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PLAN OF ACTION FOR TRAINING
OF INDUSTRIAL MANPOWER IN
MAINTENANCE IN DEVELOPING COUNTRIES

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December 1989

PLAN OF ACTION FOR TRAINING OF INDUSTRIAL MANPOWER IN MAINTENANCE IN DEVELOPING COUNTRIES

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INTRODUCTION

In September 1987, in collaboration with the ILO, UNIDO organized in Paris the Second Consultation on the training of industrial manpower, at which the following issues were discussed:

Topic 1: Human resources development for effective maintenance at the enterprise level

- policy for maintenance at the enterprise level
- training in maintenance at the enterprise level
- negotiation and acquisition of capital goods
- technical documentation
- spare parts management, reclamation, and manufacture of spare parts
- specific needs of small and medium-sized enterprises
- maintenance culture

Topic 2: Human resources development in industrial maintenance : national policies and programmes

- objectives of a national maintenance policy
- policy for training in maintenance
- role of governments and national institutions in improving maintenance
- financial implications of national maintenance policies
- international cooperation

The purpose of the present document is to provide a detailed plan of action for the implementation of recommendations for human resources development in industrial maintenance in developing countries

It is based on the conclusions and recommendations of UNIDO's Second Consultation on the training of industrial manpower and on the various contributions made by the experts who took part in the preparatory meetings for the Consultation.

The plan of action presented in the chapters below is based on ranking the proposed actions according to priority and on a pragmatic methodology for implementing them. A short-, medium-, and long-term time schedule has been defined for the plan as a whole. The short term applies to actions which should ideally be started within the first 2 years once a decision has been made by the actors involved. The medium term refers to a period of 5 years from the time the decision is made, and the long term involves a period of 10 years. Since the actions are to a large extent interdependent, especially as regards the short-term actions at government level (national level) and at the level of production enterprises, an overall PERT (Project Evaluation and Review Technique) chart and a bar chart (GANNT chart) have been included for these two levels, with the intention of providing a decision and management tool.

The present document consists of three parts :

- Part I : Plan of action at the national level
- Part II : Plan of action for manufacturing enterprises
- Part III : Appendices consisting of :
 - case studies of a few African countries
 - implementation plans for short-term activities at the national and plant levels.

We hope that this study will contribute to the economic and social expansion of developing countries

PART I : Plan of action pertaining to the implementation of recommendations to actors at the national level

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
1.1	GOVERNMENT	See chart in Appendix 1			
1.1.1	NATIONAL MAINTENANCE POLICY AND STRATEGY <ol style="list-style-type: none"> 1. definition of a national maintenance policy and strategy in accordance with three lines: <ol style="list-style-type: none"> a) long-term development of maintenance capabilities b) achievement of 3 immediate objectives : <ul style="list-style-type: none"> • awareness on a national scale • information available to economic actors • improved maintenance of existing production tool c) strengthening of maintenance capabilities in small and medium-sized enterprises 2. get the plan of action accepted by the economic actors as National Maintenance Plan 3. with the National Maintenance Plan as foundation, establish sectorial plans 4. define a bilateral and multilateral cooperation strategy for the purpose of coordinating the required financial resources for implementing the National Maintenance Plan 	<ul style="list-style-type: none"> • carry out a series of maintenance diagnostics in selected sectors to identify the problems • establish a plan of action based on ranking the problems and taking the 3 priority lines into account <p>at a national conference for consciousness-raising and deliberation regarding maintenance</p>	<p>x</p> <p>x</p> <p>x</p> <p>x</p>		

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<ul style="list-style-type: none"> + establishment of a maintenance documentation and information centre to serve all economic actors concerned. + establishment of a maintenance cell in the relevant ministries + establishment of an interministerial maintenance committee with the job of considering and guiding the actions to be undertaken + with a view to reducing the number of different makes and types of equipment, determination of a system of constructor homologation (u.g., for rolling stock to begin with, and then certain industrial machinery) + establishment of incentives and measures to promote maintenance, and ensure coordination among organisations and enterprises working in maintenance + revision of labour legislation, in particular production incentives (bonuses, rewards, etc.) and the upgrading of maintenance jobs + encouragement/support/creation of the necessary environment for the establishment of maintenance professional associations 	<ul style="list-style-type: none"> • publication of a special-interest periodical on maintenance • for example, set up the centre within the support structure • set up a database for maintenance statistics, reliability of equipment and components, training, etc. • involve the economic actors in the working sessions • take after-sales service into account • in accordance with national/international standardisation 	<p style="text-align: center;">x</p> <p style="text-align: center;">x</p> <p style="text-align: center;">x</p> <p style="text-align: center;">x</p> <p style="text-align: center;">x</p> <p style="text-align: center;">x</p> <p style="text-align: center;">x</p>	<p style="text-align: center;">x</p> <p style="text-align: center;">x</p> <p style="text-align: center;">x</p> <p style="text-align: center;">x</p> <p style="text-align: center;">x</p> <p style="text-align: center;">x</p>	<p style="text-align: center;">x</p>

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<ul style="list-style-type: none"> + Incorporation of maintenance into national planning to strengthen the existing industrial network (e.g., development of small and medium-sized enterprises) + provision for the financial resources in terms of maintenance systems, skills, and training <p>7. launch pilot projects to improve maintenance in the priority sectors/enterprises</p> <p>8. set up a system for examining the results of the maintenance policy and its impact on the national economy</p>	<ul style="list-style-type: none"> • Identify the country's priority sectors (e.g. water distribution, electricity, the food industry, machines and implements for farming, cement, transport, agriculture, etc. • make an audit of the current situation/formulate a plan of action • implement the action plan, with the participation of national consulting engineers 	<p style="text-align: center;">x</p>	<p style="text-align: center;">x</p>	
1.1.2	<p>TRAINING POLICY</p> <p>1. set up a consultation group for the purpose of formulating a national policy for training in maintenance and the human resources development</p>	<ul style="list-style-type: none"> • Inventory of the country's existing capabilities for training in maintenance 	<p style="text-align: center;">x</p>		

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>2. study the feasibility of incorporating the skills of emigrant workers from developing countries</p> <p>3. develop bodies of national maintenance consulting engineers. Create a favorable environment for the establishment of maintenance support structures</p> <p>4. encourage training organisations to adapt their programmes more closely to the needs of the economic actors</p>	<ul style="list-style-type: none"> • Inventory the needs of industry and other relevant actors. • define a plan of staggered actions • train a core-group of maintenance consulting engineers • assist in the establishment of an appropriate institutional framework for expanding the core-group • initially, direct consultancy and technical assistance services toward small and medium-sized enterprises in particular • organise working meetings after surveys of capabilities/needs • launch/fund a feasibility study on instituting a maintenance track in courses of engineering studies • set up training programmes for trainers in maintenance • include in the national curricula the training of supervisory staff, technicians and workers for maintenance 	<p>x</p> <p>x</p> <p>x</p>	 <p>x</p> <p>x</p> <p>x</p> <p>x</p>	

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>5. set up a working group responsible for adapting existing or future training structures</p> <p>6. study appropriate Incentive schemes to encourage maintenance training/upgrading at vocational training institutions and in enterprises</p> <p>7. provide for the financial resources for launching training programmes</p>	<ul style="list-style-type: none"> • analyse the surveys of existing capabilities • adaptation studies on what already exists • study on new structures • fiscal advantages • promote collaboration between state and private sectors • other measures • institute a training levy • negotiate international funding 	<p></p> <p>x</p> <p>x</p> <p></p> <p></p> <p></p> <p></p>	<p></p> <p>x</p> <p></p> <p>x</p> <p></p> <p>x</p>	<p></p> <p></p> <p>x</p> <p></p> <p></p> <p></p>
1.1.3	<p>EQUIPMENT NEGOTIATION/ACQUISITION</p> <p>1. set up a system for ensuring that steps are taken regarding maintenance, technical documentation, maintenance training, etc. when equipment is acquired</p>	<ul style="list-style-type: none"> • e.g., preconditions to be instituted in the set-up of funding • organisation of training seminars for industrial executives, sales engineers, and contract negotiators • encouragement to enterprises to include maintenance specialists in contract negotiations 	<p></p> <p>x</p> <p></p> <p></p> <p>x</p>	<p></p> <p></p> <p>x</p> <p></p> <p></p>	<p></p> <p></p> <p></p> <p></p> <p></p>

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
1.1.4	<p>SPARE PARTS</p> <ol style="list-style-type: none"> 1. carry out a survey of the country's existing spare parts manufacturing/reconditioning capabilities 2. encourage spare parts reclamation and manufacturing 3. implement promotion of local spare parts manufacturing 	<ul style="list-style-type: none"> • investment subsidy for establishing workshops • training grants • tax benefits • tax reductions for importing raw materials, machine-tools, etc. • launch a study to identify parts suitable for local manufacturing (quality/cost) • encourage national and regional research centres to participate in the spare parts actions <p>a) assistance by the core-group of consulting engineers to one pilot workshop</p> <p>b) extension of assistance to two workshops initially, and later to other workshops</p>	<p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p>	<p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p>	

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	4. review policies affecting parts importation, i.e. bank transfers, taxes, licences, etc./lighten the procedural burden	c) study the feasibility of establishing a subcontracting exchange for the manufacturing of spare parts within the core-group of consulting engineers	x	x	
1.1.5	COOPERATION AMONG DEVELOPED AND DEVELOPING COUNTRIES 1. promote maintenance projects in multilateral and bilateral cooperation	Priority areas : <ul style="list-style-type: none"> • human resources development • measures to guarantee maintenance in equipment purchasing contracts • promotion of exchanges among research institutions • exchanges of experience and information among economic actors from various countries • strengthening of local parts manufacturing capabilities 	x		

ST = Short term • MT = Medium term • LT = Long term

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
1.1.6	COOPERATION AMONG DEVELOPING COUNTRIES				
	1. exchange information	<ul style="list-style-type: none"> • information networks to be set up among institutions • establishment of regional maintenance associations • participation in international seminars 	x	x	x
	2. pooling training programmes and educational equipments	<ul style="list-style-type: none"> • publicise interest through regional/international seminars • surveys to be launched in the various countries 	x	x	
	3. training cooperation at regional or subregional level	<ul style="list-style-type: none"> • formulate projects for training in maintenance • contribute to the funding • provide training services in regional or subregional projects 	x	x	x
1.1.7	COOPERATION BY INTERNATIONAL ORGANISATIONS				
	1. in the country-programme, provide for the requisite budgets for funding maintenance projects or parts manufacturing/reclamation projects		x		

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	2. set up a system to improve coordination of bilateral and multilateral cooperation programmes concerned with maintenance 3. make sure that whenever equipment is supplied, full technical documentation and maintenance training is provided with it	<ul style="list-style-type: none"> • check the "equipment" component of the project document 	x x		
1.2 1.2.1	EDUCATION AND TRAINING INSTITUTIONS NATIONAL MAINTENANCE POLICY AND STRATEGY 1. take part in the work of the consultation group charged with defining a national policy for training in maintenance 2. take part in work aimed at making vocational training programmes more appropriate, in collaboration with industry	<ul style="list-style-type: none"> • send representatives to working sessions • in preparing answers to questionnaires in the framework of the inventory of existing capabilities • take part in survey analysis • establish training programmes for trainors • prepare programmes for the training of the various levels of maintenance personnel <ul style="list-style-type: none"> • of a practical type 	x x x x	x	

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>3. take part in work to enhance the adequacy of existing training facilities or ensure that of future ones</p> <p>4. bring programmes for consciousness-raising regarding maintenance into training courses for supervisory personnel, technicians and production staff</p> <p>5. get a study started on the feasibility of introducing computer-aided training (CAT) into courses on maintenance</p> <p>6. set up regional and international courses in the redaction of operation and maintenance documents</p>	<ul style="list-style-type: none"> • of a specific type : <ul style="list-style-type: none"> • through apprenticeship • vocational training • at polytechnical institutes or universities • on-the-job <p>see 1.1.2.</p> <ul style="list-style-type: none"> • analyse the adequacy of existing programmes • run a comparative cost analysis of CAT and traditional training • evaluate a few pilot training programmes (comparison with needs) • identify the areas in which use of this system is warrantable 	<p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p>	<p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p>	

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>7. establish programmes of practical training in maintenance, for small and medium-sized enterprises</p> <p>8. set up a maintenance track in engineering studies</p> <p>9. improve the calibre of trainers in maintenance and allow appropriate salaries</p> <p>10. bring in more effective methods of verifying the knowledge required in training or upgrading programmes</p> <p>11. contribute to the development of capabilities of national maintenance consulting engineers</p> <p>12. set up a system for assessing the results achieved by the various training institutions</p> <p>13. develop a system for the exchange of information and experience among training institutions at national as well as at regional and international levels</p> <p>14. launch a comprehensive upgrading programme for maintenance managers, technicians and workers</p>	<p>on the basis of the study referred to in 1.1.2.</p> <p>make a study as to existing foreign institutions for short-range upgrading and inform enterprises by means of a brochure</p>	<p>x</p> <p>x</p> <p>x</p>	<p>x</p> <p>x</p> <p>x</p>	<p>x</p>

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
		<ul style="list-style-type: none"> • relax procedures for sending trainees abroad for upgrading • encourage enterprises to make studies of training needs, and to present applicants who are appropriate, so that the available funds in multi-lateral or bilateral budgets can be used • organise periodic upgrading and retraining courses in various fields, in accordance with the needs of the industry and technological development • in training programmes, bring in new special skills and gradually adapt existing ones to new techniques 	x	x	x
1.3	EMPLOYERS' AND WORKERS' ORGANISATIONS				
1.3.1	MAINTENANCE POLICY 1. raise the consciousness of enterprise executives regarding the financial benefits resulting from improved maintenance		x		

ST = Short term · MT = Medium term · LT = Long term

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>2. have interenterprise exchanges of experience and report the results of actions to improve maintenance</p> <p>3. set up Maintenance Committees within professional groups</p>		<p>x</p>	<p>x</p>	
1.3.2	<p>TRAINING</p> <p>1. have maintenance managers participate in round tables, national and international seminars, and study tours in industrialized countries</p> <p>2. for small and medium-sized enterprises, set up a system for interenterprise training and comparison of experiences</p> <p>3. analyse and contribute to the improvement of proposed training programmes</p>	<p>e.g., within professional associations and employer groups</p> <ul style="list-style-type: none"> • study and boost the "training contract" concept with the relevant institutions • plan for training by equipment suppliers • encourage the training of trainers 	<p>x</p> <p>x</p>	<p>x</p> <p>x</p>	

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
1.3.3	<p>EQUIPMENT NEGOTIATIONS AND ACQUISITION</p> <p>1. In preliminary contacts with plant engineering companies, general contractors and suppliers, as well as in contract negotiations, stress the need for dealing with maintenance problems, especially in design, technical documentation, and personnel training</p> <p>2. encourage production enterprises to take part in the training programmes on maintenance issues for negotiators of equipment acquisition contracts</p>		<p>X</p> <p>X</p>		
1.3.4	<p>SPARE PARTS : INVENTORY CONTROL AND MANUFACTURING</p> <p>1. establish/develop small and medium-sized enterprises as suppliers of maintenance services (spare parts manufacturing/reclamation, workshops specialising in, e.g., electric motor rewinding, combustion engine overhaul, surface treatment, electronics in specific fields, etc.)</p>				<p>X</p>
1.3.5	<p>DEVELOPING MAINTENANCE CULTURE</p> <p>1. support consciousness-raising actions at national level (see 1.1.1.) and encourage members of federations and professional associations to take part</p>		<p>X</p>		

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>2. hold discussion meetings and seminars or round tables on maintenance</p> <p>3. take part in deliberations and encourage the establishment of an association of maintenance engineers in line with actions taken at the national level (see 1.1.1)</p> <p>4. assist member enterprises in their search for maintenance training facilities and information that may be helpful in setting up maintenance structures in their enterprises</p>		x	x	
1.4	<p>OTHER NATIONAL ECONOMIC ACTORS</p> <p>1. on planning level</p>	<ul style="list-style-type: none"> • maintenance function to be included in preinvestment studies • budget for maintenance projects in bi- or multilateral cooperation programmes • guide development, e.g., of small and medium-sized enterprises, toward providing maintenance services • budget for the development of local spare parts manufacturing 	x	x	x

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>2. In labour legislation</p> <p>3. In finances and the interior</p>	<ul style="list-style-type: none"> • upgrade the status of maintenance workers • revise salaries and bonus systems for government maintenance personnel (equivalence with the private sector) • revise productivity incentive schemes • set up a tax relief scheme for importing raw materials, machines and tools for local manufacturing of spare parts • bring in a levy for maintenance training for enterprises • develop a tax benefit scheme for small and medium-sized enterprises that want to start up in maintenance services or spare parts manufacturing/reclamation • ease procedures for importing spare parts (bank transfers, customs, transit, etc.) • ease authorization of foreign currency expenditure for training or technical assistance in maintenance • provide tax relief for setting up companies for maintenance consulting 	<p>x</p> <p>x</p> <p>x</p> <p>x</p>	<p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p>	

ST = Short term • MT = Medium term • LT = Long term

PART II : Plan of action pertaining to the Implementation of recommendations to manufacturing enterprises

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
<p>2.1</p> <p>INDUSTRIAL PLANTS</p> <p>2.1.1</p> <p>MAINTENANCE POLICY</p> <p>1. define a plan of action to improve maintenance</p>		<ul style="list-style-type: none"> • prepare a diagnostic report on maintenance in the production units • identify the actions to be taken, especially in following fields : <ul style="list-style-type: none"> • consciousness-raising/information • maintenance/production relationship • maintenance policy • position of maintenance in the organisational structure • maintenance organisation chart and job descriptions • setting up of data collection procedures (Management Information Systems) • spare parts management • improving electromechanical works • introduction of planned maintenance • workshops/spare parts manufacturing • cost control/maintenance management 	<p>x</p> <p>x</p>		

ST = Short term - MT = Medium term - LT = Long term

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>2. In every plant, define a maintenance policy</p> <p>3. Include maintenance managers on the executive boards of enterprises</p> <p>4. budget separately for the operation of maintenance services and for investment in systems, skills, and training</p>	<ul style="list-style-type: none"> • give maintenance the same rank as production • tighten the links between maintenance and production • devise a simple maintenance chart and clear job descriptions • introduce planned maintenance gradually, and strike a proper balance among condition-based maintenance, systematic maintenance and corrective maintenance • Improve maintenance staff motivation by devising a policy on productivity incentives and on implementing guidance measures • launch a campaign of consciousness-raising at all levels to develop maintenance-mindedness • Inform personnel of the maintenance policy and show the benefits resulting from it • devise a policy on training in maintenance (see 1.3.2.) <ul style="list-style-type: none"> • analyse the maintenance costs for previous years. Prepare forecasts in budget form 	<p>x</p> <p>x</p> <p>x</p> <p>.</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p>	<p></p> <p>x</p> <p></p>	<p></p> <p></p> <p></p>

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	S	MT	LT
	5. establish a maintenance committee within the plant, with the job of observing the implementation of actions for maintenance improvement and evaluating their results	<ul style="list-style-type: none"> • estimate personnel requirements for training and upgrading • identify requirements in organisation and management methods and systems. Define the resulting amount of external assistance required. 	x	x	
2.1.2	TRAINING 1. devise a policy of human resources development for maintenance 2. recruit highly qualified staff for maintenance - provide for additional training if need be 3. establish training courses in maintenance, coordinated with production needs	to be incorporated in the national policy (see 1.1.2.) <ul style="list-style-type: none"> • of practical type • of specific type <ul style="list-style-type: none"> • by apprenticeship • vocational training • at polytechnical institutions or universities • on-the-job 	x	x	x

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>5. start training the maintenance staff as soon as the project is in its earliest stages</p> <p>6. In planning the construction of an industrial plant, provide for construction of the offices, warehouses and workshops before the erection of the production facilities</p>	<ul style="list-style-type: none"> • methods department staff as soon as documentation is delivered • stock management staff as soon as documents and/or spare parts are delivered • maintenance intervention staff, to be incorporated into the constructor's erection and start-up teams • bring in the maintenance personnel, starting from the top 	<p>x</p> <p>x</p> <p>x</p> <p>x</p>	<p>x</p>	
2.1.4	<p>TECHNICAL DOCUMENTATION</p> <p>1. draw up specific terms of reference on technical documentation</p>	<p>the following points must be incorporated in it :</p> <ul style="list-style-type: none"> • itemized contents • language • presentation (illustrated with samples, perhaps even standard forms) • delivery conditions (time schedule, amount, packing, place, etc.) • conditions of acceptance • penalties 	<p>x</p>		

ST = Short term · MT = Medium term · LT = Long term

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>2. set up a team of specialists (in-house department staff) to do the acceptance of/inspect the technical documentation at the time of equipment acquisition</p> <p>3. start training programmes on technical documentation</p> <p>4. make an assessment of existing technical documentation at the factory - gather all documentation in one central place - make copies for the users</p>	<p>subject matter :</p> <ul style="list-style-type: none"> • drawing up terms of reference • checking documentation sent in connection with equipment supplying • setting up machine-files • updating documentation • filing documentation • providing user service 	<p>x</p> <p>x</p> <p>x</p>		
2.1.5	<p>SPARE PARTS : INVENTORY CONTROL AND MANUFACTURING</p> <p>1. make a stock analysis currently held in the plant</p>	<ul style="list-style-type: none"> • classify and set a value on spare parts in three categories : <ul style="list-style-type: none"> • consumables • standard parts • specific parts 	<p>x</p>		

ST = Short term - MT = Medium term - LT = Long term

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>2. make a study of spare parts requirements/make sure that designations are accurate</p> <p>3. set up a stock management department</p> <p>4. study the parts with a view to local manufacturing or repair</p> <p>5. initiate studies on in-plant standardisation of spare parts</p> <p>6. establish specific terms of reference for spare parts in the supplying of equipment</p>	<ul style="list-style-type: none"> • Identify dead stock • study of technical documentation and investigation among users according to priority machines • bring stock up to required levels • code all spare parts • define stock management parameters • set up a data collection system • institute a computerised stock management system based on a preceding feasibility study • classify parts as <ul style="list-style-type: none"> • to be imported • available on the market • can be manufactured • can be repaired • define in particular : <ul style="list-style-type: none"> • mandatory information • supply time schedule • packing and crate marking • intermediate storage conditions 	<p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p>	<p></p> <p>x</p> <p></p> <p>x</p> <p></p> <p></p>	<p></p> <p></p> <p></p> <p></p> <p>x</p> <p></p>

ST = Short term · MT = Medium term · LT = Long term

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>7. design warehouses of ample size, with adequate facilities for the storage, handling and protection of the spare parts</p> <p>8. speed up the enterprise's in-house procedures for parts reordering</p> <p>9. establish a foreign currency reserve fund to cover parts reordering</p> <p>10. devise a subcontracting policy for parts manufacturing; alternatively, for plants of a size to justify it, set up manufacturing workshops/train staff accordingly</p> <p>11. develop parts reclamation/manufacturing techniques</p>	<ul style="list-style-type: none"> • conditions of acceptance • penalties 	<p>x</p> <p>x</p> <p>x</p>	<p>x</p> <p>x</p>	
2.1.6	<p>MAINTENANCE CULTURE</p> <p>1. develop a maintenance culture within the plant</p>	<ul style="list-style-type: none"> • actions to raise the consciousness of personnel • incentive scheme • informing personnel of results achieved 	<p>x</p>	<p>x</p> <p>x</p>	

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	2. compare experience with that of other plants 3. make the link between productivity and improved maintenance obvious at every level	<ul style="list-style-type: none"> • set up opportunities for input of original ideas (quality circles, think tank, suggestion box, etc.) • maintenance/production link • maintenance/enterprise's economy link • maintenance/quality link • maintenance/environment link • maintenance/safety link 	x x	x	
2.2	EQUIPMENT MANUFACTURERS AND PLANT BUILDERS 2.2.1 EQUIPMENT DESIGN AND ENVIRONMENTAL SUITABILITY 1. make maintenance a major consideration in equipment design	Design departments should consider the following points with a view to improving maintainability, i.e. : <ul style="list-style-type: none"> • accessibility • in situ reparability • possibilities for dismantling 	x	x x	

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>2. conform to international standards in the choice of components and initiate affirmative in-plant standardisation of equipment and components</p> <p>3. establish a relationship with users in developing countries</p> <p>4. select adequate technology</p>	<ul style="list-style-type: none"> • choice of reliable components • ultrafiltration for hydraulic installations • efficient cooling of electric motors and electronic components • anti-corrosion protection • tropicalisation as needed • set up an information feedback system regarding the use and operation of equipment installed on the premises of customers in developing countries • keep statistics on breakdowns, component reliability, etc. • take the statistics into account in plant and machinery design • make a preliminary analysis of a country's actual technological grounding before submitting a tender or starting studies 	<p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p> <p>x</p>	<p></p> <p></p> <p></p> <p></p> <p></p> <p></p> <p></p> <p></p>	<p></p> <p></p> <p></p> <p></p> <p></p> <p></p> <p></p> <p></p>

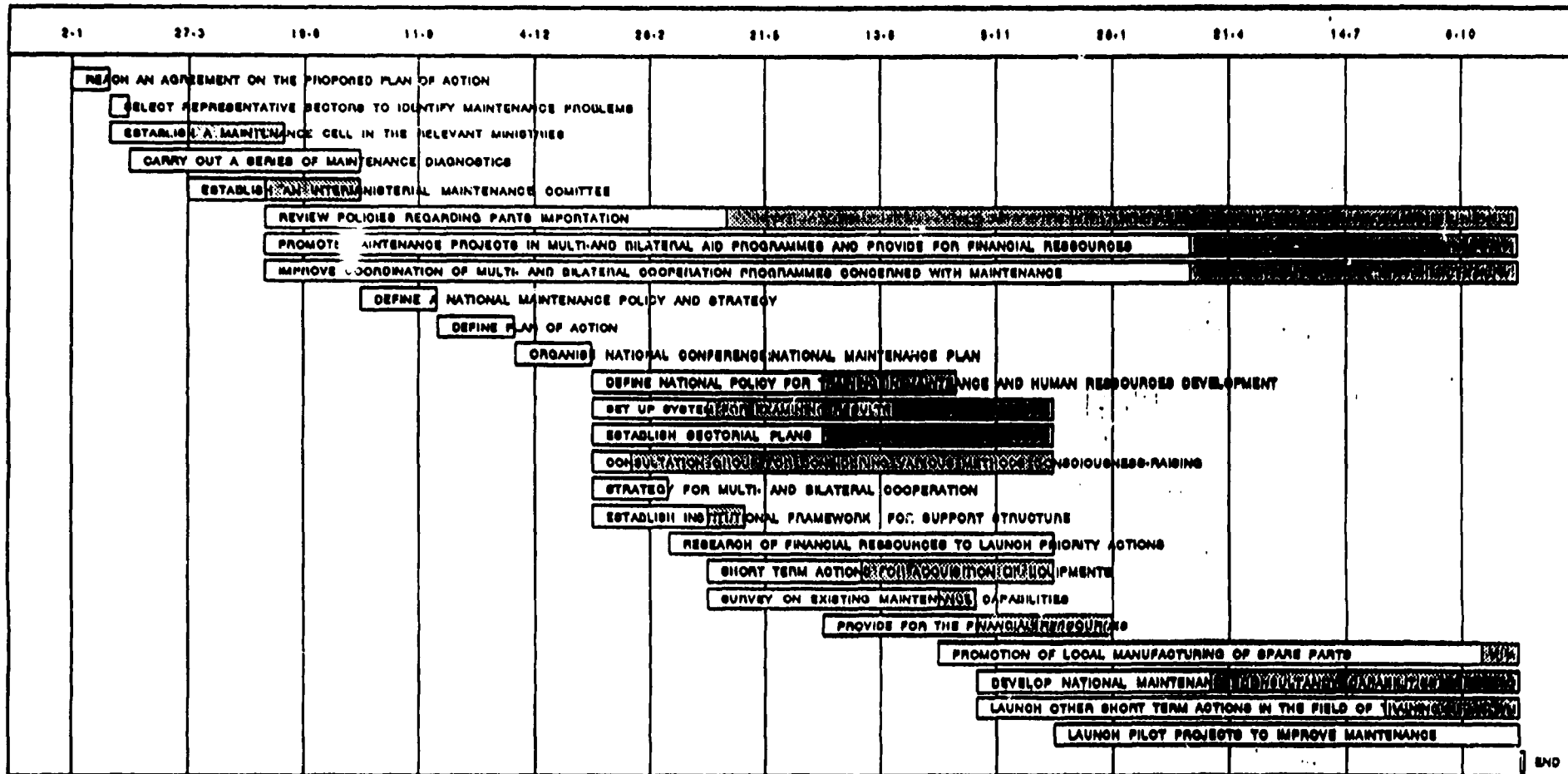
ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>5. take part in training courses for the benefit of equipment designers/manufacturers, to become more familiar with running conditions in developing countries as well as the durability, maintainability and cost factors related to the use of their equipment</p> <p>6. apply to specialised companies and take part in international seminars to establish appropriate technical documentation on operation and maintenance, to set up the maintenance organisation, to select the parts to be stored, to train maintenance staff, etc.</p>	<ul style="list-style-type: none"> • Include an analysis of the potential for maintenance and after-sales service • do everything possible to promote easy running of the equipment • call upon the design centres existing in the receiving country or in the region to assist/advise the designer <p>get information from specialised international organisations such as UNIDO and ILO regarding the training programmes provided ; get in touch with maintenance engineering consulting engineers</p>	<p>x</p> <p>x</p> <p>x</p> <p>x</p>		<p>x</p>

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
2.2.2	<p>CONTRACTUAL PROVISIONS</p> <ol style="list-style-type: none"> 1. when preparing tenders/contracts, show services related to maintenance as individual items : i.e., training, technical documentation, spare-parts, technical assistance, after-sales service 2. begin the training of the client's maintenance staff as soon as plant erection starts 3. make sure that all terms of the contract are clearly and simply written up. In particular, check all document translations carefully 4. In the budgets, plan for the supply of outlines, charts and detail-drawings as well as spare parts manufacturing drawings 	<p>Itemize services and provide individual budgets to permit equal comparison of the various tenders</p> <p>consider the possibility of incorporating the client's maintenance staff into the erection and start-up teams</p>	<p>X</p> <p>X</p> <p>X</p>	<p>X</p>	
2.2.3	<p>ERECTION OF INDUSTRIAL PLANTS</p> <ol style="list-style-type: none"> 1. design the maintenance organisation and set up the methods unit and the departments for management of the spare parts and warehouses, and especially the work-shops, at the time when erection first begins, which means long before start-up 		<p>X</p>		

ITEM	ACTIONS	METHODOLOGY/OBSERVATIONS	ST	MT	LT
	<p>2. In the erection strategy, provide for construction of the facilities relating to maintenance very early in the project planning (warehouses, workshops, offices)</p> <p>3. establish a realistic schedule of works, allowing for probable delays in the initial phases of erection</p> <p>4. In particular, make sure that the finishing stages of the erection work are properly carried out, especially the electrical and instrumentation work</p> <p>5. when the equipment is dispatched, take particular care that packing (strength, appropriateness for sea transport, etc.) is suitable for prolonged outdoor storage</p>	<ul style="list-style-type: none"> • pack the spare parts in separate, clearly marked crates • use welded containers for packing to the extent possible 	<p>x</p> <p>x</p> <p>x</p> <p>x</p>		

PART III

APPENDICES



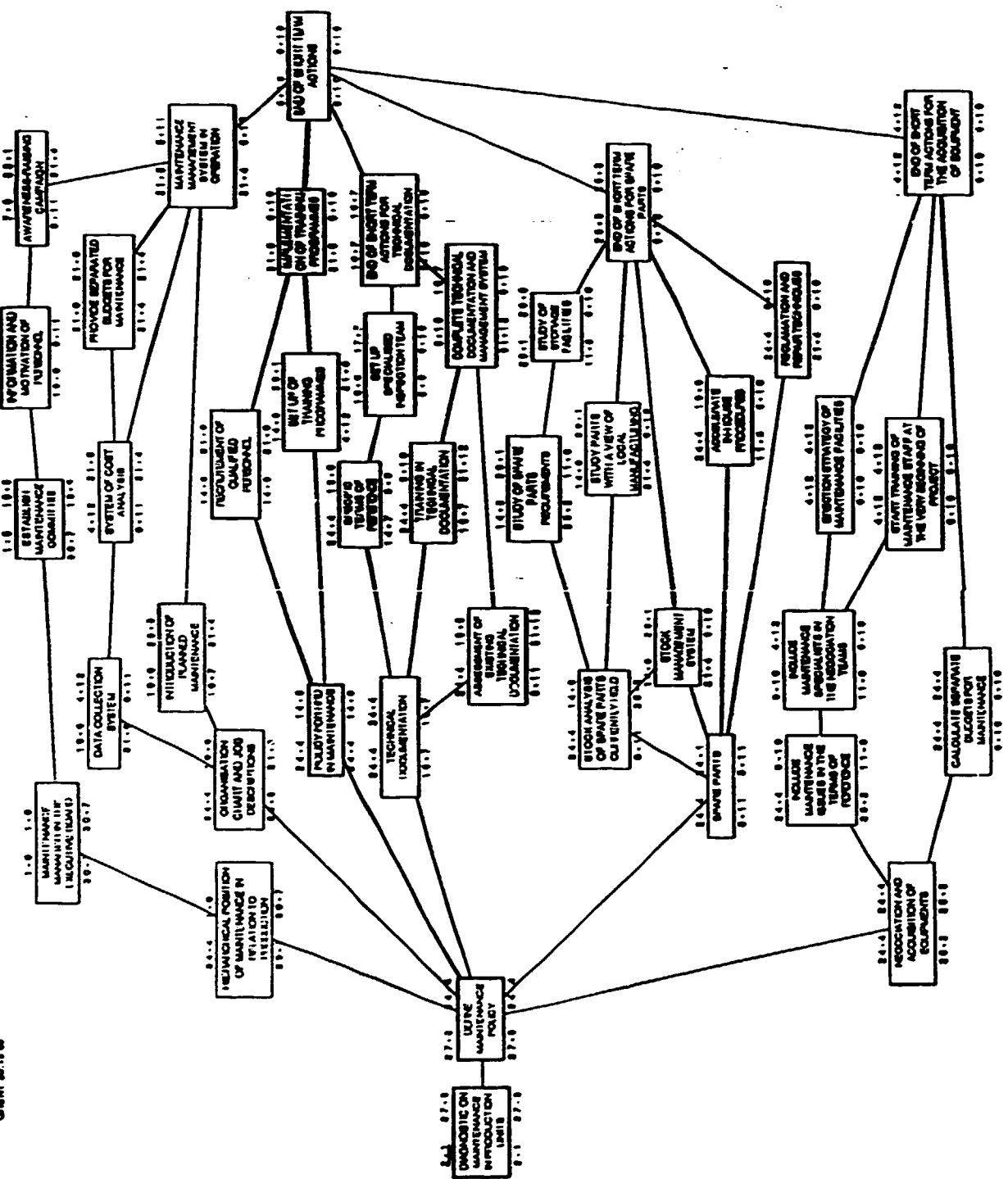
PLAN OF ACTION FOR INDUSTRIAL MANPOWER TRAINING IN MAINTENANCE
ACTIONS PROPOSED AT A NATIONAL LEVEL

ORIENT 26.12.66

PLAN OF ACTION FOR INDUSTRIAL MANPOWER TRAINING IN MAINTENANCE

PROPOSED ACTIONS ON THE LEVEL OF INDUSTRIAL PLANTS

DATE: 28.12.66



2-1	3-1-3	12-4	11-9	11-9	20-2	21-0	18-6	8-11	8-01	81-4	18-7	0-10
DIVERSIFIED MAINTENANCE IN PRODUCTION UNITS ON THE MAINTENANCE POLICY	INITIALIZATION OF MAINTENANCE INFORMATION PROGRAMS											
	STOCK MANAGEMENT AND ASSOCIATED POLICIES											
	ORGANIZATION OF MAINTENANCE AND INSPECTION											
	INCLUDE MAINTENANCE STAFF IN THE TRAINING PROGRAM											
	STANDARDIZATION OF MAINTENANCE PROCEDURES											
	POLICY FOR THE MAINTENANCE											
	STOCK ANALYSIS OF MAINTENANCE											
	STANDARDIZATION OF THE MAINTENANCE											
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PLAN OF ACTION FOR INDUSTRIAL MANPOWER TRAINING IN MAINTENANCE
 PROPOSED ACTIONS ON THE LEVEL OF INDUSTRIAL PLANTS
 (FERN 2012 66)

CASE STUDIES IN SELECTED AFRICAN COUNTRIES

3.1 Madagascar

a) Background

The industrial sector in Madagascar consists of some 400 enterprises, including about 25 large, 115 medium-sized, and 260 small industries.

The large industries provide about 20,000 jobs, the medium-sized enterprises 17,000, and the small ones 5,000.

On the basis of a general study of the industrial sector in Madagascar, carried out in 1982 by a team of UNIDO consultants, a number of priority objectives were set regarding industrial development. Among the recommendations formulated as a result of this study were the establishment and implementation of a maintenance, repair, and spare parts manufacturing programme.

In 1983 a study was subsequently made by UNIDO, and led to the definition of a maintenance strategy at national level.

On the basis of this study, the government of Madagascar asked for UNDP/UNIDO assistance in implementing an industrial maintenance support programme.

The main goal of the project, which was started in 1984, is development of domestic consultancy capabilities in the field of maintenance, linked to an existing organisation, SERDI (Société d'Etudes et de Réalisation pour le Développement Industriel: Industrial Development Studies and Realisation Company), which is responsible for implementation and/or guidance of the national maintenance strategy. Project activities concern:

- national consciousness-raising and promotional action regarding the function of maintenance
- training in the various branches of maintenance of the supervisory personnel and technicians of enterprises
- advice and technical support to enterprises regarding maintenance systems and their implementation
- development of local capabilities in spare parts manufacturing
- participation in studies on the rehabilitation of industrial plant
- assistance and advice in equipment acquisition

In addition, the shortage of qualified maintenance workers is a matter of unanimous complaint among Madagascar's industrial actors. In this field the training provided in schools appears inadequate to meet the needs of industry. Moreover, a wide gap has been noted between the levels of operatives and engineers. With this problem in mind, the Ministère de l'Enseignement Supérieur (Ministry of Higher Education) (MINESUP) plans to establish an Institut Supérieur Technique (IST) (Advanced Technical Institute),

MAINTENANCE branch. The IST's job will be to provide specific training, spread over 2 years, for which "Baccalaureate" diploma holders will be eligible. In its concern to provide the best possible response to the needs of industry, MINESUP has requested the above-mentioned UNIDO project to participate actively in the preparatory work for the IST and its start-up.

b) Main lines of national maintenance strategy

The main lines of Madagascar's national maintenance policy are implemented within the framework of a multiform action programme, with the ultimate goal of promoting the maintenance function in all its complexity. The authorities have indeed become aware that the complex of problems raised by maintenance is the outcome of a number of interdependent factors, and that overall solutions at the national level and individual solutions at the enterprise level must both be brought in.

The national maintenance policy is one of the most important parts of the government of Madagascar's industrial policy, and is based on a number of priorities:

- rehabilitation and preservation of the industrial heritage, and thereby improvement in the profitability of the existing machinery;
- raising the rate of use of the production capabilities, through improved technical availability of the machinery;
- intensification of exchanges among industrialists, and thus promotion of industrial sector integration;
- restriction of imports by all possible means: in this case, by reducing spare parts requirements through more effective maintenance, and decreasing imports by developing local manufacturing of certain parts;
- developing the export of manufactured goods on the basis of competitive cost.

The strategy for implementing this maintenance policy is based upon the execution of a certain number of priority actions, carried out within the framework of a UNPD/UNIDO assistance programme, and including:

- a national campaign of consciousness-raising among industrial personnel and the general public, to develop positive attitudes toward maintenance and stimulate generation of maintenance-mindedness by modifying behaviour at work or through maintenance-oriented upbringing from childhood onward;
- advice, technical assistance, and expert guidance to industrial enterprises for the establishment of maintenance structures in factories;
- advice on making vocational training appropriate for meeting the needs of industries as concerns the maintenance trades;
- advice, technical assistance, and expert guidance to improve technical documentation on existing equipment;
- rehabilitation and development of existing capabilities for the repair and manufacture of parts and personnel training in this field, through promotion of local manufacturing of spare parts;
- advice, technical assistance, and expert guidance to enterprises regarding spare parts inventory control;

- advice and expert guidance in carrying out new industrial projects and equipment acquisition;
- training for maintenance cadres by means of seminars, training courses, study tours, etc.
- action to supply industry with information and documentation;
- capability transfer to a core-group of national consulting engineers who will be able to continue the project activities within SERDI.

c) Present status of implementation

In view, on the one hand, of the success the above project has had since 1984, and on the other hand, of the ever-increasing needs of an economy in the full swing of change, it was decided in 1987, at the end of the first stage, to expand activities in the various fields, by regionalising technical support and training actions, establishing a subcontracting grant for parts manufacturing, and thereby a real network of local capabilities, and enlarging the core-group of consulting engineers. Hence a second project stage was implemented, and is expected to last until 1992. By the end of the second stage, Madagascar should have at its disposal an operational, self-sufficient body of maintenance consulting engineers.

The preparatory work for establishing an IST Maintenance track started in 1989 with a national-level survey to determine needs, and an assessment of the necessary investment for equipment

3.2 Algeria

a) Background

Since independence in 1962, and in particular over the past 20 years, Algeria has accumulated a very considerable industrial stock in most of the sectors concerned with natural resource exploitation, the processing industries, consumer goods and equipment production, energy, and so on. The production facilities engaged are sizeable, and include turnkey or "product-in-hand" plants as well as large expandable complexes.

The problem of maintaining this large production apparatus appeared very early on, and by the beginning of the 70s the large factories had begun to get organised and do training in this field.

The government, having become aware of the impact of maintenance on the country's economy, requested bilateral and international help in analysing the maintenance problem in its various forms.

In 1976-77 the problem of maintenance in Algerian industry was studied as a whole, and for the first time, the approach of a coherent strategy at both the national level and the level of enterprises and factories was recommended.

In light of the recommendations in this study, various consultation groups were set up in Algeria between 1987 and 1982, and their work led to the definition of a national maintenance policy which found expression at the first stage in the introduction of a National Maintenance Plan affecting four priority areas: rolling

stock, industrial plants, spare parts manufacturing, and component and product reclaiming.

Two action plans: "Rolling Stock" and "Industrial Maintenance," were then established, and culminated in 1983 in a Specific Emergency Programme comprising 50 priority action items.

Between 1983 and 1984, a number of actions were implemented, including the establishment of Maintenance Directorates at ministerial level and in enterprises, the setting up of an Interministerial Committee on Maintenance, the start of additional studies in various maintenance fields, and in particular, in February 1984, the establishment of the Institut National d'Etudes et de Recherches en Maintenance (INMA) (National Institute for Maintenance Studies and Research).

INMA received international and bilateral assistance to implement a comprehensive programme of actions, among which the main ones to date have been:

- updating the National Maintenance Plan
- the establishment of a plan of short-, medium-, and long-range actions to implement the Plan
- the establishment of technical files concerning the priority projects that might receive external or national financing
- the definition of an implementation strategy for a programme of international and bilateral technical cooperation on maintenance
- the definition and establishment of a structural and operational organisation for INMA, enabling it to fulfil its consulting engineering role
- the definition of an approach methodology for INMA's activities within the framework of the tasks assigned to it at the national level
- the establishment of a maintenance documentation and information centre
- basic training in the techniques of diagnosis and evaluation of maintenance services in a few branches of industry
- definition of a methodology for first-stage maintenance and support in implementing it
- a study on maintenance infrastructure
- a study on defining a set of maintenance management ratios for use by industrial enterprises
- diagnosis and advice to various industrial enterprises
- holding seminars, technical conventions, and various events.

INMA is presently preparing to play its part within the framework of the national maintenance policy, namely

- implementing a continuous, country-wide campaign of consciousness-raising and promotion concerning maintenance;
- supplying information and data on maintenance to the relevant economic actors;
- providing advice, technical assistance, and training services to enterprises and those acquiring new equipment, regarding analysis, expertise, organisation, and setting up maintenance systems;

- establishing reports on the actions undertaken and motivating deliberations concerning the implementation of the National Maintenance Plan.

b) Main lines of the national maintenance strategy

The National Maintenance Plan revolves around four force-lines, namely :

1. improved organisation
2. qualitative and quantitative development of human resources
3. rational management of maintenance, with maintenance treated as a separate function on the same basis as an enterprise's other functions
4. development of maintenance capacities.

Implementation of the maintenance plan is provided for under a multilevel action plan, with the following components:

a) *at the national/ministerial level*

1. Organisation

- establishment of institutional structures, pivotal in implementing the National Maintenance Plan: a National Maintenance Institute, Wilaya (governorate) committees (i.e. the Institute's regional information sources), a maintenance structure in the ministries, an Interministerial Committee on Maintenance, maintenance managers in every enterprise, selection of a few pilot units to be used as a support-base for putting into practice methods of upgrading maintenance
- establishment of sectorial maintenance plans giving priority to industrial plants and heavy machinery
- organisation of a continuous consciousness-raising and promotion campaign concerning maintenance
- homologation of rolling stock builders with a view to standardisation of all stock
- actions with a view to standardisation of industrial machinery
- reducing the burden of the spare parts supply network
- definition of measures to be taken to guarantee maintenance within the framework of new projects
- upgrading of maintenance jobs
- establishment of an Algerian Association of Maintenance Engineers

2. Training/skills upgrading

- definition of a national policy of training, skills upgrading, and retraining for maintenance staff
- launch of the following training projects: training of maintenance instructors, definition of training needs, establishment/adaptation of maintenance training programmes, training of cadets, designing training centres
- establishment of a working group with the task of adapting existing training structures or defining future ones
- establishment of interenterprise training groups

- inclusion of a foundation module on maintenance in production staff training programmes.

3. Maintenance management

- development and continuance of after-sales service networks
- definition of a set of maintenance management ratios and a methodology for putting them into practice in enterprises

4. Development

- definition of a national policy of subcontracting for maintenance work
- implementation of a policy of local spare parts manufacturing and reconditioning.

b) *At enterprise level*

1. Organisation

- launch of a targetted action for maintenance organisation in a few pilot enterprises/factories
- expansion of the pilot-enterprise experiments to include additional enterprises/factories
- organisation of an experience and information exchange system
- coordination of activities in all the factories belonging to a single enterprise
- optimisation of the funding allocated to maintenance
- revision of wage policy/incentives to maintenance staff

2. Training/skills upgrading

- definition of training and upgrading needs
- implementation of contracts between the enterprise/factory and adult vocational training centres
- start-up of training programmes, especially training courses for maintenance instructors

3. Management

- implementation of maintenance management systems in factories
- spare parts inventory analysis and identification of dead stock, with a view to resale or re-export
- development of inter-factory subcontracting
- launch of studies on specification/standardisation of machinery and parts
- planned funding to strengthen factories' spare parts manufacturing capacities
- advice for factories in the definition of a maintenance policy
- establishment of a specific budget for maintenance
- organisation of a reporting system enabling the parent enterprise to keep track of maintenance expenditures in factories.

c) Present status of implementation

The problem of industrial maintenance in Algeria remains sizeable, and is still far from being solved. However, the results achieved by the maintenance policy are encouraging and significant. They may be summarised as follows:

- very substantially increased awareness on a national scale regarding the importance of maintenance
- maintenance taken up in a large number of factories and training organisations
- development of national maintenance consultancy services, especially through INMA, for example, through a UNIDO support project aimed at developing a methodology for organising maintenance, assisting enterprises, and training a core-group of consulting engineers
- a national policy for training in maintenance (a current bilateral project with Belgium)
- promotion of local manufacturing of spare parts (a bilateral project under preparation with Germany).

3.3 Morocco

a) Background

In Morocco, a big effort was made long ago concerning maintenance. However, the complex of issues with respect to maintenance and the need for an overall industrial maintenance strategy, were only recently brought to light

Indeed, in 1984, in full awareness of the situation, government officials and United Nations representatives jointly debated :

- the difficulty of replacing machinery in view of the economic crisis and the resulting austerity policy;
- the abnormally low, and rapidly falling, output from recently acquired, high-cost machinery, to the detriment of a national production under pressure to draw on all capabilities to meet development imperatives and financial obligations.

By the end of these deliberations, the essential need to make investments more profitable had emerged, and a change in "the way things were done" was shown to be crucial: the will to make this change was demonstrated by the decision to launch an overall action bringing into play all the actors involved and supported at the highest political level. In this spirit, a National Seminar on "Post-investment" was held in Rabat in May 1985, and was itself preceded by a survey of the needs, organisational status, and wishes of enterprises and organisations regarding this matter. On that basis, the government set about raising additional resources in this field, from both the national budget and international organisations, and it was planned that this topic would receive priority consideration in new investments. A number of actions were then launched or extended:

- strengthening of maintenance training in the engineering schools;
- training/organisation for hospital maintenance;
- implementation of central maintenance for the Casablanca telephone system;

- setting up of an instrumentation laboratory at the National Centre for the Coordination and Planning of Scientific and Technical Research
- technical support for maintenance development.

Thus a support structure came to be designated as promoter of maintenance. This was the OFPPT (Office pour la Formation Professionnelle et la Promotion du Travail: Office for Vocational Training and Employment Development). With the assistance of the UNDP/ILO, the OFPPT implemented a maintenance training programme. The initial stage of the project got under way in 1986, and dealt with training programme development, the training of trainers, technicians, and cadets in enterprises and organisations, and the establishment of a small unit of maintenance consulting engineers. In addition, a programme of consciousness-raising regarding the importance of maintenance was launched. In view of the results achieved and the interest shown by the economic actors, it was agreed that the project be extended into a second stage, of which the immediate objectives were:

- to increase the OFPPT's operational capability as consulting engineer, technical assistant, and maintenance instructor
- to promote maintenance through the establishment of maintenance committees within professional groups
- to contribute to the development of consulting engineering throughout the country.

b) Main lines of national maintenance strategy

Morocco's maintenance strategy is based on an integrated approach to the relevant factors as a whole, or those covered by the term "Post-investment," and its aims are:

- to advise on, and/or organise, the identification, acquisition, or production of machinery and equipment of all types by enterprises;
- to valorise the stock thus constituted, through optimum use in terms of productivity and useful lifetime, in keeping with judicious depreciation of the stock;
- to increase the profitability of the enterprises using the stock, while keeping an eye on the quality of the products and services and on personnel safety;
- to enable the best possible use to be made of foreign currency, in terms particularly of problems of uniformity in equipment and spare parts purchasing;
- to promote, among all "users" of this "stock," attitudes and information conducive to its proper economical use .

The implementation strategy may be summarised as follows:

- a) to develop awareness among all economic actors of the obligation to protect the investments and render them profitable;
- b) to improve maintenance structures through actions likely to facilitate or stimulate the adoption of effective maintenance;

- c) to make users aware of maintenance concepts, methods, and techniques, and give them ongoing training in these subjects;
 - d) to promote and increase the value of maintenance from the standpoint of productivity and improved quality;
 - e) to assist enterprises and organisations to improve their maintenance services;
 - f) to facilitate and stimulate the practice of effective maintenance, through measures taken in various fields.
- c) Present status of implementation

A project document has been prepared for the second stage of the project, as described above.

This stage is being funded by the UNDP and the government, and its execution will be entrusted to a specialist company. An international invitation to tender has been issued, and a final selection has been done by now. The planned duration of the project is 3 years and activities will start in May 1990.

3.4 Angola

a) Background

Since independence, the industrial sector in Angola has experienced a decline, due primarily to the mass departure in 1975 of the Portuguese, who had not trained indigenous supervisory staff to take over. Most of the manufacturing enterprises have been nationalised, although of the small and medium-sized enterprises, a number have remained in private hands. In some fields (e.g. oil), foreign enterprises have remained in operation.

Output in the industrial sector, with the exception of the oil industry, remains well below available plant capability.

One of the main reasons is the lack of maintenance of machinery and infrastructure.

Having become aware of the need for upkeep capabilities, the Angolan government set up in 1980 the EMIN (Empresa de Manutenção Industrial: Industrial Maintenance Company), whose jobs are equipment maintenance of factories depending on the Ministry of Industry, and development of other activities related to the first, such as the training of maintenance technicians.

In March 1983, the National Assembly of the People's Republic of Angola adopted an "Emergency Plan" for restoration of the country's economy, based on rational use of human and material resources and capital. One of the plan's objectives is to increase industrial production so that existing industrial resources can be used to full capacity and expenditures and investments in foreign currency can be reduced.

Between 1980 and 1988, the government received assistance from UNIDO, and it was thus possible to install machines at EMIN and train workshop personnel.

As a consequence of an evaluation of the project, carried out in 1986, and a UNIDO course on maintenance attended by the project director, the Angolan government was made aware of the need for a broader view of maintenance, combining the concepts of prevention, planning, and management. An action plan was therefore adopted by the Ministry of Industry.

Besides project funding, the UNDP provided assistance in the organisation of the first national maintenance seminar, in February 1988, in which nearly 250 enterprise executives took part, the majority from Angolan firms. In the course of the seminar, a national maintenance strategy was recommended, and a plan of action was proposed.

Thus the government decided to broaden the services of the EMIN, and in addition to turn it into a support centre for national maintenance and training efforts.

The Angolan government then requested the UNDP's help in carrying out a project aimed at implementing the maintenance strategy, in the form of a new stage of UNDP assistance. At the end of 1989, the activities of this project had just begun.

b) Main lines of the national maintenance strategy

National maintenance strategy is based on a comprehensive approach to the maintenance problem, and focusses on three lines:

- organisation and management of maintenance services
- spare parts
- training.

Implementation of the strategy rests on completion of an action plan, in which the first action was making available national and international funds to carry out as a whole the actions set forth below

a) At country level

- nominate an official to be in charge of maintenance in the technical department of each ministry concerned
- set up an interministerial maintenance commission
- identify the priority sectors in which actions are to be taken
- on the basis of emergency programmes, formulate priority projects and devise a strategy of international cooperation to secure funding
- reduce the burden of parts and materials import networks
- establish sector-wide maintenance plans
- produce and publish an inventory of domestic maintenance capabilities
- define a national policy of training in maintenance
- gradually develop the maintenance commission until it becomes a real structure for support in maintenance matters

- organise a continuous campaign of consciousness-raising and promotion of maintenance
- set up a working group within the maintenance structure to establish standard specifications relating to maintenance in connection with equipment acquisition or rehabilitation projects
- develop after-sales service networks
- establish related measures as incentives to investors in the establishment of new maintenance service companies
- devise a maintenance subcontracting policy
- set up an Angolan Industrial Maintenance Association.

b) At Ministry of Industry level

- devise emergency programmes in priority sectors
- hold specialised seminars for the cadres of enterprises, in the fields of maintenance organisation and management, inventory control, and planned maintenance
- strengthen the activities of EMIN as concerns parts manufacturing and advice services to enterprises
- implement technical support for target enterprises
- set up a maintenance documentation and information unit within EMIN

c) At enterprise level

- designate a maintenance head in every enterprise
- include a maintenance unit in every company organisation chart
- set up maintenance data collection procedures
- start maintenance training programmes, for middle management personnel in particular
- weed out the spare parts situation
- bring in planned maintenance and inventory control
- allow for the financial resources to carry out the above actions

c) Present status of implementation

Implementation of the maintenance strategy culminates in the strengthening of EMIN, which becomes a maintenance support centre with the dual role of provider of workshop services on the one hand, and consulting engineer and technical assistant on the other.

A UNDP/UNIDO technical assistance project to EMIN, of about 40 months' duration, has been approved and is in its start-up stage. The project aims to achieve two objectives by way of the following preliminary goals :

Direct objective 1 : enable EMIN to improve and show a profit on its service operations in machinery repairs and and spare parts manufacturing

Goal 1.1 : EMIN's structural and operating organisation in place

Goal 1.2 : a technical support office and a manufacturing department in operation

Goal 1.3 : an operations cost accounting (CAE) system set up and operational

Direct objective 2 : establish domestic capability for providing advice, enterprise support, and training in industrial maintenance

Goal 2.1 : A core-group of maintenance consultants established

Goal 2.2 : Five industrial enterprises served with advice and ad hoc assistance on maintenance

Goal 2.3 : Twenty-five qualified enterprise staff members trained in maintenance management

3.5 Burkina Faso

a) Background

In 1984 Burkina Faso started a comprehensive programme for the rehabilitation of various enterprises. The government, and in particular the Ministry for the Promotion of the Economy, has justly drawn attention to the importance of industrial maintenance and the urgency of establishing and/or improving maintenance in the existing industrial enterprises.

In 1985 a seminar on industrial development strategy was held in Ouagadougou. In the course of the seminar, the problems related to the absence of a maintenance policy were stressed, and recommendations were made concerning the establishment of a maintenance structure in the industrial areas of the country.

As a consequence of the Second Consultation on the training of industrial manpower, held by UNIDO in Paris in September 1987, at which Burkina Faso's statement was a very pertinent contribution to the proceedings, recommendations of particular relevance to training in industrial maintenance especially attracted attention.

Various studies carried out by UNIDO and the ILO, and by the country's own authorities, have highlighted the urgency of the actions that must be undertaken to bring out the true value of maintenance in relation to production, in the efficient management of enterprises

At the end of 1987 the government of Burkina Faso submitted a request to UNDP for assistance in carrying out a study aimed at defining a national maintenance policy and a national maintenance strategy

The study was carried out in 1988/89 and includes recommendations, based on an analysis of the present situation, on the definition of a policy and a strategy for maintenance for Burkina Faso at both government and enterprise level. It also includes an action plan, of which the details are currently under study and the main lines are set forth below.

b) Main lines of the national maintenance strategy

The national maintenance policy is one of the components of the development policy, and focusses on two force-lines:

1. increasing the present level of output, through the enhancement of existing assets by continuing with the equipment reconditioning, rehabilitation, or modernisation projects;
2. protecting future output by means of :
 - urgent equipment conservation steps - thus maintenance measures;
 - appropriate measures on acquiring equipment and carrying out rehabilitation, expansion, or new construction projects.

This policy should lead to an implementation policy,

in the short term, aimed at making available

- staff members who are qualified, motivated, and aware of the importance of good maintenance;
- full appropriate technical documentation;
- organisation and management methods to ensure efficient maintenance;
- the requisite spare parts;
- well-equipped maintenance workshops;
- and consequently the necessary financial resources.

in the medium and long terms, aimed at taking steps

- to take account of maintenance in contract negotiations and in the specifications for equipment acquisition;
- to expand maintenance capabilities or establish additional capabilities, potentially in the form of integrated or regional workshops.

The strategy is based on:

- coherence and coordination in the various actions for improvement of maintenance;
- interenterprise exchanges of information and experience;
- interenterprise collaboration, with emphasis to be placed on the role to be played by small and medium-sized enterprises;
- mediation with the competent organisations, to facilitate implementation.

Strategy at enterprise level mainly concerns:

- dealing with maintenance at the executive level
- raising the awareness of upper management and staff concerning the importance of maintenance to company economics
- proper choice of structure for organising maintenance
- allotment of adequate budgets and assignment of competent personnel
- a maintenance training policy
- dealing with maintenance in equipment acquisition

- interenterprise exchanges of experience and statistics.

Implementation of the strategy is to be rendered feasible through a driving and coordinating organisation, which is its keystone, in a sense. At the same time, capabilities of Burkina Faso's own will be developed in maintenance consulting and technical assistance for the benefit of enterprises. The organisation is therefore charged with a support mission in maintenance matters and with laying the foundations from which will spring a combination of capabilities in the private, in-enterprise, or other areas, according to need, permitting better organisation of maintenance services in the enterprises and organisations concerned.

c) Present status of implementation

With the goal of involving all the economic actors concerned, and so as to start off the consciousness-raising actions with a noteworthy event, the government of Burkina Faso submitted a request for UNIDO assistance in organising a national consciousness-raising and deliberation seminar, directed toward the relevant centres of decision-making. The seminar was scheduled to take place in the second quarter of 1990.

The whole range of actions planned under the maintenance strategy is centred on a support organisation which would initially be attached to the central administration and would in future develop toward becoming a national capability for consulting engineering in maintenance, in private or other form. To set up the structure and to train a corps of consulting engineers, the government of Burkina Faso will request the assistance of UNDP or other financing organisations. This project is at the study and formulation stage. The intention behind the project is that by its results it will contribute to realisation of the national maintenance policy, and in particular :

- see that the maintenance strategy is implemented
- set up and organise a support structure in maintenance matters
- promote maintenance and raise consciousness
- train a core-group of national consulting engineers
- train enterprise agents
- assist and advise enterprises
- advise on the purchasing of new equipment
- promote local manufacturing of spare parts.