

## **6.10 Strategy and Measures for Strengthening Environmental Awareness and Education**

### **6.10.1 Analysis.**

Strategy emerges from analysis of the present situation. A summary of the analyses made earlier are as follows:

- Identify key environmental issues and problems in Hanoi.
- Identify social, legal and institutional context
- Identify audiences who should receive EEAR, and the topics for EEAR and skills needed
- Identify current strengths and weaknesses in audiences' knowledge, awareness and practices
- Identify suppliers of EEAR and evaluate their current strengths and weaknesses
- Analyse the underlying causes for weaknesses in design, delivery and acceptance of EEAR

Table 6.10.1 illustrates the current level of environmental awareness and future needs according to the main audiences.

### **6.10.2 Strategy.**

To be effective, the strategy must i) identify priorities for EEAR, ii) build on existing strengths and address areas of weakness, iii) avoid unnecessary duplication of activities, iv) design measures to address institutional and policy problems and promote synergistic solutions, and v) prepare an action plan of priority studies and projects to move towards implementation.

#### **(1) Priorities.**

From the earlier evaluation, two related topics stand out:

- a) Management of solid and liquid wastes, both by households and industries,
- b) Conservation and management of wetlands, involving the inter-related system of lakes, rivers and marshes in the Hanoi region

These two topics are intimately connected. Bad management of wastes leads both to directly to disease, and also to pollution of the water bodies and their encroachment by filling with wastes. This, in turn, leads to further transmission of diseases from the polluted water, as well as destruction of aquaculture businesses. Poorly planned development around the water bodies leads to further encroachment and reduction in their critical functions of flood reduction, space for

recreation, and purifying the air through their surrounding trees.

A program of EEAR activities focussed on these topics, and highlighting their linkages would intensify and deepen the "Clean and Green Hanoi" slogan. A slogan for this initiative might be "Clean Communities, Healthy Lakes"

Some further advantages of such a linkage is that it would i) address the highest priority at the community level (wastes) with the highest priority for city-wide environmental management (wetlands), ii) it could use the interests and efforts of existing mass organizations and NGOs, and iii) it would act both on changing behaviour in the immediate living environment and in strengthening the people's capability to influence and participate in city-wide strategy and decisions.

## (2) Program Activities..

To implement the strategy, programs and resource materials are needed. The programs would focus at two levels:

- a) At the community level: Strengthen selected programs focussed on i) women's actions to improve waste management and greening in their households and neighborhoods, with a special emphasis on newly-developed areas of the city where wastes are poorly managed, including all communities around water bodies and marshes, ii) school children in districts surrounding water bodies – the emphasis would be to implement, in a few pilot schools, the environmental education strategy developed by the MOET, iii) cleaner industry program, focussed on industries polluting the water with solid and liquid wastes, and iv) a pilot program in community land management in an district around West Lake, which would strengthen the local stakeholders' abilities to plan local land uses, re-adjust plot boundaries to allow space for infrastructure and public facilities, and implement improved waste management methods,
- b) At the city-wide level the strategy would comprise two programs: i) mobilizing youth motivators to raise awareness and action on the lakes and wetland system in surrounding communities and preparing a plan for the conservation of the wetlands which they would then promote to the city authorities, and ii) strengthening awareness among policy-makers and the mass media on environmental management and quality of life, including issues of waste management and wetlands. Additional work in this area will need to focus on training of government officials in the organizations which develop EEAR , and more details on this are provided in the Human Resource section of this report.

Details on the programs which serve to get this strategy under way, and the organizations which could implement them are described later in this section in

the Action Plan, and summarized in the list of priority projects in a later chapter.

(3) Supporting Measures.

The second part of a strategy is to design and implement a set of institutional, policy, and resource measures which will provide a proper supporting framework for EEAR in Hanoi in the future. It would build on existing strengths, eliminate areas of weakness and fill important gaps.

The following weaknesses and gaps in EEAR were identified:

- a) lack of continuity
- b) fragmentation and isolation
- c) inadequate organizational arrangements
- d) weak knowledge base
- e) weak links to public policy
- f) lack of secure source of funding
- g) inadequate legal basis for public participation
- h) untapped potential for partnership with the private sector
- i) effectiveness of mass organizations, some NGOs, and some programs of international assistance
- j) scope for intensification of awareness and practical education in urban schools
- k) gradual build-up of numbers trained in higher technical and management courses, (although basic technical, and also the policy courses are inadequate).
- l) rising awareness of environmental issues among the public, and increasing attention from the communications media.

Most measures which affect Hanoi, such as legal and organizational changes, will need to be initiated by the central government. The following measures would support each other, and if possible, should be implemented together. Each measure would address some of the subjects noted in the above paragraph, and are cross-referenced to them in the text

- *Public Relations and Environmental Awareness (PREA)*

This division to be created as part of new Hanoi Environmental Agency (HEA) would have responsibility both for environmental awareness and public relations. It should cover the following functions:

- a) Research and Development in Communications – including problem evaluation, audience and resource identification, strategies (e.g. social mobilization, advocacy, social marketing, networking, visioning), preparation of management plan and communication materials, monitoring and evaluation.

b) Programs and Public Information and Relations – including implementation of targeted programs in information dissemination and support to specific social groups such as NGOs, business and industry groups, children and youth, women, government organizations and mass media, using an appropriate selection of the strategic activities noted above. It would also respond to questions and inquiries from the public and prepare speeches for officials.

While starting as a small group of 3 to 4 staff, the size of the problems in Hanoi and the scope of interaction with the numerous interest groups indicate that it should rapidly develop a larger staff, well-trained in PREA techniques. Technical assistance to provide support and advice to the division is proposed. (ref. a, b, c, d, e, h, k above)

- *Improve the quality of environmental data.*

This is a key measure to establish the accuracy of information for purposes of policy-making, for assessing the health of the environment, for identifying polluters and appropriate levels of penalties, and for providing accurate information for public discussion and awareness. This work requires long-term improvements to ambient and point monitoring, sample analysis and data compilation and analysis. VCEP and other programs have been working on this, and the effort needs to be extended, together with improvement of facilities and staff training.

- *Prepare resource materials and train trainers*

This activity would be based in PREA with support from IET division of the NEA. For the immediate needs of the Action Plan, however, resource materials for the priority projects need to be prepared before the HEA is established. It is proposed that some of these materials would be prepared by consultants, based in DOSTE, or by university research institutes. Other materials could be prepared by the organizations implementing the priority projects, using consultants if required. (ref. d, e, i, j above)

- *Strengthen the awareness of key Departments in the Hanoi government and in the District and Ward People's Committees.*

The broader issue of human resource development is addressed in Chapter 5 of the report. There needs to be a unit, or at least a designated staff member within each sectoral department, and a DOSTE unit in each district government which can act as the environmental knowledge resource, and be the contact point for communication with MOSTE/DOSTE. Improving the accessibility of environmental information to the departments and the mass organizations would be helped if NEA established an Internet Web site for

environmental laws, policies, guidelines, case studies etc. (ref. b, c, d, e, k above)

- *Access to Information.*

Improvements in environmental quality in Vietnam require easier access to information by the public, greater accountability to the public by government agencies and polluters, and stronger support to NGOs which address environmental and social problems. In relation to urban issues the following areas of legislation need attention:

- i) Right to Information – citizens and interest groups should have right of access to data or information from government or state agencies in order to monitor the conduct of their functions by government officials when these activities have or may have impacts on an individual or the concerns of a public interest group.
- ii) Right to a Public Hearing – citizens should be entitled to information, explanation and reasons to be given by government agencies, state enterprises and local authorities prior to approval or implementation of projects or activities which may have adverse impacts on the environment, health, life quality and other significant interests of the citizen or local community affected. They should have the right to express their views on the matter through a public hearing process.

Related areas of legislation or regulation may need adjustment such as guidelines for public participation in the environmental impact assessment process and the urban planning process, and requirements for industries and developers to provide regular information on effluents and emissions from their facilities and products. Following a workshop to discuss the issue, a short study could be undertaken to review the legislative basis for access to information and public participation and recommend adjustments.

- *Establish a Partnership with the Private Sector.*

The awareness activities can be greatly strengthened through involvement of the private sector. A potential range of partners could include i) local merchants and businesses, ii) large local corporations, iii) international corporations operating in Vietnam, iv) international foundations. Work will be needed to identify those potential partners who could have a particular interest in environmental awareness, discuss with them the financial or other resources they could offer, and develop a working group to plan for their involvement. Activities in EEAR which could be undertaken include i) sponsorship and promotion of some of the community and city-level programs proposed here, ii) establishment of a waste exchange information

system through the VCCI, iii) endorsement of the "eco-labelling" system and its joint management with DOSTE, iv) technical outreach from larger to smaller firms, v) advice network on environmental technology and management between international and local firms, etc. Development of this approach could be undertaken as a part of the technical assistance package to the HEA division on IEC.

### **6.10.3 Action Plan**

Ideally, environmental awareness needs to be promoted in advance of the implementation of hardware projects, in order to use the understanding and input from the public for better program and project design. Even when this has not happened, it is important to start EEAR activities as soon as possible. Since the cost of EEAR is low, and initiatives are diverse and flexible, it should be possible to raise funds for them in a shorter time frame than for hardware projects. Some initiatives rely on existing organizations, and can start very quickly and in parallel. Others may have to wait for improvements to institutions or development of data. The following action plan has been developed with this in mind and also designed to address the three major strategic areas noted above, namely, i) policy studies and organizational strengthening to provide a firm basis for long-term, continuing program of EEAR, ii) activities focused on EEAR at the community level, iii) activities addressed to city-wide issues, and in addition iv) international linkages with EEAR in urban areas. Each of the organizations noted in sections B) and C) below have prepared proposals for action on the topics for which they would be responsible. Each project now needs to be refined and developed in more detail.

#### **(1) Institutional Support and Policy Studies.**

- 1) Organization and development support to the PREA division in the Hanoi Environment Agency.

This assistance would form part of the overall support to the HEA. It would cover the organizational design, staff job descriptions, and design for most of the Research and Development Section's activities, and identify the Program Section's activities which would be undertaken beyond the immediate priority projects noted below. It would also cover the arrangements for partnership with the private sector (cost included in Study section on Institutions)

- 2) Preparation of resource materials for EEAR to government departments, and for the general public.

This would cover i) preparation of a "State of Hanoi's Environment" report,

with an emphasis on wastes management and wetlands. It would be written in non-technical language and attractively presented for popular consumption. It would also contain a set of statistical appendices which can be used as reference in public as well as professional discussions. A proposal to undertake this work has been made by Hanoi Science University, ii) a video for EEAR use for city department staff and managers and people's committees at various levels, and topic booklets to support the video on environment sectors in Hanoi, options and issues for their future management, iii) a webpage on Hanoi's environment to contribute to the general web page currently under preparation and iv) posters, leaflets, decals.

(2) Support to Community-level Awareness-raising.

1) Program for Women and Environment.

This would assist the Hanoi Women's Union (HWU) to intensify their activities in environmental and cleanliness awareness-raising and household practice. While some components would provide a city-wide coverage, most of the focus would be on the newly-developed urban neighborhoods around wetlands where most low-income households are located, the problems of sanitation are greatest, and the infrastructure and waste collection services are weakest. While HWU's budget pays its staff, it lacks funds to mount a stronger outreach program, or to address new areas such as human waste disposal, greening and community composting. The program would support education courses for environmental communicators, production of posters, 300,000 leaflets and music compositions, expansion of their TV and radio information, establish 12 pilot clubs on "Women and Environmental Issues", provide funds to purchase communication equipment for use by their district offices, and one vehicle for supervision. (cost: \$60,000)

2) School Programs in Environmental Education..

This project would assist a limited number of schools located around lakes in Hanoi to strengthen their environmental education activities and to provide a model which can be used to extend and evaluate full-scale coverage in urban areas. The activities would focus on practical projects which provide a learning experience which the students can undertake in their schools and communities, and which lead to behavioral change. These could include: establishment of school "Green Clubs", field visits, art and music competitions, greening activities, monitoring water and air quality, and developing other projects in their schools and neighborhoods. The project would use materials available from the MOET work, and supplement

them with additional materials relevant to Hanoi. The project would deepen the activities started in Trung Vuong school and initiate the program in a further 1 to 5 schools over a 3 year period. It would fund pedagogical and technical advice (prepared mainly by Hanoi University, Faculty of Science), teaching materials, environmental and communication equipment and construction and planting materials. DOET or DOSTE could coordinate and evaluate the work.

### 3) Cleaner industry program.

Over the past 4 years CEST and CECS have been doing some work on this topic, and in 1998 VNCPC was established to initiate an overall program, funded by the Swiss government. Fourteen demonstration in-factory projects have been undertaken so far as well as the training of trainers. Since the Swiss are expected to continue to fund this program, it is recommended that no more funds are proposed at this stage, but that discussions are held with VNCPC to see whether their program can include a focus on polluting industries around Hanoi's wetlands. After a further year the program could be evaluated to see whether an additional effort, focused on Hanoi is justified.

### 4) Demonstration Project in Environmental Management.

A pervasive and expanding problem affecting both the neighborhood environment and quality of life in Hanoi is the development patterns of settlements in the newly-urbanizing areas of the city. These settlements are springing up without adequate space to construct physical and social infrastructure, or space for recreation. High-density development is also eating up the lakes and wetland systems, causing increasing flooding and pollution. City-level planning and development regulations alone have proven ineffective to guide development, due to impractical plans and weak enforcement. Action among local stakeholders, including owners of land and buildings, district authorities, NGOs and mass organizations offer a better chance to avoid the mistakes in the current pattern of development. This pilot project which would both address the problems of pollution and sanitation in a semi-agricultural community, and plan for the on-coming urbanization. Building on the work of HAPI in Phu Thuong Ward of Tay Ho District, the project would include about 2,000 households and cover an area of between 300 and 600 hectares. Through the assistance of a local NGO and with specialist technical assistance, the first phase of 12 months would include awareness-raising, stakeholder mobilization and organization,



overall land use allocation, land consolidation, adjustment and re-registration, market identification of buyers, and planning of infrastructure and social facilities. It would organize training courses to help households improve their solid waste and sanitation arrangements, and reduce bacterial pollution of their ponds and lakes through substituting nightsoil with compost. An initial proposal, which will need further modification has been made by Hanoi Institute for Socioeconomic Development Studies (HISEDs). The second phase would include construction of infrastructure, sales of housing plots, and operation and maintenance. The district authority would provide overall guidance, with inputs from HAPI, HCAO and HEA.

(3) City-wide Actions on environmental policy and management.

A comprehensive set of city-wide actions will have to await the formation and strengthening of the HEA and its PREA division, which can provide the focus for continuing strategy and programs, and the development and maintenance of a data base on environmental quality. Nevertheless, the Study Team has identified a few initiatives which can proceed in advance of these institutional changes.

1) Protection and management of lakes and wetland systems of the Hanoi region.

These are the most critical natural systems of Hanoi and need urgent attention to prevent their disappearance and the consequent increase in flooding and pollution, avoid costs of additional infrastructure and loss of aquaculture and recreation space. While the lakes in the old built-up area need attention, the most important resource are those areas around the city which are being filled in, by individual plot owners and both public and private sector agencies. As with other aspects of land development, government agencies have been ineffective in preventing loss of wetlands. The Youth Union, with its enthusiastic and energetic young people and their concern for the public interest, as well as its representation on the HPC, would be a good mass organization to raise awareness of this problem and to develop solutions which could be implemented through the cooperation of local stakeholders. The Youth Union has developed a proposal to select 70 activators in 7 districts along the wetland areas of the region, to train these activators with audio-visual and other materials which would be developed for the purpose to enable them to motivate local youths to i) develop monitoring of the condition of the wetlands, ii) undertake wetland cleaning and restoration activities, iii) launch communication and action campaigns in the city, and iv) to assist the motivators to develop overall plans and policies for

the wetland systems which could be discussed within HPC. The Youth Union would also prepare and mount information on the TV and radio. Technical advice could be supplied by NIURP and CRURE, with some supplementary external assistance in the form of seminars and workshops. The project would provide funds for technical advice, workshops, preparation of communication materials and basic water monitoring and testing equipment for amateur use. Cooperation would be established with APNEH, DOSTE, HSDC, and other technical arms of government as needed.

2) **Strengthening Awareness among Policy-makers and Communicators.**

This component would complement the formal training courses noted elsewhere in the Study. APNEH has prepared some materials on urban environmental policy and management and briefed journalists and policy-makers. It is in a good position to intensify this activity as well as to provide information and advice to other groups in this action plan, such as the Youth Union and Women's Union. It needs to strengthen its members' knowledge on technical methods and international practice. This project would assist APNEH to transfer knowledge to its membership, compile training and reference materials, promote awareness through the TV and radio and to targeted groups such as journalists and policy-makers through discussion groups and workshops. The main focus would be on waste management and wetlands.

The following are a selection of topics which could be addressed by the IEC division of the HEA when it is formed:

3) **Topics for HEA's PREA Division on Awareness-raising:**

- i) **Compiling and publicizing data on environmental quality.** This is a function which is essential for any informed discussion among the public or policy-makers. It should be disseminated in various forms suitable for different audiences.
- ii) **Preparing the Hanoi component to the NEA web-site**
- iii) **Advisory outreach service to schools, youth, retirees and community groups to raise awareness, provide information and organize local groups to monitor and report air and water quality and pollution**
- iv) **Awareness-raising and training to People's Committees at various levels and to officials in Hanoi's sectoral agencies,**
- v) **Industrial "eco-watch" program with community groups in industrial areas**
- vi) **Collaboration with VCCI on clean technology and pollution control**

- needs of their members and small industry
- vii) "Clean River and Lakes" program (similar to Indonesia's "Prokasih"), to take on the momentum from the Youth Union work.
  - viii) "Eco-labelling" product certification program
  - ix) Regular briefing sessions for journalists
  - x) "Enquiry" workshops with professionals from other agencies together with NGO and other groups to encourage expression of views on environmental problems and suggest solutions
  - xi) Celebration events and campaigns on various topics such as noise ("Quieter Hanoi"), air, water, using music, plays, graphic arts etc. Undertaken with mass organizations.
  - xii) Arranging for international exchange of experience

(4) International Exchange of Experience.

An increasing number of countries, in the Asia region as well as in Europe and North America, are emphasizing awareness and education as a powerful tool to improve environmental quality. Exchange visits from individual practitioners and specific interest groups, workshops and study tours, and case study dissemination and email conferences over the Internet are all useful means to gain knowledge. A possible range of activities could be among:

- 1) managers of awareness programs of city environmental agencies
- 2) Teachers and organizers of children's "eco-camps"
- 3) Organizers of community and informal waste collection and recycling activities
- 4) Organizers of river monitoring programs by communities and students
- 5) Industrialists interested in clean technologies
- 6) Practitioners preparing urban environmental strategies and masterplans
- 7) Practitioners conserving urban heritage and mounting heritage events.

These topics could draw on programs which are being supported by international agencies, such as the World Bank's Metropolitan Environmental Improvement Program (MEIP. - for aspects such as above), the UNDP's Sustainable Cities Program and the Regional Water and Sanitation Program, NGOs such as IUCN and the Orangi community project in Pakistan, environmental outreach programs by the Friends of the Earth and the EPA (USA), case studies from bilateral aid agencies such as DIFID (UK), Netherlands, and non-profit organizations such as the British Broadcasting Corporation's "Television Trust for the Environment", the UK "Hastings Trust" (for tools on community participation), etc. Information materials on these and other programs are on file with the Study Team.

**Table 6.10.1 Current Level of Environmental Awareness and Future Needs**

AUDIENCES	CURRENT SITUATION		FUTURE NEEDS	
	Community Practices	City-wide Issues	Community Practices	City-wide Issues
General Public	*	O	**	**
Women	**	O	*	*
Children	*	O	**	*
Youth	*	O	**	**
Business & Industry	O	O	**	**
Journalists	*	*	*	**
Educators	O	*	O	*
Legislators	O	*	*	**
Policy-makers	O	*	O	**
Technical/Prof.	O	*	O	**
Operational staff	O	O	*	O

Legend: o = Little  
 \* = Moderate  
 \*\* = Great

## **6.11 Strategies for Human Resources Development for Environmental Management and Services**

### **6.11.1 Strategic framework for human resources development**

#### **(1) Existing problems of human resources development (HRD)**

Activities that fall under the umbrella of Human Resources Development (HRD) normally include:

- hiring qualified staff,
- providing them with the equipment and tools they need to do the job, and
- providing opportunities for the development of skills and knowledge through training.

Environmental management and the delivery of services that have an impact on the environment cannot be effective unless all three elements of HRD are planned for and appropriately managed. HRD practices are reviewed for six organizations whose activities have a direct impact on the urban environment:

- environmental management agency, DOSTE
- planning agencies, HAPI, HCAO
- project implementation agency, TUPWS
- operation and maintenance utilities HSDC, and URENCO,

A questionnaire survey was used to obtain the baseline data required to assess the human resources capabilities and needs of agencies that have direct responsibilities for development planning, environmental management, implementation and operation of environmental projects in Hanoi City. Hanoi DOSTE was not included in the survey because sufficient information is already available from the VCEP project. Two agencies, HCAO and TUPWS, did not respond to the survey. It is therefore assumed that neither of these two agencies have people assigned to environmental management duties. Training needs identified by participants are presented in previous Chapter 5, Table 5.1.

HRD issues and needs are different for each organization depending on their management responsibilities. For example, DOSTE, who is responsible for environmental monitoring and enforcement, will have different HRD needs from HSDC, who is responsible for compliance. Environmental management responsibilities for each of the six organizations is presented in the following table:

**Environmental Management Responsibilities of the Organizations**

ORGANIZATION	MANAGEMENT RESPONSIBILITY	ENVIRONMENTAL FUNCTIONS
DOSTE	<ul style="list-style-type: none"> <li>• Environmental Management</li> </ul>	<ul style="list-style-type: none"> <li>• EIA,</li> <li>• Monitoring,</li> <li>• Enforcement</li> </ul>
IIAPI	<ul style="list-style-type: none"> <li>• Socioeconomic development planning</li> </ul>	<ul style="list-style-type: none"> <li>• Set directions and growth targets,</li> <li>• Identify specific investment projects</li> </ul>
HCAO	<ul style="list-style-type: none"> <li>• Master planning (spatial)</li> </ul>	<ul style="list-style-type: none"> <li>• Site selection and approval</li> <li>• Spatial arrangement</li> <li>• Land use</li> </ul>
TUWPS	<ul style="list-style-type: none"> <li>• Project implementation in accordance with M/P and EIA</li> </ul>	<ul style="list-style-type: none"> <li>• Management of infrastructure projects for improved environment</li> <li>• Coordination with operation and maintenance organizations</li> </ul>
URENCO	<ul style="list-style-type: none"> <li>• Operation and maintenance</li> </ul>	<ul style="list-style-type: none"> <li>• Pollution control</li> </ul>
HSDC		<ul style="list-style-type: none"> <li>• Compliance with environmental regulations</li> </ul>

A general assessment of current HRD for environmental management among the six organizations indicates the following common trends:

- Limited technical skills to plan and implement projects
- Limited managerial skills
- Limited technical operations and maintenance skills
- Limited operating budgets resulting in lack of HRD opportunities

A questionnaire survey and selected interviews have identified the following training issues:

- Majority of managers and staff have not received training since completing their formal pre-service education.
- Most managers have not received formal technical training in environmental management or a discipline closely related to their area of responsibility.
- Training needs analysis are conducted irregularly and are seldom connected to annual staff performance appraisals.
- Training courses are not readily available and in many cases are too theoretical in nature.
- Budget allocations for training are almost always too low to be effective (usually less than 1% of operating budgets)
- Selection of staff to participate in the few available training opportunities is not linked to operational improvement objectives

Inadequate staffing levels compound the training and HRD issues. The current mix of skills within technical government entities is inappropriate for effective performance of changed roles regarding environmental management.

(2) Future Directions and HRD Strategy

1) External influences/constraints:

- Increased awareness of the public to environmental issues is creating pressure on government entities at all levels to improve environmental protection.
- Rapid urban growth is accelerating the demand for infrastructure and urban services such as water supply and sanitation. Fiscal constraints and competing funding priorities mean that organizations cannot afford to hire more staff. Therefore, existing human resources will need to be trained to provide the new skill sets required for environmental management.
- Environmental issues are rather new and most organizations will need new skill sets to cope with a wider range of environmental responsibilities
- The growing complexity of planning issues and environmental protection systems, e.g. wastewater treatment plants, will create the need for qualified technicians, managers and operators who can ensure that projects provide the environmental benefits they were intended to.

2) Objectives

HRD must anticipate future trends and react well in advance with an appropriate staffing and training strategy. The following objectives are set in response to foreseeable external influences and constraints:

- Develop a cadre of environmental management professionals within each of the six organizations
- Improve managerial and technical skills for planning, designing, implementing and evaluating investments in environmental projects.
- Increase the level of specialization in operation and maintenance units whose activities have a direct impact on pollution control efforts.
- Where possible, retrain and upgrade skills of existing personnel to meet the changing skill sets required for environmental management.

Unless these objectives are achieved, large investment projects aimed at improving the environment will not provide the intended benefits. For example, a large wastewater treatment plant, will not reduce pollutant loads as intended if operators do not understand how to adjust the process under variable operating conditions to obtain desired effluent quality. Therefore, hiring qualified staff and providing them with proper training on an on-going basis is of the utmost importance to the success environmental improvement projects proposed in this study.

### 3) Strategy

#### (a) Short-term: 2005

In the short term, HRD is modulated by the need to provide staff with the required qualifications and in sufficient numbers to carry out the many new tasks that come with the environmental programs and investment projects proposed in this environmental master plan.

The strategy for achieving the proposed HRD objectives will consist of retraining and/or hiring personnel to meet the needs of individual investment projects and programs. Thus, each future investment project should include a comprehensive HRD component to ensure successful and sustainable implementation of the project.

For structural projects (e.g. wastewater treatment plant), all organizations involved in the project decision-making hierarchy will be included in the HRD component. This will include organizations involved in the initial planning, design, implementation and finally operations. HRD will consist of:

- technical assistance at the project identification and planning stage,
- formal training courses during project implementation
- on-the-job training during the commissioning period, and
- technical assistance for a period of at least two years after the implementation of a project

For non-structural projects that are targeted at a specific organization (e.g. DOSTE) technical assistance and specialized training will be used to introduce and demonstrate new approaches. These technical assistance projects will increase capacity within the agency and raise awareness to build a core group of personnel that can eventually support and train others in the organization.

In developing specific HRD programs for each organization the following methodology should be applied:

- Identify all organizations that will be involved in the investment or capacity building project
- Identify the existing skill sets, and supporting systems or tools in each organization and compare to those required
- Identify existing staff that have the potential to upgrade their skills or achieve the desired qualifications
- Hire qualified staff in appropriate numbers to fill the gaps
- Provide technical assistance, training and tools (software, hardware, equipment) to support staff.



**(b) Mid-term: 2010**

There will continue to be a large number of investment projects whose funding can support staff training and technical assistance. However, by the mid-term each organization should strive to increase the level of funding in their annual operating budgets for HRD. In this way, organizations can develop some autonomy and develop their own HRD programs customized to meet their specific needs. HRD should be aimed at maintaining the skills of professionals, managers, and operators trained on previous projects.

**(c) Long-term: 2020**

A cadre of environmental management professionals will by now have been established. Organizations will need to plan for the eventual replacement of highly trained managers, technicians, and operators. In addition to the ongoing training required to maintain acquired skills, HRD programs should also focus on hiring and training potential candidates to assume key positions in the organization

**(3) Training Capacity**

The civil engineering departments of both Hanoi University and the National University in Ho Chi Minh City offer urban watersupply and sanitation related degree courses.

The Environmental Engineering Department Hanoi University has graduated an average of 30 engineers per year during the period 1967 – 1998. The training has a strong design focus.

The Environmental Engineering Department at the Institute of Environment and Resources (IER) at Ho Cho Minh City's National University also graduates about 12 students per year. IER's curriculum has a more practical focus on solving water treatment, wastewater, and environmental hygiene issues.

In addition, the Architectural University, which operates under the authority of MoC. Provides a sanitary engineering degree focused on urban utility management. The Architectural University plans to train about 100 sanitary engineers annually beginning 1998. Of that number, about 30 percent are expected to be enrolled as part-time students.

Technician level training is provided exclusively by MoC vocational colleges, but they do not maintain adequate links to urban utilities therefore the training tends to be impractical and not sufficiently up-to-date.

Although Vietnam has an educational infrastructure that could potentially meet the

planning and practical operating needs of the urban environmental sector, current curriculums and pedagogical methods are woefully inadequate. According to a survey of six domestic training institutions (Table 6.11.1) carried out by the Swiss Development Cooperation, current urban water supply, and sanitation training capacity is characterized by:

- A limited number of training institutions
- Absence of sector specific equipment required for practical, operational-oriented training
- Inadequate linkages between government entities and educational/training institutions resulting in differences between the training offered and operational sector requirements
- Absence of trainers familiar with competency based training approaches and participatory techniques (emphasis on wrote-learning and one way communication by teachers to students)
- Vocational schools that offer only general training in such subjects as mechanics, electricity, with no focus on specialized skills for urban infrastructure
- General financial management, bookkeeping and accountancy training provide by Departments of Finance and Accounting at various universities which does not focus on the specific needs of urban utilities
- Training institutes which provide a wide range of potentially relevant training in areas such as Project Planning and Management, Financial Management, Marketing Management, Corporate Strategy, Human Resources Management, but without any specific focus on the requirements of urban water, sewer and solid waste utilities.

The output of trained manpower at both professional and technician levels is not adequate to meet the demand created by existing infrastructure and the additional requirements of significant infrastructure investments proposed for the future. Improving capacity within selected training institutions is not a specific objective of the urban environmental master plan. However, development of institutionalized training capacity can occur through the proposed HRD strategy by involving local training institutions in training events, course design and direct provision of in-service training.

## **6.11.2 Human Resource Development for Environmental Management**

### **(1) Hanoi DOSTE**

#### **1) Existing Problems of Human Resource Development (HRD)**

The EMD does not have enough people to conduct all the necessary functions for effective environmental management in Hanoi City. Also, many of the existing staff do not have necessary skills to be effective environmental professionals given the challenges facing Hanoi. Capacity building programs (e.g. VCEP) are providing technical training to upgrade skills in environmental monitoring, laboratory analysis, industrial pollution control, and environmental impact assessment. However, the DOSTE-EMD is still lacking sufficient capability to be effective at these functions

#### **2) Future Directions of Hanoi DOSTE-EMD**

In the short term (by the year 2000), it is anticipated that the EMD will be elevated to the level of an environmental agency. This will bring about an increase in the number of staff devoted to environmental management and will increase the DOSTE capability to discharge its environmental management responsibilities. The proposed reorganization of the DOSTE will have six major divisions: administration, environmental monitoring, EIA and technology, pollution control, environmental inspection, and public relations and environmental awareness. Each of these divisions will require some strengthening to create better trained management and staff. Additional proposals to create effective environmental management at the district level will also increase the number of staff and overall capability for environmental management. In the longer term, an environmental agency may be needed. This agency will have a broader mandate and will also require more and better trained management and staff.

#### **3) Future HRD Needs and Basic Strategy for HRD**

##### **(a) Basic Needs**

This assessment of basic needs assumes that the new environmental agency will be created, and, soon after, district level environmental management will become established. Because of these proposed organization changes, and the resulting increase in staff, it is necessary to consider both recruitment of new staff and training of all staff.

a) DOSTE Level

Qualified staff in sufficient numbers are needed. The table below identifies the positions required.

Summary of Personnel Requirements.

Division	Job Title (# staff)	Total
Directors Office	<ul style="list-style-type: none"> <li>• Director (1)</li> <li>• Deputy Director (1)</li> <li>• Support staff (1)</li> </ul>	3
Administration	<ul style="list-style-type: none"> <li>• Chief (1)</li> <li>• Finance (2)</li> <li>• Support staff (1)</li> </ul>	4
EIA and Technology	<ul style="list-style-type: none"> <li>• Chief</li> <li>• EIA Specialists (2)</li> <li>• Environmental Research (1)</li> </ul>	4
Environmental Monitoring	<ul style="list-style-type: none"> <li>• Chief (1)</li> <li>• Senior Environmental Monitoring Specialist (1)</li> <li>• Monitoring Technicians (1)</li> <li>• Laboratory Manager (1)</li> <li>• Laboratory Technicians (1)</li> <li>• Information Systems Specialist (1)</li> </ul>	6
Pollution Control	<ul style="list-style-type: none"> <li>• Chief (1)</li> <li>• Environmental Engineers (3)</li> <li>• Information System Specialist (1)</li> </ul>	5
Inspection	<ul style="list-style-type: none"> <li>• Chief (1)</li> <li>• Inspectors (3)</li> </ul>	4
Public Relations and Environmental Awareness	<ul style="list-style-type: none"> <li>• Chief (1)</li> <li>• Public relations officer (1)</li> <li>• Environmental Coordinator (1)</li> </ul>	3
District Level Environment Management	<ul style="list-style-type: none"> <li>• Regional District Level Team Leaders</li> </ul>	6
Total All Divisions		35

Given the existing staffing level of the EMD (about 20), it is expected that up to 15 new staff will need to be recruited. It is anticipated that these new recruits will have suitable education background and the basic technical skills to undertake their jobs. Managerial personnel will be needed to lead the seven divisions (including district environmental management division) that will be created.

b) District Level

Qualified and sufficient staff will be needed to work at the district level. It is anticipated that up to 40 environmental professionals will be needed. These staff will have to have skills in:

- environmental impact assessment
- environmental education and awareness
- environmental inspection
- complaint and dispute resolution

(b) Strategy

The basic HRD strategy is to create a strong cadre of environmental management professionals within the DOSTE level. This cadre will then provide active leadership to district level environmental professionals. As the capacity develops at the district level, more responsibility will be given to the DPCs. Once effective district offices are established, the environmental management professionals at the DOSTE level will concentrate on providing professional guidance to the district level.

Training programs at the DOSTE level will concentrate on:

- the development of superior higher technical skills in all key functional areas
- leadership, managerial and supervisory training for new division heads

Training programs at the district level will concentrate on:

- i) basic environmental management skills,
- ii) developing superior skills for EIA, education and awareness, environmental inspection, and
- iii) techniques for effective conflict resolution.

4) HRD Program

The HRD program will have four parts:

- a basic core curriculum in environmental management and administration
- advanced technical training courses for specialized environmental management functions
- a mentorship program of on-the-job training for district level staff to learn from more experienced DOSTE Level staff
- managerial and supervisory training for division heads

Topics of the basic core curriculum in environmental management and administration are:

- legal and regulatory framework of environmental management in Vietnam
- environmental management administration
- principles of environmental monitoring
- principles of pollution control
- principles of environmental impact assessment
- introduction to environmental inspection
- communication and environmental awareness
- conflict resolution for environmental disputes
- managing environmental information
- urgent environmental problems in Vietnam

Advanced technical training courses will include:

- field sampling techniques for environmental monitoring data collection
- environmental information systems for monitoring data
- preparation of State of Environment Reports
- laboratory analysis of basic environmental data
- setting up and managing environmental laboratories
- industrial pollution prevention
- pollution assessment techniques for air, water, and soil
- economic instruments for pollution control
- solid and hazardous waste management systems
- preparation of terms of reference for EIA reports
- review and appraisal of EIA reports
- environmental planning
- ecological approaches to environmental management
- environmental communications
- environmental inspection systems

The DOSTE Level Staff will conduct the mentorship program for district environmental professionals. The six regional team leaders for district environmental management for the environmental will provide on-the-job training and monitor the progress of district level environmental professionals.

(a) Short-term Program

a) DOSTE Level

The short-term program at the DOSTE Level will be four-fold:

- i) new staff or inexperienced staff will complete the basic core curriculum;
- ii) advanced courses targeted on staff in different divisions (see Table below);

- iii) leadership, managerial and supervisory training for division heads; and
- iv) leadership, managerial and supervisory training for regional team leaders in district environmental management division.

**Advanced Training Courses Targeted on Divisions**

Division	Course	Year
EIA and Technology	<ul style="list-style-type: none"> <li>• preparation of State of Environment Reports</li> <li>• preparation of terms of reference for EIA reports</li> <li>• review and appraisal of EIA reports</li> <li>• environmental planning</li> </ul>	2001-2002
Environmental Monitoring	<ul style="list-style-type: none"> <li>• field sampling techniques for environmental monitoring data collection</li> <li>• environmental information systems for monitoring data</li> <li>• laboratory analysis of basic environmental data</li> <li>• setting up and managing environmental laboratories</li> </ul>	2000-2001
Pollution Control	<ul style="list-style-type: none"> <li>• industrial pollution prevention</li> <li>• pollution assessment techniques for air, water, and soil</li> <li>• solid and hazardous waste management systems</li> <li>• economic instruments for pollution control</li> </ul>	2002-2005
Inspection	<ul style="list-style-type: none"> <li>• environmental inspection systems</li> </ul>	2002-2005
Public Relations and Environmental Awareness	<ul style="list-style-type: none"> <li>• environmental communications</li> </ul>	2000-2001

**b) District level**

The short-term program at the district level will have:

- district environmental professional completing the basic core curriculum
- DOSTE level district environmental management team leaders providing on the job training to district level environmental professionals

These programs will begin when district level environmental teams are created.

**(b) Middle-term Program**

The middle term program assumes that an Office of Science Technology and Environment is created at the District level.

**a) DOSTE Level**

The middle term program will be similar to the short term program with the exception that district level management division leadership training will not be continued. The focus will be on skill upgrading and new staff training.

b) District Level

The program at the district level will include:

1. new staff or inexperienced staff will complete the basic core curriculum;
2. advanced courses targeted on staff in specialized units  
leadership, managerial and supervisory training for management.

Tables 6.11.2 and 6.11.3 show estimated HRD costs for DOSTE.

(2) TUPWS

1) Existing problems of human resources development (HRD)

TUPWS is the implementing agency and project management agency for all new public works infrastructure projects. TUPWS is responsible for managing the construction of facilities once the siting decisions are made and the facilities are planned. TUPWS participates as a member of the master planning team lead by HCAO and plays a critical role in ensuring all the environmental considerations and mitigation measures that were designed into a project during the planning process are carried forward during the construction and operation.

TUPWS is involved in the following environmental management functions through its many companies:

- Inspection in conjunction with the DOSTE
- Must ensure EIAs are prepared for new projects
- Must obtain necessary licenses for DOSTE/MOSTE
- Pollution control and management associated with landfill sites

There is a major concern as to whether the staff of TUPWS have the capability to ensure that their environmental management responsibilities with respect to construction and operation of infrastructure are adequately discharged.

Other problems:

- Inadequate project management skills
- Lack of capacity to provide effective input to the master planning process
- Inadequate budget planning skills

2) Future directions of TUPWS

(a) Proposed Institutional Arrangement with respect to Solid Waste Management

The role to be played by TUPWS will be closely related to the institutional



arrangement concerning solid waste management and administration. The JICA Study Team proposes:

- devolution of solid waste management responsibility from HPC level to district level
- privatization with competition (contracting out of waste collection and transport services)
- management autonomy of URENCO from HPC, and conversion to a pure service provider in a long run

**(b) New Role of TUPWS with respect to solid waste management**

If the above-proposed institutional setting is accepted by HPC, TUPWS should have a capacity in doing the following activities:

- Make a future disposal plan (deciding on location of landfill site and methods of disposal) and acquire land without delay
- Assist district administrations in planning and discharging solid waste management responsibility
- Set policy on cost recovery and other methods for financing solid waste management costs
- Make a plan for establishing a regulatory framework (regulations and regulatory agency) in view of future privatization.

**(c) Integration of environmental services**

In addition to solid waste planning, TUPWS must also strengthen its human resources capacity to play a more direct role in managing environmental services such as water supply and sewerage more effectively. It is recommended that all companies providing urban environment services be grouped into one specialized Environmental Services Department (water supply, sewage, drainage, solid waste & parks)

Re-structuring will allow for specialization within the TUPWS hierarchy to provide more direct support to companies providing operation and maintenance of environmental services.

A new Engineering Division within the environmental services department will provide specialized planning and engineering of urban water supply and sanitation infrastructure.

### 3) Future HRD Needs and basic strategy

#### (a) Needs

It is expected that a none of the staff within the TUPWS planning and technical office have the required skills to plan, design, construct and manage urban infrastructure. Therefore it is likely that new staff will need to be hired to provide the technical expertise required to develop a new Environmental Services Department that canadequately support the operating groups providing utility services. Qualified staff will be required in the following areas:

- Urban infrastructure planning (water, sewer, solid waste)
- Site selection and EIA for future landfill and wastewater treatment plants
- Project management
- Utility operation and maintenance,
- solid waste management

Staff in the administration management unit are probably sufficient in numbers but do not have the required skill sets to oversee utility operations. Accordingly they will need skills training in the following areas:

- Utility management, commercial business practices
- Fiscal policy, budgeting and tariff setting for cost recovery
- Customer relations and demand responsive approach to service delivery
- Preparing framework (regulatory and institutional) for future privatization of services

#### (b) Strategy

##### a) Short-term: 2005

In the short term, HRD will should concentrate on identifying potential candidates who take leadership positions in the future re-organization proposed for the mid-term. These people should be moved into positions where they can become familiar with all aspects of operations.

##### b) Mid-term: 2010

In the mid-term, HRD will be modulated by the need to provide management, engineering and technical staff with the required qualifications and in sufficient numbers to carry out the planning, engineering and project management of urban water supply and sanitation infrastructure.

For the new Environmental services Department the HRD strategy will consist of seconding a few well qualified staff from each of the service companies (URENCO, HSDC, WSBC) to staff the new Engineering

Division. Vacant positions will then need to be staffed with qualified and experienced individuals by following a judicious selection process. A staffing plan for the planning period, including annual operating costs, is summarized below:

Staffing requirements for TUPWS Environmental Services Engineering Division

ENVIRM. SERVICES DEPT.	DIRECTOR/MANAGER	PLANNING ENGINEERS	DESIGN/PROJECT ENGINEERS	TECHNICAL SUPPORT	CAD OPERATORS	CLERICAL	TOTAL
Engineering Division	1					2	3
Water Supply	1	2	8	3	4	2	20
Sewerage	1	2	4	3	2	2	14
Solid Waste	1	1	2	2	1	1	8
Parks	1	1	2	1	1	1	7
Total	5	6	16	9	8	8	52
Seconded from URENCO, HSDC, WSBC	3	3	6	4	4	6	26

HRD will focus on the need to strengthen utility management functions leading to financial autonomy and improved customer services. The strategy will consist of capacity building through the use of technical assistance programs offered by foreign aid donors.

#### c) Long-term

In the long-term, the strategy should be to maintain a complement of properly qualified and trained staff. This will require adequate succession planning, and a commitment by TUPWS to budget sufficient funds in the annual operating budget for on-going staff training and professional development.

#### 4) HRD program

The HRD program will consist of specialized training aimed at two groups:

- Engineers and technicians doing urban infrastructure planning (water, sewer, solid waste, parks), project management, and operational support.
- Managers and administrators responsible for utility operation, fiscal policy, budgeting and tariff setting

Specialized skills will be developed through technical assistance aimed at a core group of professionals and through the assignment of resident experts who will work within each of the three environmental services areas to strengthen capacity.

In addition, several activities can be undertaken by TUPWS under the

guidance of resident technical assistance experts to demonstrate new approaches. Some suggested projects include:

- Study of other cities such as Da Nang that have a good solid waste management and administration systems.
- Have regular operational meetings with URENCO, HSDC and other service companies to understand current situation and problems that each company faces.
- Have meetings with citizens (NGO, etc) to monitor their opinions and complaints.

The following training topics and priorities are identified:

TUPWS – Training needs

TIMEFRAME	UTILITY MANAGEMENT	ENGINEERING	OPERATIONS & MAINTENANCE
In 2006	<ul style="list-style-type: none"> <li>• Commercial financial management and analysis practices</li> <li>• Analyzing the cost-effectiveness of utility operations</li> <li>• Principles of cost accounting</li> <li>• Life cycle costs analysis for fixed assets management</li> </ul>	<ul style="list-style-type: none"> <li>• Wastewater treatment systems, application and design criteria</li> <li>• Sewerage system planning and design criteria</li> <li>• Treatment and disposal of septage (fecal sludge)</li> <li>• Landfill operations management and environmental protection</li> <li>• Solid waste treatment processes</li> </ul>	<ul style="list-style-type: none"> <li>• Organizing solid waste collection</li> <li>• Vehicle/equipment management and maintenance</li> </ul>
	TOTAL COST (US\$)		\$90,000
2007 - 2010	<ul style="list-style-type: none"> <li>• Pricing strategies and options for urban infrastructure</li> <li>• Management information systems for financial planning and cost control</li> <li>• Customer relations management</li> <li>• Privatization of water supply and sanitation services</li> </ul>	<ul style="list-style-type: none"> <li>• Procurement and contract management</li> <li>• Project planning and management</li> <li>• Recycling and re-use of solid waste</li> <li>• Technologies for renewal of water supply and sanitation infrastructure</li> <li>• Solid waste Disposal technologies</li> <li>• EIA process for siting disposal and treatment facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Maintenance management practices and information systems</li> <li>• Optimization of treatment plant operations</li> <li>• Operation and maintenance of water supply and sanitation systems</li> </ul>
	TOTAL COST (US\$)		\$120,000

Training cost estimates are presented in Table 6.11.4. It is assumed that training up to the year 2010 will be provided by official ODA as technical

assistance. From 2011 to 2020 it is assumed that TUPWS will include appropriate funding in its operating budget from HPC for training.

### (3) HAPI

#### 1) Existing Problems of Human Resource Development (HRD)

HAPI is primarily a planning agency and only has two environmental staff. As such its capacity for environmental management is extremely low. Most of HAPI planning staff do not have good understanding of environmental management and struggling to find ways to better consider the environment in their socioeconomic planning activities. However, they lack the necessary understanding and methodological tools to do so.

#### 2) Future Directions of HAPI

It is proposed that HAPI develop the capacity to conduct environmentally sustainable socioeconomic and development planning. HAPI is responsible for the coordination of the sectoral planning of many agencies. As such it is a unique position to influence the incorporation of environmental consideration into most of socioeconomic and development planning in Hanoi City. To exert this influence HAPI needs to develop the technical capability to guide these agencies in incorporation of environmental consideration into their development plans.

HAPI is also responsible for evaluation of the plans. To better evaluate plans, HAPI staff must strengthen its capability in methodology for:

- environmental impact assessment of regional and sector plans
- economic evaluation of environmental improvements
- strategic environmental assessment of policies and plans

#### 3) Future HRD Needs and Basic Strategy for HRD

##### (a) Future Needs

The most immediate need within HAPI is staff training in the environmental assessment of plans and investment projects. This training is needed at both the senior managerial levels and at the technical level. An important part of this training will be in methodology for conducting environmental impact assessment and in the review of EIA reports. This will provide HAPI with increased capacity to advise sector planners. It will also provide HAPI will greater capability to supervise environmental experts that provide advice to HAPI.

In the medium to long term, HAPI will need an environmental evaluation

unit. The functions of this unit will include:

- guidance to sector planners in the consideration of environmental factors in sector plan development
- evaluation of the environmental consequences of sector plans
- economic evaluation of environmental improvement projects

This environmental evaluation unit will require up to 10 staff with backgrounds in:

- environmental impact assessment
- environmental planning
- environmental economics
- ecological management of natural resources
- social impact assessment

(b) Basic Strategy

The basic strategy is to use technical assistance and training to introduce and demonstrate new approaches. These technical assistance projects will both increase capacity and raise awareness. Successful results from these technical assistance projects will provide the foundation for the creation of an environmental evaluation unit.

4) HRD Program

(a) Short-term Program

- a) Technical assistance in environmental aspects of socioeconomic development planning in Hanoi.

The technical assistance will involve:

- introduction of new approaches to planning to integrate environmental considerations
- seminars and training course on new approaches
- case studies to test the effectiveness of new approaches
- development of guidance manuals

- b) Technical assistance to introduce new methods and approaches to economic evaluation of environmental projects.

The technical assistance will involve:

- review of evaluation procedures in developed and ASEAN countries
- development of methodology appropriate to needs of HAPI
- case studies to test the new methods and approaches in practice
- development of guidance manuals

(b) Middle-term Program

The middle term program assumes that an environmental evaluation unit will be created. Staff in the environmental evaluation unit will require training and practice in:

- methodology for environmental assessment of policies and plans
- methodology economic evaluation of environmental improvement projects

Table 6.11.5 show estimated HRD costs for HAPI.

(4) HCAO

1) Existing Problems of Human Resource Development (HRD)

The HCAO does not have any environmental positions, environmentally trained staff or landscape architects. This must remedied to ensure successful integration of environmental considerations into the master plans and day-to-day planning functions of the HCAO.

2) Future Directions of HCAO

The HCAO has the central role in development of General Urban Master Plan for Hanoi. This plan set outs the proposals for the physical locations of different facilities and infrastructure. The development of this plan is complex undertaking in spatial planning. Environmental information technologies like Geographic Information System have become indispensable tools in spatial planning in many part of the developing world. The HCAO needs to develop this computer based spatial planning capability in house to both develop its plans and to communicate the objectives and restrictions of the General Urban Plan to proponents of new projects.

3) Future HRD Needs and Basic Strategy for HRD

(a) Basic Needs

The spatial planning capability of the HCAO needs to be upgraded through provision of trained staff and modern computer based spatial planning systems.

The staffing requirements are: 1) one new environmental specialist positions in HCAO Planning Management Division; 2) two additional environmental specialist positions in the Hanoi Planning Institute; and 3) two GIS application specialist positions in the Hanoi Planning Institute.

**(b) Strategy**

The basic strategy is to first use technical assistance and training to introduce and demonstrate new approaches. In addition, it is proposed that environmental specialists and GIS specialists be added to the staff of the HACO to increase the benefits of the technical assistance. These new staff and the results of the technical assistance projects will both increase capacity and raise awareness. These first efforts are expected to provide the foundation for the creation of a spatial planning unit. This spatial planning unit:

- will be responsible for creation and maintenance of spatial environmental database
- provision of basic environmental and social information to support the urban master planning process
- preparation of information on spatial impacts of proposed development to support the environmental impact assessment process

**4) HRD Program**

**(a) Short-term Program**

- a) Technical Assistance to Increase Environmental and Spatial Planning Capacity of HCAO.
  - i) development of the spatial planning capacity through introduction of geographic information systems to the Hanoi Planning Institute; and
  - ii) technology transfer on the methodology of environmental master planning.
  - iii) Technical assistance in developing the next amendment of Hanoi Master Plan to 2020.

Decision 91 requires that the Hanoi Master Plan to 2020 be amended every five years. One potential avenue for inclusion of the EMP into the Hanoi Master Plan is through incorporation of results of EMP during the next amendment process. The necessary institutional arrangements to allow the incorporation of the results of the EMP into the process for amending the Hanoi Master Plan to 2020 are part of the mandate of the ECC.

The technical assistance will include:

- seminar or training courses in methodologies and approaches to environmental master planning
- case studies application - amendment of the Hanoi Master Plan to 2020 to test the methods and approaches in practice
- development of guidance manuals



(b) Middle-term Program

The middle term program assumes that a spatial planning unit will be created in the HCAO. The staff in this spatial planning unit will require a high level of technical training in geographic information systems, database management, as well as spatial planning techniques. In addition, one or two staff will require overseas training in a one or two year diploma program in Geographic Information Systems.

Table 6.11.6 show estimated HRD costs for TUPWS.

### **6.11.3 Human Resource Development for Environment-related Public Services**

(1) HSDC

1) Existing problems of human resources development (HRD)

At present HSDC carries out a number of tasks related to sewerage and drainage but has very few environmental management responsibilities:

- Cleaning sewers and street drains
- Approval of sewer connections
- Rehabilitation of sewers
- Dredge canals and lakes
- Maintain levees
- Operate flood control gates
- Monitor water levels for operational control

Ability to manage the environmental impacts of its operations is inadequate. For example, sludge from sewer cleaning activities is not treated and is currently being used to fill ponds in Tran Chi district. The disposal site has absolutely no engineering controls to mitigate negative environmental impacts.

HRD Problems:

- Limited technical skills to cope with investment projects
- Limited managerial skills
- Limited technical operations and maintenance skills to manage new wastewater plants and flood control operations

2) Future directions of HSDC

Inadequate staffing levels compound the training and HRD issues. The current mix of skills is inappropriate for effective performance of changed roles regarding future environmental management functions (i.e. operation of wastewater treatment plants).

The following organizational strengthening objectives will require corresponding improvements in HRD:

- developing a functional organizational structure that reduces the impact of operations on the public and the environment.
- improving maintenance levels to protect the significant investment in infrastructure.
- Strengthening technical capacity of in-house personnel to support operation of sewerage and flood control systems and implement maintenance management systems.

### 3) Future HRD needs and basic strategy

#### (a) Needs

HRD needs are driven by the implementation of major drainage and sewerage works. These works will require a skilled labor force and qualified operators. HSDC does not currently have these skills and will need to train and/or hire the required personnel. The following HRD needs and timeframes are based on the organizational strengthening plan for HSDC recommended in this Study:

OBJECTIVE	SHORT TERM 2005	MID TERM 2010	LONG TERM 2020
<u>Sewerage Functions:</u>	<ul style="list-style-type: none"> <li>• hire and train personnel to operate pilot treatment plants</li> <li>• hire and train laboratory personnel</li> <li>• include funds for staff training in the annual operating budget</li> <li>• transfer of septage collection and disposal unit from URENCO</li> </ul>	<ul style="list-style-type: none"> <li>• hire and train more wastewater treatment plant operators and process engineers to meet the growing number of treatment plants</li> <li>• hire and train staff for approval of septic tanks, sewer connections, inspection of sewers and septic tanks</li> </ul>	<ul style="list-style-type: none"> <li>• develop technical skills required to support wastewater treatment plant operators</li> </ul>
<u>Drainage Functions:</u>	<ul style="list-style-type: none"> <li>• hire personnel for operation of Yen So pumping station and control gates</li> <li>• increase personnel maintaining levees</li> <li>• include funds for staff training in the annual operating budget</li> </ul>	<ul style="list-style-type: none"> <li>• provide computers and software tools to engineering department for flood database and mapping project</li> </ul>	<ul style="list-style-type: none"> <li>• develop software and hardware tools to support engineering analysis and modeling for flood control operations</li> <li>• develop technical skills required to support drainage system operators</li> </ul>
<u>Management Functions:</u>	<ul style="list-style-type: none"> <li>• provide training and develop skills for business accounting, financial analysis and economic effectiveness of business operation.</li> </ul>	<ul style="list-style-type: none"> <li>• provide training on pricing strategies and tariff setting for cost recovery</li> </ul>	<ul style="list-style-type: none"> <li>• develop financial analysis skills to reduce operating costs and improve fiscal planning</li> </ul>

a) Short-term: 2005

i) Drainage

The Yen So drainage project will create the need for technically competent operators and maintenance staff with specialized skills to maintain pumps, control systems and telemetering systems.

Personnel required to operate the system total 29 and will be assigned as follows:

Personnel required for flood control operations

Personnel	Yen So pumping station	Thanh Liet flood gate	West Lake Control Gate A	Total
Engineers	2	0	0	2
Technicians	6	1	1	8
Operators	4	1	1	6
Clerical	3	0	0	3
Mechanics	4	*	*	4
Mech. Apprentice	2	*	*	2
Electricians	2	*	*	2
Elect. Apprentice	2	*	*	2
Total	25	2	2	29

\* indicates that maintenance will be provided by crews travelling from Yen So

More personnel will be required to maintain the large number of levees recently rehabilitated throughout the city and levees newly constructed under the drainage project. It is proposed that each sewerage and drainage enterprise dedicate 3 more work crews to the task of maintaining levees. Each work crew should consist of 5 laborers, 1 foreman, a truck and a driver. The total number of new personnel required is 21 per enterprise x 3 enterprises for a total of 63.

Personnel Required for Levee Maintenance

Position	Sewerage and Drainage Enterprises			Total
	No.1	No.2	No.3	
Foremen	3	3	3	9
Laborers	15	15	15	45
Drivers	3	3	3	9
Total Personnel	21	21	21	63

ii) Sewerage

Wastewater treatment facilities presently do not exist and will be gradually implemented over the planning period. The implementation of wastewater treatment will create a need to hire qualified and knowledgeable operators and engineers as well as trained mechanics and electricians. It is, therefore, important that HSDC move quickly to hire and train technical personnel for treatment plants as follows:

**Personnel required for wastewater treatment plants 2000 - 2005**

Position	Pilot Treatment Plants (2)	Zone 2-1	Total
	2000-2004	2005	
Process Engineer	1	1	2
Process Operators	2	2	4
Mechanics	3	3	6
Electricians	2	2	4
Lab technicians	2	2	4
Total	10	10	20

Operational control of wastewater treatment systems will require frequent sampling and laboratory analysis to monitor:

- Influent wastewater characteristics
- Effluent characteristics
- Performance of the treatment systems and
- Operating adjustments to various stages of the treatment process

Treatment plants will, therefore, need to be supported by a properly equipped laboratory and a team of technicians. Initially, the two pilot treatment plants will each have their own small laboratory for process control. However, with the completion of a full-scale treatment plant in 2005 it is recommended that a single, centrally located laboratory be constructed to provide lab services to all wastewater treatment plants operated by HSDC. A central laboratory will facilitate standardization, make it possible to obtain consistent results, and reduce the duplication of lab equipment, space and personnel required to support several treatment plants. Sampling can be done on a rotational basis by a team of travelling laboratory technicians.

As sewage treatment becomes available the wastewater collection system will be improved and extended into urban areas. Existing sewer maintenance crews can cope with the increase in the length of sewer reticulation but the introduction of sewage pumping stations and mechanical regulators will require new mechanical and electrical (M&E) maintenance skills and new staff. It is recommended that M&E

teams be organized on the basis of sewer collection districts with district per treatment plant and one maintenance team serving up to 4 pumping stations. Each M&E team should consist of 1 mechanic and a helper, 1 electrician and a helper, 1 trucks and 1 drivers.

**Personnel required for wastewater collection pumping stations  
2000-2005**

Position	Collection District		Total
	for Pilot Treatment Plants	Treatment Zone 2-1	
Mechanics	1	1	2
Electricians	1	1	2
Helpers	2	2	4
Drivers	1	1	2
<b>Total</b>	<b>5</b>	<b>5</b>	<b>10</b>

**b) Mid-term:2010**

**i) Drainage**

Once HSDC becomes comfortable with the operation of Yen So reservoir and the flood control scheme it will need to develop a database to support operational control decisions and operational policies regarding flood control and water levels. Two new tasks will be required:

- Compile data on flooding and flood damages
- Prepare flood mapping

It is proposed that the engineering division implement these tasks. A number of engineers and technicians will be required on a full time basis to develop the database, interpret the data, and develop computer based flood maps.

The following staffing levels are recommended:

**Personnel required for compiling flood data**

Position	Database and analysis	Flood mapping	Total
Engineers	5	2	7
Technicians	3	5	8
Computer/database	2	2	4
CAD operators	3	5	8
Clerks	2	2	4

Computers and software tools will be required to support the development of the database and computer based maps.

ii) Sewerage

The availability of treatment will open the way for expansion of the underground sewer reticulation system and result in a larger inventory of sewer pipes that will need to be inspected, cleaned and repaired. It will therefore be essential for HSDC to have a well-organized record keeping system to support proper maintenance and response to problems such as sewer blockages. It is recommended that a database, known as a "sewer inventory" be developed. The typical inventory includes information such as: pipe size, material, age, location, flow, repair history, location of connections. The sewer inventory can be developed as the first step in a larger sewer inspection and maintenance program that will be implemented over the mid-term to long-term.

It is recommended that a specialized "sewer inspection unit" be created within the Engineering Department to develop the inventory. Personnel requirements will include: 1 engineer, 1 information management specialist, 5 technicians, and 5 sewer system inspectors, 2 survey crews, 10 sewer maintenance laborers. The engineer will oversee the project. The information management specialist will develop the database structure. The technicians will identify the required data, verify information collected in the field, enter data, and prepare location maps and inspection schedules. The sewer inspectors will work closely with surveyors, and laborers in the field to survey locations, inspect conditions of existing sewer pipes, and take measurements.

Staffing for sewer inspection and inventory database

Position	Sewer Inspection	Sewer inventory	Total
Engineers	1	1	2
Inspectors	5	0	5
Surveyors	6	0	6
Laborers	10	0	10
Technicians	0	3	3
Clerical	0	1	1
CAD operators	0	3	3
Total	22	8	30

Sewers will be cleaned prior to inspection by the cleaning enterprise using existing hydro jet and vacuum equipment. The following equipment will be required for sewer inspection:

- sewer inspection truck equipped with CCTV equipment and recorders
- in-sewer TV camera with cables and winch

By 2010, two more wastewater treatment plants will be in operation. Personnel for operation and maintenance of new plants should be hired and trained before completion of the construction to ensure a smooth transition. Training can take place at existing treatment plants. Equipment and personnel in the central lab will need to be increased to cope with the work load created by new treatment plants.

Personnel Required for Treatment Plants 2006-2010

Position	Treatment Zone 3	Treatment Zone 4	Total
	2010	2008	
Process Engineer	0	0	0
Process Operators	2	2	4
Mechanics	3	3	6
Electricians	2	2	4
Lab technicians	1	1	2
Total	8	8	16

As the sewer reticulation system expands so will the number of pumping stations. Additional electrical and mechanical maintenance staff will be required to cover a wider geographical collection area and a greater number of pumping stations:

Personnel required for wastewater collection pumping stations  
2006-2010

Position	collection district		Total
	Treatment Zone 3	Treatment Zone 4	
Mechanics	1	1	2
Electricians	1	1	2
Helpers	2	2	4
Drivers	1	1	2
Total	5	5	10

c) Long-term:2020

i) Sewerage

The level of sewerage development activity planned for the period 2010 to 2020 is significant:

- Two more treatment plants in (zone 5 and 6)
- expansion of treatment plant for zone 2-2
- new treatment
- plant in Gia Lam
- extension of collection system coverage in urban areas to serve 90% of the population

The significant investment in sewerage infrastructure will require a corresponding increase in operation and maintenance levels. The organization will need to devote more resources to sewerage operations and human resources must be developed to provide effective maintenance and quick response to sewer maintenance problems.

Personnel Required for Treatment Plants 2011-2020

Position	Treatment zone 2-2	Treatment zone 6-1	Treatment zone 5	Treatment zone 6-2	Gia Lam	Total
	2015		2018	2020		
Process Engineer	1	0	1	0	0	2
Process Operators	2	2	2		2	8
Mechanics	3	3	2	0	0	8
Electricians	2	2	0	0	0	4
Lab technicians	1	1	0	0	0	2
Total	9	8	5	2	2	24

Similarly the expanding geographical area of the collection network will require a greater number of staff for mechanical and electrical maintenance of pumping stations:

Personnel required for wastewater collection pumping stations 2011-2020

Position	collection district				Total
	Treatment zone 2-2	Treatment Zone 6-1 & 6-2	Treatment zone 5	Gia Lam	
Mechanics	0	1	1	1	3
Electricians	0	1	1	1	3
Helpers	0	2	2	2	6
Drivers	0	1	1	1	3
Total	0	2	2	2	6
Trucks	0	1	1	1	3

Note: Zone 2-2 will be served by the same staff doing maintenance for zone 2-1

## ii) Drainage

At this stage it is recommended that the drainage & sewerage functions be separated in order to allow a greater degree of specialization among operating and management staff and a greater level of flexibility in responding to problems sewerage problems.

Drainage operations will have progressed to the stage where technical expertise in the area of hydrology, open channel hydraulics, flood routing, and reservoir control will be required. The level of



technological sophistication required for operational control will need to be increased to include:

- modeling of reservoirs to optimize flood and control gate operations
- flood forecasting linked to water level monitoring and mapping tools

The engineering department will need to be strengthened by hiring qualified and specialized engineers capable of understanding and using models for analysis. The engineering department will need to increase computers and software tools to develop databases, models and maps.

**(b) Strategy**

**a) Short-term: 2005**

In the short term, HRD is modulated by the need to provide staff with the required qualifications and in sufficient numbers to carry out the many new tasks that come with the investment projects proposed wastewater and drainage.

The strategy will consist of retraining and/or hiring personnel to meet the needs of individual investment projects and programs as each project is implemented. Each future investment project should, therefore, include a comprehensive HRD component to ensure successful and sustainable implementation of the project.

In order to obtain the benefits of HRD programs associated with each investment project, HSDC will need to:

- Identify which units within the organization will be involved in the investment project
- Identify the existing skill sets of personnel, and supporting systems or tools in each organization and compare to those required by the project
- Identify existing staff that have the potential to upgrade their skills or achieve the desired qualifications
- Hire qualified staff in appropriate numbers to fill the gaps
- Identify what technical assistance, training and tools (software, hardware, equipment) are required to support personnel.

**b) Mid-term: 2010**

Non-structural projects such as developing the sewer inventory and flood control database should be implemented through technical assistance and specialized training to introduce and demonstrate new approaches. These

technical assistance projects will increase capacity within the agency and raise awareness to build a core group of personnel that can eventually support and train others in the organization.

There will continue to be a large number of investment projects whose funding can support staff training and technical assistance. However, by the mid-term HSDC should strive to increase the level of funding in their annual operating budgets for HRD. In this way, HSDC can develop some autonomy and develop a program that is customized to meet specific needs. HRD should be aimed at maintaining the skills of professionals, managers, and operators trained on previous projects.

c) Long-term: 2020

A cadre of environmental management professionals will by now have been established. HSDC will need to plan for the eventual replacement of highly trained managers, technicians, and operators. In addition to the on-going training required to maintain acquired skills, HRD programs should also focus on hiring and training potential candidates to assume key positions in the organization

4) HRD program

(a) Staffing

Incremental staffing needs for HSDC are discussed in previous sections and overall positions needed are summarized in the following table:

**Incremental Staffing needs for HSDC – 2000 to 2020**

Division/program	Staffing No. (to end of period)		
	2005	2010	2020
Flood control/drainage operations	29	29	29
Levee Maintenance	63	63	63
Flood control data, mapping and modelling	0	31	33
Wastewater treatment plants	20	36	60
Sewer inspection program	0	22	22
Sewer inventory data	0	8	8
Sewer pumping station maintenance	10	20	35
Total staff cost (000's USD)	73.3	134	163.4

(b) Training

The HRD survey has identified training priorities:

Training priorities

Timeframe	Management	Operations and maintenance
2000 - 2005	<ul style="list-style-type: none"> <li>Analyzing cost effectiveness of utility operations</li> <li>Pricing strategies and options</li> <li>Cost accounting</li> <li>Life cycle cost analysis and fixed asset management</li> </ul>	<ul style="list-style-type: none"> <li>New facilities start-up</li> <li>Pump operation and maintenance skills</li> <li>Operation of reservoirs and pumping station</li> <li>Biological wastewater treatment theory</li> <li>Wastewater treatment process control</li> <li>Vehicle and equipment management and maintenance.</li> <li>Treatment process sampling and laboratory analysis</li> </ul>
	TOTAL COST (US\$)	\$590,000
2006 - 2010	<ul style="list-style-type: none"> <li>Human resources management</li> <li>Management information systems</li> <li>Maintenance management</li> <li>Commercial financial management practices</li> <li>Customer relations</li> </ul>	<ul style="list-style-type: none"> <li>Sewerage and drainage system planning and design</li> <li>Operation and maintenance of wastewater collection systems</li> <li>Inspection and rehabilitation of sewer systems</li> <li>Information management systems</li> <li>Advanced process control for wastewater treatment</li> </ul>
	TOTAL COST (US\$)	\$635,000

Training cost estimates are presented in Table 6.11.7. It is assumed that training up to the year 2010 will be provided by official ODA as technical assistance. From 2011 to 2020 it is assumed that HSDC will include appropriate funding in its operating budget from HPC for training.

Training will be delivered by:

- technical assistance at the project identification and planning stage,
- formal training courses during project implementation,
- on-the-job training during the commissioning period, and
- technical assistance for a period of at least two years after the implementation of a project

The training program developed under each project should have three parts:

- basic management skills for all administrators and unit managers
- intensive and specialized technical training for operators
- specialized on-the-job skills training for maintenance personnel

(2) URENCO

1) Existing problems of human resources development (HRD)

At present URENCO carries out a number of tasks related to solid waste management and has several environmental management responsibilities:

- Clean streets
- Collect and transport of solid waste

- Manage landfill site operations
- Mitigate environmental impacts of landfill operations
- Closure of Tay Mo landfill site

Ability to manage the environmental impacts of its operations is inadequate. For example, correct operating procedures for landfilling waste are not followed:

- Leachate is collected but not treated
- Disposal at the tipping face is not controlled
- Compaction is inadequate
- No daily soil cover.

HRD Problems:

- Limited technical skills to cope with new investment projects
- Limited managerial skills
- Limited technical operations and maintenance skills to manage the new landfill site, hazardous waste, and composting operations
- Inadequate staffing levels compound the training and HRD issues

## 2) Future directions of URENCO

### (a) Proposed Institutional Arrangement with respect to Solid Waste Management

Role to be played by URENCO is closely related to the institutional arrangement concerning solid waste management and administration. The JICA Study Team proposes:

- devolution of solid waste management responsibility from HPC level to District level
- privatization with competition (contracting out of waste collection and transport services)
- Detach URENCO from HPC, and make it a pure service provider in a long run

### (b) New Role of URENCO

If this institutional setting is accepted by HPC, URENCO will be detached from HPC, and act as a pure service provider. Institutional changes will be introduced in a step by step manner. URENCO's major clients will be each district administration. In the initial stage, URENCO will enjoy monopolistic conditions. However, in the medium and long term, it is desirable that URENCO will have some competitors. As a commercial and pure service provider of solid waste management, a principle business motto of

URENCO will be "better service with higher efficiency".

### 3) Future HRD needs and basic strategy

#### (a) Needs

The current mix of skills is inappropriate for effective performance of changed roles regarding future environmental management functions (i.e. commercial operation of solid waste disposal, and environmental impact management at treatment facilities).

The following organizational strengthening objectives will require corresponding improvements in HRD:

- developing a functional organizational structure that reduces the impact of operations on the public and the environment.
- improving capacity to plan and optimize waste collection
- Strengthening technical capacity of in-house personnel to support operation of a sizeable vehicle fleet and implement maintenance management systems.
- Providing cost-effective and customer responsive services

Short-term HRD needs are driven by the implementation of a major new landfill site and transfer station. These works will require a skilled labor force and qualified operators. URENCO does not currently have these skills and will need to train and/or hire the required personnel.

The following HRD needs and timeframes are based on the organizational strengthening plan for URENCO recommended in this Study

Objective	Short Term 2005	Mid Term 2010	Long Term 2020
<u>Transfer and Disposal:</u>	<ul style="list-style-type: none"> <li>• hire and train personnel to operate landfill site and transfer station</li> </ul>	<ul style="list-style-type: none"> <li>• develop technical skills required to support solid waste management operations</li> </ul>	<ul style="list-style-type: none"> <li>• hire and train environmental engineers to develop and implement recycling and waste reduction programs</li> </ul>
<u>Collection, and transportation:</u>	<ul style="list-style-type: none"> <li>• hire and train drivers and mechanics for vehicles</li> <li>• improve skills of mechanics to repair modern vehicles</li> <li>• provide equipment and tools</li> </ul>		
<u>Management Functions:</u>	<ul style="list-style-type: none"> <li>• provide training and develop skills for business accounting, financial analysis and economic effectiveness of business operation.</li> </ul>	<ul style="list-style-type: none"> <li>• provide training on pricing strategies and tariff setting for cost recovery</li> </ul>	<ul style="list-style-type: none"> <li>• develop financial analysis skills to reduce operating costs and improve fiscal planning</li> </ul>

The Nam Son landfill and transfer system project will create the need for technically competent operators, drivers and maintenance staff with specialized skills to maintain vehicles.

Personnel requirements are as follows:

**Personnel required for landfill and transfer station operations**

Personnel	Landfill site	Transfer station
Managers	2	4
Engineers	3	0
Operators	1	8
Clerical/others	1	27
Mechanics	0	8
Drivers & equipment operators	18	88
Scale operators	3	4
Total	28	139

a) Strategy

i) Short-term: 2005

In the short term, HRD is modulated by the need to provide staff with the required qualifications and in sufficient numbers to carry out the transfer operations and landfill site operations.

In Vietnam, no cities have experience in construction and operation of a sanitary landfill. URENCO will need to hire and train at least one engineer to act as manager of the new sanitary landfill site in Nam Son. In addition the manager should be supported by at least one O&M superintendent who is qualified and understands the importance of proper operating practices to minimize environmental impacts.

The HRD strategy will consist of identified qualified staff for retraining or hiring new personnel to meet staffing needs of the urgent project. The project should, therefore, include a comprehensive technical assistance component to ensure successful and sustainable implementation of transfer and disposal operations. It is advisable for URENCO to use a training program such as the one offered by JICA, and some training opportunities offered by Tokyo Metropolitan Government or other cities.

In order to obtain the benefits of HRD program associated with the project, URENCO will need to:

- Identify which units within the organization will be involved in the investment project
- Identify the existing skill sets of personnel, and supporting systems or tools in each organization and compare to those required by the project
- Identify existing staff that have the potential to upgrade their skills or achieve the desired qualifications

- Hire qualified staff in appropriate numbers to fill the gaps
- Identify what technical assistance, training and tools are required to support personnel.

#### 4) HRD training program

A training program for cadres involved in management, operation and maintenance should cover the following topics:

- basic management skills for all administrators and unit managers
- intensive and specialized technical training for operators

specialized on-the-job skills training for maintenance personnel. The HRD survey has identified the following specific training priorities:

**Training priorities for solid waste management**

Timeframe	Management	Operations and maintenance
2000 - 2005	<ul style="list-style-type: none"> <li>• Commercial financial management and analysis</li> <li>• Pricing strategies</li> <li>• Cost accounting and analyzing cost effectiveness</li> <li>• Life cycle cost analysis for fixed assets</li> </ul>	<ul style="list-style-type: none"> <li>• New facilities start-up</li> <li>• Principles of integrated solid waste management</li> <li>• Operation of landfill sites</li> <li>• Environmental protection</li> <li>• Vehicle /equipment maintenance</li> </ul>
	<b>TOTAL COST (US\$)</b>	
2006 - 2010	<ul style="list-style-type: none"> <li>• Human resources management</li> <li>• Management information systems</li> <li>• Supervisory skills</li> <li>• Customer relations</li> </ul>	<ul style="list-style-type: none"> <li>• Technologies for sorting solid waste</li> <li>• Re-use of solid waste</li> <li>• Waste disposal technologies</li> </ul>
	<b>TOTAL COST (US\$)</b>	

Training cost estimates are provided in Table 6.11.8. It is assumed that training up to the year 2010 will be provided by official ODA as technical assistance. From 2011 to 2020, it is assumed that URENCO will include appropriate funding in its operating budget from HPC for training.

In general, HRD will be delivered by:

- technical assistance at the project implementation stage,
- formal training courses during project implementation
- on-the-job training during the commissioning period, and
- technical assistance for a period of at least one year after the implementation of the project

A specific program is required to provide the manager and superintendent of Nam Son Landfill with knowledge about proper operation of a sanitary landfill. Japanese municipalities and some universities have experience in

this field, and some of them already accepted trainees from developing countries. It is recommended that URENCO send the superintendent, who should be an engineer, to one of the following programs and opportunities:

- A JICA training program "Solid Waste Management". Its duration is about 2 months from May to July every year.
- A JICA training program "Solid Waste Management Technique" offered by Kita-Kyushu JICA training center every year. Duration is 3 months.
- Tokyo Metropolitan Government has this year launched a five year cooperation program with Hanoi URENCO. A training opportunity may soon be offered under this cooperation program
- Fukuoka university that has a good reputation and experience in scientific and technological research into the sanitary landfill. Fukuoka city may be a contact.

#### **6.11.4 Human Resource Development for Environmental Education and Awareness-raising**

##### **(1) Existing Problems in Human resource Development (HRD)**

The skills required for HRD in EEAR are in the category of Policy and Intersectoral Planning. The HRD specialist in this area also needs to be able to draw on the Higher Technical skills (category B), and occasionally on the Basic Technical and Operational skills (category A). This analysis will therefore concentrate on category C skills, particularly in the areas of information management and communications.

In this area, Vietnam human resource (HR) is strong in propaganda and exhortation, but weak in management of information, market analysis and interactive participation between organizations and between government and non-government social groups. EEAR relies heavily on these skills, thus the situation in Vietnam is unbalanced. There is considerable ability among the mass organizations to reach many social groups, but their style for addressing EEAR needs modifying and strengthening in these areas of weakness. Among the environmental professionals in government and academia, who constitute the other, technically-trained resource for EEAR, these skills are also weak.

##### **(2) Future HRD needs, and Basic Strategy for HRD**

Since the Basic Skills and Higher Technical skills category are not central to HR for EEAR, but can be mobilized as required, the strategy should concentrate on category C skills. These areas are primarily i) information and data management, ii) social marketing, iii) participation techniques, iv) teaching theory and methods



and public speaking, and v) graphic arts and audio-visual techniques. For a concentration in the urban-industrial environment sector they need to be supplemented with some knowledge of urban economics and urban-environmental land use planning. Not all staff need to be conversant with all these skills, but the skills would be deployed relative to the needs of the activities.

The HRD strategy for EEAR should be to:

- 1) concentrate on skills and support materials to deliver the EEAR program, and
- 2) strengthen the staff, skills and support requirements of the PREA division of HEA, and the Hanoi DOSTE, which are the core agencies to promote EEAR.

And in the longer term:

- 3) strengthen the capabilities in the general education system for EEAR.

### (3) HRD Program

#### 1) Short Term Program. (2000-2002)

This section will focus on item (2) 2) above, namely the HR requirements of the PREA/HEA and Hanoi DOSTE.

PREA/HEA needs to strengthen skills in the areas of urban environmental management, especially i) knowledge of the issues in the sector, source materials and case examples of experience, ii) social marketing, graphic arts and audio-visual techniques, and iii) methods in motivation and participation. In view of Vietnam's increasing pace of urbanization, three positions in the PREA division would be justified to address this topic. Courses should be arranged to focus on these aspects, to train existing as well as the new staff, and to also include the urban DOSTEs. IEC also needs to strengthen its library in the field of urban management, as well as a computerized information base on key urban environmental statistics and documents on Vietnamese cities, and a web-site on the topic. The latter could be used by government agencies, academic institutions and consultants, since they all have phone links, and increasingly used by the general public.

Hanoi DOSTE needs to make a major effort to establish an EEAR function. A new division for Information, Education and Communication (IEC) in the DOSTE would have two major functions:

- a) Research and Development in Communications – including problem evaluation, audience and resource identification, strategies (e.g. social mobilization, advocacy, social marketing, networking, visioning), preparation of management plan and communication materials, monitoring and evaluation.
- b) Programs and Public Information and Relations – including

implementation of targeted programs in information dissemination and support to specific social groups such as NGOs, business and industry groups, children and youth, women, government organizations and mass media, using an appropriate selection of the strategic activities. It would also respond to questions and inquiries from the public and prepare speeches for officials.

It should initially start as a small group of 3 to 4 staff, although, in the medium term, the size of the problems in Hanoi and the scope of interaction with the numerous interest groups indicate that it should develop a larger staff, well-trained in IEC techniques. Technical assistance to provide support and advice to the division would be needed. This might be undertaken as an extension of the VCEP work. The DOSTE should also establish a web site, possibly as part of the web site on Hanoi, which is now being designed with assistance from HISDES. It should also be linked to the NEA's web site. Another urgent matter is to improve the information base of the DOSTE on environmental statistics and trends, which can be used for promotional information, discussion groups etc.

Department of Education and Training also needs to improve its HR capability in EEAR to pick up on the work started by MOET, and support the schools initiative. Initially it should designate one person as the liaison point for EEAR to establish links on this topic both with MOET and DOSTE. This person should undertake a basic course in urban environmental management, with the focus on community participation, and also be familiar with the main programs of EEAR

In each of the Hanoi sectoral departments concerned with environmental issues (especially TUPWS, HSDC and URENCO) there would be a person designated to deal with environmental matters (see section on Institutions), and this individual would also receive training on EEAR and serve as the liaison with the DOSTE/IEC Division.

Finally, APNEH members should receive training in the information, marketing and communication techniques. This could be done as part of the APNEH program mentioned in Section 6.12.3 (C)

The short term program would also make arrangements to supply the NEA/IEC and DOSTE with relevant materials on EEAR from other countries, and begin a program of workshops and exchange visits.

## 2) Medium Term Program (2003-2007)

This time period would concentrate on i) deepening the capabilities of the

DOSTE's PREA Division with additional staff and training, ii) establish the PREA function at the district level, and provide training to these staff, especially in social marketing and community communication, iii) strengthening the EEAR training in the Hanoi sectoral departments, and iv) start a program of EEAR courses in selected Universities and research institutes in communication, social marketing and participation techniques.

3) Long term period (after 2007)

This would start with an evaluation of the progress, strengths and weaknesses of the HR work in EEAR undertaken to date, and use this to identify future requirements. It is likely that, by that time, environmental conditions at the community and industry level will have improved, and the EEAR can begin to shift its focus to deeper participation of the general public and interest groups in urban and industrial development policy and projects.

Table 6.11.1 - Training institutions in Vietnam (1/4)

The "Training & Institutional Capacity Needs Assessment for the Water Supply & Sanitation Sector" (financed by SDC) focused on a review of training capacity at five GoV institutions and two externally financed (and staffed) institutions.

The five GoV training institutions are:

- Hanoi University of Civil Engineering (Center for Environmental Engineering for Towns and Industrial Area)
- Hanoi University of Technology (Center for Environmental Science and Technology)
- Ho Chi Minh National University (Institute for Environment and Resources)
- Danang National University
- Hanoi Architecture University

The two externally supported training institutions are:

- Center for Formation aux Metiers de l'Eau et de Assainissement
- Asian Institute of Technology - Hanoi Branch

Information on the following training institutions is presented below: (i) HCMC National University (*Institute for Environment and Resources*); (ii) Hanoi University of Civil Engineering (*Faculty of Environmental Engineering* in collaboration with the Center for Environmental engineering of Towns and Industrial Areas); (iii) Hanoi University of Technology (*Center for Environment Science and Technology*); and (iv) *the National Training Center for the Water and Environment Sector. (CNEE)*

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HCMC national university  
Institute for Environment and Resources

The *Institute for Environment and Resources* offers **Degree Programs** in:

- Environmental Engineering (since 1981)
- Environmental Science (planned for 1998)
- Environmental and Resources Management (planned for 1998)

It also offers **Short-Term Training** as follows

Target group: Technical Managers/officers of WSS Enterprises

Subject Area: Environmental Technology and Management

Duration: Variable

**Table 6.11.1 - Training institutions in Vietnam (2/4)**  
**HANOI UNIVERSITY OF CIVIL ENGINEERING**  
Faculty of Environmental Engineering  
with  
Center for Environmental Engineering of Towns and Industrial Areas

1. The **Degree Program** curriculum includes the following subject areas:

No	Subject Area	Training Hours
1	Microbiology	60
2	Environmental Chemistry	30
3	Climate of Building	30
4	Natural Resources Conservation and sustainable development	30
5	Environmental Impact Assessment	30
6	Environmental Pollution Control	45
7	Air Environmental Survey	30
8	Water Pollution and Treatment Technologies	75
9	Water Environmental Survey	30
10	Urban Ecology	30
11	Water Resources Protection	30
12	Water Supply and Management	45
13	Water Treatment Plant: Design and Management	
14	Wastewater Treatment Plant: Design and Management	
15	Collection and Treatment of Solid Waste	30
16	Environmental Law	30
17	Sewerage network for Urban Areas	30

2. **Short-Term In-Service Training** is provided to managers, engineers, and technicians as follows--

(i) **For managers**

Duration: 3 months (620 hours)

Curriculum: Selection from above list

(ii) **For Engineers**

Duration: 2 months (416 hours)

Curriculum: Selection from above list

(iii) **For Technicians**

Duration: 4 months (860 hours)

Curriculum: Selection from above list

**For Bill Collectors:**

Duration: 2 weeks (120 hours)

Curriculum: Selection from above list

**Table 6.11.1 - Training institutions in Vietnam (3/4)**

**HANOI ARCHITECTURE UNIVERSITY  
National Training Center for Water and Environment**

The *National Training Center for Water and Environment* provides short-term in-service training for technicians and operators, as follows--

**1) For Technicians**

Duration: variable

Curriculum: as follows--

1. Biology and Microbiology
2. Hydrology and Branch network for storm Drain Calculation
3. Hydrology
4. Auditing and Measurement of water quality
5. Environmental Management
6. Maintenance and Management of water treatment plans
7. Pumps and Pumping station
8. Water treatment technology
9. Water supply network
10. Sewerage and Drainage Network
11. Waste water Treatment Technologies

**2) For operators**

Duration: variable

Curriculum: as follows

1. Water analysis
2. Water meters and Test bench technique
3. Water loss reduction
4. Pump operation and maintenance
5. Disinfection of pipelines and reservoir
6. Rehabilitation Technique for water supply network
7. Automation
8. Maintenance

**Table 6.11.1 - Training institutions in Vietnam (4/4)**

**NATIONAL TRAINING CENTER FOR THE WATER AND ENVIRONMENT SECTOR  
(CNEE)**

CNEE offers **short-term in-service training** for executive managers, general managers, personnel managers, technical supervisors, technicians, pumping station operators, foremen, and laborers in a wide variety of managerial and technical subjects. Its scheduled training program for 1998 is provided below.

**TRAINING PROGRAM  
1998**

<b>Training Description</b>	<b>Target Group</b>	<b>Timing</b>
1. Administrative and Financial Management	Senior Managers	6-18 April 1998
2. Customer Relations Management	Managers	9-21 March 1998
3. Technology Management	Technical Staff	9-21 February 1998
4. Water Quality Management	Managers & Technicians	7-20 September 1998
5. Human Resource Management	Senior Managers, Personnel managers	4-16 May 1998
6. Establishing O&M Procedures	Technical Directors and Staff	13-25 July 1998
7. Assuring Drinking Water Supply	Technical Directors and Staff	12-24 October 1998
8. Pump Technology	Pumping Station Operators	15-27 June 1998
9. Water Meter Selection and Installation	Technicians	23-28 March 1998 (5 times in 1998)
10. Pipe Laying	Foremen, Laborers	13-18 April 1998 (9 times in 1998)

Table 6.11.2 Costs for Human Resources Development at the Hanoi City Level						
1.Short Term Program (2000-2005)*						
	1	2	3	4	5	6
1.1 Short Term Training	Trainees	Course	Days/Unit	Trainer	Trainer	Total
		Units		Days	Cost/Day	Cost
Basic Core Curriculum	20	5	20	100	100	\$ 10,000
Advanced Topics	30	5	20	100	100	\$ 10,000
Managerial and Leadership Training	10	2	20	40	100	\$ 4,000
On-the-job Training	30	2	30	60	100	\$ 6,000
<b>Total Short Term Training</b>	<b>90</b>			<b>300</b>		<b>\$ 30,000</b>
1.2 Technical Assistance (funded by ODA) - Short Term ((2000 -2005)						
EIA and Technology						\$25,000
Environmental Monitoring						\$100,000
Pollution Control						\$25,000
Inspection						\$25,000
District Environmental Management						* See District Costs
Public Relations and Environmental Awareness						\$25,000
<b>Total Technical Assistance</b>						<b>\$200,000</b>
<b>TOTAL SHORT TERM HRD COSTS</b>						<b>\$ 230,000</b>
2. Middle Term Program						
	1	2	3	4	5	6
2.1 Middle Term Training	Trainees	Course	Days/Unit	Trainer	Trainer	Total
		Units		Days	Cost/Day	Cost
Basic Core Curriculum	10	5	20	100	100	\$ 10,000
Advanced Topics	40	5	20	100	100	\$ 10,000
Managerial and Leadership Training	10	1	20	20	100	\$ 2,000
On-the-job Training	40	1	40	40	100	\$ 4,000
<b>Total Middle Term Training</b>	<b>100</b>			<b>260</b>		<b>\$ 26,000</b>
<b>Total Technical Assistance</b>						<b>\$ -</b>
<b>TOTAL MIDDLE TERM HRD COSTS</b>						<b>\$ 26,000</b>
3. Long Term Program						
	1	2	3	4	5	6
3.1 Long Term Training	Trainees	Course	Days/Unit	Trainer	Trainer	Total
		Units		Days	Cost/Day	Cost
Basic Core Curriculum	12	5	20	100	100	\$ 10,000
Advanced Topics	50	5	20	100	100	\$ 10,000
Managerial and Leadership Training	10	1	20	20	100	\$ 2,000
On-the-job Training	50	2	50	100	100	\$ 10,000
<b>Total Long Term Training</b>	<b>122</b>			<b>320</b>		<b>\$ 32,000</b>
<b>Total Technical Assistance</b>						<b>\$ -</b>
<b>TOTAL LONG TERM HRD COSTS</b>						<b>\$ 32,000</b>
<b>GRAND TOTAL</b>						<b>\$ 288,000</b>

\* Assumes upgrading to environmental agency

\*\* Assumes an Office of Science Technology and Environment will be created at district level

1. Trainees - the number of people that need to take the training course.
2. Course units - the number of units in each training course (1 unit equals one week of training)
3. Days/Unit - the number of days require by the trainer to develop and deliver the training unit
4. Trainer days - (2) times (3) - the total number of days needed by the trainer to training
5. Trainer Cost/Day - daily rate for trainers to develop or deliver training
6. Total Cost - cost to develop and deliver the training course



Table 6.11.3 Costs for Human Resources Development at the District Level

1. Short Term Program						
	1	2	3	4	5	6
1.1 Long Term Training	Trainees	Course Units	Days/Unit	Trainer Days	Trainer Cost/Day	Total Cost
Basic Core Curriculum	20	5	20	100	100	\$ 10,000
Advance Topics					100	\$ -
Managerial and Leadership Training					100	\$ -
On-the-job Training	20	4	20	80	100	\$ 8,000
<b>Total Short Term Training</b>	<b>40</b>			<b>180</b>		<b>\$ 18,000</b>
Total Technical Assistance						\$ -
<b>TOTAL SHORT TERM</b>						<b>\$ 18,000</b>
2 Middle Term Program **						
	1	2	3	4	5	6
2.1 Long Term Training	Trainees	Course Units	Days/Unit	Trainer Days	Trainer Cost/Day	Total Cost
Basic Core Curriculum	28	5	20	100	100	\$ 10,000
Advance Topics	48	5	20	100	100	\$ 10,000
Managerial and Leadership Training	12	2	20	40	100	\$ 4,000
On-the-job Training	48	2	48	96	100	\$ 9,600
<b>Total Middle Term Training</b>	<b>136</b>			<b>336</b>		<b>\$ 33,600</b>
Total Technical Assistance						\$ -
<b>TOTAL MIDDLE TERM HRD COSTS</b>						<b>\$ 33,600</b>
3 Long Term Program						
	1	2	3	4	5	6
3.1 Long Term Training	Trainees	Course Units	Days/Unit	Trainer Days	Trainer Cost/Day	Total Cost
Basic Core Curriculum	4	5	20	100	100	\$ 10,000
Advance Topics	48	5	20	100	100	\$ 10,000
Managerial and Leadership Training	12	1	20	20	100	\$ 2,000
On-the-job Training	48	2	48	96	100	\$ 9,600
<b>Total Long Term Training</b>	<b>112</b>			<b>316</b>		<b>\$ 31,600</b>
Total Technical Assistance						\$ -
<b>TOTAL LONG TERM HRD COSTS</b>						<b>\$ 31,600</b>
<b>GRAND TOTAL</b>						<b>\$ 83,200</b>

\* Assumes upgrading to environmental agency

\*\* Assumes an Office of Science Technology and Environment will be created at district level

1. Trainees - the number of people that need to take the training course.
2. Course units - the number of units in each training course (1 unit equals one week of training)
3. Days/Unit - the number of days require by the trainer to develop and deliver the training unit
4. Trainer days - (2) times (3) - the total number of days needed by the trainer to training
5. Trainer Cost/Day - daily rate for trainers to develop or deliver training
6. Total Cost - cost to develop and deliver the training course

**Table 6.11.4 Training Costs for Human Resources Development for TUPWS**

Training (Technical assistance)	1 Trainees	2 Course units	3 Days/unit	4 Trainer days	5 trainer cost/days	6 Total cost
<b>Short Term (2006)</b>						
utility management	10	4	20	80	500	40,000
engineering, operation & maintenance	15	5	20	100	500	50,000
<b>Total cost for the period</b>						<b>90,000</b>
<b>Mid Term (2007-2010)</b>						
utility management	20	6	20	120	500	60,000
engineering, operation & maintenance	30	4	30	120	500	60,000
<b>Total cost for the period</b>				<b>240</b>		<b>120,000</b>

1. Trainees - the number of people that need to take training courses
2. Course units - the number of units in each training course (1 unit = 1 week of training)
3. Days/unit - the number of days required for the trainer to develop and deliver the training unit
4. Trainer days - (2) times (3) - the total number of days needed by the trainer
5. Trainer cost per day - daily rate for trainers to develop and deliver training
6. Total cost - cost to develop and deliver the training course

Table 6.11.5 Costs for Human Resources Development for HAPI						
1. Short Term Program (2000-2005)						
	1	2	3	4	5	6
1.1 Short Term Training *	Trainees	Course Units	Days/Unit	Trainer Days	Trainer Cost/Day	Total Cost
Seminars and Training Courses	15	2	20	40	100	\$ 4,000
EIA of policies and plans	4	4	20	80	100	\$ 8,000
Evaluation of environ. improvements	4	4	20	80	100	\$ 8,000
On-the-job Training	4	2	4	8	100	\$ 800
<b>Total Short Term Training</b>	<b>27</b>			<b>208</b>		<b>\$ 20,800</b>
1.2 Technical Assistance (funded by ODA) -Short Term (2000 - 2005)						
1. Policy Analysis Study on Relocation						\$ 50,000
2. Environmental Aspects of Socioeconomic Planning						\$ 100,000
3. Economic Evaluation of Environmental Projects						\$ 100,000
<b>Total Technical Assistance</b>						<b>\$ 250,000</b>
<b>TOTAL SHORT TERM HRD COSTS</b>						<b>\$ 270,800</b>
2. Middle Term Program (2006-2010)						
	1	2	3	4	5	6
2.1 Middle Term Training	Trainees	Course Units	Days/Unit	Trainer Days	Trainer Cost/Day	Total Cost
Refresher Training	15	2	20	40	100	\$ 4,000
Training for Env. Eval. Unit	4	5	20	100	100	\$ 10,000
<b>Total Middle Term Training</b>	<b>20</b>			<b>144</b>		<b>\$ 14,000</b>
<b>Total Technical Assistance</b>						<b>\$ -</b>
<b>TOTAL MIDDLE TERM HRD COSTS</b>						<b>\$ 14,000</b>
3. Long Term Program (2011-2020)						
	1	2	3	4	5	6
3.1 Long Term Training	Trainees	Course Units	Days/Unit	Trainer Days	Trainer Cost/Day	Total Cost
Refresher Training	15	5	20	100	100	\$ 10,000
Training for Env. Eval. Unit	4	10	20	200	100	\$ 20,000
<b>Total Long Term Training</b>	<b>19</b>			<b>300</b>		<b>\$ 30,000</b>
<b>Total Technical Assistance</b>						<b>\$ -</b>
<b>TOTAL LONG TERM HRD COSTS</b>						<b>\$ 30,000</b>
<b>GRAND TOTAL</b>						<b>\$ 314,800</b>

\* Assumes that will be undertaken in conjunction with technical assistance and assumes that environmental evaluation unit will be created

1. Trainees - the number of people that need to take the training course.
2. Course units - the number of units in each training course (1 unit equals one week of training)
3. Days/Unit - the number of days require by the trainer to develop and deliver the training unit
4. Trainer days - (2) times (3) - the total number of days needed by the trainer to training
5. Trainer Cost/Day - daily rate for trainers to develop or deliver training
6. Total Cost - cost to develop and deliver the training course

Table 6.11.6 Training Costs for Human Resources Development for HCAO						
1. Short Term Program (2000-2005)						
	1	2	3	4	5	6
1.1 Short Term Training *	Trainees	Course	Days/Unit	Trainer	Trainer	Total
		Units		Days	Cost/Day	Cost
Seminars and Training Courses	15	2	20	40	100	\$ 4,000
Database Management	5	4	20	80	100	\$ 8,000
Geographic Information Systems	5	5	20	100	100	\$ 10,000
Spatial Planning Applications	5	5	20	100	100	\$ 10,000
Overseas Training -GIS	1					\$ 25,000
On-the-job Training	5	4	5	20	100	\$ 2,000
<b>Total Short Term Training</b>	<b>36</b>	<b>20</b>		<b>340</b>		<b>\$ 59,000</b>
<b>1.2 Technical Assistance (funded ODA) - Short Term (2000 - 2005)</b>						
1. Increase Environmental Spatial Planning Capability in HCAO						\$ 150,000
2. Developing the next amendment of Hanoi Master Plan to 2020.						\$ 100,000
<b>Total Technical Assistance</b>						<b>\$ 250,000</b>
<b>TOTAL SHORT TERM HRD COSTS</b>						<b>\$ 309,000</b>
2. Middle Term Program (2006-2010)						
	1	2	3	4	5	6
2.1 Middle Term Training	Trainees	Course	Days/Unit	Trainer	Trainer	Total
		Units		Days	Cost/Day	Cost
Training for Spatial Planning Unit	5	5	20	100	100	\$ 10,000
<b>Total Middle Term Training</b>	<b>5</b>			<b>100</b>		<b>\$ 10,000</b>
<b>Total Technical Assistance</b>						<b>\$ -</b>
<b>TOTAL SHORT TERM HRD COSTS</b>						<b>\$ 10,000</b>
3. Long Term Program (2011-2020)						
	1	2	3	4	5	6
3.1 Long Term Training	Trainees	Course	Days/Unit	Trainer	Trainer	Total
		Units		Days	Cost/Day	Cost
Training for Spatial Planning Unit	5	10	20	200	100	\$ 20,000
<b>Total Long Term Training</b>						<b>\$ 20,000</b>
<b>Total Technical Assistance</b>						<b>\$ -</b>
<b>TOTAL LONG TERM HRD COSTS</b>						<b>\$ 20,000</b>
<b>GRAND TOTAL</b>						<b>\$ 339,000</b>

\* Assumes training will be undertaken in conjunction with technical assistance and assumes that a spatial planning unit will be created

1. Trainees - the number of people that need to take the training course.
2. Course units - the number of units in each training course (1 unit equals one week of training)
3. Days/Unit - the number of days require by the trainer to develop and deliver the training unit
4. Trainer days - (2) times (3) - the total number of days needed by the trainer to training
5. Trainer Cost/Day - daily rate for trainers to develop or deliver training
6. Total Cost - cost to develop and deliver the training course

**Table 6.11.7 - Training Costs for Human Resources Development for HSDC**

	1	2	3	4	5	6
Training provided through technical assistance	Trainees	Course units	Days/unit	Trainer days	trainer cost/days	Total cost US\$
<b>Drainage</b>						
<b>Short Term</b>						
basic management/technical skills	10	4	20	80	500	40,000
specialized operator training	15	6	30	180	500	90,000
on-the-job training	20	8	30	240	500	120,000
total short-term				500		250,000
<b>Mid Term</b>						
basic management/technical skills	5	4	20	80	500	40,000
specialized training	10	5	30	150	500	75,000
on-the-job training	10	6	30	180	500	90,000
total mid-term				410		205,000
Total training for drainage						455,000
<b>Sewerage</b>						
<b>Short Term</b>						
basic management/technical skills	5	4	20	80	500	40,000
specialized operator training	10	8	30	240	500	120,000
on-the-job training	10	12	30	360	500	180,000
total short-term				680		340,000
<b>Mid Term</b>						
basic management/technical skills	10	4	20	80	500	40,000
specialized operator training	40	10	30	300	500	150,000
on-the-job training	20	16	30	480	500	240,000
total mid-term				860		430,000
Total training for sewerage						770,000
total short-term						590,000
total mid-term						635,000
<b>Total training</b>						<b>1,225,000</b>

1. Trainees - the number of people that need to take training courses
2. Course units - the number of units in each training course (1 unit = 1 week of training)
3. Days/unit - the number of days required for the trainer to develop and deliver the training unit
4. Trainer days - (2) times (3) - the total number of days needed by the trainer
5. Trainer cost per day - daily rate for trainers to develop and deliver training
6. Total cost - cost to develop and deliver the training course

**Table 6.11.8 - Training Costs for Human Resources Development URENCO**

Training provided through technical assistance	1 Trainees	2 Course units	3 Days/unit	4 Trainer days	5 trainer cost/days	6 Total cost (US\$)
<b>Solid Waste Landfill and Transfer Operations</b>						
<b>Short Term</b>						
basic management/technical skills	15	5	20	100	500	50,000
specialized operator training	20	4	20	80	500	40,000
on-the-job training	30	8	30	240	500	120,000
Sub-total				420		210,000
<b>Management/ O&amp;M training</b>						
<b>Short Term</b>						
basic management/technical skills	10	4	20	80	500	40,000
specialized training	15	8	20	160	500	80,000
on-the-job training	15	12	30	360	500	180,000
Sub-Total				600		300,000
<b>Mid Term</b>						
basic management/technical skills	10	4	20	80	500	40,000
specialized training	15	5	20	100	500	50,000
on-the-job training	20	6	30	180	500	90,000
Sub-Total				360		180,000
<b>Total short term</b>						510,000
<b>Total mid-term</b>						180,000
<b>Total training investment</b>						690,000

1. Trainees - the number of people that need to take training courses
2. Course units - the number of units in each training course (1 unit = 1 week of training)
3. Days/unit - the number of days required for the trainer to develop and deliver the training unit
4. Trainer days - (2) times (3) - the total number of days needed by the trainer
5. Trainer cost per day - daily rate for trainers to develop and deliver training
6. Total cost - cost to develop and deliver the training course