

Republic of Lebanon

الجمهورية اللبنانية
مكتب وزير الدولة لشؤون التنمية الإدارية
مركز مشاريع ودراسات القطاع العام

MINISTRY OF ENVIRONMENT

Republic of Lebanon
Office of the Minister of State for Administrative Reform
Center for Public Sector Projects and Studies
(C.P.S.P.S.)

EVALUATION STUDY OF EXISTING PROJECTS AND CONTRACTS

Solid Waste Sector

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Executive Summary

The solid waste sector implementation unit main achievements during the past year may be described as:

- Execution of terms of reference for 2 compost plants, 2 incinerator plants, toxic waste management and garbage collection supervision.
- Project Management and technical supervision for Karantina's compost plant
- Technical management of Amrousieh Incinerator plant
- Production of the Inception report for the SIU-3 mission
- Analysis and evaluation of contracted solid waste management studies
- Technical and administrative co-ordination between CDR, MOE, the World Bank and related organizations
- Sector contracts supervision, cost and schedule control and payments processing
- Sector data collection and organization
- Co-ordination, planning and supervision of existing projects and contracts
- Advising on critical and urgent issues
- Implementing organisation systems and procedures
- Assuming leadership to accomplish management tasks where required

The Solid Waste Sector in Lebanon main achievements during the past year may be described as follows:

- Securing funding for reconstruction and development
- Establishment of a short-term and long-term strategy
- Procurement of garbage collection equipment for the municipalities
- Implementation of Garbage collection for Beirut and its suburbs

- Implementation of street sweeping for Beirut
- Development of data collection systems for information gathered from different channels of activity
- Implementation of project management procedures to organise and control the investments
- Rehabilitation of Karantina compost plant
- Rehabilitation of the Municipal garage at Karantina to secure a place for maintenance of garbage collection equipment
- Establishment of garbage collection monitoring and controlling systems

Among the outstanding unresolved issues the following are worth to mention:

- Marketing development for the existing and proposed compost plants
- The Government proposed change to less sanitary landfills than those scheduled in the programme and the suitability of the transfer stations as they have been designed
- Clear definition of a Sector programme management structure with well-implemented lines of authority and responsibility
- Conceptual planning consolidation between Ministries involved and the CDR
- Design and implementation of adequate monitoring and controlling systems

Finally, it is worth mention that the Development of the Solid Waste Sector has registered a considerable level of activity during the past year thanks to the effective participation of the CDR, the MOE, the World Bank Missions and the European Community Support.

1. Introduction

In the year since SIU-3 started work in July 1994, the work at the MOE has been as demanding as it can be due to the emergency character of most of the solutions requiring implementation. The determination to help implement the Solid Waste Programme with a minimum of resources has been seriously challenged by real factors such as:

- Existing and partially implemented contracts
- Emergency situations
- Lack of adequate human and equipment resources
- Political issues

SIU-3 staff has tried to cope with a wide variety of requests to help develop solutions to existing contracts and other national urgent needs. The understanding of difficulties usually accompanying this kind of situations has been resolved with common sense and flexibility of action.

An indication of the magnitude of the involvement of the SIU may be gathered from the following figures from the Sector:

- | | |
|------------------------------------|----------------|
| • Contracting amount: | USD 35 Million |
| • Technical reports processed: | 45 |
| • Special & Urgent issues handled: | 17 |

This report records the main features of the Solid Waste Sector activity, describes the status of the mission and the sector, submits descriptions of outstanding issues and presents objectives and plans to cover the next twelve months and the long-range development.

2. Sector Implementation Unit Status (SIU-3)

2.1 General

The SIU-3 team is currently run by two professionals on long-term assignments:

- The Senior Project Manager (teamleader) in charge of all technical aspects
- The Senior Cost Control Specialist in charge of all contractual, administrative and financial aspects.

One local contract assistant/secretary have been hired by SIU-3.

2.2 Work carried out

The structure of works carried out by SIU-3 assignments can be better explained by separating technical and cost management work as follows:

Technical and Project Management performed work:

- TOR for Sour Compost plant
- TOR for Zhale Compost plant
- TOR for Dora incineration plant
- TOR for Tripoli incineration plant
- TOR for toxic waste management
- TOR for garbage collection supervision
- Quarantine Compost plant rehabilitation management and supervision of contractual terms
- Amrousieh Incineration plant operations technical and administrative management supervision

Administrative work:

The Sector implementation unit main administrative jobs may be summarised as follows:

- Technical and administrative co-ordination between CDR and MOE
- Technical support to analyse proposed solutions, joint meetings with government organisations and contractors, recommendations on procedures implementation and representation on sector study groups.
- Long term strategy for Solid waste management study assessment and recommendations. The contracted work with Libanconsult was analysed, relevant data selected and organised and recommendations produced.
- Existing and new contracts supervision, cost and schedule control, progress measurement and payments processing. Contractual obligations were closely followed, progress measurement was implemented, invoices were checked and recommended for payment and technical issues were studied and recommendations forwarded to interested parties.
- Safety procedures implementation. PMU recommended procedures were passed and explained to contractors and supervisors and implementation was followed up to ascertain its compliance.
- Subcontracting control. Guidelines for subcontracting control according with CDR and PMU procedures were explained to contractors and supervision consultants.
- Data collection and organisation. Selected, relevant data concerning the Sector has been extracted from studies and recommendations and organised on data bases for their usage in future endeavours.
- Project management procedures as produce by PMU has been implemented. A project management procedure to ascertain better contracting and consulting practices in the sector has been set up in addition to the already implemented input from PMU and other SIU's.
- Contracted studies analysis and recommendations. Old and new studies related to the Sector has been analysed and recommendations on the subject forwarded to the MOE and CDR.

- Planning and scheduling of proposed plans has been worked out to ascertain proper communications within the programme.
- Analysis of the cash flow required according to existing contractual obligations and future commitments has been set up and recommendations based on results forwarded to financially responsible groups.

2.3 Reporting to Sponsoring Organisations.

Regular reporting on technical, contractual and administrative matters was provided by means of:

- *Monthly Status Reports*
Holding information on the sector implementation unit progress on monthly basis to keep involved organisations aware of constant developments within the Sector.
- *Monthly Cost Reports*
Supplying information related to contractual progress, payments and commitments to date.
- *Quarterly Reports*
Sector progress report including status, planning and cost analysis results.
- *Annual Report*
Including information on SIU-3 past year achievement, the Sector progress, status of the programme implementation, planning for the next year and recommendations to optimise performance.
- *Ad hoc Reporting*
This reporting section included analyses and recommendations on punctual Sector problems and contractual and technical matters requiring professional analysis and guidance.

This reporting has been constantly reviewed and revised to effectively cope with the needs of the CDR and the MOE.

2.3 Contracting Status

Project Name: Rehabilitation of Karantina

Contracts date: 6 November 1993

Funded by : IBRD

Value: USD 4,500,000

Contractor: OTV

Contracts No. 1267 and 1268

Status: Awaiting commissioning

Comments:

- SIU-3 paid its last inspection of the plant on December 28, some of the problems found are described here below:
 - ♦ The overhead cranes are lacking safety devices to avoid unnecessary work accidents
 - ♦ The evacuation of fluids in the silos area is inadequate and hazardous and nothing has been done to fix the situation
 - ♦ The handling of the machefers is still a problem
 - ♦ The evacuation system out of the cyclones is not working properly and has not been rehabilitated
 - ♦ The metal work at the upper part of the air handling systems for the incinerators is still unacceptable
 - ♦ Foundations for supporting equipment are loose and dangerous and have not been taken care of
 - ♦ Safety protection for the rotating equipment is not adequate
 - ♦ The spare parts delivered by OTV do not correspond with contractual obligations
 - ♦ Trucks stops at the receiving bunkers are inadequate
- OTV, CREED, SUKKAR ENG. and SIU-3 have been meeting regularly to resolve all outstanding issues

- OTV outstanding invoices payment has been delayed until the industrial run of the plant becomes evident.

Project Name: Exploitation of Amrousieh incinerator plant

Sign date: 5 August 1993

Funded by : Lebanese Government

Value: USD 1,350,000

Contractor: Sukkar Engineering

Contract No. 1191

Status: In operation. Incineration line No.1 remains shut down

Comments:

- The plant continues processing an average of 85 tons of garbage per day
- Lack of refractory material in the local market forced a delay in the commissioning of the maintenance work on the incineration line No. 1. Commissioning is expected on the second week in January.
- The SIU-3 incineration specialist took up his post at MOE on 10.1.96 and is expected to present a comprehensive report within the next two months.

Project Name: Garbage Collection for Greater Beirut

Sign date: 8 February 1994

Funded by : Lebanese Government / IBRD

Value: USD 3,597,000

Contractor: Sukkar Engineering

Contract No. 1348

Status: Running normally.

Comments: This contract has the following addenda:

- Street sweeping Beirut intramuros USD 2,800,00
- Street sweeping Beirut suburbs USD 7,500,000
- Additional containers and trucks USD 737,430

- 1,100 ton of domestic waste are being collected every day according to the latest reports from D.G. Jones who is supervising the contract for the last 178 days.
- The Karantina garage for trucks maintenance is being equipped and rehabilitated to ascertain adequate service to the operation.
- The contractor is still working on the trucks washing facility and headquarters for the street sweeping operations.
- A special administrative section has been implemented to handle public complaints on the collection and sweeping services.

Project Name: Garbage Collection in Chouf

Sign date: 24 December 1994

Funded by : Lebanese Government

Value: USD 690,000

Contractor: Terro Engineering

Contract No.1598

Status: The contract for the first year was completed

Comments:

- The estimated cost of the operation for the first year has been analysed by SIU-3 and a recommendation for the second year contract has been submitted to the CDR.
- The contractor has continued operations within the second year awaiting for decisions on CDR part on price adjustment and other outstanding issues

Project Name: Karantina Compost Plant Rehabilitation Supervision

Sign date: 25 November 1993

Funded by : IBRD **Value:** USD 335,000

Contractor: CREED **Contract No.** 6123

Status: The contractor is supervising the commissioning of the plant

- **Comments:** This contract has been extended again to cover newly found delays with the delivery of the plant

Project Name: Garbage Collection and Sweeping Supervision for Greater Beirut

Sign date: March 1995

Funded by : Lebanese Government **Value:** USD 293,415

Contractor: D.G. JONES **Contract No.** 6315

Status: Being implemented

Comments:

The contractor has developed several contractual analysis which have been very helpful in determining the main constraints of the operations.

Project Name: Operation and Maintenance of Karantina

Sign date: May 1994

Funded by : Lebanese Government

Value: USD 1,307,000

Contractor: SUKKOM

Contract No. 1349

Status: Currently receiving the plant

Comments:

The contractor has invoiced for the expenses incurred during the four months support which he had carried out on behalf of CDR to the industrial run expected to be accomplished by OTV.

3.0 Sector status and Implementation schedule

The Sector implementation planning has been so far based on the NERP programme which has an allocation of USD 69.4 million applied to the rehabilitation of an incinerator plant and a compost plant, purchasing of compactors and containers and related consultancy services.

With the approval of a World Bank loan and the contribution from the Japanese Government the implementation of a new programme called the Solid Waste/Environmental Management Project (SWEMP) has given the Sector a clear objective up to the year 2002.

3.1 NERP Programme Status

The major components of the SWM component of the NERP have been completed. Planning for maintenance and optimisation of the part of the programme being executed (Garbage collection, sweeping, disposal plants operation) has been drawn according with established contracts. A total of USD 31 million has been actually disbursed and there is a USD 26 million amount to be committed and disbursed.

The rehabilitation of the *Karantina Compost plant* has been successfully completed with strong participation from SIU-3 and a satisfactory cold test run has taken place. Problems with the lining of the chimney of the incinerator and the power supply deficiency have been tackled and the plant is expected to be commissioned by the end of September.

The rehabilitation of *old compactor trucks* and the procurement of *new compactor trucks* and *containers* have been achieved as scheduled. They have been distributed to Cazas all over the country.

The Amrousieh incinerator remains a problem due to the collection of garbage with extremely low calorific value. Furthermore, the incinerator is creating severe atmospheric pollution because of the high organic content and the humidity found in the waste collected. The out-dated design of the plant leaves little room for improvements and most likely it will have to be replaced by another disposal facility.

The Programme has successfully involved the private sector through contracts for *collection services in Greater Beirut and the Chouf region*, and similar contracts for O&M for the Karantina compost plant and the Amrousieh incinerator. Although there is a substantial shortage of equipment, the areas kept by the private sector contractors look cleaner than before.

The Long Term strategy study / Cost recovery awarded to Libanconsult has been well structured and has become a real tool for the sector future development and financial expectations.

Landfills utilisation has been chosen as the main garbage disposal alternative by the administration and they will be implemented through the programme established in cooperation with the IBRD and the Japanese Government.

3.2 The Solid Waste Management/Environmental Project (SWEMP)

The SWEMP main objectives are the following:

- Clean up and rehabilitate the coastal zone
- Improve methods of waste collection and disposal
- Improve cost recovery and modernise municipal accounting systems
- Improve the quality and marketability of compost by upstream sorting of the waste
- Increase the involvement of the private sector in solid waste management
- Strengthen MMRA and the principal municipalities

The project will comprise:

- Purchase of refuse collection equipment: 5,200 containers and 180 compactor trucks
- Design, procurement, construction and management of waste disposal facilities: 8 sanitary landfills and 4 compost plants
- Design, procurement, construction and management of a hospital waste collection and disposal system
- Provision of technical assistance to support the above mentioned activities
- Implementation of a coastal zone management plan

The total cost of the project is estimated to be about USD 135 million of which about 41% will be financed by the approved World Bank loan of USD 55 million, another 41% will be provided by the Japanese Government and the rest will be supplied by the local administration.

The project implementation has been estimated to take place over six years starting in the second half of FY 1996 and completed in FY 2002.

4.0 Definition of objectives for the Solid Waste Sector 1995-96

The following paragraphs will explain the Solid Waste Sector objectives within the NERP and SWEMP programmes.

4.1 NERP short-term objectives

Short-term objectives are based on the current level of activity generated by present NERP contractual obligations and comprises the following categories:

- Evaluation of waste treatment, transfer and materials recovery opportunities.
- Development of engineered sanitary (controlled) landfills to replace open and indiscriminate dumps.
- Improvement of private sector participation (PSP)

4.2 SWEMP Projects short-term objectives

The SIU-3 short-term objectives within the SWEMP will comprise the following categories:

- Strategic solid waste management planning and improved technical expertise and co-ordination of solid waste management at national level.
- Procurement and provision of new waste storage facilities, collection transport and disposal equipment.
- Investigation of cost-recovery approaches and implementation strategies.

5.0 Consultancy scope of work

SIU-3 scope of work for the immediate future is based on the objectives mentioned above following the activity areas defined in the terms of reference of the Consultancy contract document.

5.1 NERP maintenance scope of work

The Sector scope of work within the current contractual load will be limited to:

- Providing guidelines for the organisation of waste collection services and the waste evacuation as a function of the local economical conditions, the technical criteria and the degree of development of the area.
- Identifying energy requirements, the level of maintenance and the required manpower.
- Monitoring the contracts execution through appointed supervision consulting contractors
- Processing payments to contractors based on information supplied by the supervising consultants
- Enforcing safety and security procedures
- Setting up the administrative framework in relation to: object and duration of contracts, norms and standards to be followed, conditions of utilisation, selective collection systems, inspection and testing practices.

5.2 SWEMP scope of work

The Sector scope of work within the Solid waste/environmental management project will be limited to:

- Management of specialists support
- Monitoring and supervising contractors work
- Advising on issues related to contractual matters

- Planning and implementation of the projects
- Co-ordination among MOE, CDR, PMU and other ministries and government agencies
- Production of TOR's as required

Appendix 1 and 2 show the priority projects and activities for the on-going and new projects respectively, their status and the planned intervention.

APPENDIX 1
PRIORITY PROJECTS AND ACTIVITIES 1995/96
ON GOING

| No. | DESCRIPTION | Original Contract value | LOAN | FINANCING LOCAL | TOTAL | STATUS | PLANNED SIU-3 INTERVENTION |
|--------------------------------|------------------------------|----------------------------|------------|--------------------|------------|--------------------|-------------------------------|
| AWARDED CONTRACTS | | | | | | | |
| 1 | COMPACTOR TRUCKS | | | | | | |
| 1.1 | New trucks | 5,638,845 | 5,638,845 | 0 | 5,638,845 | Processing | Monitoring |
| 1.2 | Rehabilitation of old trucks | 46,647 | 46,647 | 0 | 46,647 | Reception | |
| | subtotal: | | 5,685,492 | 0 | 5,685,492 | | |
| 2 | CONTAINERS | | | | | | |
| 2.1 | All containers | 910,671 | 910,671 | 0 | 910,671 | Processing | Monitoring |
| | subtotal: | | 910,671 | 0 | 910,671 | | |
| 3 | Quantana compost plant | | | | | | |
| 3.1 | Electro mechanical works | 3,431,636 | 2,745,341 | 686,335 | 3,431,676 | Starting | Technical |
| 3.1.1 | Additions to EAM Works | | 118,698 | 29,674 | 148,372 | Plant | Directions |
| 3.2 | Civil works | 524,017 | 419,214 | 104,803 | 524,017 | Commissioning | |
| 3.2.1 | Additions to civil works | | 155,563 | 103,269 | 258,832 | | |
| 3.3 | Supervision | 185,250 | 185,250 | 0 | 185,250 | | |
| | subtotal: | | 3,624,065 | 924,522 | 4,548,587 | | |
| 4 | Amrousch incinerator | | | | | | |
| 4.1 | Additional equipment | 207,700 | 165,600 | 41,400 | 207,000 | Testing | Technical |
| 4.2 | Backyard layer | 20,000 | 12,000 | 8,000 | 20,000 | New | Support |
| 4.3 | Other equipment | 360,000 | 360,000 | 80,000 | 440,000 | Equipment | |
| | subtotal: | | 537,600 | 139,400 | 677,000 | | |
| 5 | Engineering for landfills | | | | | Preliminary | Technical |
| 5.1 | Design | 526,000 | 526,000 | 0 | 526,000 | Studies | Recommendations |
| 5.2 | Supervision | 1,000,000 | 1,000,000 | 0 | 1,000,000 | Completed | |
| | subtotal: | | 1,526,000 | 0 | 1,526,000 | | |
| 6 | O & M SERVICES | | | | | | |
| 6.1 | Amrousch incinerator | 1,350,000 | 690,000 | 3,520,000 | 4,210,000 | Running Operations | Project Management |
| 6.2 | Quantana compost plant | 1,307,576 | 523,030 | 784,546 | 1,307,576 | Industrial run | Project Management |
| 6.3 | Collection in greater Beirut | 3,597,282 | 2,549,068 | 21,750,000 | 24,299,068 | Running operations | Project Management |
| 6.4 | Collection in chof | 550,000 | 251,734 | 298,266 | 550,000 | Running operations | Project Management |
| | subtotal: | | 6,804,858 | 4,013,832 | 26,352,812 | | |
| | TOTAL COMMITTED | | 7,715,529 | 16,297,660 | 27,416,734 | | |
| CONTRACTS TO BE AWARDED | | | | | | | |
| 14 | LANDFILL LAND ACQUISITION | | | | | | |
| 15 | CLOSURE OF DUMPS | 8,000,000 | 0 | 8,000,000 | 8,000,000 | Under study | Technical input |
| 16 | DEVELOPMENT OF LANDFILLS | 1,400,000 | 840,000 | 560,000 | 1,400,000 | Under study | Technical input |
| 17 | LANDFILL EQUIPMENT | 6,400,000 | 3,840,000 | 2,560,000 | 6,400,000 | Under study | Technical input |
| 18 | ENGRG. REMAINING L/FILLS | 4,000,000 | 4,000,000 | 0 | 4,000,000 | Under study | Technical input |
| | SUB TOTAL | | 600,000 | 600,000 | 600,000 | | |
| | TOTAL | | 20,000,000 | 9,280,000 | 11,120,000 | | |
| | Contingencies | | 28,115,529 | 25,577,660 | 38,536,734 | | |
| | GRAND TOTAL | | 2,784,826 | 312,566 | 3,097,392 | | |
| | GRAND TOTAL | | 28,362,486 | 38,849,300 | 67,211,786 | | |

APPENDIX 2
PRIORITY PROJECTS AND ACTIVITIES 1995/96

NEW PROJECTS

| REF. | PROJECT DESCRIPTION | No. CONTRACTS | COST USD/M | CONTRACT TYPE | FINANCE SOURCE | STATUS | PLANNED SIU-3 INTERVENTION 95/96 |
|-------|-----------------------------------|------------------|---------------|------------------|-------------------|--------|-------------------------------------|
| 3.012 | AMROUSSIEH COMPOST P. | 2 | 1 | C | WB1 | P | T.A., TOR |
| 3.02 | CONSULT.SANIT.LANDFILLS | | 0.5 | TA | WB1 | PRE | CONTRACT MANAGEMENT |
| 3.03 | COLLECTION SERVICE | 1 | 14.4 | O | WB1 | PRE | MONITORING |
| 3.04 | 180 COMPACT TRUCKS | 1 | 1.2 | S | WB1 | PRE | MONITORING |
| 3.05 | 5200 WASTE CONTAINERS | | 1.2 | S | WB1 | PRE | MONITORING |
| 3.06 | COASTAL ZONE MNGMT.COM | | 5 | T.A | WB3 | P | T.A. |
| 4.011 | SAIDA COMPOST PLANT | 3 | 23.4 | C,W | MOE, WB3 | P | T.A., TOR |
| 4.012 | SAIDA LANDFILL | 3 | 1.5 | C,W,O | MOE, WB3 | P | MONITORING |
| 4.022 | TRIPOLI LANDFILL | 3 | 1.5 | C,W,O | WB3 | F | T.A. |
| 4.031 | ZAHLE COMPOST PLANT | | 17.5 | S,W,O | MOE, WB3 | PPE | T.A. TOR |
| 4.032 | ZAHLE LANDFILL | | 1.5 | C,W,O | MOE, WB3 | PRE | MONITORING |
| 4.033 | ZAHLE COLLECT. SERVICE | 2 | 1.5 | T.A.O | MOE | I | DECISION, TOR |
| 4.041 | SOUR COMPOST PLANT | 2 | 15.3 | C | MOE | PRE | T.A., TOR |
| 4.042 | SOUR LANDFILL | 3 | 1.5 | C,N,O | WB3 | PRE | MONITORING |
| 4.043 | SOUR COLLECT. SERVICE | 2 | | T.A.O | T.B.D. | I | TOR |
| 4.052 | KESROUAN LANDFILL | | 15 | C,W,D | MOE, WB3 | I | DECISION, LAND |
| 4.054 | KESROUAN COLLECT. SERV. | 2 | | T.A.O | MOE | I | DECISION, TOR |
| 4.061 | JBEIL COLLECTION SERVICE | 1 | 1 | F | T.B.D. | I | TOR |
| 4.065 | BOURJ HAMOUD REHABIL. | | 15 | W | MOE | P | T.A. |
| 4.08 | MARKETING STRATEGY FOR COMPOST | 1 | 0.2 | C | T.B.D. | I | TOR |
| 5.01 | HOSPITAL WASTE DISPOSAL | 1 | 10 | TAO | WB3 | I | T.A. |
| 6.01 | TECHNICAL ASSISTANCE | 3 | 2 | TA | WB3 | I | TOR |
| | TOTAL | 30 | 131.4 | | | | |

T.A = TECHNICAL ASSISTANCE C = DESIGN & ENGINEERING
S = SUPPLY CONTRACT W = WORKS CONTRACT
O = OPERATION CONTRACT T.B.D. = TO BE DECIDED
PRE = PREQUALIFICATION I = IDENTIFIED
P = PROPOSAL F = FEASIBILITY

6. Conclusions and Recommendations

This section is a presentation of the outstanding issues which the Sector have to face in the future and its intention is only to show awareness of them for consideration in the long-term strategy of the Solid Waste Management.

The conclusions and recommendations have been broken down into the following issues for better understanding.

- Consultants studies and supervision
- Technical Decisions
- Works Contracting
- Planning

6.1 Consultants studies and management

Consultants studies and management of the same are not being executed according to state of the art techniques to facilitate the execution of the projects.

Consultant studies and supervision contractual obligations recommendations to be incorporated in future projects has been submitted to CDR for revision and approval on the following topics:

- Job execution sequence CPM
- Cost estimates
- A job explanation meeting to prospective bidders
- Safety and security requirements contractual requirements
- Constructability procedures

6.2 Technical Decisions

The MOE has been actively working on working procedures for CDR/MOE to ascertain improvement of technical decisions on the following issues:

- Job co-ordination (Planning & Scheduling)
- Detailed work break-down structures
- Work progress measuring systems
- Procurement progress measurement systems

- Cost control at all project levels
- Value engineering
- Evaluation and implementation of changes
- Quality control
- Management Information systems
- Historical data base information

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6.3 Works Contracting

It has been found that the contracting of works has been clearly impacted by the lack of essential project management principles which should have been incorporated in the contracting documents to facilitate management of the projects.

The following recommendations has been forwarded to CDR and will be followed up for their implementation when negotiating future contracts:

- Minimum planning and scheduling required to work along CDR guidelines
- Progress measuring system
- Variation orders implementation under the currently approved plan
- Early warning systems (Cost and schedule)
- Payments relation to progress achievements
- Procurement schedule
- Manpower allocation
- Equipment and tools allocation

6.4 Planning

Planning within the Sector has been quite deficient with regard to:

- Leadership
- Guidelines
- Contractual obligations
- Reporting goals
- Automation
- Training

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