

## 10.0 Environmental Management Plan and Office

A primary goal of Environmental Impact Assessment (EIA) is to develop procedures to ensure that all mitigation measures and monitoring requirements specified in the approved EIA will actually be carried out in subsequent stages of project development. These mitigation measures and monitoring requirements are normally set out in an Environmental Management Plan (EMP). A well structured EMP usually covers all phases of the project, from preconstruction right through to decommissioning. The Plan outlines mitigation and other measures that will be undertaken to ensure compliance with environmental laws and regulations and to reduce or eliminate adverse impacts. Specifically, the EMP outlines:

- the technical work program to carry out the EMP, including details of the required tasks and reports, and the necessary staff skills, supplies, and equipment;
- a detailed accounting of the estimated costs to implement the EMP; and
- the planned operation or implementation of the EMP, including a staffing chart and proposed schedules of participation by the various members of the project team, and activities and inputs from various governmental agencies.

The main mechanism for implementation of the EMP is the establishment of an Environmental Management Office (EMO). The EMO is to be established, with sufficient staffing and budget, as part of the project proponent's Project Management Office. Environmental staff in this office work alongside the construction and operation personnel to ensure that the measures and requirements outlined in the EMP are actually carried out. The establishment and funding of an EMO is essential insurance for environmentally sound projects.

### 10.1 Implementing an Environmental Management Plan

Implementation of the EMP requires that:

1. the detailed final design (plans and specifications) for the project incorporates all mitigation measures specified in the approved EIA. This is facilitated if the EIA is conducted as an integral part of the project feasibility study;
2. the contract for construction of the project includes all mitigation measures to be implemented. The mitigation measures should be sufficiently detailed that the construction contractor, in preparing his bid, will be clearly aware that he will be required to comply with these mitigation measures;
3. the construction contractors' performance is duly monitored for compliance with the EMP by competent environmental construction inspectors furnished by the EMO. This means implementation of the construction stage portion of the Environmental Monitoring Program specified in the EIA;
4. on completion of construction, inspection takes place to check that the works, as built, meet all significant environmental requirements before the project is officially accepted;
5. the operations stage monitoring program is implemented as specified in the EMP; and
6. there is effective reporting by the EMO, through the Project Management Office, to show that the EMP is being properly managed.

### 10.1.1 Modifications in Detailed Final Design

In developed countries, laws and regulations require that mitigation measures specified in the EIA be incorporated into the detailed final design of the plans and specifications. These requirements are duly enforced. In many developing countries, it has been difficult to ensure the mitigation measures are incorporated in the final design. Numerous projects have been constructed without proper attention to the specified mitigation measures. The EMO staff are responsible for working with the project design engineers to ensure the mitigation measures are incorporated into the detailed design; as such, the description in the EIA of the required mitigation measures must be sufficiently detailed to permit the design engineers to understand exactly what is needed. It is thus preferable for the EIA to be an integral part of the overall feasibility study — thereby allowing for mitigations to be routinely included by the design engineers.

### 10.1.2 Construction Contractors' Contract Requirements

Past experience has shown that many construction contractors do not fully understand their obligations with respect to mitigation measures. Often, they do not make adequate provision for this work during bid preparation, and they find themselves without sufficient monies to carry out the works needed to implement mitigation measures. This makes them reluctant to comply with the requirements of the EIA and EMP. It is important that the construction contract include provisions to ensure: 1) the construction contractor clearly understands mitigation requirements, 2) environmental construction inspectors from the EMO monitor the contractor's performance in this regard; and 3) the mitigation measures are specified in sufficient detail that the contractor can make reasonable estimates of actual costs (see Box 10-1). Staff from the EMO must work and cooperate with the design engineers to gain agreement on final contract details.

**Box 10-1:** Mitigation measures must be of sufficient detail to guide construction contractors and allow for realistic cost estimates.

Mitigation Measure	Contract Requirements
resurfacing of exposed areas	provide estimate of actual area to be resurfaced
prevent soil erosion operations so as not to incur damages to adjacent properties and downstream waterways	require that dikes or other erosion control structures must be built and provide examples of acceptable structures
eliminate objectionable noise nuisances to neighboring properties	specify allowable noise limits
will control dust nuisances	specify dust control is to be undertaken

### 10.1.3 Environmental Supervision of Construction

Environmental construction inspectors from the EMO must work alongside and together with the engineering construction supervisors to ensure the specified mitigation measures are carried out. The environmental construction inspectors must keep daily log books of their work and observations for this purpose. This is a common practice for engineering construction supervisors. Environmental construction inspectors should prepare periodic reports (weekly and monthly) to the EMO. These reports should document instances of inattention to mitigation measures and suggest needed improvements in the mitigation measures. Copies of this report should be provided to the chief engineering construction supervisor.

The EMO should cultivate appropriate working relationships between the engineering construction supervisors and the environmental construction inspectors. General agreement should be made on reporting procedures. Usually the construction contract will give legal authority to the engineering construction supervisor to supervise the work; in such cases, the instructions from the environmental construction inspector to the construction contractor may need to be transmitted via the engineering construction supervisor. When problems are identified by environmental construction inspectors, it is essential that the EMO act quickly to ensure that the construction contractor take corrective action.

#### **10.1.4 Environmental Acceptance of Completion of Construction**

Environmental Management Office staff should participate in the inspection of completed construction works to ensure that the mitigation measures have been completed as related to environmental requirements. Where possible, final payment to the construction contractor should be withheld until the EMO certifies concurrence with mitigation measures proposed in the EIA and EMP.

#### **10.1.5 Monitoring During Operations Stage**

Staff from the EMO are responsible for ensuring the operations stage monitoring program is successfully implemented. Part of this responsibility includes ensuring proper report preparation and distribution. This includes periodic reports as well as special reports needed for managing special environmental problems which may arise. Monitoring is necessary to ensure that the mitigation measures specified in the EIA are effectively implemented. It is also necessary for identifying any significant environmental deficiencies in the project plan. Quantified descriptions of deficiencies in the project facilities and operational procedures should be prepared. Recommendations for corrective action should include firm justifications based on the monitoring observations.

#### **10.1.6 Opportunities for Environmental Improvements**

The EMO's monitoring operations, at both the construction and operational stages, should identify potential modifications to the overall project plan to enhance environmental protection. Many development projects present opportunities for add-ons not directly related to the primary project objective. Often valuable environmental benefits can be realized for a small incremental cost.

### **10.2 Environmental Management Office**

The EMO should be established by the Project Management Office as soon as possible, preferably in time to manage planning and carrying out of the EIA, and certainly prior to implementation of construction. Should it not be possible to establish the EMO until after completion of the EIA, consideration should be given to use of the EIA team to serve as the interim environmental management office pending official establishment of the EMO.

A budget (covering the project's design life period) for the EMO should be an integral part of the project's core budget. It should include funding for the EMO staffing, environmental construction inspectors, and monitoring done by other agencies on behalf of the EMO. The budget should cover both the construction and operational stages, as well as facilities and support. For major projects, the EMO staff should include a professional engineer (usually as the full-time EMO Chief), an ecologist, a sociologist, and an economist.

### **10.2.1 Reporting by Environmental Management Office**

The EMO is to prepare and distribute, through the Project Management Office, periodic reports. These monthly and annual reports on its operations should be of sufficient detail to allow both public and private sectors to evaluate the environmental soundness of the project. The report should provide information on both the project plan and operations, including attention to needed corrective measures. Generally these reports should be distributed by the Project Management Office to concerned government agencies (including the environmental agency) and to other concerned agencies, including those participating in project funding.

The EMO, based on the information from its various activities, is in an excellent position to assist in preparing post evaluation and auditing reports which may be required by the multi-lateral development banks (for example, the Asian Development Bank and the World Bank).

### **10.3 Environmental Review Panel**

In the event of major projects, it may be desirable for the project proponent to establish an Environmental Review Panel which meets periodically (for example, semi-annually) to guide the EMO operations. The Panel would prepare reports on each visit (say ten days per visit for major projects); these reports would include a description of observations, findings, and recommendations for improvements. Such a panel is not only valuable for guiding the EMO operations to suit the project proponent's needs, but also for ensuring optimal cooperation with all agencies who have significant concerns about the project's environmental effects.

### **10.4 Difficulties in Implementing the Environmental Management Plan and the Environmental Management Office**

Those responsible for managing development projects in developing countries may not readily be receptive to the need for an EMP and the creation of an EMO. Some decision makers and developers lack proper understanding of the necessity and benefits of environmentally sound design and effective mitigation measures. Others are reluctant to commit the financial resources necessary to hire staff and operate an EMO. Many wish to minimize the costs associated with implementation of the mitigation measures and monitoring requirements. These costs are really quite small relative to overall project costs, yet are usually essential in terms of achieving an environmentally sound and sustainable project.

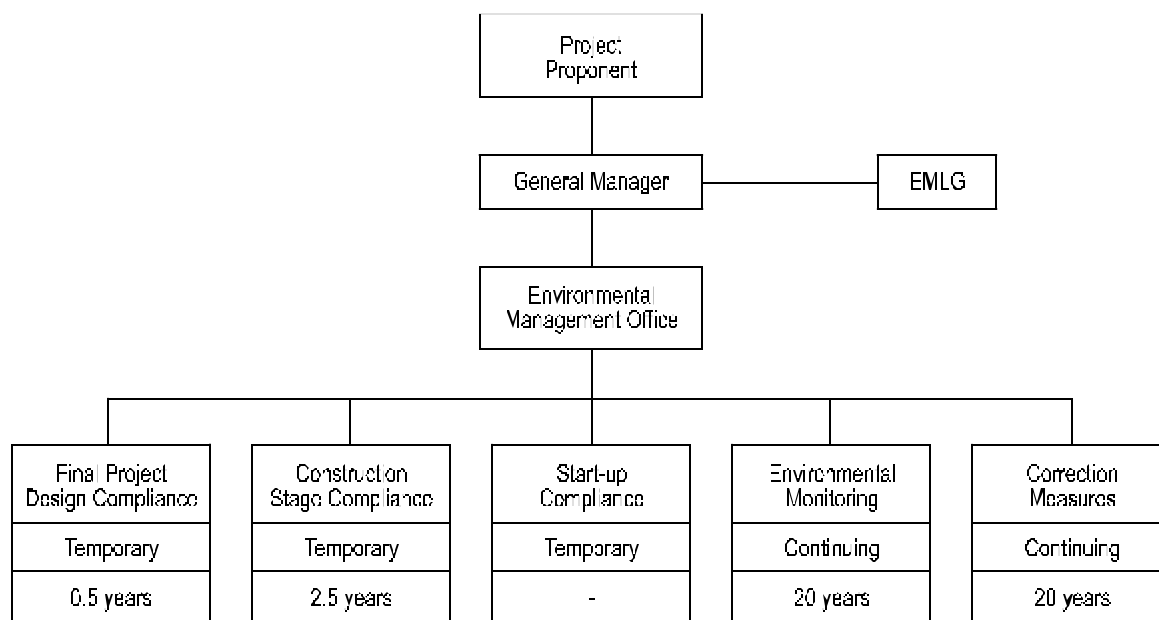
### **10.5 Generic Environmental Management Plan and Environmental Management Office**

The generic EMP and EMO (Figure 10-1 and Tables 10-1 and 10-2) are representative summaries of an approach being utilized for major water resource development projects in PRC. Similar approaches can be used for any type of project.

The basic functions (Table 10-1) that must be discharged to implement the EMP change as the project moves through its various phases. During the pre-construction stage, the focus is on establishing the EMO, ensuring the final design incorporates the appropriate mitigations, and finalizing construction contract requirements for mitigation and monitoring. During construction, the focus is on ensuring the construction contract requirements are fulfilled. These requirements include basic health and safety requirements as well as ensuring the project works and mitigation measures are environmentally sound. During operations, the monitoring programs begin in earnest and the role of the EMO shifts to identifying problems and recommending corrective actions. Throughout implementation of the EMP there are a number of functions that must be discharged. These

include liaison with environmental agencies, preparation and distribution of periodic reports, preparation of press releases, public participation and consultation, and benefit cost analysis of the EMP.

The staff of the EMO (Table 10-2) will include a chief engineer, an assistant chief engineer, an ecologist, a socio-economist, an economist, consultants, and inspectors. The level of effort required from these individuals changes throughout the project. The estimates of level of effort (Table 10-2) are based on: 1) a 0.5 year pre-construction period; 2) a 2.5 year construction period; and 3) a 20 year operational period. The estimates do not include the costs of monitoring or training, but do include the costs of supervising monitoring and training. The estimates also do not include the level of effort for the Expert Panel which includes four local professionals plus two foreign experts. The Panel meets every six months, for a total of six meetings from start to end of the construction period. These estimates are based on the approach being taken in the People's Republic of China for large water resource developments. The required level of effort for projects in other sectors and jurisdictions may be very different.



*Notes:*

1. The time frames shown above were selected for illustrative purposes. These time-frames must be tailored to match the particular project.
2. Final design for the project including contract documents, plans and specifications must include the EPMS specified by the EIA.
3. Provisions for the construction stage must include construction supervision for environmental matters as well as the usual construction supervision for engineering activities.
4. On completion of construction, a trial run will be conducted to be sure that EPMS have been implemented effectively.
5. Operational phase monitoring will be done to ensure that the project is being operated in compliance with the constraints intended to protect the environment, and to provide feedback necessary to identify and correct residual problems or to take advantage of enhancement opportunities.
6. Approval of officials will be gained so that required engineering or institutional correction measures can be carried out.

**Figure 10-1:** Implementation of an Environmental Management Plan.

**Table 10-1:** Example environmental management functions and Environmental Management Office work load.

Work Items	Frequency / Timing	Annual Level of Effort (Person Months)
<b>1 Pre-construction (PC)</b>		
1.1 Establishment of Environmental Management Liaison Group and Environmental Management Office	as soon as possible	6
1.2 Ensuring that final designs incorporate mitigation measures	during preconstruction	6
1.3 Ensuring that contractor's contract includes mitigation measures	during preconstruction	6
1.4 Planning of construction stage Environmental Management Office program	during preconstruction	2
1.5 Beginning implementation of training program	during preconstruction	6
1.6 Planning for use of Expert Panel on Environment	during preconstruction	2
	Total	28
<b>2 Construction Period (CP)</b>		
2.1 Complete environmental training program	start of construction	2
2.2 Implement use of environmental construction inspectors and use of environmental inspection reports for controlling the construction contractor's operations	start of construction	72
2.3 Medical screening and facilities for construction works	start of construction	2
2.4 Water supply, sanitation, housing for construction camps	start of construction	2
2.5 Insecticide spraying of construction camp buildings	start of construction	1
2.6 Ensuring health and safety of tunnel construction workers	start of construction	2
2.7 Ensuring carrying out of mitigation measures of resettlement program (housing, water supply, sanitation, etc.)	start of construction	1
2.8 Checking on disease rates in construction camps and in service areas/vicinity for hemorrhagic fever, malaria, encephalitis	start of construction	2
2.9 Rat control measures at construction camps	start of construction	2
2.10 Check on adequacy of disposal of tunnel excavation materials	start of construction	2
2.11 Other mitigation measures	start of construction	4
2.12 Planning and implementation of special studies shown needed by items above	during construction	2
2.13 Assisting in establishment of institutional system for integrated water and waste management and reuse for optimal use in target areas, including permit systems	during construction	4
2.14 Assistance to institutional system of 2.13 in planning and implementation of water use, waste management, and water reuse facilities	during construction	4
2.15 Use of expert panel on environment	during construction	4
	Total	118
<b>3. Operation Stage</b>		
3.1 Implementation of monitoring program	start of operation	36

Work Items	Frequency / Timing	Annual Level of Effort (Person Months)
3.2 Based on results of 3.1, plan and implement necessary connections for project facilities and for operation/ management of project facilities	during operation	2
3.3 Based on results of 3.1, plan, recommend, and implement desirable environmental enhancement facilities/programs	during operation	2
3.4 Formulate and implement needed additional training	during operation	1
3.5 Formulate and implement needed additional special environment studies	during operation	1
3.6 Continuation of 2.13	during operation	2
3.7 Continuation of 2.14	during operation	2
	Total	46
<b>4. Continuing Activities</b>		
4.1 Liaison with environmental agencies, provincial agencies, local agencies	continuing	6
4.2 Preparation and distribution of periodic Environmental Management Office reports	semi-annual plus specials	3
4.3 Preparation and use of media releases	continuing	3
4.4 Public participation and consultation	continuing	6
4.5 Estimation of the cost and benefits of environmental management plan	annual	2
4.6 Overall administration of environmental management office	continuing	12
	Total	32

**Table 10-2:** Estimated staffing requirement for the Environmental Management Office.

Item / Professionals	Pre-construction (half-year)	Construction Period (2.5 years)		Operation Period (20 years)	
	Total Months	Annual Months	Total Months	Annual Months	Total Months
Chief Engineer	6	12	30	12	240
Asst. Chief Engineer	6	12	30	12	240
Ecologist	6	6	15	6	120
Socio-Economist	6	8	20	6	120
Economist	2	4	10	2	40
Consultants	2	4	10	4	80
Inspectors	0	72	180	36	720
<b>Sub Total</b>	<b>28</b>	<b>118</b>	<b>295</b>	<b>78</b>	<b>1560</b>

### 10.6 Xiaolangdi Project

An EMP was prepared for the Xiaolangdi multipurpose dam and reservoir project on the Yellow River at Xiaolangdi in Henan Province of the People's Republic of China (Ludwig et al, 1994). The Xiaolangdi Project, under construction (circa 1997), is a major project with the primary objectives of flood control, sediment control in the Yellow River channel, power production, and water supply. The EIA took six years and involved a team from the Yellow River Conservancy Commission (YRCC) supported by eighty-eight Chinese experts. An international Panel of Experts was appointed to provide advice on dam design and safety factors.

The EMP provided for the establishment of an EMO to lead and coordinate the implementation of all mitigation measures and monitoring requirements (section 9.3 provides more information about the monitoring program). The responsibilities of the EMO include: 1) management of periodic monitoring for assessing actual effects; 2) planning and implementing corrective measures; 3) providing periodic reports and, as needed, special reports for distribution to concerned government agencies and the World Bank. The work of the EMO is funded by the core project funding.

The EMP includes a number of major sub programs (Table 10-3).

- seismic monitoring program;
- resettlement program;
- protection of cultural relics;
- sanitation and anti-epidemic program;
- monitoring of hydrology, sediment, meteorology, and water quality;
- management of the construction area;
- reservoir clearing;
- special studies; and
- environmental library, consultants, and technical exchanges.

Most of these programs will be implemented by agencies other than the EMO, however, it will have major responsibilities to monitor and report on the performance of these programs. For example, the YRCC Hydrographic Bureau will be responsible for monitoring of hydrology, sediment, meteorology, and water quality,

while the EMO will monitor their performance, evaluate the monitoring results, and, if necessary, recommend corrective action.

Table 10-4 illustrates the staffing requirements and responsibilities for the EMO. The staff are organized into five sections: 1) chief engineer's office; 2) deputy chief engineer's office; 3) management section; 4) monitoring section; and 5) administrative section.

The total budget (Table 10-5) for the EMP is 132 million Chinese Yuan (approximately \$US 16 million in 1994). While not specifically included in the EMP, environmental enhancement programs for recreational development and aquaculture were identified in the EIA. An additional investment of 8,130,000 Yuan for recreational development and 850 million Yuan for downstream aquaculture is required to maximize the benefits from the Xiaolangdi reservoir.

**Table 10-3:** Summary description of Xiaolangdi Environmental Management Plan.

	Task Description	Implementor	Monitor
	organize and monitor implementation of environmental protection activities	Yellow River Water and Hydropower Development Corporation (YRWHDC)	National Environmental Protection Agency, Water Resources
ng	1. organize and monitor implementation of environmental protection activities 2. monitor the region 35 km upstream and 10 km downstream of the dam 3. prepare monthly seismic reports, and to expeditiously report unusual events to the decision makers	Reconnaissance Planning and Design Institute under YRCC	Environmental Management Office (EMO) under
	1. complete EIA of resettlement area 2. organize and implement environmental aspects of resettlement planning 3. write up quarterly report on resettlement progress 4. do annual socioeconomic environmental evaluation in the host area 5. conduct environmental management of development projects	local resettlement offices, environmental protection bureaus (EPBs), experts employed by EMO	EMO under YRWH
ns	1. organize and monitor implementation of environmental protection activities 2. prepare quarterly reports	provincial cultural relics bureaus	National Cultural Relics Administration, EMO under YRWH
ic	1. give annual physical examinations to construction workforce and to 1-10% of people in affected areas 2. monitor epidemic situations, rats, mosquitoes, diet, hygiene 3. control rats and mosquitoes to prevent malaria, encephalitis and hemorrhagic fever 4. distribute vaccines to susceptible communities	reservoir anti-epidemic station, and station at province, prefecture, and municipal levels	EMO of YRWHDC
	1. monitor reservoir and downstream hydrology 2. monitor reservoir and downstream sediment 3. conduct meteorological monitoring 4. analyze water quality and bottom sediment	YRCC Hydrographic Bureau	EMO under YRWH
on	check on contractors' implementation of environmental protection rules	local EPBs, EMO of YRWHDC	EMO under YRWH
	clear the reservoir area	Resettlement Offices	EMO under YRWH
	1. Study of surface and ground water balance 2. Study of downstream aquaculture 3. Planning of recreation development 4. Feasibility study of reservoir navigation 5. EIA for irrigation areas	YRCC, relevant authorities of Henan Province	EMO under YRWH
	1. set up an environmental library 2. employ expert consultants as required 3. technically train staff of EMO and EIA Team	EMO under YRWHDC	YRWHDC

**Table 10-4:** Staffing and responsibilities of Xiaolangdi Environmental Management Office.

Sub-Division	Man-Month / Year	Person	Main Tasks
Director	12	1	overall responsibility, representative on Environmental Management Leading Group
Chief Engineer	12	1	1. Assisting Director in preparing and reviewing Environmental Management Office technical reports 2. Responsible for annual technical reviews and appraisal

Management Section	6	0.5	1. Long-term planning of mitigation measures, annual work plans
	6	0.5	2. Assisting Planning and Financial Department in allocating money in EMMs.
	24	2	3. Checking and monitoring implementation of mitigation measures
	12	1	4. Coordination between resettlement agencies, local environmental protection bureaus and cultural relics bureaus
	12	1	5. Controlling environmental protection at site, monitoring and checking contractors' implementation of environmental provisions
	12	1	6. Preparing quarterly and annual reports on performance of mitigation measures
Monitoring Section	12	1	1. Responsible for implementation and coordination of environmental monitoring programs
	12	1	2. Statistics and analysis of monitoring results, recommending how to control unfavorable impacts (in consultation with management section)
	12	1	3. Preparing annual monitoring reports on XLD Project
Administrative & Foreign Affairs Section	18	1.5	1. Management of library and technical files including translation as necessary
	6	0.5	2. Technical training and international liaison, accessing funding for environmental work form various sources
	6	0.5	3. Preparing bulletin on XLD environment
	18	1.5	4. Daily affairs of Environmental Management Office (secretarial, etc.)
<b>Total</b>	<b>180</b>	<b>15</b>	

Not all the costs will be part of the implementation of the EMP. Other agencies will also have significant disbursements. For example, an additional 105 million Yuan is required for environmental aspects of the resettlement plan, and another 18,660,000 Yuan will be spent on protection of cultural relics.

**Table 10-5:** Cost estimate (millions of Yuan) for the Xiaolangdi Environmental Management Plan.

Item	Total (10 <sup>6</sup> Yuan)	Capital Construction (10 <sup>6</sup> Yuan)	Equipment (10 <sup>6</sup> Yuan)	Implementation & Operation Cost (10 <sup>6</sup> Yuan)
1. Seismic Monitoring	7.10	0.73	2.05	4.32
2. Resettlement Management	1.07			1.07
1) Impact Assessment	0.61			0.61
2) Management & Monitoring	0.46			0.46
3. Salvage of Cultural Relics	17.16			17.16
4. Sanitation & Anti-epidemic	4.24	0.27	0.30	3.67
5. Monitoring of Hydrology, Sediment, Meteorology & Water Quality	71.62	9.05	16.25	46.32
6. Reservoir Clearing	10.85			10.85
1) Optimization	0.04			0.04
2) Reservoir Clearing	10.81			10.81
7. Environmental Management Office (including library)	4.65	0.50	0.60	3.55
8. Technical Exchanges & Training	0.50			0.50
9. Special Studies	0.65			0.65
10. Advice by Experts	2.43			2.43
11. Sub-total of items 1-10	120.27	10.55	19.20	90.52
12. Contingency (10%)	10.03			
13. Total for EMP Implementation (items 1-12)	132.30			
14. Recreation Development	8.13			
15. Downstream Aquaculture	850.00			

Table 10-6 shows an example table of contents of a report prepared by the EMO's Expert Panel for the EMO of the Xiaolangdi project, based on a periodic inspection/review of the EMO's environmental monitoring during the construction stage. A brief excerpt from the report (Box 10-2) illustrates the type of conclusions and recommendations contained in the report.

**Table 10-6:** Example table of contents for a report by the Environmental Management Office of the Xiaolangdi project.

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**Report of Xiaolangdi Expert Panel on  
Visit to Zhengzhou of 3 to 11 September 1995 (3rd Panel Meeting)  
For Review of Environmental Management Offices Construction Stage Monitoring**

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        - 4.3.6.1 Scope of Task
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        - 4.3.13.3 Solid Waste Management
        - 4.3.13.4 Schools, Clinics, Hospitals, Roads
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      - 4.3.14 Missing Items in PR/4
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  5. Management Information System (Environmental Aspects)
  6. Recommendations for Preparation of Future PRs
  7. Recommendations for Future Visits by Environmental Panel
  8. Next Panel Meeting
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**Box 10-2:** Excerpt from Expert Panel Report - Xiaolangdi project. The text has been edited for readability and to remove direct references to specific individuals.

#### **4.3.15 Conclusions and Recommendations (Progress Report /4/Section 3)**

##### **4.3.15.1 Progress Report /4/Section 3 (ii)**

This discussion notes that the overall construction program managed by XECC treat environmental protection lightly. This is precisely why environmental monitoring of the construction operation is so important.

Item (ii) of progress report 4/Section 3 notes that the Environmental Handbook (Reference 2) is to be distributed to all construction zone staff so that they will pay conscientious attention to environmental protection in their future work. The Handbook should indeed be distributed to officials concerned with dam construction (and also to those concerned with Resettlement), but this should not be interpreted to mean there will be compliance, compliance can be expected only with use of enforcement procedures noted in Section 4.2.

##### **4.3.15.2 Progress Report 4/Section 3 (iv)**

This statement is not consistent with progress report 4/Section 2.5 (which indicates that all is OK).

##### **4.3.15.3 Progress Report 4/Section 3 (v)**

See Section 4.2 (a)(b)(c).

#### **5. Management Information System (Environmental Aspects)**

This is missing in progress report 4. Please include this in future progress reports.

#### **6. Recommendations for Preparation of Future Progress Reports**

Based on all of the discussion above, Annex A has been prepared to serve as a guideline for preparation of future progress reports.

#### **7. Recommendations for Future Visits by Environmental Panel**

(a) One day of the field visit should be allocated for a classroom meeting at the dam site of the Environmental Panel with Environmental Management Offices group of Environmental Inspectors, plus others, for detailed discussion of the work of the Environmental Inspectors. This should include i) presentation by each Environmental Inspector to describe his own work, with typical copies of his routine reports, ii) presentation on effectiveness of relationships with the Engineering Supervisor of Construction, and iii) presentation on technical problems.

(b) The next field visits to the construction zone should include inspection of points of discharge of sewage effluent to waterways and of the refuse disposal site.

© The Environmental Panel and the Resettlement Panel both need to focus their field visits to Resettlement communities on Resettlement communities which have been completed, including infrastructure, and which are occupied and being lived in.

(d) One full day should be allowed by Environmental Expert to prepare his final draft report (same for the Resettlement Expert) and the next day for translation, with the following day for discussion of the draft (Panel Member to read Chinese draft at the beginning of the third day, to set the stage for discussion of the draft).

#### **8. Next Panel Meeting**

This is scheduled to begin 14 April, 1996.

### 10.7 Summary and Conclusions

The implementation of an EMP and EMO is relatively new in EIA for developing countries, having evolved in the early years of the 1990s. This evolution happened because it was found that, in many past projects, the EIA requirements were not actually achieved in the project's final design, construction and operation. It is now recognized that an EMP implemented through an EMO is essential for ensuring environmental soundness in developing country project planning and implementation. The benefits are great compared to the relatively low cost.

### 10.8 References and Further Reading

**Ludwig, H.F., D. Gunaratnam, and Z. Yuming.** 1994. Environmental impact assessment for Xiaolangdi Yellow River multi-purpose economic -cum-environmental improvement project. *The Environmentalist*, 14(3): 1-12.