPUK workshop. This workshop does some vehicle repairs for the private sector.

There are three alternative facilities in Pinrang to the DPUK's workshop, which sometimes perform repairs for the workshop. The repairs actually performed in the DPUK workshop are done by a private repair contractor using the DPUK's facilities.

There is one private workshop in Sidrap which does machining, engine and vehicle rebuilds for local transport contractors and farmers. This workshop also does work for the DPUK workshop.

There are small, light transport vehicle workshops in Sinjai, but at present they do no work for the DPUK workshop.

There are no alternative facilities in to the DPUK workshop in Takalar. The private sector here use workshops in Ujung Pandang.

The DPUK workshop in Atambua, kabupaten Belu, is frequently used by the contractors for repairing their equipment because of its superior facilities to the contractors' workshops.

Most of the contractors in Kupang have their own workshops and there are also specialized machine shops for engine boring and crankshaft grinding.

The service to be provided by the private sector must ensure high equipment availability at least. From the condition of contractors equipment seen during visit, equipment maintenance standards vary between contractors and it is doubtful if some contractors could provide the required availability with the maintenance policies they appear to be using at present.

2. Interest in Options

PT Trakindo Utama and PT. United Tractors have an interest in option 1a and 1b, applied only to equipment for which they are the dealers.

PT. Amarta Karya's interest in options 2b, 4b and 5 has not been explored specifically. Initial meetings with the director and staff in Jakarta indicated concerns regarding capacity for expansion into new areas at this time.

The remaining contractors and workshops who are interested in any of the options are mainly interested in options 1a, 1b and 3. Any contractor who discussed option 5 expressed hesitancy due to high risk and uneven demand.

Some of the more specialized workshops, such as HS Motor, at present offer only welding and machining services, a component of 1a, from their existing premises and already perform these services for the DPUK's as well as the private contractors.

Other private companies, interested mainly in 1a and 1b would only consider the kabupatens in which they are based at present.

The larger class A contractors showed no interest in any of the options at present. In NTT two contractors showed some interest in options 1a and 1b, but both contractors would need to restructure their existing management organizations to operate equipment workshops effectively and provide high machine availability. One of these contractors would also need to make a substantial investment in workshop equipment and tools, which he would be reluctant to do under the present circumstances.

III. OPTIONS FOR PRIVATIZATION

A. Options

The study team has analyzed deficiencies in the current kabupaten equipment maintenance system in Report One. A full discussion of the causes for these deficiencies is included in that report. In order to determine whether these deficiencies could be resolved by privatizing components of kabupaten equipment maintenance services, and by revising equipment hire policy, five options are proposed for consideration. The options contain privatization scenarios which can affect equipment maintenance and hire.

The options are described in this section, and analyzed on the basis of nine criteria in the following sections. One option is recommended for pilot implementation in the study area.

LIST OF OPTIONS

1. Contracted Equipment Maintenance
2. Autonomous Equipment Maintenance Unit
3. Privatized Equipment Maintenance
4. Autonomous Plant Hire Unit
5. Privatized Plant Hire

1. Option One - Contracted Equipment Maintenance

Option One leaves the ownership of equipment and facilities unchanged, and contracts out all or some of the maintenance operations to private firms. Two methods of contracting are considered:

1a Contracted Equipment Maintenance, which would allow contracting equipment maintenance activities to private firms operating in their own facilities; and

1b Contracted Workshop Operation, which would contract out equipment maintenance to one firm which would also operate the existing kabupaten workshop.

2. Option Two - Autonomous Equipment Maintenance Unit

Option two leaves the ownership of equipment and facilities unchanged, and establishes the workshops and workshop equipment as Autonomous Equipment Maintenance Units owned by the government. Two methods of contracting are considered:

2a Autonomous Equipment Maintenance Unit - New Organization, which would establish new entities for equipment maintenance, such as a Unit Swadana, BUMN or BUMD; and

2b Autonomous Equipment Maintenance Unit - Amarta Karya, which would establish equipment maintenance operations under an existing government-owned enterprise (BUMN).

3. Option Three - Privatized Equipment Maintenance

Option Three leaves the ownership of equipment unchanged, and transfers the existing kabupaten workshops and workshop equipment to privately owned and managed firms.

4. Option Four - Autonomous Plant Hire Unit

Option Four transfers ownership of equipment and facilities to Autonomous Plant Hire Units owned by the government. Two methods of establishing these autonomous units are considered:

4a Autonomous Plant Hire Unit - New Organization, which would establish new entities for equipment hire and maintenance, such as a Unit Swadana, BUMN or BUMD; and

4b Autonomous Plant Hire Unit - Amarta Karya, which would establish equipment hire and maintenance operations under an existing government-owned enterprise (BUMN).

Private firms could be contracted to perform management functions. The plan hire would be free to compete in the open market for equipment hire and maintenance.

5. Option Five - Privatized Plant Hire

Option Five would encourage privatization of both workshops and equipment, and thus transform the present kabupaten equipment management systems into competitive privately owned and

managed plant hire firms. Privatization could be carried out in several ways, but would involve the transfer of equipment ownership to the private sector.

B. Evaluation Criteria

Options for privatization should meet the goal of more efficient utilization of equipment. In order to meet that goal, several factors need to be dealt with which will affect the feasibility of implementation of the option. Both internal and external factors are considered. Nine criteria were used to evaluate the options:

LIST OF CRITERIA

1. Efficient Equipment Utilization
2. Risk Minimization
3. Financial Viability
4. Conflict with Existing GOI Policy
5. Addresses System Deficiencies
6. Qualified Providers
7. Mobilization of Resources
8. Human Resource Development
9. Potential for Development into Sustainable Privatization

A viable and effective option for privatization pilots should meet the following criteria:

1. Efficient Equipment Utilization - It will provide incentives to encourage effective and efficient use of road maintenance equipment.

To what extent does the option encourage the use of road maintenance equipment for tasks for which it is suited and in a manner that economizes in its use?

Are there incentives to maintain equipment in use so as to increase its life and availability?

Do hirers have incentives use equipment quickly and to return it when no longer needed?

Are there incentives to scrap or cannibalize equipment past its useful life?

Are there incentives to dispose of unwanted equipment?

2. Risk Minimization - It will avoid unacceptable risks.

To what extent will the option involve risk to the parties directly concerned?

Risks include financial risks to investors, (e.g., arising out of delays in payment or from deficient legal procedures, or limited return on investment) and risks to Kabupatens and road users that equipment and road maintenance could suffer.

3. Financial Viability - It will favor financial viability:

To what extent are the operations resulting from the option likely to be financially viable?

Consideration needs to be made of the amount and source of revenues required to cover equipment maintenance costs.

What guarantees of continued revenues will be provided?

Is there a market mechanism for ensuring sufficient revenues, or is the option dependent upon annual government budgets or donor financing?

4 Conflict with Existing GOI Policy - It will not conflict with existing government policy, and involve minimal adjustments to existing regulations:

To what extent is the option inconsistent with existing governmental policies, regulations and procedures?

What changes in policies, regulations and procedures would be required to allow for implementation of the option?

In what areas will obstacles to successful implementation arise?

5. Addresses System Deficiencies - It will address and help to overcome the fundamental causes of poor equipment maintenance which are found in the current system:

Does the option address the problems of limited market and uneven demand?

Will fragmentation be resolved, including features such as donor provision of equipment, inappropriate equipment resources, separation between owners and users, and the gap between revenues and expenditures?

Will the effects of fragmentation be resolved, such as:

a. low hire rates
b. insufficient utilization
c. inadequate maintenance budget
d. divided repair liability
e. low technical skills
f. inadequate management skills

6. Qualified Providers - It will rely on qualified providers, preferably from the pilot areas:

To what extent are there in the pilot areas organizations with the resources required to implement the option under consideration?

Resources include facilities, equipment, management, capital, skilled personnel

7. Mobilization Resources - It will stimulate management to be innovative and resourceful in the public interest:

Will the responsible organization be able to mobilize its potential and actually carry out the duties required? Are there incentives for the organization to utilize its potential to provide services as described in the option? Are there obstacles to development of the full potential of the organization, based on current or past performance, organizational structures or environmental factors?

8. Human Resource Development - It will encourage human resource development:

To what extent does this option encourage training and other aspects of human resource development which are necessary for efficient utilization of equipment?

Does it stimulate demand for skills?

Is it likely to increase investment in activities that will develop human resources in the pilot areas?

9. Privatization Potential - It will have the potential for development into better options:

Is the option likely to develop into a sustainable method of providing efficient equipment utilization and maintenance? If the option is not fully sustainable or efficient by itself, does it hold the possibility of encouraging the development of a more sustainable and efficient option?

C. Discussion of the Options

1. OPTION ONE - Contracted equipment maintenance

Option One provides for contracting out workshop operations. This option provides for the kabupatens to retain ownership of their workshops and workshop equipment, but allows all or some workshop services to be contracted out to private firms.

Contracts for maintenance could fall into one of two categories:

Option 1a - maintenance of kabupaten equipment on the contractors' premises.

Option 1b - management of the Kabupaten workshops along with maintenance of kabupaten equipment.

Implementation of this option would lead to maintenance operations being performed by contract staff instead of by government staff.

The kind of services that could be considered for contracting out are shown in Table 6, Components for Contracting. They could range from specialized equipment maintenance tasks (such as engine overhauls) to minor items of building maintenance.

Contracting maintenance and workshop operations would require all costs to be budgeted directly, eliminating variable hidden costs which are currently paid by equipment hirers.

The advantages of contracting out specialized services are of two kinds: First, there could be financial savings to the Kabupatens by having work done without specialists having to be employed full-time by the public service. Second, the development of local specialist firms are a key element in promoting economic growth.

The disadvantages of contracting out specialized services include the possibility that the firms being contracted would become monopolists for the length of their contracts. Indeed, for this reason, contracting out is one of the least satisfactory forms of privatization, recommended mainly for services which cannot, by their nature, be provided competitively.

Second, and more importantly, contracting out services under present arrangements would not deal with the basic lack of incentives for equipment owners or hirers to maintain equipment efficiently and effectively. A contracting system would need to be devised with sufficient incentives for both parties to the contract to maintain the equipment, and to minimize the risk of misuse or negligence on the part of the equipment hirer.

Third, the need to ensure the integrity of contract awards, and to monitor implementation by the contractors, is likely to impose heavy administrative burdens.

Assessment of Option One against the criteria:

1. Efficient Equipment Utilization

Under both Options (1a) and (1b) neither the Kabupatens nor the road maintenance contractors would have any new incentives to make the best use of road maintenance equipment.

It would be the equipment maintenance contractors, especially under option (1b), who would be stimulated to make the best use their facilities This would not lead directly to improved maintenance of equipment.

1a The private sector plant companies, such as Trakindo and United Tractors, have a good record of economic efficiency in maintaining the equipment which they sell and/or manufacture. This indicates an ability to maintain equipment. These companies could service only part of the kabupaten fleet.

1b Encouraging utilization of equipment in proper and economical ways is only provided through realistic costs of repair charged for plant which has been misused, and these costs being passed on to the party misusing the equipment. This would require adequate tracking mechanisms to determine the proper payor for repairs.

1b No inherent incentives are present in the form of reduced administrative procedures allowing sale, scrap or cannibalization of equipment at the proper time.

Incentive are present if funds flow smoothly for payment of maintenance contracts, and if kabupatens monitor the work. Private maintenance contractors would maintain equipment in order to get the next contract, if contracts are awarded on merit.

2. Risk Minimization

A major risk to government under this option is poor performance by monopoly contractors who might be difficult to dismiss rapidly.

A major risk to contractors would be delays in getting their bills paid. In addition, there could be a risk of the contractor not receiving payment in full, or other administrative problems commonly found in contracting in Indonesia.

1a From provider's point of view, the main risk is in delayed payment by GOI, who would be their customer, rather than the hirer. Interviews indicate that, even though payments are often delayed, contractors are able to rely on eventual payment from the government more readily than payment from other private contractors.

1a Some investment would be required by maintenance contractors for expansion.

1b Little investment will be needed by maintenance contractors, other than to build up adequate spare parts inventory, and to upgrade workshops

Equipment hirers in some kabupatens currently use private workshops for repair, and would lose this option under a contracted maintenance system.

3. Financial Viability

As payments from governmental sources in Indonesia tend to be irregular, the financial viability of such operations would depend on the contractors being strong enough to cope with delayed payments, and the fear of such delays would probably result in bids being high.

1a A high standard of maintenance would be provided by Trakindo/United Tractors, and the cost would be proportionately high. Trakindo/United Tractors would also always fit genuine parts at a higher cost than those often purchased by the workshops under the existing arrangements. These providers could service only Caterpillar and Komatsu products; other brands of equipment would need to be.

1b The end product of a well maintained fleet is potential high output. This would not accrue to the workshop services contractor but would be retained by the plant owners/operators.

1b The negotiation of the service contractors fee would determine whether or not it is financially viable from the point of view of both him and GOI.

The budget for contracted maintenance would need to include all maintenance costs, and would therefore be much larger than the current maintenance budget. The same applies to all expenses for workshop operations and maintenance.

This option does not address the revenue - expenditure gap, and leaves the kabupatens dependent on central government grants for equipment maintenance, as is currently the case.

4. GOI System Conflicts

GOI budgetary and contracting procedures could obstruct the speedy execution and implementation of such agreements, but these procedures could have the beneficial effect of routing funds directly to equipment maintenance.

Equipment maintenance budgets would need to be increased significantly, with difficulty encountered in mobilizing sufficient resources, determining funding sources, and guaranteeing stable budgets over the long term. There are inherent difficulties in guaranteeing on-going contracts with providers.

Inpres funds are those which are consistently late, thus leaving a multi-month gap in payments by the government. In order to conduct maintenance during this period, maintenance contractors would need to cover costs. This is unlikely for small local businesses, who would be likely candidates for maintenance contracts. It would be a more likely possibility for larger contractors such as Trakindo or United Tractor, but there services would not cover all equipment in the kabupatens.

1a Significant private sector maintenance is already occurring in some kabupatens. This is not carried out on an overall contract basis, but for individual repairs only. Kabupatens currently involved in having equipment maintained by private workshops would have an easy transition to fully contracted work. Conversely, they may see no advantage to contracting over the current system.

1a Kabupaten workshops, which represent a major investment, would be idle if all maintenance work were contracted out. Even if only some maintenance were contracted out, workshops which are already operating below capacity would be used even less.

1b Represents a potentially significant shift in policy with transfer of traditional GOI activity (workshop operation) to be operated by private sector.

1b There could be implications for manpower if contractors' personnel replace GOI civil servants -- or negative benefits for the contractor if he is forced under contract to maintain staff which is not qualified or presents other management difficulties.

1b There could be legal questions and payment problems regarding the leasing of government property for operations.

Multi-year contracts would be advantageous but difficult to achieve in the current budgeting system.

5. Addresses System Deficiencies

Option one does not address the root causes of limited market and GOI budgetary cycle. It will have little affect on donor provision of equipment or equipment resources, except to lessen the need for replacement equipment as current equipment is better maintained.

Operations will continue to be fragmented, with owners and users continuing to be from different organizations, and a continuing revenue-expenditure gap.

There will be no effect on hire rates. Utilization may improve due to improved conditions of equipment, but there will be no additional incentives for more efficient utilization. The maintenance budget will need to be inclusive, without hidden costs, unless spare parts remain outside the cost of the contract. In this case, costs could continue to be passed on to the hirer. and remain hidden. The option does not provide a solution to the problem of allocating sufficient maintenance budgets consistently over the life of the equipment.

Repair liability will be rationalized to a certain degree if hidden costs are eliminated. Liability for repairs due to negligence will continue to be problematic.

Management and technical skills would be higher than currently found in the kabupaten workshops if (a) contracts are awarded on merit, and (b) kabupatens are willing and able to enforce terms of the contract. With such methods, incentives will be present for the provider to carry out satisfactory maintenance services. In turn, the most cost-effective way for the provider to guarantee this is to employ highly-skilled managers and mechanics.

The main advantage would be to highlight the cost of maintenance through the procedures for procurement of the suppliers contract. This cost and the possible lack of a sufficient budget would have to be faced at the beginning of the maintenance period instead of remaining concealed until part way through each year.

6. Qualified Providers

1a The capacity of the private sector to maintain road maintenance equipment under contract (Option 1a) is reasonably good, at least for the most common equipment brands, due to the presence of the manufacturers' representative offices in the pilot areas.

Significant differences are apparent in the study areas. Most notably, no potentially qualified providers interviewed in NTT were interested in becoming involved in any of the options. Potentially qualified providers were identified for all areas of Sulawesi, although not located in every kabupaten. Potentially qualified providers were identified in Kupang but not Belu. There would be severe logistical and other difficulties for a Kupang firm to provide services in Belu.

1b The capacity to operate the Kabupatens' workshops is more difficult to determine but firms that appear to be qualified have been identified both inside the pilot areas and outside them Although companies exist which would be qualified to operate the workshops, their willingness to do so is uncertain. Much would depend upon the degree of autonomy their would be allowed to employ i.e., no restrictive clauses in the agreement.

7. Mobilization of Resources

Profit will serve as an incentive to realize potential of the provider company.

Both options would stimulate the energies of the maintenance contractors' firms to reduce their costs, as this would increase their profits.

The desire to have their exclusive contracts renewed would provide stimuli to good performance, but incentives to perform well would not be as strong as under options that allowed competition.

1b There would be scope for the organizations to be innovative outside traditional GOI methods of operation - if allowed to do so.

Incentives for greater efficiency will be present only if maintenance contracts provide sufficient compensation to providers, all payments are made timely and in full, and the government undertakes effective monitoring and enforcement of the contracts. Possibilities for shortcomings in all of these areas are substantial.

8. Human Resource Development

Assuming that road maintenance equipment would be better maintained, the demand for mechanical skills would increase, which would have a positive effect on training and human resource development.

There could be job losses in the public sector, if kabupaten civil servants are replaced by managers, operators and mechanics by private sector providers. This is integrated by the fact that many civil servants currently perform multiple job duties.

The private sector would find some difficulties in recruiting staff with the necessary expertise, and the sudden increased demand would inflate the price which would be passed on to GOI in the prices quoted in contracts for maintenance or workshop operations.

Transfer of expertise to remaining GOI workshop personnel could be promoted if they were encouraged to work beside the suppliers mechanics.

1b This option would develop jobs within the private sector and probably lead gradually to a more skilled labor force.

9. Privatization Potential

The supplier companies might be more prepared to take over responsibility for workshop operation under option 1b once they have had a period of operation under option 1a,

1b Does not positively point in the direction of an autonomous plant operating unit but might be useful as a preliminary example of private/public sector interface working.

There is no potential movement to plant hire for either 1a or 1b.

2. OPTION TWO - Autonomous equipment maintenance unit

Option Two would establish the maintenance workshops as Autonomous Equipment Maintenance Units (AEMUs). Road Maintenance Equipment ownership would remain with the Kabupatens.

The kabupatens' workshops would be run on a commercial basis, by government-owned autonomous units. While giving priority to maintaining kabupaten equipment, these AEMUs would have the right to offer similar services to other customers. Private firms could provide management services (on a fee basis) to the AEMUs, but would have no share in their ownership.

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Major advantages of such an arrangement would be:

(a) If organized in certain ways, AEMUs could offer better employment terms than the kabupaten governments and so would be better placed to attract and retain qualified staff. AEMUs would be able to pay higher wages and provide permanent employment more easily than the kabupaten governments.

(b) The real cost of maintaining the kabupatens' equipment would come down as a result of the overhead costs being spread over more work.

(c) AEMUs could hire professional management, if established in certain ways.

This option could be considered for implementation in two ways:

Option 2a - the AEMUs would be established as new enterprises owned by the government. Organizational frameworks to consider include Unit Swadana, BUMN or BUMD.

Option 2b - the AEMUs would be established as branches or subsidiaries of an existing state-owned enterprise (BUMN), PT Amarta Karya, which has already been established by GOI to provide and maintain road maintenance equipment (among other activities -- please see Company Reports for a background description of Amarta Karya).

Responsibility for equipment units would be shared between the government unit which owns or controls them, the contractors who operate them, and the AEMUs who maintain them; the scope for disputes would be significant and the procedures for avoiding or resolving them would be burdensome.

Without major changes in governmental budgeting procedures, there would have no assurance that the kabupatens - who are already short of funds - would be able to fund the AEMUs sufficiently for maintenance operations on kabupaten equipment.

Assessment of Option Two against the criteria:

1. Efficient Equipment Utilization

As ownership of the equipment would remain with the Kabupatens, and as much of it will be operated by the road contractors, these options will not provide strong incentives for efficiency in its use.

The AEMUs would in practice operate as monopoly provider for kabupatens, at least in the short term. It is conceivable that private competition could develop over the longer term, with

kabupatens free to contract maintenance services with other providers, although institutional structures (government ownership of AEMUs) would work against this.

2a Some positive and negative incentives would be available to PU to force good maintenance, but these would be weakened by connections between kabupaten government and the AEMU. This would be a stronger connection with kabupaten-owned AEMUs than with Amarta Karya.

2a Profit from outside sources would have a mixed effect. Profits from outside work can be used to offset maintenance costs which need to be paid by the kabupaten. On the other hand, outside work could be of greater interest than maintenance of kabupaten equipment, if financial incentives from outside work are greater or more direct. Because workshop operations are currently operating below capacity, there should be sufficient capacity to handle all work, regardless of source.

Control by the kabupaten over AK performance cold be more difficult than that over a kabupaten-owned organization or a private firm.

2. Risk Minimization

As equipment maintenance would remain under governmental control, the risk of losing equipment maintenance capabilities in the kabupaten would be minimal, and there would be possibilities for improvement.

2a Transfer of government-owned workshops to AEMUs would lessen investment risk.

2b The current Amarta Karya infrastructure would be available in option 2b Amarta Karya has facilities only in Ujung Pandang. Expansion to other kabupaten of Sulawesi would be difficult and to NTT highly unlikely. Management and administrative infrastructure would in theory be available, but in practice are not the strong points of the organization.

3. Financial Viability

Financial viability of the AEMUs would be improved by the ability to maintain non-government equipment, but the problems of GOI budgeting, and of the misuse of equipment by road contractors, would remain serious burdens.

The budget for maintenance which is contracted by the kabupaten to the AEMU would need to include all maintenance costs, and would therefore be much larger than the current maintenance budget. This option does little to address the revenue expenditure gap, other than attempting to supplement government budgets with profit-making outside repair work.

4. GOI System Conflicts

Current government regulations allow for establishment of self-financing units (unit swadana) and government owned commercial enterprises (BUMN, BUMD). No new institutional structures would be needed under the Amarta Karya option.

2a This would be the easiest legal way to establish local organizations.

Option 2b would fit in well with GOI regulations because Amarta Karya was set up to do the kind of work envisaged in this option. Amarta Karya currently operates as a construction and plant hire firm, and is managed at the national level, working on central government projects This option would involve Amarta Karya expanding only one category of their activities at the local level. Only equipment maintenance would be involved, not full plant hire functions or other activities now carried out by Amarta Karya.

5. Addresses System Deficiencies

Option two does not address the root causes of limited market and GOI budgetary cycle. It will have little affect on donor provision of equipment or equipment resources, except to lessen the need for replacement equipment as current equipment is better maintained.

Operations will continue to be fragmented, with owners and users continuing to be from different organizations, and a continuing revenue-expenditure gap.

There will be no effect on hire rates. Utilization may improve due to improved conditions of equipment, but there will be no additional incentives for more efficient utilization.

The option does not provide a solution to the problem of allocating sufficient maintenance budgets consistently over the life of the equipment. Maintenance costs could continue to be hidden, through requirements that contractors pay for maintenance and repairs. This has the added effect of minimizing incentives to perform maintenance.

Management and technical skills would be higher than currently found in the kabupaten workshops if AEMUs are able to employ highly-skilled managers and mechanics.

6. Qualified Providers

Option 2a would transform the structure of the existing kabupaten workshops. Amarta Karya is an existing organization, but has only a limited and recent presence in Ujung Pandang, and does not have a presence in NTT or any of the kabupatens. Components of AEMUs exist in the form of kabupaten workshops and private firms operating workshops. These components from various

sources would need to be re-structured into a new organization, by taking personnel, facilities and equipment from both public and private sources. As the equipment maintenance would continue to be done by governmental units, the main scope for the private sector would be to provide professional management services.

The necessary technical expertise could be found in the pilot areas with certain major work performed in provincial capitals. This would result in the need for more than one provider, although a sub-contracting system could be used. The ability of kabupaten AEMUs or the Amarta Karya to employ the professional managers needed is in doubt.

7. Mobilization of Resources

There are difficulties in improving performance in existing organizations. The track records of both kabupatens and Amarta Karya in this area are indicative of the difficulties. It is unlikely that sufficient incentives could be brought to bear on any of these organizations to enable them to fully mobilize their existing resources.

The capability to mobilize the potential of the AEMUs would be limited by the inability of government organizations to place the most suitable people in commercial operations.

2a Some motivation to improve performance would be due to organizational independence from PU, which would enable the unit to concentrate on equipment maintenance alone.

2a Some profit motive would be available as a tool to maximize performance, but this is limited by regulations affecting government-owned enterprises.

2a The structural change in kabupatens to separate the AEMU from Public Works may introduce opportunities as discussed above.

2b An AEMU absorbed into Amarta Karya will entail no significant structural changes to that organization, which has thus far had poor performance in equipment maintenance. No new incentives would be provided to help AK mobilize potential within its organization.

8. Human Resource Development

Both options would require upgraded skills, which could stimulate training and have a positive effect on the development of human resources. This would require a commitment on the part of the AEMU management to invest in training and higher wages for qualified staff. In turn, funding would need to be provided by the government (or possibly a donor) for training of 2a AEMUs. Higher wages would need to come out of AEMU operational expenses, which would be passed on to local government through charges for equipment maintenance.

9. Privatization Potential

Both options would offer the possibility of moving into the more favorable plant hire options, which would integrate equipment hire and maintenance.

2b Adsorption into an existing plant hire organization increases the likelihood of movement to plant hire in the kabupatens. Although privatization of Amarta Karya is possible, there is no indication that this will be carried out, even with the limits discussed in the next paragraph. Amarta Karya would need to prove its profitability before privatization could take place.

Both options would allow the possibility of moving to more market-oriented options, even to become privatized. This is limited by government policy for privatization of government-owned enterprises The current policy specifies that a minimum of 80% of the equity should remain in GOI hands.

3. OPTION THREE - Privatized equipment maintenance

Options Three calls for full privatization of workshop operations. Ownership of maintenance equipment will remain with the kabupatens.

This option differs from Option Two in that ownership of the workshops and workshop equipment would be transferred to the private sector. Private firms would be invited to bid for the purchase of the Kabupatens' workshops and equipment and for the right to operate them on a commercial basis. Option Three differs from Option One in that the privatized workshops would have the right to serve the needs of the kabupatens, and may or may not have contracts to do so as part of the privatization process There would preferably be a competitive situation, with the Kabupatens free to take their work where they please. The purchase conditions could require the buyers to give priority to maintaining Kabupaten equipment, but it would be difficult to enforce any such condition. The kabupatens would have the right to get their work done by others.

The advantages and disadvantages pertaining to Option Two would apply to this option also. The main advantage of this option over Option Two would be the earlier integration of equipment maintenance into the market sector. However, this advantage would be bought at the cost of increased risk to all concerned. The kabupatens would lose their equipment workshops without any assurance that the alternative arrangements would work, and the private investors would have to put capital at risk without the opportunity of testing the market.

Assessment of Option Three against the criteria:

1. Efficient Equipment Utilization

Option (3) would raise the direct cost of equipment maintenance to market levels, and may raise the cost of using road maintenance equipment. This would increase efficiency by encouraging equipment owners to make the best use of their equipment.

In the absence of financial reforms, the Kabupatens might not be able to pay to keep their equipment maintained, and road maintenance could suffer.

It will be difficult to enforce any condition to be made at point of sale of facilities that private providers maintain kabupaten equipment.

Private equipment maintenance units will be motivated to perform if they are paid timely and in full

As a practical matter, privatization of workshops would force the kabupatens to find another location to store equipment not currently in use and not currently under repair.

2. Risk Minimization

The risk would be high to the Kabupatens, who would give up their workshops with no assurance that private workshops would provide acceptable service at costs they could afford. In the event the new providers do not provide acceptable levels of service, the kabupatens would need to seek out another source of equipment maintenance. This would be a greater risk in kabupatens such as Belu, where the kabupaten workshop is the best and practically only) facility in the area, compared to Pinrang, where repairs are often carried out by private providers, or to Bulukumba, which does not have an operational workshop.

The risk would be high to the private companies Capital would be required to buy facilities. Because facilities have recently been upgraded, little capital would be needed to upgrade facilities. The capital cost, as well as operational costs, would need to be recovered through profits from equipment maintenance operations, and any other activities the private companies would manage from the workshops.

The core of these earnings would need to come from maintenance of the kabupaten fleet, and as such would be dependent on a decision by the government to provide realistic budgets for equipment maintenance Maintenance of kabupaten equipment could be done on a contract basis as in Option One, or on a more *ad hoc* basis, the former being less risky for the provider. Determinations of profit or loss would be difficult without the certainty of guaranteed equipment maintenance budgets. Even with sufficient budgets, the provider would run the risk of not being the recipient of the expenditures, particularly in areas where there are existing workshops.

Risks to the provider would be lessened if he could find other uses for the workshop facilities, either for profit or to maintain his own fleet of equipment.

3. Financial Viability

Financial viability would depend on:

Steady and secure sources of funds for kabupaten equipment maintenance.

Return on investment of providers, through adequate payment for maintenance of kabupaten equipment.

The possibility of outside equipment maintenance work to supplement earnings from kabupaten sources, and to raise the utilization of workshop capacity. In most kabupatens, it would be difficult to make determinations of the amount of outside work which could be captured by the provider using the former kabupaten workshop facilities. A provider who owns equipment can utilize the new facilities and personnel.

4. GOI System Conflicts

Option Three would run into problems in the area of GOI policies and procedures relating to sale of government assets. Perhaps a greater source of conflict would be policies in individual kabupatens regarding government control of equipment, including equipment maintenance budgets.

5. Addresses System Deficiencies

Option Three does not address the root causes of limited market and GOI budgetary cycle. It will have little affect on donor provision of equipment or equipment resources, except to lessen the need for replacement equipment as current equipment is better maintained.

Operations will continue to be fragmented, with owners and users continuing to be from different organizations, and a continuing revenue-expenditure gap.

There will be no effect on hire rates. Utilization may improve due to improved conditions of equipment, but there will be no additional incentives for more efficient utilization.

The option does not provide a solution to the problem of allocating sufficient maintenance budgets consistently over the life of the equipment. Maintenance costs could continue to be hidden, through requirements that contractors pay for maintenance and repairs. This has the added effect of minimizing incentives to perform maintenance.

Management and technical skills could be higher than currently found in the kabupaten workshops if private workshop operators spend the necessary funds for human resource development. In addition, there will be profit incentives for maintenance of workshop facilities and equipment.

6. Qualified Providers

A survey of the private sector indicates that in most areas, there are private companies operating and maintaining equipment, with varying degrees of involvement in developing their own facilities. In some areas, the kabupaten workshops represent the best facilities in the area, whereas in other kabupatens the private sector has greater capacity. This would indicate a difference in both availability of experienced providers and the desirability of private investment in kabupaten workshop facilities. Only one private company interviewed (in Kupang) expressed interest in this option.

7. Mobilization of Resources

This option would be likely to stimulate management to mobilize the potential of its staff, because profit will be available as an incentive for efficient operation. Difficulties will arise if capacity remains low and decisions are made not to invest in human resource development, well-paid management and staff, or other elements which will affect the functioning of the organization.

8. Human Resource Development

If the operation is run commercially, incentives will be present for the provider to carry out satisfactory maintenance services. In turn, the most cost-effective way for the provider to guarantee this is to employ highly-skilled managers and mechanics, and to invest in human resource development. If there is significant work from sources from outside the kabupaten government or the owner is maintaining his own equipment, there will be incentives for such investment.

9. Privatization Potential

Option Three would offer the possibility of development into private plant hire units, since the likely providers for this option are contractors who own equipment.

The development of private hire firms would continue to be hindered by the market effects of low hire rates for kabupaten equipment

4. OPTION FOUR - Autonomous plant hire unit

Option Four would establishing Autonomous Plant Hire Units (APHUs). Plant hire firms would own and manage all aspects of equipment utilization and maintenance. Plant hire firms would be government-owned.

This option incorporates all the changes of Option Two, Autonomous Equipment Maintenance Units, with the addition that the APHUs would own and operate their equipment, in the manner of plant hire firms, in a commercial manner. As in the current system, equipment would be hired under contract to road maintenance contractors and to any other interested customers. All the advantages of Option Two would still remain, plus the advantage that the APHUs would have total control over the operation and maintenance of their equipment. Most importantly, revenues from plant hire operations will remain under control of the APHUs, to be used for maintenance and replacement of equipment.

As in the case of Option 2, This option could be considered for implementation in two ways:

4a The APHUs would be established as new enterprises owned by the government. Organizational frameworks to consider include Unit Swadana, BUMN or BUMD.

4b The APHUs would be established as branches or subsidiaries of an existing state-owned enterprise (BUMN) PT Amarta Karya, which has already been established by GOI as a plant hire firm, along with other duties such as construction.

Assessment of Option Four against the criteria:

1. Efficient Equipment Utilization

There would be strong incentives for efficiency in both options, as the APHUs would own and control the equipment and would stand to lose from its misuse or neglect.

The unit would set economic hire rates, which would be greater than existing rates. This in turn would provide hirers with incentives to maximize machine output and minimize machine hire periods.

If equipment ownership is transferred to the APHU, the units would be free to cannibalize, sell or scrap surplus equipment.

2. Risk Minimization

Risks to GOI overall under these options would be low, as no private investment would be required and operations would remain under the control of governmental units.

4b Kabupatens would have no guarantee that equipment would be available for kabupaten projects if under the control of the nation-wide Amarta Karya organization, which could have other priorities than providing full equipment resources for all kabupatens.

The APHU would inherit kabupaten plant and facilities, but would need to invest in upgrading and repairing equipment. Investment would be required to establish adequate fleets.

Over the longer term, APHUs would need to replace equipment, rather than rely on donor provision. This will need to be reflected in economic hire rates to cover replacement as well as maintenance. The risk involved is due to limited markets for equipment, with no guarantees that income would be sufficient to cover all costs.

3. Financial Viability

Financial viability is improved by the linking of revenues and expenditures, relieving the APHUs of the limitations of government maintenance budgets. It is, however, questionable whether demand for equipment is sufficient to ensure high utilization and thus adequate revenues to cover costs.

Over the longer term, APHUs would need to replace equipment, rather than rely on donor provision. This will need to be reflected in economic hire rates to cover replacement as well as maintenance.

Financial viability would be improved because the units would have operational control over the equipment maintained by them.

The operation will not be viable unless proper economic hire rates are paid by leasers who will in turn be dependent upon realistic rates in their bills of quantity for equipment related construction works.

The new institution would have access to the private sector hire market (i.e., those engaged on non-GOI construction projects and any other plant related activities), but these are likely to be few.

4. GOI System Conflicts

Current government regulations allow for establishment of self-financing units (unit swadana) and government owned commercial enterprises (BUMN, BUMD). No new institutional structures would be needed under the Amarta Karya option.

2a This would be the easiest legal way to establish local organizations.

Option 2b would fit in well with GOI regulations because Amarta Karya was set up to do the kind of work envisaged in this option. Amarta Karya currently operates as a construction and plant hire firm, and is managed at the national level, working on central government projects.

There would be some difficulties in justifying a new company to carry out the work already legally defined as the responsibility of PT Amarta Karya. However, because Amarta Karya is a national organization, it will not be as well suited to deal with local needs, which indeed vary from kabupaten to kabupaten, and between the two provinces in the pilot area. Organizationally, Amarta Karya is not presently structured to operate multiple pilot projects at the local level. Additionally, Amarta Karya is currently engaged in steel fabrication and construction activities. Equipment hire accounted for only 27% of Amarta Karya revenues in 1991. Implementation of pilots in the study area will require greater concentration than a large organization such as this would be able to provide.

5. Addresses System Deficiencies

Option Four does not solve the root causes of limited market and uneven demand, but addresses the problem by more closely linking revenues and expenditures.

The option can reduce dependency on donor provision of equipment and therefore equipment resources, by providing for replacement costs in its revenues determinations. This is dependent on adequate revenues, which is in turn dependent on adequate demand, which is in question.

Operations will no longer be fragmented. APHUs will be both owners and users of equipment, and can rationalize operations to make most efficient use of both equipment and organizational resources.

There will be a significant effect on hire rates. Rates will need to be set economically, in order to cover operational, maintenance and replacement costs.

Utilization will improve primarily due to increased hire rates, which will force hirers to use equipment more efficiently. Other limitations on efficiency of equipment use will remain, such as scheduling problems on the project. Utilization should also improve due to improved conditions of equipment.

The option eliminates the dependency on government maintenance budgets, assuming adequate revenues. APHUs will continue to be dependent on financial assistance as long as revenues from plant hire do not cover maintenance costs, due to limited market and uneven demand.

Maintenance costs could continue to be hidden only if contractors are still required to pay for maintenance and repairs, as they are under the current system. This has the effect of minimizing incentives to perform maintenance. A well-managed plant hire unit would place responsibility

for maintenance on the owner of the equipment. Costs for maintenance would be recovered through hire rates.

Management and technical skills could be higher than currently found in the kabupaten workshops if APHU management spend the necessary funds for human resource development. This would be to their advantage, in order to have the most cost-effective operation possible. In addition, there will be profit incentives for maintenance of workshop facilities and equipment. Under BUMN and BUMD approaches to organization, professional managers can be hired.

6. Qualified Providers

There are no existing providers in the kabupatens ready to work in this capacity. Amarta Karya is an existing organization, but has only a limited and recent presence in Ujung Pandang, and does not have a presence in NTT or any of the kabupatens. Components of APHUs exist in the form of kabupaten fleets and private firms owning equipment. These components from various sources would need to be re-structured into a new organization, by taking personnel, facilities and equipment from both public and private sources.

Both systems of organization could benefit from the employment of professional management firms, which could be found in Indonesia, but may have to be brought in from outside the pilot areas. There are construction companies in all pilot areas (and in provincial capitals) that own and maintain equipment, and have varying degrees of experience and expertise in this area.

However, because Amarta Karya is a national organization, it will not be as well suited to deal with local needs, which indeed vary from kabupaten to kabupaten, and between the two provinces in the pilot area. Organizationally, Amarta Karya is not presently structured to operate multiple pilot projects at the local level. Additionally, Amarta Karya is currently engaged in steel fabrication and construction activities. Equipment hire accounted for only 27% of Amarta Karya revenues in 1991. Implementation of pilots in the study area will require greater concentration than a large organization such as this would be able to provide.

There is a clear need to find management with experience of competitive and profit orientated plant hire operations. Although qualified providers can most likely be found, their interest in working as management of a government-owned enterprise is questionable.

There is experience in local government regarding equipment operations and maintenance, although levels of expertise in these areas are determined to be low. Limitations may also be found in Amarta Karya.

7. Mobilization of Resources

4a There would still be potential for government regulatory interference in plant hire unit affairs, although at a different level for local APHUs than for Amarta Karya.

Local APHUs would be more subject to interference from local government than from the central government.

4b Amarta Karya would be more immune to interference from local government, and more subject to interference from central government. as it is under the supervision of the Department of Public Works.

Both options would be limited by the difficulties that governments have in placing the most suitable people in commercial operations.

There will be profit incentives, but the potential of government organizations to act rationally and commercially is limited by mindset, organization and limits on above-board financial incentives available to individuals in organization.

There are difficulties in improving performance in existing organizations. The track records of both kabupatens and Amarta Karya in this area are indicative of the difficulties. It is unlikely that sufficient incentives could be brought to bear on any of these organizations to enable them to fully mobilize their existing resources. The structural change in kabupatens to separate the AEMU from Public Works may introduce opportunities as discussed above An AEMU absorbed into Amarta Karya will entail no significant structural changes to that organization, which has thus far had poor performance in equipment maintenance.

8. Human Resource Development

Operating plant hire units would require upgraded skills, and so would have positive effects on the development of human resources.
If the operation is run commercially, incentives will be present for the provider to carry out satisfactory maintenance services. In turn, the most cost-effective way for the provider to guarantee this is to employ highly-skilled managers and mechanics, and to invest in human resource development. Higher salaries and wages will be necessary.

4a Provided the new local APHUs can select personnel with potential rather than being allocated existing, superfluous personnel from elsewhere, human resource development will be possible. APHUs could absorb some skilled and experienced former kabupaten staff, many of whom are temporary employees, and provide them with permanent employment.

9. Privatization Potential

The option would allow the possibility of moving to more market-oriented options, even to become privatized. This is limited by government policy for privatization of government-owned enterprises. The current policy specifies that a minimum of 80% of the equity should remain in GOI hands.

5. OPTION FIVE - Privatized plant hire

Option Five would encourage privatization of both workshops and road maintenance equipment, and thus transform the present kabupaten equipment management systems into competitive privately-owned and managed plant hire companies.

Privatization could be carried out in several ways, but would involve the transfer of equipment ownership, and therefore responsibility for maintenance and replacement, to the private sector. This could be achieved by sale of all existing plant and facilities to one or more bidders, by sale of some or all individual components (e.g., heavy equipment only, all equipment, equipment and facilities), or by the gradual devolution of ownership encouraged by changes in equipment provision policies and other policy changes which would develop a larger and more reliable market for equipment hire, stimulating private plant hire firms to develop independently.

Some of the advantages and disadvantages pertaining to Option Four would apply to this option also. The main advantage of this option over Option Four is a greater guarantee of eventual privatization of plant hire services However, as in the case of Option Three, this advantage would be bought at the cost of increased risk to all concerned, if implemented all at once. The kabupatens would lose their equipment workshops without any assurance that the private plant-hire firms would work, and the private investors would have to put capital at risk without the opportunity of testing the market These risks could be alleviated by the gradual encouragement of private plant hire, rather than a wholesale transformation from one system to another.

In considering how this option might be implemented in practice, it should be noted that at present there are no companies in Indonesia engaged only in plant hire. The members of APPAKSI, the national equipment hirers association, are all contractors who hire out equipment which is surplus to their needs.

If, therefore, GOI equipment were offered to the private sector, it would be the contractors who would bid for it. This means that risk factors regarding untested markets and source of private capital for plant hire companies may be less than they first appear.

Conversely, since the major contractors already have their own workshops, they may not be interested in taking over the kabupaten facilities. It may be unacceptable to GOI policies to see the workshops lose most of their existing markets (kabupaten equipment).

Assessment of Option Five against the criteria:

1. Efficient Equipment Utilization

Option Five would encourage economic efficiency in the use of equipment because the equipment would be owned, maintained, and operated by one organization operating in a competitive environment. This is the best option to provide this incentive, because it links profitability to efficient utilization of equipment, without possibility of interference from other institutions with possibly conflicting goals (as in the case of government-owned enterprises).

2. Risk Minimization

It could be a high-risk option, requiring substantial private sector investment and leaving the kabupatens without their equipment. This risk could be diminished through gradual implementation, using policy changes to develop incentives for development of private plant hire firms. The riskiest approach would be to attempt to transfer all resources immediately to the private sector The option would require the highest initial investment of all options.

Current kabupaten fleets could be made available under this option. Investment would be lower, compared to the investment required for a plant hire firm to buy all new equipment, thus decreasing risk to the plant hire firm. Purchase of existing fleets could also increase risk both to the plant hire firm and to hirers, due to overall poor condition of this equipment. Implementation of kabupaten projects could be affected.

Plant hire firms would run the risk of financial loss if revenues from plant hire do not cover maintenance costs.

3. Financial Viability

Financial viability is improved by the linking of revenues and expenditures, relieving the plant hire firms of the limitations of government maintenance budgets. It is, however, questionable whether demand for equipment is sufficient to ensure high utilization and thus adequate revenues to cover costs. Demand is, in turn, largely effected by government budget cycles, which are not directly affected by this option.

The problem of limited markets can be alleviated in part by establishing plant hire firms to serve an area larger than a single kabupaten, although this approach is still obstructed by the government budget cycle.

Over the longer term, plant hire firms would need to replace equipment. This will need to be reflected in economic hire rates to cover replacement as well as maintenance.

Financial viability would be improved because the units would have operational control over the equipment maintained by them.

The operation will not be viable unless proper economic hire rates are paid by hirers who will in turn be dependent upon realistic rates in their bills of quantity for equipment related construction works

Economic hire rates can only be introduced if competition is significantly decreased from public sector equipment hired at low rates. Transfer of kabupaten fleets to private hands would be a factor in this, but other equipment in public hands could continue to affect hire rates.

The private plant hire firms would have access to the private sector hire market (i.e., those engaged on non-GOI construction projects and any other plant related activities) but these are likely to be few.

4. GOI System Conflicts

This option would represent a major shift in government policy, which is to give local governments the responsibility to make available equipment which is required for local government projects. This policy, developed in the 1970s, reflects the shortage of equipment available from the private sector in local areas, and the desire of the government to use small local contractors who are financially unable to invest in their own equipment. Shortages of equipment at the time were due largely to limited market demand, a situation that persists in the study areas, for the reasons discussed in Report One of this study. Without a clear demonstration that the market would be adequate to stimulate the private sector to invest in equipment for hire, the government is unlikely to risk divestiture of kabupaten equipment.

If the move to private plant hire is not immediate, it will mean a period during which both kabupatens and private companies hire equipment. This would require a change in GOI regulations in order to allow and encourage the kabupatens to hire all of their equipment at economic rates.

Sale of non-scrap equipment, either wholesale or piecemeal, would be difficult under current regulations.

5. Addresses System Deficiencies

Option Five does not address the root causes of limited market and uneven demand.

The option can reduce dependency on donor provision of equipment and therefore equipment resources, by removing equipment management from government responsibility. Private plant hire firms would provide for replacement costs in their revenues determinations. This is

dependent on adequate revenues, which is in turn dependent on adequate demand, which is in question.

Operations will no longer be fragmented. Private plant hire firms will be both owners and users of equipment, and can rationalize operations to make most efficient use of both equipment and organizational resources.

There will be a significant effect on hire rates. Rates will need to be set economically, in order to cover operational, maintenance and replacement costs. This is dependent on the end to low-rate competition from existing kabupaten and other government fleets.

Utilization will improve primarily due to increased hire rates, which will force hirers to use equipment more efficiently. Other limitations on efficiency of equipment use will remain, such as scheduling problems on the project. Utilization should also improve due to improved conditions of equipment.

The option eliminates the dependency on government maintenance budgets. Plant hire firms would run the risk of financial loss if revenues from plant hire do not cover maintenance costs.

Maintenance costs could continue to be hidden only if contractors are still required to pay for maintenance and repairs, as they are under the current system. This has the effect of minimizing incentives to perform maintenance. A well-managed plant hire unit would place responsibility for maintenance on the owner of the equipment.

Management and technical skills could be higher than currently found in the kabupaten workshops if plant hire management spend the necessary funds for human resource development. This would be to their advantage, in order to have the most cost-effective operation possible. In addition, there will be profit incentives for maintenance of workshop facilities and equipment.

6. Qualified Providers

There are construction companies in all pilot areas (and in provincial capitals) that own and maintain equipment, and have varying degrees of experience and expertise in this area. No plant hire firms exist in Indonesia at this time, only contractors who sometimes hire out temporarily idle equipment.

Plant hire firms could be established to serve an area larger than a single kabupaten, and likewise, more than one plant hire firm could operate in any given area.

Some personnel, particularly temporary staff, would be available from kabupaten workshops. The private firms could hire appropriate staff from this pool and provide further training for upgrading of skills.

7. Mobilization of Resources

Profit as incentive to the owners of plant hire firms. This option would be the most effective in terms of mobilizing full potential of providers.
Private companies could employ and provide incentives to professional management and staff.

8. Human Resource Development

Option Five would require upgraded skills, and so would have positive effects on the development of human resources.

The operation will be run commercially, so incentives will be present for the provider to carry out satisfactory maintenance services. In turn, the most cost-effective way for the provider to guarantee this is to employ highly-skilled managers and mechanics, and to invest in human resource development.

Plant hire firms could absorb some skilled and experienced former kabupaten staff, many of whom are temporary employees, and provide them with permanent employment and training.

9. Privatization Potential

Option Five aims at full privatization of equipment ownership and maintenance. If successful, it could provide incentives to the Department of Public Works (Bina Marga) to divest of its equipment.

D. Comparisons and Evaluation of the Options

Table 5 summarizes the evaluation of options against the nine criteria, and assigns a numerical score to reflect the overall evaluation of the option.

1. Summary by Option

Option 1, Contracted Equipment Maintenance, faces potential problems in reaching the objective of effective maintenance and efficient equipment utilization, as well as questions regarding financial viability. The central problem faced in implementing this option would be that it does little to change the funding system for equipment maintenance, and thus remains dependent on government budgets for funding, rather than on more direct and dependable revenues. Although in most areas, private sector capabilities are available, there is no guarantee that use of the private

sector will produce better maintenance, because of this revenue problem as well as other institutional limitations, such as monitoring capabilities. Additionally, deficiencies in equipment utilization, which affect the condition of equipment, would not be addressed. It should be noted that in the kabupatens, most or even all equipment maintenance is already performed by the private sector, although not on a long-term contract basis. This private sector involvement does not appear to be a factor in the quality of equipment maintenance -- condition of equipment is poor in all areas.

Option 2, Autonomous Equipment Maintenance Unit, is the least desirable option for approaching privatization. It does no more than option 1 to address funding issues, and has added problems of developing new institutional structures and human resources. None of the institutional vehicles considered in this option would sufficiently overcome the obstacles in these areas.

Option 3, Privatized Equipment Maintenance Unit, contains the advantages that the private sector has to offer, such as strong potential for mobilizing human and other resources at its disposal, but inadequately addresses problems of viability, risk and government policy. It is considered unlikely that GOI and local government would be willing and able to implement this option, with all of the risks it entails.

Option 4, Autonomous Plant Hire Unit, addresses the financial issues which constitute the biggest obstacle to the previous options, but it is not clear whether it is able to do so sufficiently. Implementation of this option will be constrained by the limited and uneven market for equipment. Although it is does not call for full privatization of equipment management, in consideration of the risks involved and the constraints of government policy, it could conceivably be viable as a pilot, except for the effects of the limited market and uneven demand The choice of institutional vehicle would be important, and in this regard, option 4a involves a far more appropriate institutional structure than 4b. Option 4a involves the establishment of locally-controlled enterprises devoted solely to management of kabupaten equipment, as opposed to 4b, which requires an existing firm to add to its various duties.

Option 5, Privatized Plant Hire, addresses the same issues as option 4, with notable exceptions. Because it involves full privatization, risk for the government and the private sector is potentially high. Proper approaches to implementation can alleviate much of this risk. Financial viability remains in question, for the same reasons as in option 4. The added disadvantage is that, unlike option 4, if profits are not generated, private operations will simply fail, whereas government operations could conceivably be subsidized, at least for the short term. Largely due to the risk involved, conflicts are likely to arise regarding government policy, which have up to now supported provision of equipment via the local government.

2. Summary by Criterion

Options 1, 2 and 3 have shortcomings in the area of efficient equipment utilization, due to problems in budgeting and monitoring. Options 4 and 5 are more likely to ensure efficient utilization, due to the inherent incentives associated with profitability.

In the area of risk, option 2 has the advantage of the least risk to all parties involved. Full privatization options 3 and 5 run the greatest risk. The risk involved in option 5 could be minimized by gradual implementation. Other options contain risks for one party or the other, but not great risks for both.

The assessment of financial viability of the options followed the same pattern as that of criterion 1, efficient equipment utilization. Options 1, 2 and 3 would experience great difficulties in this area, because there remains no connection between revenues and expenses, and therefore organizations involved would be dependent upon government budgets for their operating funds. Options 4 and 5 are specifically designed to address the revenue-expenditure problem, and have much greater prospects for financial viability, with the important caveat that they do not adequately address the limited market for equipment.

The potential for conflict with GOI policy is greatest with the full privatization options. Full implementation of option 1 could encounter a number of conflicts with GOI policy, even though there is a certain amount of private participation in equipment maintenance in various kabupatens at this time. Option 1b, which contracts out all workshop operations, is more problematic. Options which do not remove ownership of equipment and operation of workshops from government contain fewer areas of potential conflict. Options 2 and 4 were evaluated separately for different kinds of organizations in part in consideration of existing policies and regulations. Amarta Karya as an option for plant hire creates fewer problems in this area than as an option for equipment maintenance.

Plant hire options best address system deficiencies and get closer to the root causes of poor equipment maintenance. It must be noted that none of the options adequately addresses the limited market caused in large part by distortions brought about by the GOI budgetary cycle. For this reason, it is doubtful that any of the options can fully successful in providing effective equipment maintenance. Options 4 and 5 have the greatest possibilities for illustrating where the true causes of poor maintenance lie, but they would not have a great probability of success (sustainability and good results) as long as the market problem continues.

Existing private sector providers exist in most areas for option one, contracting of maintenance services. Availability is uneven between kabupatens for this and all other options In addition, there is a problem regarding how interested the qualified providers are regarding any of the options, due to their own assessment of criteria such as risk and financial viability. Options 2a and 4a are designed for the creation of a new organization, in part to address this problem. These options would draw upon structural support from the local governments, and existing personnel and skills from the private sector. Amarta Karya is assessed as a qualified provider

at least structurally, although its interests and specific capabilities vis a vis options 2b and 4b are in doubt.

Options which involve the existing private sector directly have the best possibility of mobilizing existing resources. Problems in this area arise for the autonomous units proposed to operate under government control. Incentives for maximization of potential within these organizations are diminished by the difficulties involved in meshing government ownership with profitability

Human resource development will most likely be financially advantageous to enterprises involved in the full privatization options. This will be limited by any profitability problems which may occur. Option 2 does not provide sufficient independence or profit incentives to encourage significant investment in human resource development, nor does option 4a.

The options explore various ways to privatize components of equipment management, and are designed to address perceived issues in the existing environment. These issues include markets structures, demand, government funding and human resources. In an environment without limitations in these issue areas, full privatization of equipment management would be a fully rational and viable approach. Option 5 explores the potential for implementation of full privatization in the existing environment. Options 1 through 4 propose limited privatization for certain components in response to environmental limitations. Options 1 and 4b have little potential for developing into more sustainable privatization options The privatized equipment maintenance unit, option 3, and the autonomous plant hire unit, option 2a, have some possibility of developing into more sustainable and fully private options.

E. Conclusions and Recommended Option

Option 4a, Autonomous Plant Hire Unit - New Organization, is recommended for pilot implementation.

The study team concluded that the deficiencies in the kabupaten equipment maintenance program are caused by fundamental constraints of limited markets and uneven demand for equipment in the study areas, and the fragmented system of equipment management which has developed to deal with these two root causes.

Five approaches to privatization were considered as options to overcome the deficiencies in kabupaten equipment maintenance. Evaluation of the five options led to the conclusion that the most viable and effective approach to privatization of equipment maintenance is to establish Autonomous Plant Hire Units, which would consolidate management of equipment under local government management. As such, it addresses both of the objectives of privatizing equipment maintenance services and revising equipment hire policy.

Of all options considered, the recommended option is seen as most able to overcome the maintenance deficiencies which derive from the fragmentation of responsibility in the current equipment management system. However, the root causes of deficiencies in the system -- limited markets and uneven demand -- will remain, as they are determined by larger, systemic factors which are beyond the scope of any study of this nature. As long as these fundamental constraints remain, full privatization is not viable. Further, these same constraints render the full self-financing of a plant hire unit impossible. The recommended option moves in the direction of privatization by consolidating equipment management in a commercially operated plant hire firm. When, in the future, economic and policy changes succeed in removing the constraints of limited markets and uneven demand, the plant hire unit will be able to provide the basis of privatized services.

APPENDIX 1 - COMPANY REPORTS

PT TRAKINDO UTAMA, Ujung Pandang

This company is the Caterpillar dealer for Indonesia. With their headquarters in Jakarta, they have branches, stores, and workshops throughout Indonesia as part of their product support strategy. The capacities of these facilities depends on the known population of Caterpillar products in a particular area.

Ujung Pandang is PT Trakindo Utama's regional depot for Eastern Indonesia. They have recently opened a small support office in Kupang.

The provision of service, maintenance and repair facilities for Caterpillar equipment is an extremely important component of Caterpillar's after sales service and product support policy, which is implemented through their dealers, PT Trakindo Utama in Indonesia.

Servicing and maintenance can be provided by PT Trakindo Utama for Caterpillar machines, but they are reluctant to consider any other manufacturers' products.

This servicing and repair will be performed to Caterpillar's recommendations and standards. It will be performed regularly, in accordance with standard contracts and therefore may appear expensive to any organization unfamiliar with the real costs of equipment operation and revenue losses through machine unavailability.

Being aware of real equipment operating costs, Caterpillar carry out extensive, regular research into the reduction of these costs, the results of which are made available to their customers through their dealers and provide an integral element of Caterpillar equipment service policies and recommendations.

The mining industry is one of the largest equipment users in Indonesia, often with equipment working continuously 24 hours per day. Machine availability is critical in this industry, as it is in all profit making concerns. Many of the mining companies rely on PT Trakindo Utama to provide service support to assist in ensuring high machine availability. These companies usually employ their own skilled mechanics to perform routine maintenance to Caterpillar specifications, but revert to PT Trakindo Utama for major repairs, which will carry warranties, track inspections and other specialized product support services.

PT Trakindo Utama already have the ability and the facilities to carry out options 1a and 1b, but they are only interested in Caterpillar products and other products for which they are the dealer.

PT UNITED TRACTORS, Ujung Pandang

This company is the Komatsu dealer for Indonesia. With their headquarters in Jakarta, they have branches, stores and workshops throughout Indonesia as part of their product support strategy. The capacities of these facilities depends on the known population of Komatsu products in a particular area.

Ujung Pandang is PT United Tractor's regional depot for Eastern Indonesia. They have recently established a small support office in Kupang.

The provision of service, maintenance and repair facilities for Komatsu equipment is an extremely important component of Komatsu's after sales service and product support policy, which is implemented through their dealers, PT United Tractors in Indonesia.

Servicing and maintenance can be provided by PT United Tractors for Komatsu machines, but they are reluctant to consider any other manufacturers' products.

This servicing and repair will be performed to Komatsu's recommendations and standards. It will be performed regularly, in accordance with standard contracts and therefore may appear expensive to any organization unfamiliar with the real costs of equipment operation and revenue losses through machine unavailability.

Being aware of real equipment operating costs, Komatsu carry out extensive, regular research into the reduction of these costs, the results of which are made available to their customers through their dealers and provide an integral element of Komatsu equipment service policies and recommendations.

The mining industry is one of the largest equipment users in Indonesia, often with equipment working continuously 24 hours per day. Machine availability is critical in this industry, as it is in all profit making concerns. Many of the mining companies rely on PT United Tractors to provide service support to assist in ensuring high machine availability. These companies usually employ their own skilled mechanics to perform routine maintenance to Komatsu specifications, but revert to PT United Tractors for major repairs, which will carry warranties, track inspections and other specialized product support services.

PT United Tractors already have the ability and the facilities to carry out options 1a and 1b, but they are only interested in Komatsu products and other equipment for which they are the dealer.

PT HEXINDO ADIPERKASA, Ujung Pandang

This company is the Hitachi dealer for Indonesia. With their headquarter in Jakarta they have branches, stores and workshops throughout Indonesia as part of their product support strategy. The capacities of this facility depend on the known population of Hitachi products in the particular area

Ujung Pandang is PT Hexindo Adiperkasa regional depot for Sulawesi, and intend enlarging this facility in the very near future.

The provision of service, maintenance and repair facilities for Hitachi equipment is and extremely important component for the Hitachi after sales service and product support policy, which is implemented through their dealers, PT Hexindo Adiperkasa in Indonesia.

Servicing and maintenance can be provided by PT Hexindo Adiperkasa for Hitachi machines, but are reluctant to consider any other manufacturers' products.

This servicing and repair will be performed to the Hitachi recommendations and standards. It will be performed regularly, in accordance with standard contracts and therefore may appear expensive to any organization unfamiliar with the real costs of equipment operation and revenue losses through machines unavailability.

Being aware of real equipment operating costs, Hitachi carry out extensive, regular research into the reduction of these costs, the results of which are made available to their customers through their dealers and provide an integral element of Hitachi equipment service policies and recommendations.

Mr. Soedarsono - Branch Manager of Hexindo Adiperkasa Ujung Pandang advised a warranty period of a Hitachi excavator was 1000 hrs/6 months and they performed four after sales services during that period at no cost to the owner. He also indicated that his normal sales were to the following:

B2 class contractors - 60 percent

B1 class contractors - 35 percent

A class contractors - 5 percent

There are approximately 100 Hitachi units in Sulawesi but no sales have been made to DPU or DPUK.

Another point worthy of mention is that all the Hexindo Adiperkasa staff were recruited from United Tractors.

The mining industry is one of the largest equipment users in Indonesia, often with equipment working continuously 24 hours per day. Machine availability is critical in this industry, as it is in all profit making concerns. Many of the mining companies rely on PT Hexindo Adiperkasa to provide service support to assist in ensuring high machine availability. These companies usually employ their own skilled mechanics to perform routine maintenance to Hitachi specifications, but revert to Hexindo Adiperkasa for major repairs, which will carry warranties.

PT Hexindo Adiperkasa have the facilities and ability to carry out options 1a and 1b, but are normally only interested in Hitachi products.

PT. BARATA INDONESIA, Ujung Pandang

Numerous efforts have been made to meet with senior management of this company in Ujung Pandang but without success.

The initial visit was made to the Barata fabrication facility for information as to the location of the main office. The chief of the Barata workshop was very helpful in explaining where the office was located. However, when the study team members arrived at the Barata office Mr. Suwono was not available and the team was advised to call back the next day which they did but without success.

An appointment with Mr. Suwono director of PT Barata, was finally made by telephone for Friday November 27, 1992 at 1400 hours, however, when the team arrived at his office, it was discovered he was not available and he was busy checking materials on a project.

It was agreed at the time, arrangements would be made to take another appointment to see Mr. Suwono after the study team arrived back from N.T.T. during the first week of December 1992.

An attempt at arranging this meeting over the telephone on Tuesday December 8, 1992 was again fruitless. Allegedly Mr. Suwono was ill and had been in hospital for two weeks.

Other management staff were reluctant to discuss PT Barata business, claiming they were not authorized.

Considering PT Barata Indonesia are a major manufacturer and supplier of heavy equipment to the GOI, especially road rollers to all kabupatens, the attitude adopted was disappointing.

PT AMARTA KARYA, Ujung Pandang

The company was set up to recondition idle equipment owned by the Ministry of Public Works and be commercially active in the equipment hire business in Indonesia. They have recently acquired land and have commenced construction of a new workshop facility at ± Km 17 North East of Ujung Pandang and maintain an office in the city.

The company currently utilizes workshop space on their irrigation project in Pinrang and when required, at ALKAL and PALAN workshop facilities for the reconditioning of equipment.

The equipment is handed over from Bina Marga i.e., Director General of Bina Marga and Director General of Pengairan as main contributors. Condition and value is assessed by a committee, allegedly from Ministry of Finance and then posted as assets of Amarta Karya.

Items of equipment assessed by the committee as scrap may be sold as such, however the manager advised scrap value was only Rp 150,- per Kg and transport was an additional cost. Equipment not assessed as scrap by the committee though considered as scrap due to the unavailability of spare parts because of age etc., may not be sold without the express permission of the Ministry of Finance.

Amarta Karya currently has combined inventory of 34 items of equipment of which ± 60% are allegedly available for hire. The combined inventory of available equipment by classification:

Bull Dozers	8	Tire Rollers	4
Motor Grader	1	Mobile Crane	1
Wheel Loader	1	Excavator	3
Vibrator Roller	1		

The balance of equipment on the Amarta Karya inventory numbers 42, all of which are designated as scrap.

Hire rates calculations are based on AMKA system and based on the Ministry of Finance Committee assessed value, at the time of hand over plus the estimated costs for reconditioning. Minimum hire period is 200 hours with a 50% deposit and if hirer defaults after 200 hours equipment is immediately retrieve from the site.

Amarta Karya has 4 mechanics at their temporary workshop, performing day to day repairs and reconditioning work and 2 mechanics in the field performing preventative and routine maintenance duties. These mechanics have received on the job training at the AMKA facility at Bekasi and specialized component overhaul training from PT Trakindo, the Caterpillar distributors in Indonesia. Amarta Karya employs their own operators for equipment on hire to contractors, whom also monitor and report equipment utilization and maintenance.

Amarta Karya would be a company worth considering for options 2 and 4.

PT ADI JAYA LIMA PRADANA, Ujung Pandang

The company is a general contractor classified as B1 and 90% of their contracts are with DPU Pengairan.

They have their equipment fleet amounting to approximately 100 units of various types, excavators, loaders and trucks. The loaders are caterpillar and the excavators are Hitachi for example. Of this fleet of equipment, 15 - 20% are idle due to a combination of parts and personnel problems.

Ir. Ricky Tungka - Operations Director explains that the company has its own workshop, which he intends to develops when he is able to employ qualified mechanics. He claims a major problem in South Sulawesi is in human resources due to cultural differences and attitude toward responsibility.

Mechanics and operators are sought from technical school and selected candidates are trained internally with the help of PT Trakindo for mechanics specialized courses.

Currently Adi Jaya employ the services of PT Trakindo or PT United Tractors for the servicing and repair hydraulic and fuel system components as they do not have the equipment for testing hydraulic pressures, nor do they have specialized equipment to service and repair fuel pumps.

The company indicates that fast moving spare parts (i.e., filters, belts and hoses) are generally available in Ujung Pandang for the more common brand names of equipment. Component parts and components, for slow moving spare parts, they have supply sources in Java. However, they tend to prefer Singapore as a source of supply for genuine spare parts, allegedly cheaper and quicker delivery time

Ir. Ricky raised a long standing valid point regarding correct Indonesian translation of equipment servicing and workshop manuals. Many manuals have been translated into Bahasa Indonesia in the past by various equipment manufacturers. However most are not of good quality.

Adi Jaya equipment hire rate indications for their two excavators are:

Hitachi E110 value ± Rp 140 million
Rp 55,000/hr min 8 hr/day 200hr/month

Hitachi E180 value ± Rp 200 million
Rp 65,000/hr min 8 hr/day 200 hr/month

PT Adi Jaya Lima Pradana may well be considered in the future for equipment hire, and once their workshop facility is built be a candidate for options 1 a+b and 2.

BENGKEL UTAMA, Ujung Pandang

A machine shop and fuel injection pump repair shop with facilities to repair most minor equipment components, (crankshafts cylinder blocks, transmission cases, etc.), and major equipment units, (engines, transmissions, hydraulic pumps, etc.), as well as to repair complete machines.

This workshop has in the past repaired components and engines for both the private sector and Perkerjaan Umum Daerah in various Kabupatens throughout South Sulawesi. Usually these repairs are made to components and units brought to the workshop by the owners, Occasionally, the workshop has sent its staff and vehicles to the Kabupatens to help remove units prior to bringing them into the workshop.

Bengkel Utama are associated with PT Tri Utama Sentana, a foundry and metal workshop with large premises near to Ujung Pandang airport, providing a potentially very comprehensive equipment repair facility.

Skilled labor, (trained and experienced mechanics), is claimed to be readily available within the combination of Bengkel Utama and PT Tri Utama Sentana, although the workshop's directors are aware of the problems of inadequately trained and inexperienced mechanics in the South Sulawesi region. Their skilled labor is claimed to have been obtained a few years ago, at a time when PT Trakindo Utama laid off a number of their own mechanics due to a down turn in their workload. At least one private contractor also obtained some skilled labor in this way, although this contractor is now working in another region of Indonesia.

There are some repairs which the workshop can not perform, such as repairs to Caterpillar and Komatsu fuel injection pumps. This is because the manufacturers do not make the tooling or specifications required available to any workshops other than their own dealers' facilities.

Additionally, Bengkel Utama does not have any specialized equipment, (track press and idler/roller welding machines), for repairing tractor undercarriages. These repairs can be done by PT Trakindo Utama or PT United Tractors, who have facilities in Ujung Pandang

The supply of spare parts from both PT Trakindo Utama and PT United Tractors is sometimes a problem. Parts for the later types of hydraulic pumps and transmissions are said to be often on long delivery times, sometimes up to three months, a problem also commented on by PT Adi Jaya Lima Pradana. This appears to be a genuine problem and not a question of poor relationships through competition. Both Bengkel Utama and PT Tri Utama Sentana often do machining and fabrication for PT Trakindo Utama and PT United Tractors.

Bengkel Utama would be interested in submitting a tender for the contracted management and supervision of the Kabupaten Equipment Maintenance and Workshops, if such tenders were requested, and providing that such tenders were potentially economically viable. They would also be prepared to consider all of the Kabupatens and not only those nearest to Ujung Pandang.

At present they have no interest in equipment hire because their experience to date is in workshop management and operation only.

Bengkel Utama consider that they can provide training, but so far they have never been asked to do so. However, they would be competing with PT Trakindo Utama and PT United Tractors, who have established, nationwide reputations as manufacturers' agents and so can provide qualification certificates which are recognized throughout Indonesia.

In conclusion, after a brief discussion with Mr. Franky Thoenger, director of both Bengkel Utama and PT Tri Utama Sentana, it would appear that there is at least one established private sector organization in Ujung Pandang with the potential to provide contracted equipment maintenance and workshop management to the Kabupaten Workshops. However, a much more detailed investigation of this company's facilities and resources is needed to establish whether or not they can supply such a service satisfactorily.

This business group would be a suitable candidate for options 1, 2a and 3.

H.S. MOTORS. Ujung Pandang

This engineering workshop in Ujung Pandang has to be the busiest organization in town.

The company's main activity is in the machining of all components such as, engine cylinder boring. crankshaft grinding, welding repair and machining of transmission and final drive cases, shaving of cylinder heads and skimming of brake drums all being part of the workshop daily activity.

H.S. motors also maintain a very impressive stock of spare parts for light vehicles and for diesel engines and specialize in Kiki and Nippon Denso fuel injection pump service and repair.

The company have a very good reputation throughout Sulawesi Selatan for their expertise and workshop, and have in the past done machining works for most of the kabupatens.

The owner of this machine shop showed interest in the management of equipment maintenance and repair and would be a candidate for options 1a and 1b.

PT DJARING TEHNIK, Ujung Pandang

This facility operates more as an equipment rehabilitation center, acquiring broken down or worn out heavy equipment through others, who have purchased various items from government and private public auction and other sources.

Rehabilitated equipment is usually put on the market for sale and in some cases made available to contractors on a monthly only rental basis (minimum 200 hours).

The company has indicated their equipment on hire is operated by the contractor. However operations are supervised by Djaring Tehnik personnel.

Preventative and routine maintenance, lube oils and grease are included in the Djaring Tehnik monthly rental charges though fuel is not. Repairs to the equipment while on hire, is carried out mainly by their own mechanics, though in some cases by the contractor mechanics under Djaring Tehnik supervision.

Djaring Tehnik also specialize in the rehabilitation of Generating Sets of 5 KVA to 500 KVA capacity, both for hire and for sale.

Spare parts availability in Ujung Pandang, in general, is said to be no major problems for this company and warehouse stocks are impressive. In the event spare parts for specialized equipment are not readily available in Ujung Pandang, they are sought in Java or in Singapore.

Skilled labor, (trained and experienced mechanics, welders and electricians) are available in Djaring Tehnik though it is indicated some of the skilled labor originated from contractor sponsored Trakindo and United Tractors Basic Training Programs. Constant on the job training is conducted day to day under the guidance of the director of the facility.

The facility Director confirms the problems in South Sulawesi of inadequate trained and experienced personnel being available and it appears this is due to some individuals inability to adsorb training input.

This workshop facility does not have specialized equipment to hold undercarriage overhaul or hydraulic component testing, however the service of PT Trakindo and or PT United Tractors are utilized when necessary.

Djaring Tehnik have not in the past been directly involved with the repair of DPUK (District Department of Public Work) equipment that is known, although they have sent their mechanics to project in the field to perform services and repairs.

Djaring Tehnik are not particularly interested in developing a special maintenance and repair facility for Pekerjaan Umum Daerah equipment under existing high risk condition. However, if and when management tenders were called and in turn found to be potentially viable, they would be interested also in a joint venture operations with other local bengkels.

In conclusion after discussion with Mr. Tasming Laurins, Director of Djaring Tehnik, it does appear there are suitable facilities available in Ujung Pandang to provide contracted equipment maintenance and repair including workshop management to the kabupatens.

Djaring Tehnik would, after more thorough details were looked into the company's facilities and resources be a possible candidate for option 1 and 3.

The following pieces of equipment are currently under rehabilitation for potential hire by PT Djaring Teknik:

Parker 30 ton/hour	Rp 15,000,000.00/month without Generator set/no fuel
150 KVA Generator	Rp 5,500,000.00/month
50 KVA Generator	Rp 2,550,000.00/month

PT BUMI KARSA, Ujung Pandang

A category A private contractor based in Ujung Pandang, engaged mainly on irrigation, national and provincial roads in South Sulawesi.

PT Bumi Karsa has its own fleet of equipment including Caterpillar, Komatsu, Hitachi and some equipment of eastern European origin.

The extent to which difficulties are experienced with spare parts varies with the equipment manufacturer. The least difficulties are experienced with Caterpillar and the most, understandably at present, with the eastern European equipment. The difficulties themselves are usually extended deliveries although with some manufacturers some parts are no longer available, particularly for the eastern European equipment

PT Bumi Karsa have their own workshops and most of their mechanics were recruited and trained locally. When the company was first established, they contracted trained mechanics from PT Trakindo Utama and PT United Tractors on a yearly basis to assist in training their own local recruits.

Local recruits for training as mechanics are selected from the Sekola Teknik Menengah, the senior technical school, and given an aptitude test by PT Bumi Karsa to assess their suitability for training.

The successful recruits are given practical training in the workshops and on the project sites. They are also sent to attend training courses given by PT Trakindo Utama, PT United Tractors, PT Astra and any other dealers offering training courses in Ujung Pandang. Trainees also attend the Balai Latihan Kerja in Ujung Pandang, a Government of Indonesia training center.

Sometimes trained mechanics leave for other employment, usually in the mining industry for higher salaries. PT Bumi Karsa accept this and are prepared to train new mechanics to replace such labor loses.

PT Bumi Karsa do not offer a repair service to other contractors and at present have no intention or desire to do so. They have no interest in providing contract workshop and equipment management, training for third party companies or anything else outside of their present activities.

PT Tuju Wali Wali, Ujung Pandang

A category A contractor based in Ujung Pandang, working on road and bridge construction projects throughout Sulawesi and also in Irian Jaya.

Much of PT Tuju Wali Wali's equipment fleet was bought new four or five years ago when the company was established and is now beginning to develop defects requiring major repairs and overhauls to rectify.

Because of this the company is now developing its workshop facilities to accommodate major repairs and overhauls, appointing an able, experienced equipment manager three months ago. (The policy of allowing the equipment fleet to deteriorate to such an extent without providing suitable support facilities earlier was short sighted, but at least the problem has now been acknowledged and attempts to rectify the situation are now being made, although two to three years late).

The equipment manager is experiencing various difficulties in implementing the new equipment management policies, but his two main problems are the supply of spare parts and the shortage of suitably skilled labor.

Some of PT Tuju Wali Wali's equipment is of Eastern European origin. Baukema from Czechoslovakia, and problems with the supply of spare parts for this equipment can be expected for some time to come because of the internal changes in that country at present.

For their Fiat Allis equipment, the problems are connected with the change of dealership within Indonesia for this equipment.

The general problem of spare parts coming from Surabaya, and therefore on long delivery times, is being addressed through establishing a central parts store with stock levels related to usage and delivery times.

PT Tuju Wali Wali have tried recruiting locally but have been unsuccessful so far in finding suitably skilled staff for equipment mechanics positions.

To overcome the lack of skilled labor, PT Tuju Wali Wali are negotiating with the Caterpillar and Komatsu dealers for the long term contracting of trained mechanics from these companies' dealers to work in PT Tuju Wali Wali's workshops with PT Tuju Wali Wali's own mechanics and trainees in order to develop the skills of these mechanics and trainees. They are also planning to send their workshop staff on short training courses at the various equipment dealers' depots These methods both proved successful for PT Bumi Khasa when they established their equipment workshop.

Additionally, the training of the workshop staff will be monitored by the workshop manager, who will also assist in the practical training in the workshop and on site.

PT Tuju Wali Wali are at present in the process of attempting to rectify an earlier erroneous policy of neglecting equipment support facilities either through the false belief that this was a good economic strategy, or through lack of appreciation of equipment management procedures. If they are to survive as a competitive, profit making construction company then they must succeed in implementing sound equipment management practices, an onus which at present does not seem to apply to DPUK to any degree, even though it should.

Because of their present equipment and workshop situation, coupled with their current workload, PT Tuju Wali Wali have no immediate interest in any other kind of work connected with equipment maintenance or workshop management. However, should they be successful with their new equipment management policies, they may be prepared to consider options 1, 2a and 3.

CV BENGKEL CAHAYA BONE, Pinrang

This is a small local private workshop in Pinrang, owned by a Mr. Sudin, whom has four mechanics of various skills employed. The workshop executes general repairs to light vehicles up to and including component overhaul. Machining work such as crankshaft grinding and cylinder boring cannot be done in Pinrang, and the company send this type of work to Ujung Pandang to be carried out. Small machining jobs, such as skimming brake drums and aligning shafts can be done in Pinrang

Bengkel Cahaya Bone have the in the past performed repair work on DPUK equipment and currently are overhauling a Toyota Rhino Dump Truck engine at their workshop facility.

The company does not have the equipment for the testing, servicing and repair of fuel injection systems, and send this work to specialized facilities in Ujung Pandang.

This company would be worth considering for option 1a.

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CV TUNAS ABADI, Watampone

The company is registered with DPUP and DPUK as a B1 class contractor, with offices in Bone and in Ujung Pandang. This company is a family concern and all activities of the group are managed by trained family members. Tunas Abadi has their own equipment fleet and a workshop facility which has machining and fabrication capabilities.

The current equipment fleet operation is:

2 Excavators
5 Three Wheel Rollers
2 Track Loaders
1 30T/hr Stone Crusher
1 Motor Grader
1 20T Tractor/Trailer Unit

Also a mixed fleet of 3 to 5 ton and above dump trucks amounting to ± 15 units sighted, though allegedly more units are on contracts hauling coal to Tonasa cement works.

The Tunas Abadi equipment fleet is available for hire to others if not in use by the company and their indicated hire rates on an all in basis, 8 hour/day including operator, maintenance, repairs, fuels and lube oils are:

EQUIPMENT	Rp/HOUR	Rp/DAY (8 HR)
PC 120 Excavator	Rp 60,000	Rp 450,000
PC 200 Excavator	Rp 75,000	Rp 500,000
D65+D55 Track Loader	Rp 75,000	Rp 500,000
GD 31 Motor Grader	Rp 60,000	Rp 450,000
3-Wheel Roller 6-8-10 ton		Rp 100,000
EQUIPMENT	**UNITS**	**RATE**
Tractor/trailer	20 km	Rp 400,000 to 500,000/trip
	over 20 km	negotiable

The Stone Crusher is not for hire.

The workshop is operated on a commercial basis and all business whether public or government is welcome, on cash terms. Heavy equipment, truck and light vehicle rehabilitation is a major activity at this workshop and quality of work sighted is good.

Mr. Abadi Tadil, the owner of Tunas Abadi, indicated his interest in tendering on Kabupaten equipment maintenance and repair if the DPUK workshop were ever privatized. However, more details would be sought and investigated at the time.

He is not interested in purchasing equipment solely for the purpose of equipment hire. He has calculated that returns on equipment would not be sufficient due to the fact that the only potential customers would be contractors for local government projects, which operate only part of the year.

This company would be worthy of consideration for options 1 and 3 after more details were known of the company's management and resources.

BENGKEL HIKMAT, Ujung Pandang

Owner/manager : Mr. M Ilyas

Bengkel Hikmat is a fabrication and machine tool workshop in Pangkajene, Sidrap. It is the main workshop of a group of three with two others in Palopo.

At present, the workshop carries out welding and turning, component manufacture and cylinder boring. Engines can be overhauled but crankshaft grinding must be done elsewhere. Gearboxes and hydraulic pumps can also be repaired and overhauled.

Occasionally some work is done for the Kabupaten workshop, but most customers are private sectors.

Mr. Ilyas is interested in the possibility of contract equipment maintenance, but not in plant hire.

He foresees no problems with skilled labor, being prepared to train people himself as necessary. His only reservation is that of labor turnover when mechanics become sufficient experienced.

The workshop, although not ideally set out, is well equipped with separate engine/gearbox rebuild facilities. The lathes are new, replacing older models which had been purchased through an auction of Pemda equipment.

This workshop could be a suitable candidate for options 1 and 3 in Sidrap Kabupaten.

CV Roda Indah, Belu

A class A contractor based in Atambua who carries out road work projects at all levels. CV Roda Indah has its own equipment fleet, all of it second hand, and also hires equipment from DPUK to make up any shortages in its fleet during project execution.

There are reliability problems with the equipment fleet because it is second hand, but CV Roda Indah say that the short term projects make financing for new equipment too difficult.

Maintenance problems are experienced because spare parts for the heavy equipment must á;ways come from Surabaya, and also because of difficulties in finding mechanics locally who are suitably trained and experienced in repairing and maintaining road construction equipment, particularly the heavy equipment. Both of the problems of spare parts and of skilled labor are more emphasized with second hand equipment because of its age, lack of warranty and, often, its unknown working history.

CV Roda Indah would like more training given to local staff through aid programs, the training being given at the DPUK Atambua workshops for Belu with repair of equipment as part of the practical training. CV Roda Indah would select their candidates for such training on a basis of proven loyalty to the company to reduce the possibility of loosing trained staff to positions with better prospects, terms and conditions.

CV Roda Indah would be interested in managing workshops for third parties such as DPUK, and even contracting the maintenance and management of the DPUK equipment fleet, provided that the terms and conditions were financially viable and also provided that skilled workshop personnel could be located and kept. However, a major potential problem at present, assuming that the above provisions could be met, would be CV Roda Indah's lack of experience to date in effectively managing skilled workshop personnel capable of achieving high equipment availability from an efficiently operated workshop.

CV RAMAYANA, Kupang

A Kupang based class A contractor who carries out maintenance, betterment and rehabilitation projects on provincial and kabupaten roads throughout Nusa Tenggara Timur. The contractor also carries out drinking water pipelines and pumping station projects.

CV Ramayana has its own fleet of second hand equipment which is large enough to allow the contractor to execute two projects simultaneously. Any temporary equipment shortages are made up for by hiring from Bina Marga or DPUK, depending on the project (the hire rates are the same for Bina marga and DPUK for identical equipment).

CV Ramayana always buys second hand equipment, because the short contract period do not provide sufficient time for financing new equipment All heavy equipment is bought from Surabaya, because of the lack of supply in NTT.

The main problem encountered by CV Ramayana in maintaining their equipment is spare parts. All spare parts for heavy equipment must come from Surabaya. For Caterpillar and Komatsu very few problems are experienced, but for other manufacturers there are often long delays.

Mechanics have not yet presented any difficulties to this contractor. To date, CV Ramayana has always been able to locate mechanics locally of sufficient ability, although none of them have received any formal training. However, no major breakdowns have yet been encountered, even though all of the equipment is second hand, which suggest that the mechanics employed by CV Ramayana are at least maintaining the equipment fairly well, although none of this contractor's equipment was working near enough to Kupang to be visited within the short period of the visit.

Occasionally mechanics leave for better terms and conditions but so far CV Ramayana have so far been able to replace them No references or formal training certificates are asked for, the contractor knows how to expect on the local market

At present CV Ramayana are satisfied with their current workload and have no interest in contacting management workshops or maintenance of equipment from third parties.

CV CENDRAWASIH, Kupang

A class A contractor based in Kupang who performs betterment, rehabilitation and periodic maintenance projects on provincial and kabupaten roads in Timor.

CV Cendrawasih began using a fleet of second hand equipment, because of the lower capital investment, but this fleet of around fifty major items is now mostly replaced with new equipment.

This contractor prefers new equipment, despite the financing problems created by the short project periods, because of the greater reliability of new equipment and therefore greater availability. Other reasons cited by CV Cendrawasih for purchasing new machines were the lack of suitably experienced mechanics in Kupang to perform major repairs on equipment, and reduced capital investment in spare parts, although the workshop's store was well supplied with spare parts.

According to CV Cendrawasih, shipping from Surabaya to NTT generally, and to Kupang in particular, no longer presents the difficulties that it did four or five years ago because of increased communications and shipping facilities. There is still an approximately 7% increase in the landed cost of equipment in NTT above Java prices because of freight costs.

The equipment fleet owned by CV Cendrawasih is sufficient for all of the present workloads. They do not hire equipment from DPUK or Bina Marga because of control problems with the operators who prefer to work their PU hours, often arriving late for the start of a working day and going home at 2 p.m.

Nor do they hire out their equipment when it is idle because of payment problems experienced during former ventures into the plant hire business. Some payments owed to CV Cendrawasih from plant hire have been outstanding for several years.

According to CV Cendrawasih, the closely interconnected business community in NTT for all business and not only the construction industry, generates a situation where assistance from some private contractors is expected to be provided free of charge to other contractors or organizations. For instance, if a private contractor offers a plant hire facility, then some potential hirers would not expect to be invoiced and might use influential business connections to avoid paying any invoices that they may be presented with.

The only interest CV Cendrawasih has at present in developing its business is through a greater annual road construction contracting workload. Although the current workload is sometimes insufficient, CV Cendrawasih continue to tender for and execute road construction projects just to keep their business turning over. They feel that there may be some discrimination or favoritism in awarding contracts as they consider that although they perform well on contract execution with an equipment fleet in better than condition than some other contractors, their competitive bids are frequently unsuccessful for some types of project in particular areas.

There is no interest in contracting equipment maintenance or workshop management from third parties.

PT PALAPA KUPANG SENTOSA, Kupang

Mr. Charles T. Pitoby - Director

This contractor does quite a lot of provincial and kabupaten road building projects. The director claimed he preferred provincial multi year projects as he was able to work continuously and keep equipment utilized. Kabupaten projects cause him problems as he claimed he was in competition with the bupati, also project time schedules were not favorable for keeping personnel and equipment fully occupied year round.

The company has quite an impressive equipment fleet inventory, claimed to be in better condition than the Pemda equipment even though the Pemda equipment is only two years old. However, his fleet was not able to be inspected at the time, due to the project locations, so condition comparisons were not made.

Details of the company equipment fleet by type only is:

4 x Bulldozers
7 x Wheel Loaders
5 x Motor Graders
12 x Three Wheel Rollers
3 x Pedestrian Rollers
2 x Excavators - (1 old and 1 new Cat E200B)
1 x Asphalt Distributor (2000 ltr)
Asphalt Sprayers (so many owner lost count)
4 x Compressors
3 x Stone Crushers
30 x Dump Trucks

Mr. Pitoby advised he occasionally buys scrap Pemda equipment by auction, and claimed he bought all old kabupaten equipment throughout N.T.T. approximately 2 years ago.

It appears he purchases used and scrap equipment and repairs what he intends to utilize himself and sells off the rest to others. This is similar to the cannibalization system whereas two or three units are made into one good unit. However, it seems from all the equipment the company has on various projects throughout NTT, they also have quite a lot out of order.

Mr. Pitoby also indicated there was quite a lot of equipment available in Kupang but not being used. Contractors do not hire equipment from his company as they prefer to hire from Pemda or P.U. One of the reasons for this would be the lower hire rates of Pemda equipment, though when one considers the suspect condition of some of the Pemda and P.U. equipment and the usual "contractor pays all" for repairs and parts, the possible conclusion is that the condition of the Palapa Kupang Sentosa equipment for hire is suspect as well and requiring frequent repair.

Palapa Kupang Sentosa have their own workshop facility which includes machine tools but not specialized crankshaft grinding equipment. There is a facility in Kupang called "Timbul Jaya" that does crankshaft grinding and other specialized work.

PKS employ 5 mechanics in their workshop, 2 are certified having 10 years Trakindo experience and 3 uncertified having average general experience. The two certified mechanics draw monthly salaries of Rp 600,000,- /month and also work on extra time, restoring selected poor condition equipment to good condition on a Rp 250,000,- /job complete basis.

The company maintains a fast moving parts stock inventory that is said to be sufficient for all equipment listed on the fleet inventory and replenishment of the fast moving parts stock as well as immediate spare parts requirements are purchased from Surabaya with a 3-4 days delivery time. The company claims they have no problem getting parts from Barata in Surabaya on a "cash n carry" basis, and the delivery time is 3-4 days to Kupang. As Barata are supposedly notorious to the contrary, this point is well worthy of mention.

Mr. Pitoby indicated his interest in the contracting of maintenance and repairs of the kabupaten equipment and indicated that the company contracting would have to have full control. As he said, contract repair of government equipment he has handled to date requires misappropriation of bills to satisfy the client. In the event the contract repair of kabupaten equipment system did come into force he would strengthen his resources by firstly adding more fully qualified mechanical and administration staff.

Equipment repair would have to be closely monitored in order the cause of the failure was corrected so as the machine was restored into good working order, instead of performing frequent temporary repair to keep the unit in service.

Mr. Pitoby also advised one of the problems would be with spare parts whereas unscrupulous equipment maintenance contractors would be forced to use cheap look alike, non genuine spare parts in order to be a successful bidder of a contract.

In conclusion this company could be considered as a candidate for options 1 a+b.

PT. LOPO INDAH PERMAI, Kupang

PT. BATU BESI, Kupang

President Director - Ir. Victor Angstrong

CV. Batu Besi is a class A contractor working on both provincial and kabupaten road projects and have recently successfully completed projects in Kupang - Kefamenanu and in Belu-Atambua.

PT. Lopo Indah Permai is a land and housing development company working together with Bank Tabungan Negara providing low cost housing to the Kupang community.

The two companies support one another with their own equipment fleet which comprises:

1 x Caterpillar 926 E		Wheel Loader
1 x Komatsu D31 E		Bulldozer (1 year old)
1 x Caterpillar 120 G		Motor Grader
3 x Stone Crushers -		2 mobile 10 ton /hr
	-	fixed 40 ton /hr
19 x Toyota Rhino -		3.5 ton Dump Trucks (2 years old)

Mr. Angstrong indicated he was able to achieve approximately 60-75 percent utilization of his equipment over the normal annual period, but this also depended on contract starting dates.

However if he was not in the housing and land development business, his equipment utilization would be below 50 percent annually, which is about average of most contractors interviewed. A random check of Pemda and Bina marga equipment annual average utilization is 500 to 600 hours.

Production and equipment utilization figures in his books indicate his best monthly equipment utilization hours to be in the range of 200 - 250, but to achieve these figures he has hand picked operators and drivers whom are paid a salary plus a bonus which ensures his production level, but the system is also reversible so as personnel have the incentive to safe guard the equipment from damage and costly unscheduled repair due to misuse.

As indicated in his books, operators monthly salaries, including bonus payments achieve take home payments in the excess of Rp 400,000,-. These figures are more than double of what a government operator would make.

The consortium have their own workshop, covered storage and parking facility, where all maintenance and repairs are done to the truck fleet. The heavy equipment is maintained in the field by his own mechanics and for any specialized repair or overhaul he uses the services of the kabupaten workshop mechanics on a overtime basis.

Mr. Angstrong usually uses his own equipment on government road works. Though on occasions he has to hire compaction equipment from Pemda or from Alkal. If Pemda equipment is not available, he must first have a letter from the project manager recommending hire from Alkal.

A lot of uncertainties exist creating problems in the hiring of government equipment.

Generally the equipment is in poor condition and must be repaired prior to use.

Operators and mechanics wages are paid by the hirer, but they are difficult to manage. Sometimes the operators play games with the equipment on hire and if the contractor complains the equipment remains idle, the operators report to the pool and contractor must still pay for salary and equipment hire.

Repairs are written into the contract and the government are in charge for the repairs by the kabupaten workshop mechanics, but the contractor pays the cost of the repairs and for the spare parts.

However, Mr. Angstrong claims hiring from Pemda is still much cheaper compared to his other options - buying new, leasing or hire purchase. Cost of money by leasing is 18 percent flat on total for full period with down payment of 10-20 percent. Directly with bank is currently 21-23 percent.

The acquisition of spare parts for the company group is handled in Surabaya by a business associate, also a member of the family. This way they have no delays in waiting for parts. The indicated lead time is a maximum of four days.

PT. Trakindo and PT. United Tractors have representative offices in Kupang though still not very active, so this contractor acquires his spare parts direct from the suppliers in Surabaya. PT. Trakindo have a 3 month credit system for fax orders with delivery of 3 to 4 days with no discount. If parts are paid for in cash there is a discount and parts delivery receives priority status.

Apparently there is also a basic labor problem in N.T.T. caused mainly by poor nutrition and labor is not able to work under too much pressure, and if overtime is adopted to increase daily production, 50 percent of the labor crews become sick and unable to work. The solution is, that more labor than is required is employed on their projects to account for the imbalance.

Mr. Angstrong advised of a Surabaya company - PT. Srikandi - that does send equipment to NTT for hire. Bulldozers, Wheel Loaders, Excavators and Dump Trucks. Hire is on a minimum of 200 hr/mth, and rates vary between Rp 75,000,- to Rp 125,000,-/hr all in, (except bonus payments to operators) depending on type of equipment

The company expressed interest in the equipment maintenance management privatization program, however they did express concern of the financial risks involved, especially in equipment hire to private companies.

In conclusion, the consortium does have adequate resources for their own needs but would have to be restructured and a proper workshop fitted out before they would be in a position to do major equipment maintenance and repair.

Candidate for options 1 a+b and 3.

ANNEX TWO

TABLES

TABLE II–1

EXISTING PRIVATE SECTOR ACTIVITIES

LOCATION	COMPANY NAME	Workshop Capabilities			Primary Activities			
		Machining	Fabrication	Maintenance	Contractor	Workshop	Dealership	Equipment Hire
Jakarta	Trakindo Utama	X	X	X		X	X	
Surabaya	Trakindo Utama			X		X	X	
Ujung Pandang	Trakindo Utama			X		X	X	
Kupang	Trakindo Utama			X			X	
Jakarta	United Tractor	X	X	X		X	X	
Surabaya	United Tractor			X		X	X	
Ujung Pandang	United Tractor			X		X	X	
Kupang	United Tractor			X			X	
Jakarta	Hexindo Adiperkasa			X			X	
Surabaya	Hexindo Adiperkasa			X			X	
Ujung Pandang	Hexindo Adiperkasa			X			X	
Ujung Pandang	Barata Indonesia		X		X	X		
Ujung Pandang	Amarta Karya	X	X	X	X	X		X
Ujung Pandang	Adi Jaya Lima Pradana				X	X		X
Ujung Pandang	Bengkel Utama	X	X	X		X		
Ujung Pandang	H S Motor	X	X			X		
Ujung Pandang	Djaring Teknik	X	X			X		
Ujung Pandang	Pantja Daya Sakti				X			X
Ujung Pandang	Bumi Karsa		X	X	X	X		
Ujung Pandang	Tuju Wali–wali		X	X	X			
Pinrang	Bengkel Cahaya			X		X		
Bone	Tunas Abadi	X	X	X	X	X		X
Sidrap	Bengkel Hikmat	X	X	X		X		
Belu	Roda Indah			X	X	X		X
Kupang	Ramayana			X	X			
Kupang	Cendrawasih		X	X	X			
Kupang	Palapa Kupang Sentosa	X	X	X	X	X		X
Kupang	Batu Besi		X	X	X	X		X

TABLE II–2
EXISTING CANDIDATES FOR PRIVATIZATION OPTIONS

Private sector and government owned entities which were interviewed for this study are listed in this table, with an indication of their potential involvement in each of the privatization options under consideration. No commitment has been made by any party regarding these recommendations.

LOCATION	COMPANY NAME	POTENTIAL INVOLVEMENT IN OPTION NO.								LIMITATION TO ABILITIES AND INTEREST
		1a	1b	2a	2b	3	4a	4b	5	
Jkt, Sby, UP, Kpg	Trakindo Utama	x	x							dealership products only
Jkt, Sby, UP, Kpg	United Tractor	x	x							dealership products only
Jkt, Sby, UP	Hexindo Adiperkasa	x	x							dealership products only
Ujung Pandang	Barata Indonesia									unable to interview – dealership products
Ujung Pandang	Amarta Karya				x			x	x	rehabilitation, equipment hire
Ujung Pandang	Adi Jaya Lima Pradana	x	x	x						source + plant hire
Ujung Pandang	Bengkel Utama	x	x	x		x				machine shop
Ujung Pandang	H S Motor	x	x							welding/machining only
Ujung Pandang	Djaring Teknik	x				x				rehabilitation of equipment
Ujung Pandang	Pantja Daya Sakti									not interviewed
Pinrang	Bengkel Cahaya									repairs only
Bone	Tunas Abadi	x	x							source of plant hire
Sidrap	Bengkel Hikmat	x	x	x		x				sidrap area only
Ujung Pandang	Bumi Karsa									no interest
Ujung Pandang	Tuju Wali–wali	x	x	x		x				future possibly but definitely
Belu	Roda Indah									no interest
Kupang	Ramayana									no interest
Kupang	Cendrawasih									no interest
Kupang	Palapa Kupang Sentosa	x	x							
Kupang	Batu Besi	x	x			x				

TABLE II - 3

OPTIONS FOR PRIVATIZATION OF EQUIPMENT MAINTENANCE

1. **Contracted Equipment Maintenance**

   1a Contracted Equipment Maintenance
   1b Contracted Workshop Operation

2. **Autonomous Equipment Maintenance Unit**

   2a Autonomous Equipment Maintenance Unit - New Organization
   2b Autonomous Equipment Maintenance Unit - Amarta Karya

3. **Privatized Equipment Maintenance Unit**

4. **Autonomous Plant Hire Unit**

   4a Autonomous Plant Hire Unit - New Organization
   4b Autonomous Plant Hire Unit - Amarta Karya

5. **Privatized Plant Hire**

TABLE II - 4

EVALUATION CRITERIA

1. Efficient Equipment Utilization

2. Risk Minimization

3. Financial Viability

4. Conflict with Existing GOI Policy

5. Addresses System Deficiencies

6. Qualified Providers

7. Mobilization of Resources

8. Human Resource Development

9. Potential For Development into Sustainable Privatization

TABLE II–5

EVALUATION OF OPTIONS

25–Feb

NO	OPTION	EVALUATION CRITERIA									SCORE
		1	2	3	4	5	6	7	8	9	
1a	Contracted Equipment Maintenance	–2	2	–3	–2	1	3	5	4	0	8
1b	Contracted Workshop Operation	–2	3	–3	–3	1	2	5	4	0	7
2a	Autonomous EM Unit – New Organization	–3	4	–3	3	1	–2	–2	–2	1	–3
2b	Autonomous EM Unit – Amarta Karya	–3	5	–3	1	1	2	–5	–2	1	–3
3	Privatized EM Unit	–2	–2	–3	–5	0	1	5	4	2	0
4a	Autonomous Plant Hire – New Organization	4	3	3	3	4	–2	1	3	2	21
4b	Autonomous Plant Hire – Amarta Karya	3	1	3	4	4	2	–5	1	0	13
5	Privatize Plant Hire	5	–4	4	–5	4	1	5	5	3	18

EVALUATION CRITERIA

1 Efficient Equipment Utilization
2 Risk Minimization
3 Financial Viability
4 Conflict with Existing GOI Policy
5 Addresses System Deficiencies
6 Qualified Providers
7 Mobilization of Resources
8 Human Resource Development
9 Potential for Development into Sustainable Privatization

TABLE II-6

Components for Contracted Maintenance

1. **Workshop Management**
   a. Development of workshop and equipment annual budgets for operations and maintenance

   b. Development and implementation of Workshop administration activities

      i. Scheduling of maintenance and repair
      ii. Equipment maintenance and repair records and files
      iii. Vehicle and equipment history records
      iv. Operators and daily logbooks

   c. Development and implementation of warehouse administration and activities

      i. Procurement procedures
      ii. Spare parts inventory
      iii. Records of spare parts issue
      iv. Warehouse shelving, parts identity and bin locations
      v. Control of tools and equipment store
      vi. Control of used spare parts

   d. Maintenance of workshop structure, outbuildings and facilities, including daily good housekeeping practices.

   e. Maintenance of Facilities

      i. Roads
      ii. Parking areas
      iii. Drainage
      iv. Vegetation control
      v. Security post and perimeter fencing

2. **Workshop Operations**

   a. Equipment preventative maintenance
      i. Routine servicing
      ii. Equipment condition inspection and reporting potential defects

   b. Equipment scheduled maintenance

      i. Manufactures recommended guidelines
      ii. Equipment repair scheduled from routine maintenance equipment inspection reports

   c. Equipment component repair/overhaul

      i. Engine
      ii. Transmission
      iii. Final drives
      iv. Hydraulic pump and hydromotors

   d. Equipment major overhaul/rehabilitation

      i. Restoring the equipment to 80 - 100 percent of its new condition.

TABLE II–7

MAINTENANCE SYSTEMS DEFICIENCIES – FOCUS OF OPTIONS ONE, TWO AND THREE

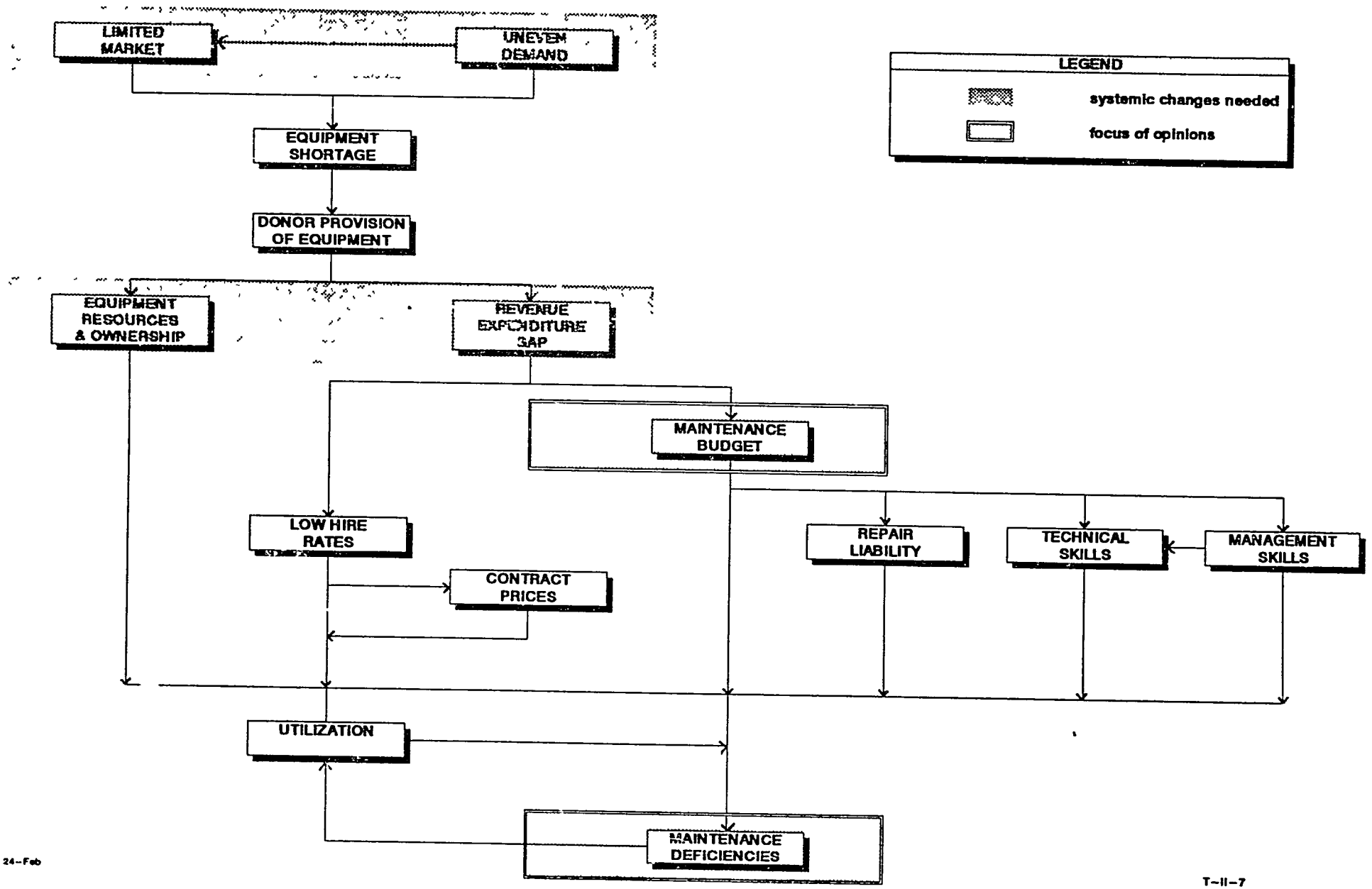

TABLE II–8

MAINTENANCE SYSTEMS DEFICIENCIES – FOCUS OF OPTIONS FOUR AND FIVE

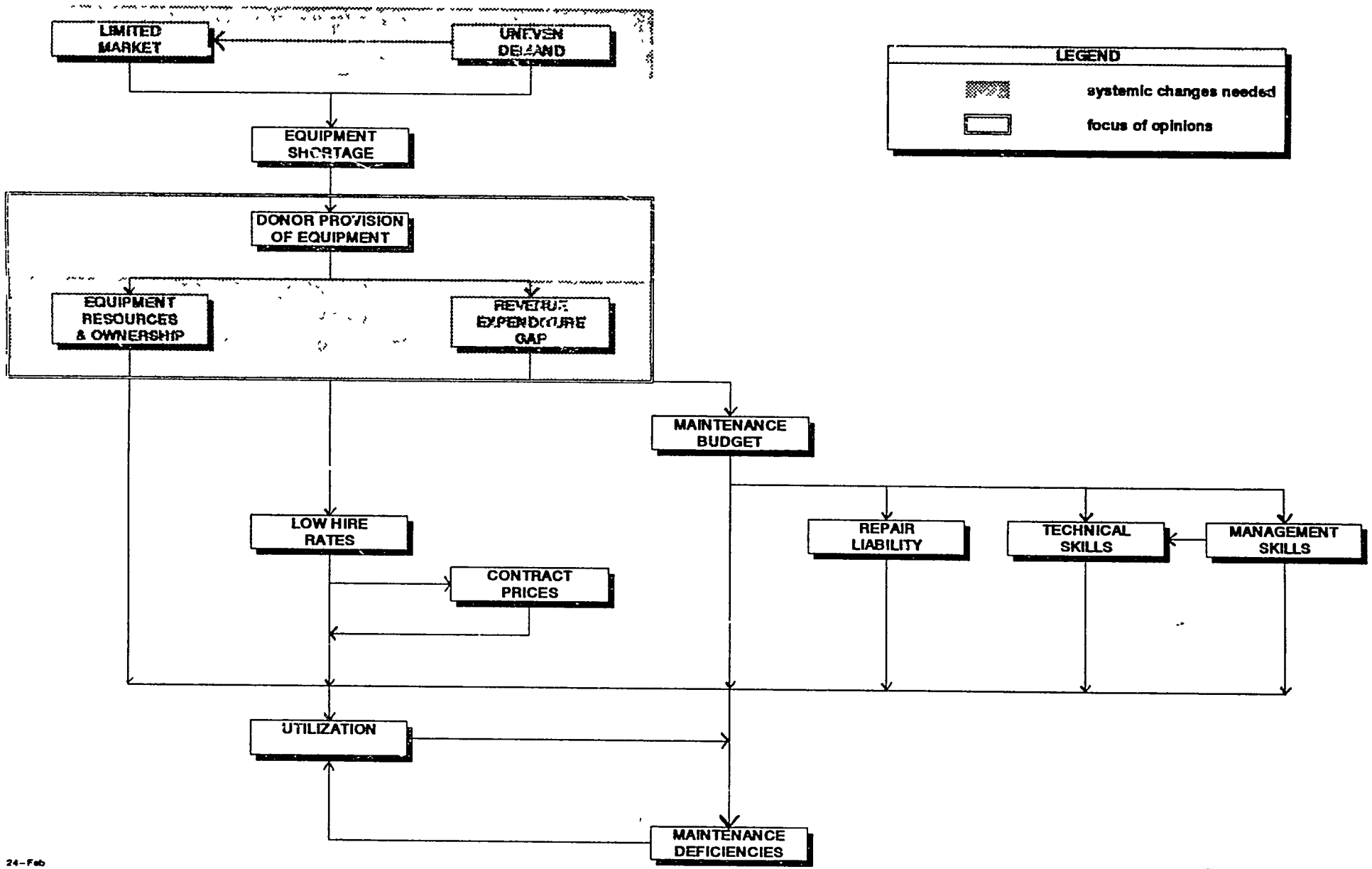

TABLE II–9

COMPARISON OF UNIT SWADANA AND BUMD

ISSUES	UNIT SWADANA	BUMD
ORGANIZATIONAL STRUCTURE	establish existing workshop as unit swadana within PU–II; can change internal structure of unit	establish new organization, with appropriate structure
PERSONNEL	no management hired from outside; additional personnel hired through civil service system; non–civil service wages are daily rates, which are not competitive	outside management can be hired; staf an be civil service or other; wages can be set by BUMD to adjust to labor market
FUNCTIONS	no change in functions for workshop	Duties and responsibilities determined in SK establishing BUMD
ESTABLISHMENT	no procedures have been determined for establishing Unit Swadana at local level; current procedures for central govt include approval by MOF, MenPan, MOHA	Peraturan Daerah, initiated by Bupati and approved by DPRD–II & Governor
LIQUIDATION		SK Bupati
FINANCE	operates as a unit within the kabupaten budget process	operates as a self–sufficient entity outside of the kabupaten budget process
SOURCES OF INCOME	all current GOI and outside sources can continue (e.g., INPRES, APBD–II, hire fees)	hire fees and APBD–II income would continue without complication; INPRES funds would need to be channelled via kabupaten accounts
APPROACH TO PROFITS	not profit–oriented; provides public service; losses possible, offset by government funds	goal to avoid losses; profits allowed; commercially operated
SURPLUS EARNINGS	rolled over to following budget year to Unit Swadana account	rolled over, invested, paid as dividends, as determined by BUMD management
LOSSES	accounts should balance; shortfalls offset by local government funds	accounts must balance; should not be dependent upon government funds
FUNDS STORAGE	in kabupaten account	own bank account
ASSET OWNERSHIP	assets remain in the hands of current owners (central or local government)	assets belong to BUMD
TRANSFER OF ASSETS	only transfer of equipment from DPU to local government is required	transfer of equipment from DPU to local government; transfer of equipment and workshops from local government to BUMD via SK Bupati (equity transfer)
SETTING HIRE RATES	set by Peraturan Daerah, initiated by PU and Bupati, approved by DPRD–II and Governor	set by BUMD management

two \swa–bumd

26–Feb

ANNEX THREE

RECOMMENDED EQUIPMENT HIRE POLICY

I. HIRE POLICY UNDER THE PLANT HIRE OPTION

A. Potential for Improvements in Hire Policy

Three improvements which are essential if an effective hire policy is to be established are:

1. The institution which hires the equipment must be established as an autonomous unit which can retain its income from hiring to meet the costs involved All costs for equipment, including procurement, maintenance and repairs, must be accounted for, recorded and used to determine hire rates.

2. The Government's Owners Estimates for kabupaten road projects must be checked to ensure that the rates allowed for equipment-related works reflect the true cost of equipment, including new hire rates.

3. Any remaining unfair competition from other government units, using hire rates which are effectively subsidized, must be eliminated or curtailed.

B. Allocation of Equipment

Equipment will continue to be allocated primarily to road projects at kabupaten level with the emphasis on betterment, rehabilitation and new roads. For the foreseeable future, few other types of equipment-related construction activity are predicted for the pilot areas. However, if the suggested plant hire unit is established on a financially viable basis, it will be able to respond to any future needs outside government-funded projects with a capability, once fully established and operating, to procure new equipment, rather than allocating existing equipment on some quota or other non-market based system

The current practice of allowing government agencies to utilize equipment without payment must be properly accounted for in the records of the new unit and the costs reflected in its budgets and its monitoring reports.

All hiring of equipment must be subject to standard agreements at the pre-set hire rates. Without this policy, actual costs of equipment utilization and maintenance cannot be calculated.

C. Hiring Regulations

1. Contractual Responsibility and Liability

a. General

Standard recommended hiring regulations should be given to all Hire Units but they may be permitted to adjust these to meet local needs and conditions. However, the hiring regulations adopted by any one Unit should be uniform for all equipment which it hires out.

The Terms and Conditions of the Hire Agreement should have the overall objectives of:

i. Removing hidden costs from equipment hire

ii. Guaranteeing proper maintenance of equipment.

iii. Reflecting correctly the decisions made in the budgets for the new Unit regarding the liabilities of the respective parties to bear each of the various costs of equipment ownership and operation.

As a general rule, any costs which relate to a period longer than the normal hire duration, such as major repairs, should be borne by the owner and built into the hire rate, in order that such costs may be distributed evenly between the hirers rather than falling upon the one who is using the equipment at the time repairs are needed.

The proposal is that hire rates should include all levels of repair and maintenance from DPU level I through V. Each unit would have the option to adopt a policy whereby the hirer (contractor) would be liable for level I maintenance, reducing the hire rate accordingly

b. Operation

The cost of operator's wages, fuel and oils should be the responsibility of the hirer since they are directly variable to the hours worked and are therefore directly under the hirer's control.

There are, however, advantages in the operator being an employee of the owner, allowing the owner to ensure that his equipment is being operated and maintained only by trained and tested personnel. The quality of record keeping relating to utilization and maintenance, which is essential to the success of EMS, can also be enforced far more through operators employed by the owner.

The owner would pay the operator's salary and recover the cost from the hirer through a separate charge. This is considered preferable to incorporating the salary into the hire rate since the latter are fixed whereas salary can vary according to overtime, etc.

c. Routine Maintenance

In order to guarantee proper and complete maintenance, the owner would assume responsibility for all maintenance of equipment and incorporate the costs into the hire rate. Basic scheduled maintenance such as lubrication should be carried out by the equipment operator. More difficult maintenance such as changing filters or fuel pump adjustments could be carried out by the operator if he is suitably qualified or otherwise by using a trained field mechanic who should make pre-scheduled visits to each project location..

To ensure that the work is properly carried out at the designated intervals, it is proposed that the cost (and thus the responsibility) be borne by the owner and included in the hire rate, the hire agreement clearly specifying that liability for the cost lies with the owner.

d. Repairs

The standard Bina Marga classifications of repairs should be used.

It is recommended that all repairs not attributable to misuse of the equipment be carried out and paid for by the owner who may choose to use a field mechanic, the kabupaten workshop or an outside workshops or maintenance provider.

The cost should therefore be included in the hire rate and the hire agreement must clearly specify that liability for the cost lies with the owner.

Where components fail before the normal working life is reached, it suggests misuse by the hirer. However, the current hirer may dispute liability, claiming that any misuse was the fault of a previous hirer. The best safeguard against misuse is to ensure that the operator is a full time, trained employee of the owner. He will be expected to refuse to operate the equipment under conditions for which it was not designed.

e. Transportation

Hire agreements should provide that the cost of transportation is the liability of the hirer. In practice, suitable facilities may be provided by the owner who may be better able to invest in proper facilities and equipment for transportation, such as a low loader or truck crane. In such cases, a separate charge would be made for the service.

f. Hours Charged

It is normal practice amongst equipment hire companies to charge actual hours worked by the machine rather that assuming a standard number of hours per day. Thus those users who work

overtime pay more hours of hire charges whereas a machine which is idle is not charged to the hirer.

Such a system can only work satisfactorily if the operator is an employee of the owner and is responsible for preparing daily time sheets which he must get the contractor to countersign.

The danger of such a system is that an inefficient contractor will have equipment idle for many hours per day yet not have to pay for it thus removing any incentive to be more efficient. To limit the owner's risk, the hire agreement should specify a guaranteed minimum number of hours per week or per month for which the contractor must pay whether or not he uses the machine.

D. Hire Revenues

1. Hire Rates

a. Costs to be included

It is proposed that the new Hire Unit should adopt a policy for determining hire rates which approximates to that which would be applied by a hire company in the private sector, setting hire rates which include:

i. Maintenance and Repairs

This should include maintenance levels I through V. Level I may be excluded if policy is that routine maintenance is to be paid for by the hirer.

Formulae for the calculation of repair costs year by year during the life of equipment are contained in the Manual "Kriteria Pemeliharaan Peralatan" issued by Secretary General PU in February 1983. However, it is proposed that these should not be used by the new hire Unit for three reasons:

- The arbitrary nature of a percentage makes it inappropriate to use in preparing detailed operating budgets. There must be compatibility between the methods used to prepare budgets and those used in hire rate calculations

- The formulae cannot be applied where the hire Unit adopts different assumptions on working life from those on which the Manual is based.

- In the early years of the Unit's operation, the cost will be heavily influenced by the backlog of repairs, especially the Klasifikasi V major overhauls, none of which appear yet to have been carried out.

It is proposed that forecasts of the cost of each level of repair for each type of machine be prepared, based on priced lists of the spare parts likely to be fitted.

The Unit will also budget separately for the cost of the workshop facility, staff salaries, transportation etc and these should also be incorporated in the hire rates.

ii. Insurance and taxes (if paid)

iii. Original cost of the item, to be written off in equal annual installments over its effective working life.

Notes:

1. The concept of writing off annual installments on the reducing balance basis which is used in KepMen 585 produces a hire rate which reduces rapidly over the life of the equipment. This is not considered suitable for the new Unit.

2. It should be assumed that a NIL residual or scrap value remains at the end of the working life and thus 100% of the cost must be included in the hire rate, not 90% as hitherto.

iv. Cost of operator and transportation are the responsibility of the hirer. However, as these can vary, they must be invoiced separately and not included in the hire rate.

b. Effective working life

The costs described in (a) above must be spread over the expected number of hours which the machine will be used during its working life (i.e., until it becomes uneconomic to continue to operate).

The KepMen 585 standard hours for most items used by the kabupaten is 2,000 hours per year for five years Very few machines used for construction projects in Indonesia ever achieve such a high annual usage and certainly those used on kabupaten roads do not do so. Conversely, many machines are seen which have reached an age of more than ten years and are still working, although with only perhaps 4,000 - 5,000 hours recorded on the meter.

This supports the conclusion of the Study Team that the average working hours are around 500 - 600 per year and that the number of years life, depending upon the quality of maintenance and repair, can be anywhere from seven to fifteen years.

In setting a target working life for the new Unit, four considerations must be borne in mind:

i. An unduly low number of hours life will produce a hire rate which none of the Unit's contractor customers would be able to afford within the existing construction contract unit rates (Bills of Quantity).

ii. It is hoped that better maintenance, management etc under the new Unit will improve the availability of the equipment.

iii. Conversely, the overall constraint of the limited markets and uneven demand will continue to be a constraint on utilization rates achieved.

iv. Manufacturers' guarantee to supply spare parts for only ten years after purchase date although parts for popular and long production run machines may continue to be available for longer. The management of the unit should generally therefore be cautious in forecasting any working life of longer than ten years.

In the calculations of indicative hire rates for ten items of equipment carried out under this Study, the target chosen has been 1,000 hours per annum over a seven year life for those items which under KepMen 585 have an assumed life of 2,000 hours per year over five years. Equivalent adjustments have been made to the KepMen assumptions for other types of equipment.

c. Indicative Hire Rates

Ten items of equipment frequently used for road projects and found in most of the pilot project kabupatens have been selected and hire rates calculated on three different bases which are described below. The calculations, together with summaries, are shown in the Appendix to this report.

BASIS I

The hire rate under this basis would provide sufficient revenue to meet all maintenance and repair costs as described in (a) above.

It would also generate enough revenue over the expected working life of the equipment to provide funds to replace it provided that the cost of the replacement were exactly the same as the original item.

BASIS II

These rates would provide for additional funds to be generated to meet the extra amount by which the purchase price of the replacement machine, seven years later, might exceed the cost of the original one.

The additional cost of the new machine may include some or all of the following factors:

- Inflation rate in Indonesia
- Price increases due to technological improvements in the equipment
- Currency exchange rate movements in supplier countries
- Inflation rate in supplier countries.

Unless some provision is made for this cost, the Unit will remain dependent upon foreign loans to assist with the purchase of replacement equipment and will never become self-sustaining.

Any hire rate calculation using follow Basis II must be approximate only since all the above factors require subjective forecasts for a period of several years ahead.

BASIS III

Many industries world wide, when carrying out financial appraisal of a proposed investment, require it to show a forecast return on capital of not less than a certain percentage. This can also be called the Internal Rate of Return. Each company must establish its own required rate taking into account its cost of capital.

The rate of return is then applied to all forecast cash flows during the life of the project. The technique is known as 'Discounted Cash Flow' (DCF). A brief description of DCF is given in the Appendix.

Indonesia has used the concept of cost of capital on a number of occasions, usually through a formula known as Capital Recovery Factor (CRF).

The rate adopted has been:

	Real cost of money	12.5%
+	Inflation	7.5%
=	Overall cost (interest rate)	20.0%

Basis III hire rates have been calculated using a rate of return of 20% and with inflation built into both revenue and cost forecasts at 7.5% per annum compound. Instead of a CRF, the Discounted Cash Flow (DCF) investment appraisal technique has been used.

While no specific provision is made for the extra cost of a replacement item of equipment under Basis III, the use of the comparatively high rate of return of 20% means that funds are generated which will be sufficient to meet the extra costs of replacement items,

provided they are correctly accumulated as undistributed surpluses within the Unit until required.

The indicative hire rates as shown in the summary in the Appendix are taken from "Year One" in the life of the machine. However, the purchase prices used in the detailed calculations are taken from KepMen 167/1991. It may therefore be appropriate to set up the new hire Unit (in 1994) using the hire rates calculated for "Year 3".

No uplift to the KepMen 167/1991 prices has been made to allow for the additional cost of purchasing equipment in Sulawesi (shipping etc). Some 7% to 10% should be considered for inclusion.

Whatever initial rates are adopted, they should be reviewed each year and raised by the cost of inflation. In the detailed calculations shown, inflation has been forecast at 7.5% compound.

d. Use of Equipment by Local Government

Equipment is often used by local government on projects such as:

i. Those implemented using Force Account (Swakelola)

ii. Those for the benefit of the community but for which no budget funds have been allocated

In neither of these cases will the project be able to pay the new hire rates to the hire Unit.

The financial and other monitoring systems of the new Unit must ensure that this use of equipment for non-revenue earning purposes is properly recorded and reported to those officials in local government who are responsible for controlling the performance of the new Unit.

Special decisions will be needed to determine how the lost revenue will be dealt with both in the preparation of budgets and in the financial reports and it will also be necessary to plan how the Unit can be subsidized to make good the resulting deficits.

e. Constraints on Setting Hire Rates

Whatever basis is used to calculate economic hire rates, they can only be applied if the hirer, i.e., the contractor, is prepared to pay. With contractors engaged on road projects there are two constraints which must be addressed:

i. The contract Unit Rates in the Bills of Quantities or the Lump Sum which the contractor will receive under his contract for equipment-related works must be

sufficient to cover the new hire rate which he must pay, together with his other costs such as fuel, oils, operator and transportation.

Standard rates for each type of machine are currently used in cost estimating. They provide for a reasonably adequate rate per hour. However, the contractors income depends not upon hours of hire for the machine but upon units of output which it produces measured in M2 or M3 of material moved or laid. The standard rates used in contracts to price these M2 and M3 are based on assumptions about the hourly output (capacity) of each type of machine.

Evidence indicates that these productivity rates are rarely achieved in practice on road maintenance and construction projects As output falls below standard, the contractor will find it increasingly difficult to pay the new hire rates from existing Bills of Quantity / Contract rates without incurring losses and will seek to have the contract rates increased

ii. There must not be an alternative source of equipment available for hire to the contractor at hire rates which, due to government policy and/or to historical events, are uneconomic. The new kabupaten Hire Unit cannot operate successfully if Palan and/or Kanwil continue to offer similar items for hire in the same province at KepMen 585/1988 rates.

2. Receipt and allocation of revenues

a. Collection and storage of revenues

Establishment of an autonomous plant hire unit will lead to a resolution of the current problem of revenue allocation Revenues would be collected, stored, and expended by the same self-accounting unit, with the ability to connect revenues and expenditures in both the budgeting and reporting formats. This is the only reasonably dependable method for ensuring proper equipment management.

Revenues will be paid directly to the plant hire unit, and stored in a bank account accessible only to that enterprise.

During the first stage of the pilot project, the Unit may be posting deficits and means of funding these must be established before the pilot is launched. The method selected will depend upon the institutional vehicle selected for the pilot.

b. Allocation

Under the method of operation of a self-accounting enterprise, the company operates on the normal commercial basis of budgetary control, monitoring total actual revenues against budget.

A similar monitoring process takes place regarding actual levels of each type of cost against the respective budgets.

E. Execution of Hire Agreements

1. Bank guarantees and bonds

Bank guarantees are required under KepMen 585/1988. The three risks which a bank guarantee is designed to protect the owner against are:

a. Damage to equipment

The equipment hire agreement must clearly differentiate between damage caused by misuse and breakdown due to fair wear and tear.

b. Failure of hirer to pay charges

This often occurs when the contractor himself has not been paid for the work done by him and seeks to share with his suppliers the burden of financing the delay. Protection against this risk can alternatively be provided by including in the hire agreement for an advance payment of hire charges to be made before delivery of the machine to site. A deposit may also be sought, equal to the costs of demobilization, to be held by the owner until satisfactory completion of the period of hire.

c. Equipment lost or stolen

i. The physical nature of road maintenance and construction equipment makes inadvertent loss unlikely.

ii. Theft of equipment is a problem usually only if it can be readily transported or if it is hired at a site far away from the hirer's scene of operations such as on another island. Neither of these applies in the pilot study area.

iii. Theft of individual components such as batteries is not uncommon and suitable procedures for care and security on site must be insisted upon by the owner. Hirers should be held liable for stolen components.

It is generally difficult for a small contractor to raise bank guarantees, as most of his credit rating with his bank is likely to be committed in support of his borrowing requirements and the

guarantees required for his construction projects. Insurance Bonds are not yet a well developed market in Indonesia and are expensive. Consideration should be given to removing the legal insistence on guarantees .

2. Enforcement of responsibilities and liability

The hire agreement must provide for the remedies available to each party in the event of failure by the other party to carry out its obligations. With equipment hire, the most common form of default is failure to pay the charges, the remedy for which is repossession of the equipment and, in serious cases, removal of the contractor from the lists of those invited to bid for future projects.

F. Monitoring by kabupaten

1 Kabupaten as Project Owner

The kabupaten must ensure that road projects are completed on time and within budget and that budget costs for such projects are as low as possible

2. Kabupaten as Responsible Agency

The kabupaten will be required to develop and to exercise a new and active management role, as the governmental entity responsible for the plant hire unit operations and finance. Duties will include:

a. Setting hire rates - as described above

b. Setting budgets and other targets

For each financial year, a budget must be prepared showing for each of the twelve months:

- Hours utilization expected from each machine
- Revenue expected from each machine
- Maintenance and repair costs forecast for each machine
- Workshop overhead costs
- Other overheads of the Unit
- GOI budget funds available

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The original budget will be constructed using the same assumptions as those included in the hire rate calculations. A proposed budget format is included with the Action Plan.

c. Monitoring actual performance

Recording and controls systems must be established which enable the kabupaten to monitor actual performance of the Unit against that budgeted.

Monitoring should include:

- hours utilization - by machine and in total
- hire revenue - by machine and in total
- cost of spare parts fitted - by machine and in total
- workshop overheads - by cost type and in total
- other Unit overheads - by cost type and in total

Comprehensive monitoring systems have already been prescribed in the EMS Manual. Some minor changes are necessary to provide for the comparison of 'actual' results against 'budget' This need was not foreseen at the time when the EMS was prepared since the concept of autonomous units, complete with budgets, had not been proposed.

d. Management

Active management will be needed to take actions indicated by the monitoring system. For example, when hire hours fall short of those budgeted, determination will need to be made of the reasons for the shortfall. Similar questions apply to the hire revenue, with the additional statistic to be considered of hours utilization for which no revenue has been received.

A detailed review of repairs carried out to each machine will indicate both excessive costs - possibly due to misuse - and failure to carry out a scheduled major repair for which reasons should be obtained.

Monitoring costs against revenue will indicate whether or not the Unit can operate for the remainder of the year without exceeding its available funds.

A possible solution where budget targets are not being achieved may appear to be to raise hire rates. This, however, cannot be done without a careful review of the constraints described above in section D-1.

II. HIRING POLICY WITHOUT THE EQUIPMENT HIRE UNIT

A. Potential for Improvements in Hire Policy

The principal difference between the Autonomous Hire Unit and the hiring policy without such a Unit lies in the control over funds.

An autonomous Unit, established as a Swadana (or BUMD) would retain its own revenues and store them to meet its own expenditures in the same, or in subsequent, years. Surpluses or deficits would be forecast as part of the annual budgeting process and monitored monthly during the year.

Without an autonomous unit, hire revenue will continue to be banked for general budget purposes.

However, some of the steps proposed for the rationalization of the equipment hire policies, and particularly the removal of some of the fragmentation of responsibility, may be carried out without the establishment of the autonomous hire unit.

Such changes have not been possible hitherto while equipment has remained in the ownership of DPU because Keppres 29/1984 requires all such hire revenue to be deposited in central government funds (Kas Negara), from which Pemda Tingkat II receives only limited budget allocations for equipment maintenance. These are unrelated to the level of revenue generated. Furthermore, the hire rates for DPU equipment are set by KepMen PU 585/1988 and KepMen 167/1991 at levels which are not economically viable.

It is assumed that Ministry of Public Works will proceed with implementation of the transfer of ownership of equipment from DPU to the kabupaten, a process started by KepMen PU 711/1992. Once transfer has occurred, realistic hire rates can be set and the responsibility for management and operation, including both revenue and cost control, can be vested in DPUK.

Not all the problems would be solved:

- The revenue would still have to be banked intact into Kas Daerah Tingkat II where it would be treated as part of general budget revenues; and

- Budget allocations for repair costs would still have to be approved as part of the budgeting process.

However, the latter would come from Dati II rather than IPJK, and the former would be considerably larger than hitherto. There would therefore be the opportunity for each kabupaten to establish a linkage between the two.

It could, for example, decide that the income banked in 1994/95 would be taken into account in deciding the budget funds to be allocated for repairs in 1995/96. Alternatively, a budget cost allocation could be made for 1994/95 on the agreed basis that it was geared to a certain level of hire revenue. However, the obvious problem with such an approach is that if, by the middle of the financial year, it is clear that the revenue target will not be reached, it might by then be extremely difficult to curtail the spending at a level below that originally allocated.

The absence of a defined Unit would also make it much more difficult to develop a sense of responsibility for managing the operation of equipment hire by Dinas PUK. Nor would it be easy to produce monitoring reports which could be used to draw the attention of central government to root problems such as:

- Uneven budget cycle affecting utilization rates.

- Inadequate contract rates allowed for in drawing up Inpres allocations.

APPENDIX I

HIRE RATES

This Appendix Contains:

A. COMPARISON OF EQUIPMENT HIRE RATES (2 pages)

Page one shows for ten items of equipment, the rates applicable using the formula in KepMen 585/188

It then shows indicative hourly rates which use of each of the suggested Bases (I to III) would produce. Because of the lack of repair cost data, these must be viewed as approximate at this stage. Provision is made in the Action Plan for preparation of more accurate rates once the policy on rates has been decided.

Page two shows examples of hire rates which were noted during field visits made by the Study Team. They mostly approximate to the rates set by KepMen 585 for four year old equipment for reasons not understood since much of the equipment concerned was ten or more years old.

B. SETTING HIRE RATES (20 pages)

For each of the ten machines, two pages of hire rate calculations are attached.

1. Page one

The first page in each case provides the figures in accordance with Bases I and II, using a simple profit and loss account form of presentation to calculate the hire rate required:

- To break even (Basis I)
- To accumulate funds for the extra cost of the replacement (Basis II)

It should be noted that the hire rate shown in the summary is that applicable to 'year one' in the detailed calculations. In subsequent years, the rate should be increased in line with inflation, estimated at 7.5% per annum compound.

2. Page two

The second page shows a Discounted Cash Flow (DCF) calculation to establish the hire rate needed to produce a nil Net Present Value at the Internal Rate of Return of 20% per annum.

A brief description of DCF is included in this Appendix.

Again, the hire rates in the summary are those which the DCF calculation produces for 'year one'

C. UNIT RATES PAID UNDER CONSTRUCTION CONTRACTS

The Reports lay great stress on the need to pay to contractors adequate rates for equipment-related activities which they perform under their construction contracts.

They also refer to the risk to the contractor that his actual productivity may be below the standard assumed in setting the unit rates.

Hitherto, any losses which contractors have been making through low machine productivity have been offset by the profit they have made due to the very low hire rates they have been paying. A further complication is the unknown amount which the contractor has actually been paying for repairs compared with the standard used in the unit rate calculations.

These profits and losses would be quite complex to separate and to monitor and it is likely that even the contractors themselves rarely know with equipment exactly where they are losing and making money. Certainly GOI has no data.

Two pages of illustrative workings are included in the Appendix to clarify what is meant in the Reports

1. Current Basis of calculation of a unit rate

   This shows how a rate, which is initially is calculated as a cost per hour, is then converted into a rate per quantity of production.

2. Risk to contractor of production shortfall (2 pages)

   This has been prepared to stress the extreme sensitivity of the contractor's income to any changes in the level of productivity.

   Observation suggests that on many road projects the actual production is very low. Indeed, on many projects, there are long periods when equipment is idle and producing nothing. During such periods, all the costs are a direct loss to the contractor.

   The first page shows the calculations of the for various levels of productivity whilst the second page translates the figures into a graph.

ANNEX THREE

TABLES

TABLE III–1

RECOMMENDED RESPONSIBILITIES AND LIABILITIES FOR HIRED EQUIPMENT

RESPONSIBILITY OR LIABILITY	CURRENT SYSTEM		PLANT HIRE SYSTEM RECOMMENDATIONS	
	OWNER (Kabupaten)	HIRER (Contractor)	OWNER (Kabupaten)	HIRER (Contractor)
Transportation		fully responsible	has loaders for hire	fully responsible
Operational Costs		fully responsible		fully responsible
Maintenance Levels I, II, III, IV *	directs	performs and pays for	fully responsible	
Major Repairs, caused by hirer's negligence	determines need	fully responsible for cost	fully responsible	
Repair of equipment returned in less than good condition	determines need, orders or contracts repair	fully responsible for cost	determines need, orders or contracts repair	fully responsible for cost if due to misuse
Loss of Equipment, caused by hirer's negligence		fully responsible		fully responsible
Operator	attempts to provide qualified operator to hirer	responsible for management and payment of wages	provides and pays for operator	
Mechanic	attempts to provide qualified mechanic to hirer	responsible for managment and payment of wages	provides and pays for mechanic as needed for repairs	
Daily Utilization Reports	inspects and approves	prepares	operator prepares, APHU inspects and approves	receives copy
Monitoring of Equipment Use	monitors	pays for costs of monitoring	monitors at own expense	
Insurance for equipment and operator	claimant for insurance settlements	fully responsible for insuring	claimant for insurance settlements	fully responsible for insuring
Tax and fees for processing hire agreement		responsible for cost		responsible for cost
Fine for delayed use of equipment		pays fine		pays fine
Cancellation of contract due to deficiencies in hirer's qualifications or performance	fully enabled to cancel		fully enabled to cancel	
Bank Guarantee	returns to hirer upon satisfactory completion of contract	obtains from bank	returns to hirer upon satisfactory completion of contract	obtains from bank
Arbitration (in Pengadilan Negeri/government court)	selects one member of Arbitration Board	selects one member of Arbitration Board	selects one member of Arbitration Board	selects one member of Arbitration Board

* Current System Levels I, II, III only in certain kabupatens, sharing of costs for repairs is often negotiated, limits on contractor liability in some kabupatens Recommended System Owner of equipment fully responsible for normal repairs, hirer responsible in cases of misuse of equipment

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COMPARISON OF EQUIPMENT HIRE RATES (per Hour)

(Excluding operator and fuel)

Type of Equipment	Bulldozer	Grader	Wheel Loader	Dump Truck	Compress	Roller 3 W (6t)	Roller Tire	Asphalt Sprayer	Vibrating Compact	Vibrating Roller
Code	E 001	E 010	E 052	E 212	E 301	E 082	E 084	E 150	E 088	E 086

PRESENT BASIS

(Per KepMen 585 & 167)

Years Life	5	5	5	5	5	5	5	5	4	3
Hours pa	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	1,000	2,000
Year 1	39,029	33516	30,870	6,174	5,733	12,348	27,122	2,646	756	5,686
Year 2	29736	25,536	23520	4704	4368	9408	20664	2016	539	3591
Year 3	21187	18194	16758	3352	3112	6703	14723	1436	340	1696
Year 4	13381	11491	10584	2117	1966	4234	9299	907	161	
Year 5 and subsequent years	6,319	5,426	4,998	1,000	928	1,999	4,391	428		
Average	21,930	18,833	17,346	3,469	3,221	6,938	15,240	1,487	449	3,658

PROPOSED ALTERNATIVES

(All repair costs paid by the owner)

Years Life	7	7	7	6	7	7	7	7	4	4
Hours pa	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000	1,000
BASIS 1 – Recover original cost only – No interest on capital	48,765	41,850	38,535	9,140	7,175	13,440	29,545	2,895	1,260	9,775
BASIS II – Recover replacement cost – No interest on capital	68,340	58,685	54,010	12,870	10,010	19,700	43,200	4,260	1,470	11,775
BASIS III – Discounted Cash Flow to show 20% Return	70,525	60,575	55,775	12,275	10,350	20,325	44,650	4,350	1,650	12,200

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COMPARISON OF EQUIPMENT HIRE RATES (per Hour)

Type of Equipment		Bulldozer	Grader	Wheel Loader	Dump Truck	Compress	Roller 3 W (6t)	Roller Tire	Asphalt Sprayer	Vibrating Compact	Vibrating Roller
Code		E 001	E 010	E 052	E 212	E 301	E 082	E 084	E 150	E 088	E 086

RATES NOTED DURING FIELD VISITS

KABUPTEN	BASIS										
BELU	KepMen Rates	13,250	11,415	9,743	2,500	3,429	3,857	7,505			
KUPANG	KepMen Rates	13,270	11,420	8,450	2,485	2,850	4,214	8,242			
TAKALAR	KepMen Rates	13,267	11,418	8,437	2,857	2,900	3,946	8,360			
JENEPONTO	KepMen Rates	13,285	11,428	10,571	2,102	2,750	4,035	9,214			
SIDRAP	KepMen Rates	13,265	11,412	4,998	2,480	1,874	4,013	7,888			
SINJAI	Perda Rates	25,000	30,000	30,000	5,000						
KUPANG	Perda Rates						3,929				
SIDRAP	Perda Rates	60,000			3,750		5,625				3,125
JENEPONTO	Putra Turatea	85,000		50 000	12,500						
BONE	Tunas Abadi		60,000				12,500				
KUPANG	Palapa							40,000			

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SETTING HIRE RATES

BULLDOZER E 001	YEARS 1	2	3	4	5	6	7	TOTAL
Original Cost of machine (per KepMen 167/1991)	177							
COSTS								
Repairs – cost per Pedoman	(8.0)	(17.1)	(27.6)	(69.3)	(31 9)	(40.7)	(5.5)	- (200.1)
Insurance	(5 8)	(6 3)	(6 8)	(7.3)	(7 8)	(8 4)	(9 0)	(51.4)
Original cost written off	(25 3)	(25.3)	(25.3)	(25 3)	(25.3)	(25 3)	(25.3)	(177 0)
	(39 1)	(48 7)	(59 7)	(101.9)	(65 0)	(74 4)	(39 8)	(428.5)
HIRE RATES REQUIRED								
BASIS I — TO RECOVER ORIGINAL COST ONLY								
Hire Revenue 1,000 hours @ Rp 48,765	48 8	52 4	56 4	60 6	65 1	70 0	75 3	428 5
Profit / (Loss) for the year	9 7	3 7	(3 3)	(41.3)	0 1	(4 4)	35 5	0 0
Cumulative Surplus / (Deficit)	9 7	13 4	10 1	(31.2)	(31 1)	(35 5)	0 0	
Cash resources generated (surplus plus cost write off)	25 3	50 6	75 9	101.1	126 4	151 7	177 0	

BASIS II — TO PROVIDE FUNDS FOR ADDITIONAL COST OF REPLACEMENT

Forecast Cost of Replacement Machine

1. 7 5% p a for Inflation only — 294 total — 65 9 % increase
2. Allowance for other increases – Technological, exchange rate etc — 349 total — 97 4 % increase

Application of the Hire Rate based only on original cost would generate cash resources at end of year 7 of — Rp (M) 177
To generate cumulative cash resources of — Rp (M) 349
Requires additional funds of — Rp (M) 172

These funds must be generated from profit on hiring operations, retained by the Hire Unit, as follows

	1	2	3	4	5	6	7	
Hire Revenue 1,000 hours @ Rp 68,340	68 3	73 5	79 0	84 9	91.3	98 1	105 5	600.5
Profit / (Loss) for the year	29.3	24 8	19 3	(17 0)	26 3	23 7	65 7	172 0
Cumulative Surplus / (Deficit)	29 3	54 0	73 3	56 3	82 6	106 3	172 0	
Cash bresources generated (surplus plus cost write off)	54 5	104 6	149 2	157.5	209 0	258 1	349 0	

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DISCOUNTED CASH FLOW (DCF) for EQUIPMENT PURCHASE

Type	BULLDOZER
Code	E 001
Horsepower	110
Repair factor	0.9
Inflation rate %	7.5
Annual Hours	1000
Years life	7

YEAR ONE HIRE RATE	70,525 Per Hour

YEAR	Purchase Price (KepMen 167)	Repairs Cost	Repairs %	Insurance/ Tax	Hire income 7000 Hours	Net Flow	Discount Factor 20 %	NPV
0	177.0			5.8		(182.8)	1.000	(182.8)
1		8.0	4.5	6.3	70.5	56.3	0.833	46.9
2		17.1	9.0	6.8	75.8	51.9	0.694	36.1
3		27.6	13.5	7.3	81.5	46.6	0.579	27.0
4		69.3	31.5	7.8	87.6	10.5	0.482	5.1
5		31.9	13.5	8.4	94.2	53.9	0.402	21.7
6		40.7	16.0	9.0	101.2	51.6	0.335	17.3
7		5.5	2.0		108.9	103.4	0.279	28.9
	177.0	200.0	90.0	51.3	619.7	191.4		(0.0)
Uninflated		159.3		40.9	0.0	(200.2)		

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SETTING HIRE RATES

MOTOR GRADER	YEARS							TOTAL
E 010	1	2	3	4	5	6	7	
Original Cost of machine (per KepMen 167/1991)	152							
COSTS								
Repairs – cost per Pedoman	(6 8)	(14 7)	(23 7)	(59 5)	(27 4)	(34.9)	(4 7)	- (171.7)
Insurance	(5 0)	(5 4)	(5.8)	(6.2)	(6 7)	(7 2)	(7.7)	(44 0)
Original cost written off	(21 7)	(21.7)	(21 7)	(21 7)	(21 7)	(21.7)	(21.7)	(152 0)
	(33 5)	(41 8)	(51 2)	(87 4)	(55 8)	(63.8)	(34 1)	(367.7)
HIRE RATES REQUIRED	BASIS I	TO RECOVER ORIGINAL COST ONLY						
Hire Revenue 1,000 hours @ Rp	41,850	41 9	45 0	48 4	52 0	55 9	60 1	64 6	367 7
Profit / (Loss) for the year		8 3	3 2	(2 9)	(35 4)	0.1	(3 7)	30 5	0 0
Cumulative Surplus / (Deficit)		8 3	11 5	8 7	(26 8)	(26 7)	(30 4)	0.0	
Cash resources generated (surplus plus cost write off)		21 7	43 4	65 1	86 9	108 6	130 3	152 0	

BASIS II	TO PROVIDE FUNDS FOR ADDITIONAL COST OF REPLACEMENT

Forecast Cost of Replacement Machine

1	7 5% p a for Inflation only	252	total	65 9 % increase
2	Allowance for other increases – Technological, exchange rate etc	300	total	97 4 % increase

Application of the Hire Rate based only on original cost would generate cash resources at end of year 7 of	Rp (M)	152
To generate cumulative cash resources of	Rp (M)	300
Requires additional funds of	Rp (M)	148

These funds must be generated from profit on hiring operations, retained by the Hire Unit, as follows

Hire Revenue 1,000 hours @ Rp	58,685	58 7	63 1	67 8	72 9	78 4	84 2	90.6	515 7
Profit / (Loss) for the year		25 2	21.3	16 6	(14 5)	22 6	20 4	56 5	148 0
Cumulative Surplus / (Deficit)		25 2	46 4	63 0	48 5	71 1	91.5	148 0	
Cash bresources generated (surplus plus cost write off)		46 9	89 9	128 2	135 4	179 7	221 8	300.0	

File \IIIREGRAD

DISCOUNTED CASH FLOW (DCF) for EQUIPMENT PURCHASE

Type	MOTOR GRADER
Code	E 010
Horsepower	100
Repair factor	0.9
Inflation rate %	7.5
Annual Hours	1000
Years life	7

YEAR ONE HIRE RATE	60,575 Per Hour

YEAR	Purchase Price (KepMen 167)	Repairs Cost	Repairs %	Insurance/ Tax	Hire income 7000 Hours	Net Flow	Discount Factor 20 %	NPV
0	152.0			5.0		(157.0)	1.000	(157.0)
1		6.8	4.5	5.4	60.6	48.3	0.833	40.3
2		14.7	9.0	5.8	65.1	44.6	0.694	31.0
3		23.7	13.5	6.2	70.0	40.1	0.579	23.2
4		59 5	31.5	6.7	75.3	9.1	0.482	4.4
5		27.4	13 5	7.2	80.9	46.3	0.402	18.6
6		34.9	16.0	7.7	87.0	44.3	0.335	14.8
7		4.7	2.0		93.5	88.8	0.279	24.8
	152.0	171.8	90.0	44.1	532.3	164.5		0.0
Uninflated		136.8		35.1	0.0	(171.9)		

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SETTING HIRE RATES

WHEEL LOADER	YEARS							TOTAL
E 052	1	2	3	4	5	6	7	
Original Cost of machine (per KepMen 167/1991)	140							
COSTS								
Repairs – cost per Pedoman	(6.3)	(13 5)	(21.8)	(54 8)	(25 2)	(32 2)	(4.3)	- (158 1)
Insurance	(4 6)	(5.0)	(5 3)	(5 7)	(6 2)	(6.6)	(7 1)	(40.5)
Original cost written off	(20 0)	(20 0)	(20 0)	(20.0)	(20 0)	(20 0)	(20 0)	(140 0)
	(30 9)	(38 5)	(47 1)	(80 5)	(51 4)	(58 8)	(31 4)	(338 6)
HIRE RATES REQUIRED	BASIS I	TO RECOVER ORIGINAL COST ONLY						
Hire Revenue 1,000 hours @ Rp	38,535	38 5	41 4	44 5	47 9	51 5	55 3	59 5	338 6
Profit / (Loss) for the year		7 6	2 9	(2 6)	(32 6)	0 1	(3 5)	28 1	0 0
Cumulative Surplus / (Deficit)		7 6	10 6	8 0	(24 6)	(24 6)	(28 1)	0 0	
Cash resources generated (surplus plus cost write off)		20 0	40 0	60 0	80 0	100 0	120 0	140 0	

BASIS II — TO PROVIDE FUNDS FOR ADDITIONAL COST OF REPLACEMENT

Forecast Cost of Replacement Machine

1. 7.5% p a for Inflation only — 232 total — 65 9 % increase
2. Allowance for other increases – Technological, exchange rate etc — 276 total — 97 4 % increase

Application of the Hire Rate based only on original cost would generate cash resources at end of year 7 of — Rp (M) 140
To generate cumulative cash resources of — Rp (M) 276
Requires additional funds of — Rp (M) 136

These funds must be generated from profit on hiring operations, retained by the Hire Unit, as follows

Hire Revenue 1,000 hours @ Rp	54,010	54 0	58 1	62 4	67 1	72 1	77 5	83 4	474.6
Profit / (Loss) for the year		23 1	19 6	15 3	(13 4)	20 7	18 7	52 0	136 0
Cumulative Surplus / (Deficit)		23 1	42 7	58 0	44 6	65 3	84 0	136 0	
Cash bresources generated (surplus plus cost write off)		43.1	82 7	118 0	124 6	165 3	204 0	276 0	

File \HIRELOAD

DISCOUNTED CASH FLOW (DCF) for EQUIPMENT PURCHASE

Type	WHEEL LOADER
Code	E 052
Horsepower	115
Repair factor	0.9
Inflation rate %	7.5
Annual Hours	1000
Years life	7

YEAR ONE HIRE RATE	55,775 Per Hour

YEAR	Purchase Price (KepMen 167)	Repairs Cost	Repairs %	Insurance/ Tax	Hire income 7000 Hours	Net Flow	Discount Factor 20 %	NPV
0	140.0			4.6		(144 6)	1.000	(144.6)
1		6.3	4.5	5.0	55.8	44.5	0.833	37.1
2		13.5	9.0	5.3	60.0	41.1	0.694	28.5
3		21.8	13.5	5.7	64.5	36.9	0.579	21.3
4		54.8	31.5	6.2	69.3	8.3	0.482	4.0
5		25.2	13.5	6.6	74.5	42.6	0.402	17.1
6		32.2	16.0	7.1	80.1	40.8	0.335	13.7
7		4.3	2.0		86.1	81.8	0.279	22.8
	140.0	158.2	90.0	40.6	490.1	151.3		(0.0)
Uninflated		126.0		32.3	0.0	(158.3)		

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SETTING HIRE RATES

DUMP TRUCK	YEARS							TOTAL
E 212	1	2	3	4	5	6	7	
Original Cost of machine (per KepMen 167/1991)	28							
COSTS								
Repairs – cost per Pedoman	(1.3)	(2.7)	(4 4)	(11 0)	(5.0)	(7 2)		(31.6)
Insurance	(0 9)	(1 0)	(1.1)	(1.1)	(1 2)	(1.3)		(6.6)
Original cost written off	(4.7)	(4.7)	(4 7)	(4.7)	(4 7)	(4 7)		(28 0)
	(6.9)	(8 4)	(10 2)	(16 8)	(10 9)	(13 2)		(66 2)
HIRE RATES REQUIRED — BASIS I — TO RECOVER ORIGINAL COST ONLY								
Hire Revenue 1,000 hours @ Rp 9,140	9 1	9 8	10 6	11 4	12 2	13 1		66 2
Profit / (Loss) for the year	2 3	1 5	0 4	(5 4)	1 3	(0 0)		0 0
Cumulative Surplus / (Deficit)	2 3	3 7	4 1	(1 3)	0 1	0 0		
Cash resources generated (surplus plus cost write off)	4 7	9 3	14 0	18 7	23 3	28 0		

BASIS II — TO PROVIDE FUNDS FOR ADDITIONAL COST OF REPLACEMENT

Forecast Cost of Replacement Machine

1	7 5% p a for Inflation only	46	total	65.9 % increase
2	Allowance for other increases – Technological, exchange rate etc	55	total	97 4 % increase

Application of the Hire Rate based only on original cost would generate cash resources at end of year 7 of — Rp (M) 28
To generate cumulative cash resources of — Rp (M) 55
Requires additional funds of — Rp (M) 27

These funds must be generated from profit on hiring operations, retained by the Hire Unit, as follows

Hire Revenue 1,000 hours @ Rp 12,870	12 9	13 8	14 9	16 0	17 2	18 5		93 2
Profit / (Loss) for the year	6 0	5 5	4 7	(0 8)	6 3	5 3		27 0
Cumulative Surplus / (Deficit)	6 0	11 5	16 2	15 4	21 7	27 0		
Cash bresources generated (surplus plus cost write off)	10 7	20 8	30 2	34 1	45 1	55 0		

File \HIRETRA

DISCOUNTED CASH FLOW (DCF) for EQUIPMENT PURCHASE

Type	DUMP TRUCK
Code	E 212
Horsepower	115
Repair factor	0.9
Inflation rate %	7.5
Annual Hours	1000
Years life	6

YEAR ONE HIRE RATE	12,275 Per Hour

YEAR	Purchase Price (KepMen 167)	Repairs Cost	Repairs %	Insurance/ Tax	Hire income 6000 Hours	Net Flow	Discount Factor 20 %	NPV
0	28.0			0.9		(28.9)	1.000	(28.9)
1		1.3	4.5	1.0	12.3	10.0	0.833	8.4
2		2.7	9.0	1.1	13.2	9.4	0.694	6.5
3		4.4	13.5	1.1	14.2	8.7	0.579	5.0
4		11.0	31.5	1.2	15.2	3.1	0.482	1.5
5		5.0	13.5	1.3	16.4	10.0	0.402	4.0
6		7.2	18.0		17.6	10.4	0.335	3.5
	28.0	31.6	90.0	6.7	88.9	22.6		(0.0)
Uninflated		25.2		6.5	0.0	(31.7)		

File \DCF-TRK

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300

SETTING HIRE RATES

COMPRESSOR	YEARS							TOTAL
E 301	1	2	3	4	5	6	7	
Original Cost of machine (per KepMen 167/1991)	26							
COSTS								
Repairs – cost per Pedoman	(1.2)	(2.5)	(4.1)	(10.2)	(4.7)	(6.0)	(0.8)	- (29.5)
Insurance	(0 9)	(0 9)	(1.0)	(1.1)	(1.1)	(1 2)	(1.3)	(7.5)
Original cost written off	(3.7)	(3 7)	(3 7)	(3 7)	(3.7)	(3.7)	(3 7)	(26.0)
	(5.8)	(7 1)	(8.8)	(15 0)	(9 5)	(10 9)	(5.8)	(63.0)
HIRE RATES REQUIRED — BASIS I — TO RECOVER ORIGINAL COST ONLY								
Hire Revenue 1,000 hours @ Rp	7,175	72	77	83	89	96	103	111	63.0
Profit / (Loss) for the year		1 4	0 6	(0 5)	(6.1)	0 1	(0 6)	5 3	0 0
Cumulative Surplus / (Deficit)		1.4	2 0	1 4	(4 7)	(4 6)	(5 2)	0 0	
Cash resources generated (surplus plus cost write off)		3 7	7 4	11 1	14 9	18 6	22 3	26.0	

BASIS II — TO PROVIDE FUNDS FOR ADDITIONAL COST OF REPLACEMENT

Forecast Cost of Replacement Machine

1. 7.5% p a for Inflation only — 43 total — 65 9 % increase
2. Allowance for other increases – Technological, exchange rate etc — 51 total — 97.4 % increase

Application of the Hire Rate based only on original cost would generate cash resources at end of year 7 of — Rp (M) 26
To generate cumulative cash resources of — Rp (M) 51
Requires additional funds of — Rp (M) 25

These funds must be generated from profit on hiring operations, retained by the Hire Unit, as follows.

Hire Revenue 1,000 hours @ Rp	10,010	10 0	10 8	11.6	12 1	13 4	14 4	15 4	88 0
Profit / (Loss) for the year		4.2	3 6	2 8	(2 6)	3 9	3 5	9 6	25.0
Cumulative Surplus / (Deficit)		4.2	7 8	10 6	8 0	11 9	15 3	25.0	
Cash bresources generated (surplus plus cost write off)		7 9	15 3	21.7	22.9	30 4	37 6	51 0	

File \HIRECOMP

DISCOUNTED CASH FLOW (DCF) for EQUIPMENT PURCHASE

Type	COMPRESSOR
Code	E 301
Horsepower	45
Repair factor	0.9
Inflation rate %	7.5
Annual Hours	1000
Years life	7

YEAR ONE HIRE RATE	10,350 Per Hour

YEAR	Purchase Price (KepMen 167)	Repairs Cost	Repairs %	Insurance/ Tax	Hire income 7000 Hours	Net Flow	Discount Factor 20 %	NPV
0	26.0			0.9		(26.9)	1.000	(26.9)
1		1.2	4.5	0.9	10.4	8.3	0.833	6.9
2		2.5	9.0	1.0	11.1	7.6	0.694	5.3
3		4.1	13.5	1.1	12.0	6.8	0.579	4.0
4		10.2	31.5	1.1	12.9	1.5	0.482	0.7
5		4.7	13.5	1.2	13.8	7.9	0.402	3.2
6		6.0	16.0	1.3	14.9	7.6	0.335	2.5
7		0.8	2.0		16.0	15.2	0.279	4.2
	26.0	29.4	90.0	7.5	90.9	28.0		(0.0)
Uninflated		23.4		6.0	0.0	(29.4)		

File \DCF-COMP

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SETTING HIRE RATES

ROLLER 3 Wheel E 082	YEARS 1	2	3	4	5	6	7	TOTAL
Original Cost of machine (per KepMen 167/1991)	56							
COSTS								
Repairs – cost per Pedoman	(1 8)	(3 9)	(6 3)	(15 6)	(7.3)	(6 4)	(4.3)	(45 6)
Insurance	(1 8)	(2 0)	(2 1)	(2 3)	(2 5)	(2 7)	(2 9)	(16 3)
Original cost written off	(8 0)	(8 0)	(8 0)	(8 0)	(8.0)	(8 0)	(8 0)	(56 0)
	(11 6)	(13 9)	(16 4)	(26 1)	(17 8)	(17.1)	(15 2)	(118.1)
HIRE RATES REQUIRED — BASIS I — TO RECOVER ORIGINAL COST ONLY								
Hire Revenue 1,000 hours @ Rp 13,440	13 4	14 4	15 5	16 7	17 9	19 3	20 7	118 1
Profit / (Loss) for the year	1 8	0 5	(0 9)	(9.4)	0 1	2 2	5 5	0 0
Cumulative Surplus / (Deficit)	1 8	2 4	1.5	(7 9)	(7 7)	(5 5)	0 0	
Cash resources generated (surplus plus cost write off)	8 0	16 0	24 0	32 0	40 0	48 0	56.0	

BASIS II — TO PROVIDE FUNDS FOR ADDITIONAL COST OF REPLACEMENT

Forecast Cost of Replacement Machine

1	7 5% p a for Inflation only	93	total	65 9 % increase
2	Allowance for other increases – Technological, exchange rate etc	111	total	97.4 % increase

Application of the Hire Rate based only on original cost would generate cash resources at end of year 7 of — Rp (M) 56
To generate cumulative cash resources of — Rp (M) 111
Requires additional funds of — Rp (M) 55

These funds must be generated from profit on hiring operations, retained by the Hire Unit, as follows:

Hire Revenue 1,000 hours @ Rp 19,700	19 7	21 2	22 8	24 5	26 3	28 3	30 4	173 1
Profit / (Loss) for the year	8.1	7 3	6 4	(1 6)	8 5	11.2	15 2	55 0
Cumulative Surplus / (Deficit)	8 1	15 4	21 7	20 1	28 6	39 8	55 0	
Cash bresources generated (surplus plus cost write off)	16 1	31 4	45 7	52 1	68 6	87 8	111 0	

File \HIREROLL

DISCOUNTED CASH FLOW (DCF) for EQUIPMENT PURCHASE

Type	ROLLER 3 Wheel
Code	E 082
Horsepower	40
Repair factor	0.65
Inflation rate %	7.5
Annual Hours	1000
Years life	7

YEAR ONE HIRE RATE	20,325 Per Hour

YEAR	Purchase Price (KepMen 167)	Repairs Cost	Repairs %	Insurance/ Tax	Hire income 7000 Hours	Net Flow	Discount Factor 20 %	NPV
0	56.0			1.8		(57.8)	1.000	(57.8)
1		1.8	3.25	2.0	20.3	16.5	0.833	13.8
2		3.9	6.50	2.1	21.8	15.8	0.694	11.0
3		6.3	9.75	2.3	23.5	14.9	0.579	8.6
4		15.8	22.75	2.5	25.2	7.0	0.482	3.4
5		7.3	9.75	2.7	27.1	17.2	0.402	6.9
6		6.4	8.00	2 9	29.2	19.9	0.335	6.7
7		4.3	5.00		31.4	27.0	0.279	7.5
	56.0	45.9	65.0	16.2	178.6	60.4		(0.0)
Uninflated		36.4		12.9	0.0	(49.3)		

File \DCF-ROL

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SETTING HIRE RATES

TIRE ROLLER E 084	YEARS 1	2	3	4	5	6	7	TOTAL
Original Cost of machine (per KepMen 167/1991)	123							
COSTS								
Repairs – cost per Pedoman	(4.0)	(8 6)	(13.9)	(34.8)	(16.0)	(14 1)	(9.5)	(100.9)
Insurance	(4.1)	(4.4)	(4 7)	(5.0)	(5 4)	(5.8)	(6 3)	(35.7)
Original cost written off	(17.6)	(17 6)	(17.6)	(17 6)	(17 6)	(17 6)	(17 6)	(123.0)
	(25.7)	(30.6)	(36 2)	(57.4)	(39 0)	(37 5)	(33 4)	(259.6)
HIRE RATES REQUIRED — BASIS I — TO RECOVER ORIGINAL COST ONLY								
Hire Revenue 1,000 hours @ Rp 29,545	29 5	31 8	34 1	36 7	39 5	42 4	45 6	259 6
Profit / (Loss) for the year	3 9	1 2	(2 0)	(20 7)	0 5	4 9	12 2	0 0
Cumulative Surplus / (Deficit)	3 9	5 1	3.0	(17 6)	(17 1)	(12 2)	0.0	
Cash resources generated (surplus plus cost write off)	17 6	35 1	52 7	70 3	87 9	105 4	123 0	

BASIS II — TO PROVIDE FUNDS FOR ADDITIONAL COST OF REPLACEMENT

Forecast Cost of Replacement Machine

1	7 5% p a for Inflation only	204	total	65 9 % increase
2	Allowance for other increases – Technological, exchange rate etc	243	total	97 4 % increase

Application of the Hire Rate based only on original cost would generate cash resources at end of year 7 of — Rp (M) 123
To generate cumulative cash resources of — Rp (M) 243
Requires additional funds of — Rp (M) 120

These funds must be generated from profit on hiring operations, retained by the Hire Unit, as follows.

Hire Revenue 1,000 hours @ Rp 43,200	43 2	46 4	49 9	53 7	57 7	62 0	66 7	379 6
Profit / (Loss) for the year	17 5	15.9	13 8	(3 7)	18.7	24 5	33.3	120 0
Cumulative Surplus / (Deficit)	17 5	33 4	47 1	43 4	62.2	86 7	120 0	
Cash bresources generated (surplus plus cost write off)	35 1	68.5	99.9	113 7	150 0	192 1	243 0	

File \HIRETIRE

205

DISCOUNTED CASH FLOW (DCF) for EQUIPMENT PURCHASE

Type	TIRE ROLLER
Code	E 084
Horsepower	40
Repair factor	0.65
Inflation rate %	7.5
Annual Hours	1000
Years life	7

YEAR ONE HIRE RATE	44,650 Per Hour

YEAR	Purchase Price (KepMen 167)	Repairs Cost	Repairs %	Insurance/ Tax	Hire income 7000 Hours	Net Flow	Discount Factor 20 %	NPV
0	123.0			4.1		(127.1)	1.000	(127.1)
1		4.0	3.25	4.4	44.7	36.3	0.833	30.2
2		8.6	6.50	4.7	48.0	34.7	0.694	24.1
3		13.9	9.75	5.0	51.6	32.7	0.579	18.9
4		34.8	22.75	5.4	55.5	15.3	0.482	7.4
5		16.0	9.75	5.8	59.6	37.8	0.402	15.2
6		14.1	8.00	6.3	64.1	43.7	0.335	14.6
7		9.5	5.00		68.9	59.4	0.279	16.6
	123.0	100.8	65.0	35.7	392.4	132.8		(0.0)
Uninflated		80.0		28.4	0.0	(108.4)		

File \DCF-TIR

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SETTING HIRE RATES

ASPHALT SPRAYER E 150	YEARS 1	2	3	4	5	6	7	TOTAL
Original Cost of machine (per KepMen 167/1991)	12							
COSTS								
Repairs – cost per Pedoman	(0 4)	(0.8)	(1.4)	(3 4)	(1.6)	(1 4)	(0.9)	(9.9)
Insurance	(0 4)	(0 4)	(0.5)	(0 5)	(0 5)	(0.6)	(0.6)	(3 5)
Original cost written off	(1.7)	(1.7)	(1.7)	(1 7)	(1 7)	(1.7)	(1 7)	(12.0)
	(2.5)	(2 9)	(3.6)	(5 6)	(3 8)	(3 7)	(3 2)	(25.4)
HIRE RATES REQUIRED BASIS I — TO RECOVER ORIGINAL COST ONLY								
Hire Revenue 1,000 hours @ Rp 2,895	2 9	3 1	3 3	3 6	3 9	4 2	4 5	25 4
Profit / (Loss) for the year	0 4	0 2	(0 3)	(2.0)	0 1	0 4	1 3	0 0
Cumulative Surplus / (Deficit)	0 4	0 6	0 3	(1 7)	(1 7)	(1 2)	0 0	
Cash resources generated (surplus plus cost write off)	1 7	3 4	5 1	6 9	8.6	10 3	12.0	

BASIS II — TO PROVIDE FUNDS FOR ADDITIONAL COST OF REPLACEMENT

Forecast Cost of Replacement Machine

1	7.5% p a for Inflation only	20	total	65 9 % increase
2	Allowance for other increases – Technological, exchange rate etc	24	total	97.4 % increase

Application of the Hire Rate based only on original cost would generate cash resources at end of year 7 of — Rp (M) 12
To generate cumulative cash resources of — Rp (M) 24
Requires additional funds of — Rp (M) 12

These funds must be generated from profit on hiring operations, retained by the Hire Unit, as follows.

Hire Revenue 1,000 hours @ Rp 4,260	4 3	4 6	4 9	5 3	5.7	6 1	6 6	37 4
Profit / (Loss) for the year	1.7	1 7	1.3	(0 3)	1 9	2 4	3 4	12.0
Cumulative Surplus / (Deficit)	1 7	3 4	4 7	4 4	6 3	8 7	12 0	
Cash bresources generated (surplus plus cost write off)	3 5	6 8	9 9	11 3	14 8	19 0	24 0	

File \HIREASPH

DISCOUNTED CASH FLOW (DCF) for EQUIPMENT PURCHASE

Type	ASPHALT SPRAYER
Code	E 084
Horsepower	40
Repair factor	0.65
Inflation rate %	7.5
Annual Hours	1000
Years life	7

YEAR ONE HIRE RATE	4,350 Per Hour

YEAR	Purchase Price (KepMen 167)	Repairs Cost	Repairs %	Insurance/ Tax	Hire income 7000 Hours	Net Flow	Discount Factor 20 %	NPV
0	12.0			0.4		(12.4)	1.000	(12.4)
1		0.4	3.25	0.4	4.4	3.5	0.833	2.9
2		0.8	6.50	0.5	4.7	3.4	0.694	2.3
3		1.4	9.75	0.5	5.0	3.2	0.579	1.8
4		3.4	22.75	0.5	5.4	1.5	0.482	0.7
5		1.6	9.75	0.6	5.8	3.7	0.402	1.5
6		1.4	8.00	0.6	6.2	4.3	0.335	1.4
7		0.9	5.00		6.7	5.8	0.279	1.6
	12.0	9.8	65.0	3.5	38.2	12.9		(0.0)
Uninflated		7.8		2.8	0.0	(10.6)		

File \DCF-ASP

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SETTING HIRE RATES

VIBRO COMPACTOR E 088	YEARS 1	2	3	4	5	6	7	TOTAL
Original Cost of machine (per KepMen 167/1991)	3							
COSTS								
Repairs – cost per Pedoman	(0.2)	(0 4)	(1.1)	(0.5)				(2 2)
Insurance	(0.1)	(0 1)	(0.1)	(0 1)				(0.4)
Original cost written off	(0.8)	(0 8)	(0 8)	(0.8)				(3.0)
	(1.1)	(1 3)	(2 0)	(1.4)	0.0	0.0	0.0	(5 6)
HIRE RATES REQUIRED								
BASIS I — TO RECOVER ORIGINAL COST ONLY								
Hire Revenue 1,000 hours @ Rp 1,260	1.3	1 4	1 5	1 6				5.6
Profit / (Loss) for the year	0 2	0 1	(0 5)	0 2				0.0
Cumulative Surplus / (Deficit)	0 2	0 3	(0 2)	0 0				
Cash resources generated (surplus plus cost write off)	0.8	1 5	2 3	3 0				

BASIS II — TO PROVIDE FUNDS FOR ADDITIONAL COST OF REPLACEMENT

Forecast Cost of Replacement Machine

1. 7.5% p a for Inflation only — 4 — total — 24.2 % increase
2. Allowance for other increases
   – Technological, exchange rate etc — 4 — total — 47.8 % increase

Application of the Hire Rate based only on original cost would generate cash resources at end of year 7 of — Rp (M) 3
To generate cumulative cash resources of — Rp (M) 4
Requires additional funds of — Rp (M) 1

These funds must be generated from profit on hiring operations, retained by the Hire Unit, as follows:

Hire Revenue 1,000 hours @ Rp 1,470	1.5	1 6	1 7	1 8				6 6
Profit / (Loss) for the year	0 4	0 3	(0 3)	0 5				1 0
Cumulative Surplus / (Deficit)	0 4	0 8	0 5	1 0				
Cash bresources generated (surplus plus cost write off)	1 2	2 3	2.7	4 0				

File \HIREVCOM

DISCOUNTED CASH FLOW (DCF) for EQUIPMENT PURCHASE

Type	VIBRATING COMPACTOR
Code	E 088
Horsepower	3.5
Repair factor	0.65
Inflation rate %	7.5
Annual Hours	1000
Years life	4

YEAR ONE HIRE RATE	1,650 Per Hour

YEAR	Purchase Price (KepMen 167)	Repairs Cost	Repairs %	Insurance/ Tax	Hire income 4000 Hours	Net Flow	Discount Factor 20 %	NPV
0	3.0			0.1		(3.1)	1.000	(3.1)
1		0.2	6.50	0 1	1.7	1.3	0.833	1.1
2		0.4	13.00	0.1	1.8	1.2	0.694	0.9
3		1.1	32.50	0.1	1.9	0.7	0.579	0.4
4		0.5	13.00		2.0	1.6	0.482	0.8
	3.0	2.2	65.0	0.4	7.4	1.7		0.0
Uninflated		2.0		0.4	0.0	(2.3)		

File \DCF-VCOM

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SETTING HIRE RATES

PEDESTRIAN ROLLER E 086	YEARS 1	2	3	4	5	6	7	TOTAL
Original Cost of machine (per KepMen 167/1991)	19							
COSTS								
Repairs – cost per Pedoman	(1.9)	(4.1)	(11.1)	(4.8)				(21.9)
Insurance	(0.6)	(0.7)	(0 7)	(0 8)				(2.8)
Original cost written off	(4 8)	(4.8)	(4 8)	(4 8)				(19.0)
	(7 3)	(9 6)	(16 6)	(10 4)				(43.7)
HIRE RATES REQUIRED								
BASIS I — TO RECOVER ORIGINAL COST ONLY								
Hire Revenue 1,000 hours @ Rp 9,775	9 8	10 5	11 3	12.1				43.7
Profit / (Loss) for the year	2.5	1 0	(5 3)	1 8				0.0
Cumulative Surplus / (Deficit)	2 5	3 5	(1 8)	0.0				
Cash resources generated (surplus plus cost write off)	4 8	9 5	14 3	19 0				

BASIS II — TO PROVIDE FUNDS FOR ADDITIONAL COST OF REPLACEMENT

Forecast Cost of Replacement Machine

1. 7 5% p a for Inflation only — 24 total — 24.2 % increase
2. Allowance for other increases
   – Technological, exchange rate etc — 28 total — 47.8 % increase

Application of the Hire Rate based only on original cost would generate cash resources at end of year 7 of — Rp (M) 19
To generate cumulative cash resources of — Rp (M) 28
Requires additional funds of — Rp (M) 9

These funds must be generated from profit on hiring operations, retained by the Hire Unit, as follows:

Hire Revenue 1,000 hours @ Rp 11,775	11.8	12.7	13 6	14.6				52 7
Profit / (Loss) for the year	4.5	3 1	(2 9)	4 3				9.0
Cumulative Surplus / (Deficit)	4 5	7 6	4 7	9 0				
Cash bresources generated (surplus plus cost write off)	9 3	17 1	18 9	28.0				

File \HIREPEDR

DISCOUNTED CASH FLOW (DCF) for EQUIPMENT PURCHASE

Type	VIB. PEDEST. ROLLER
Code	E 086
Horsepower	15
Repair factor	0.9
Inflation rate %	7.5
Annual Hours	1000
Years life	4

YEAR ONE HIRE RATE	12,200 Per Hour

YEAR	Purchase Price (KepMen 167)	Repairs Cost	Repairs %	Insurance/ Tax	Hire income 4000 Hours	Net Flow	Discount Factor 20 %	NPV
0	19.0			0.6		(19.6)	1.000	(19.6)
1		1.9	9.00	0.7	12.2	9.6	0.833	8.0
2		4.1	18.00	0.7	13.1	8.3	0.694	5.7
3		11.1	45.00	0.8	14.1	2.2	0.579	1.3
4		4.8	18.00	0.8	15.2	9.5	0.482	4.6
	19.0	22.0	90.0	3.6	54.6	10.0		(0.0)
Uninflated		17.1		4.4	0.0	(21.5)		

File \DCF-VROL

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CURRENT BASIS OF CALCULATION OF UNIT RATE IN A CONSTRUCTION CONTRACT

Kabupaten:	Tekalar
Equipment:	Motor Grader
Horse Power (HP)	125
Activity	Spread material
Production	100 cubic metres/day
Standard day	5 hours
Cost of machine	Rp 225,000,000
Scrap value	10 %
Operating life	10,000 hours

	Rp per hour
Owner's Costs	
Depreciation of equipment	
90 % x Rp 225,000,000 / 10,000 hours	20,250
Pajak 15 % per year	
15% x Rp 225,000,000 / 2,000 hours	16,875
Insurance 3 % per year	
3 % x Rp 225,000,000 / 2,000 hours	3,375
	40,500
Operator's Costs	
Diesel Fuel	6,000
0.160 litres /HP /hour @ Rp 300	
Oils	
.006 litres / HP / hour @ Rp 3,500	2,625
Spare Parts	
80 % x depreciation charge	16,200
	24,825
Total Operating Cost	65,325

Price per Cubic Metre spread
(at standard rate of production)

Rp 65,325 / 100 M3 / 5 hours per day — Rp 3,266.25 / m3

Note:

Unit Rates for the same standard activity vary greatly:
- Between different kabupaten
- Between two tenders for the same contract

Because of different assumptions used for:
- Cost price of machine
- effective working life of machine
- Production capacity of machine

CURRENT BASIS OF CALCULATION OF UNIT RATE IN A CONSTRUCTION CONTRACT

Kabupaten:	Takalar
Equipment.	Motor Grader
Horse Power (HP)	125
Activity	Spread material
Production	100 cubic metres/day
Standard day	5 hours
Cost of machine	Rp 225,000,000
Scrap value	10 %
Operating life	10,000 hours

	Rp per hour
Owner's Costs	
Depreciation of equipment	
90 % x Rp 225,000,000 / 10,000 hours	20,250
Pajak 15 % per year	
15% x Rp 225,000,000 / 2,000 hours	16,875
Insurance 3 % per year	
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Note:

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Because of different assumptions used for:
- Cost price of machine
- effective working life of machine
- Production capacity of machine

RISK TO CONTRACTOR OF PRODUCTION SHORTFALL

Production	Achieve Double	Achieve + 50%	Used in Unit Rate Calculation	Achieve Half	Achieve Nil
In cubic metres per day of 5 hours	200	150	100	50	0
In cubic metres per hour	40	30	20	10	0
	Rp / hour	Rp / hour	Rp / hour	Rp / hour	Rp / hour
Contractors income					
Rp 3266.25 per m3	130,650	97,988	65,325	32,663	0
Contractors variable costs					
Fuel and oil	17,250	12,938	8,625	6,000	0
Balance available	113,400	85,050	56,700	26,663	0
New Hire Rate under Basis III	60,575	60,575	60,575	60,575	60,575
Contractors' profit / (loss)	52,825	24,475	(3,875)	(33,913)	(60,575)

Notes:

1. Under the pilot project, the hourly hire rates proposed for the Motor Grader are:

BASIS I	Rp	41,850	/ hour
BASIS II	Rp	58,685	/ hour
BASIS III	Rp	60,575	/ hour

   Under all three bases, the contractor is not responsible for any maintenance or repair costs

2. Production can be adversely affected by many factors which are described in Report One, Section IV B 5.

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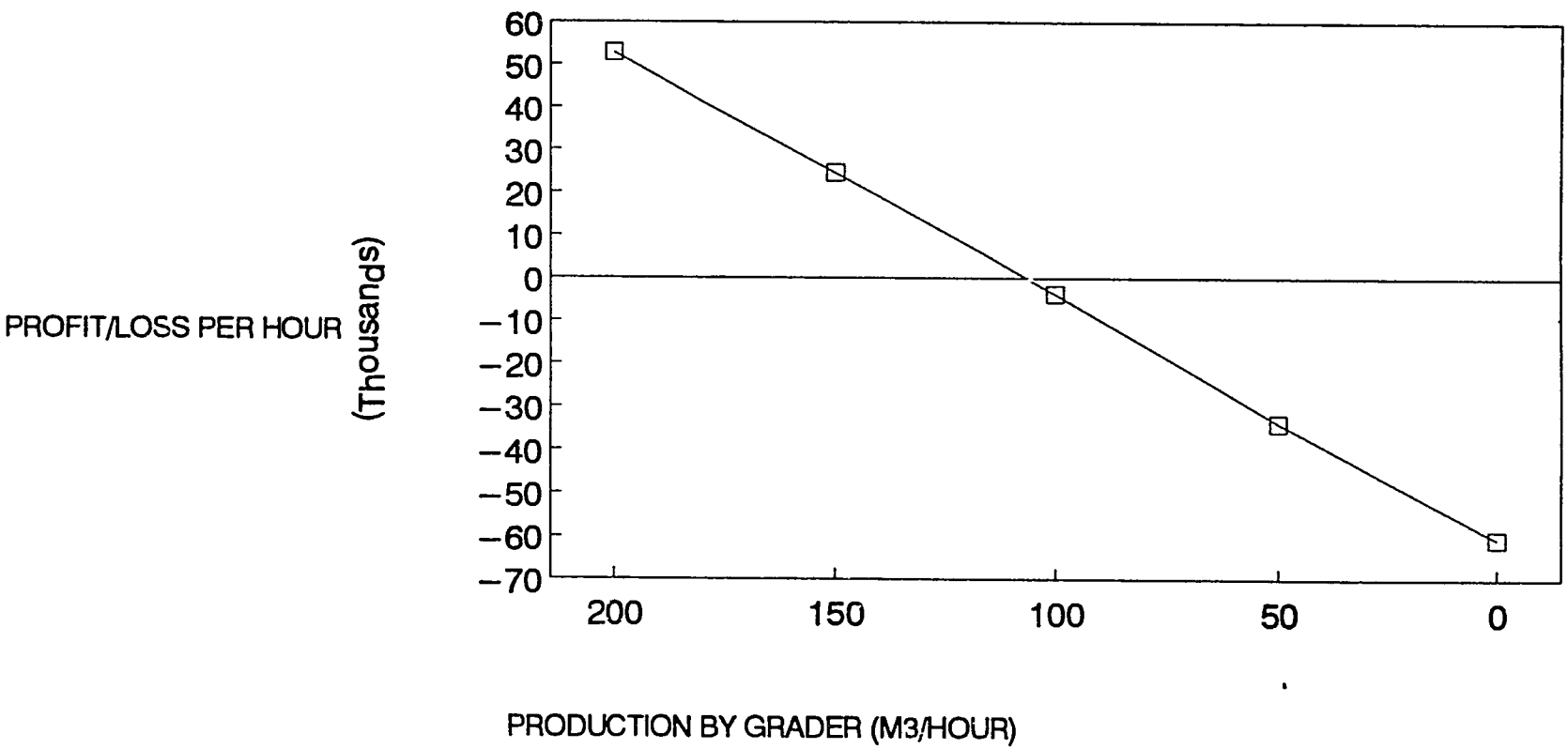
PRODUCTION (m3/HOUR)	NET HOURLY PROFIT/LOSS (Rupiah)
200	52,825
150	24,475
100	(3,725)
50	(33,912)
0	(60,575)



USING DISCOUNTED CASH FLOW (DCF)

Why DCF?

DCF is now widely used by many industries world wide as the best tool for evaluating the return on an investment in a revenue producing asset or project.

It is the only form of evaluation which correctly takes into account the "time value of money".

As DCF uses only the forecast cash flows resulting from the investment, it is independent of any accounting conventions such as depreciation rates which can artificially distort other forms of evaluation.

The underlying principles

To understand the principles of DCF, it can be compared to using a special bank account for the investment.

(i) Purchase of the asset and all associated costs are paid from the bank account which is then of course overdrawn.

(ii) Each year the revenue from the asset is paid into the account

(iii) Direct costs related to the operation of the asset are paid from the bank account

The net difference between (ii) and (iii) progressively reduces the overdraft. Note that as depreciation is not a cash flow item, it is not recorded under DCF.

(iv) Each year end, the balance on the bank account is calculated and interest charged or credited, depending on whether the account is overdrawn or in credit.

(v) At the end of the working life of the asset, it is sold and any proceeds are paid into the bank account. Note that an assumed residual value cannot be used in DCF calculations.

(v) If at the end of this working life there is a credit balance on the account, the rate of return earned by the asset is greater than the rate of interest applied. Conversely, an overdrawn balance means it has failed to do so.

This description oversimplifies DCF.

Rather than produce a figure representing the balance left on the account at the end of the asset's working life, DCF discounts all future cash flows backwards to show a "Net Present Value" (NPV) on day one. If this is a positive figure, it means that the asset could have a higher purchase price which is higher by that amount and it would still show the required return.

Conversely, a negative NPV means that it is too expensive by that amount.

The discount rate used should be the current interest rate, including the elements of both real cost of money and inflation. Meanwhile, all future cash flows must be inflated at the forecast rate of inflation, compounded.

A simple DCF evaluation is attached which shows, at a 20% rate, a positive NPV of 9,301

An alternative way of using the calculation is to find what annual income produces a nil NPV ie the asset has just earned the required rate of return. In the second example this is seen to be . This latter approach has been used in calculation of economic hire rates under Basis III.

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EXAMPLES OF DISCOUNTED CASH FLOW EVALUATION

Cost Price	100,000
Sold for scrap	5,000
Annual income	60,000
Annual outgoings	30,000
Years life	7
Rate of Return Required %	20

Year	Outflows	Inflows	Net	Discount Factor %	NPV
				20	
0	100,000		(100,000)	1.0000	(100,000)
1	30,000	60,000	30,000	0.8333	25,000
2	30,000	60,000	30,000	0.6944	20,833
3	30,000	60,000	30,000	0.5787	17,361
4	30,000	60,000	30,000	0.4823	14,468
5	30,000	60,000	30,000	0.4019	12,056
6	30,000	60,000	30,000	0.3349	10,047
7	30,000	60,000	30,000	0.2791	8,372
8		5,000	5,000	0.2326	1,163
	310,000	425,000	115,000		9,301

Cost Price	100,000
Sold for scrap	5,000
Annual income	57,420
Annual outgoings	30,000
Years life	7
Rate of Return Required %	20

Year	Outflows	Inflows	Net	Discount Factor %	NPV
				20	
0	100,000		(100,000)	1.0000	(100,000)
1	30,000	57,420	27,420	0.8333	22,850
2	30,000	57,420	27,420	0.6944	19,042
3	30,000	57,420	27,420	0.5787	15,868
4	30,000	57,420	27,420	0.4823	13,223
5	30,000	57,420	27,420	0.4019	11,019
6	30,000	57,420	27,420	0.3349	9,183
7	30,000	57,420	27,420	0.2791	7,652
8		5,000	5,000	0.2326	1,163
	310,000	406,940	96,940		1

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