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Annex 3

Establishment of the Basel Convention Regional Centre for South Asia at the SACEP, Colombo, Sri Lanka

Needs Assessment Report

(Digital Copy Only)

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Executive Summary

The South Asia Co-operative Environment Programme (SACEP) has been nominated as the host institution for a proposed Basel Convention Regional Centre for Training and Technology Transfer (BCRC). The main goal and objective of the centre is to strengthen the capacity of the governments of the South Asia region to implement the Basel Convention on Control of Transboundary Movement of Hazardous Wastes and their Disposal both in terms of complying with the legal and institutional aspects of implementation of the convention and technical requirements for the environmentally sound management of hazardous wastes.

One of the most important factors in the management of hazardous wastes is the awareness and fear of the legislative and enforcement mechanism. Alongside of this there is a need for the development of adequate infrastructure for testing, storing, handling and monitoring of hazardous wastes to address enforcement. The need for the training of personnel in different departments and organisations is of utmost necessity to update them of the latest trends and understandings of issues related to hazardous wastes.

Under the first phase of this initiative, a needs assessment for training in environmentally sound management of hazardous wastes in countries of South Asia region was carried out and the findings of the needs assessment study were facilitated in developing a comprehensive program to address these needs. The needs assessment study was carried out for the countries Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. This task was accomplished by liasoning with the respective countries and contacting the Basel convention focal points, appropriate government, industry representatives and NGOs to collect the relevant information and compiling that information through the assistance of local and regional experts.

The data was collected on the country's economy, environmental regulatory regime, legislative framework, status of hazardous waste generation and management and specific needs with respect to policy development, development of legislation, enforcement of legislation, training needs and the prioritisation of these needs. Conclusions and recommendations were formulated for each country. The reports were prepared for each member country.

Afghanistan

Afghanistan lies between 29°35’ and 38°40’ northern latitude and between 60°31’ and 75°00’ eastern longitude on the mountainous and desert areas where the Iranian Plateau borders with the mountainous systems of Central Asia. Afghanistan is bound on the north by Turkmenistan, Uzbekistan and Tajikistan, on the northeast by China, on the south and east by Pakistan and on the west by Iran. The country’s area is 653000 sq. km. Till December 2005, Afghanistan did not have a single environmental protecting legislation in place. On the eighteenth of December 2005, the cabinet approved the legislation, the Environment Act that for the first time gives Afghanistan the legal power it needs to begin bettering its environment.

Afghanistan is not a party to the Basel Convention, therefore, the regulatory regime does not address any of the articles of the convention. There is a need for policy development starting from signing/ ratification of Basel Convention, definition of hazardous waste, development of legislation & guidelines, notification and consent procedures to penal provisions. Capacity building and awareness creation for Policy makers, implementers, industry and public are important activities to initiate the process of hazardous waste management.

Bangladesh

Bangladesh is one of the youngest countries, born only in 1971. With an area of about 144,000 sq. km, Bangladesh is situated between latitudes 20 degrees 34' and 26 degree 38' north and longitudes 88 degree 01' and 92 degree 41' east. It shares almost all of it's land boundaries with India and a little with Burma. Bangladesh signed the Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention) on the 22nd of March 1989 but there has been limited progress towards the implementation of the mandate of the convention. As per the available information the environment related legislation is still not comprehensive and there is no specific legislation on hazardous wastes. The industry groups were owners of their operations and its impact on environment and human health.

The essential steps required for the country in it's efforts to strengthen the management and monitoring of hazardous wastes would be to develop a comprehensive policy and regulation on hazardous wastes. The capacity building of the enforcement authorities would be required in several areas such as policy, technical and administrative.

Bhutan

Bhutan is a landlocked country in Indian subcontinent located between latitudes 26•45'N and 28•10'N and between longitudes 88•45'Eand 92•10'E. The total land area of the country is 46,500 square kilometers with maximum latitudinal and longitudinal distance of 170 and 300 kilometers respectively. The Bhutanese economy is based on agriculture, forests and mineral resources. Industrial Development has been one of the major possibilities of the Royal Government of Bhutan, due to the availability of low-cost energy from hydropower and natural raw material resources. The most important industrial activities in Bhutan can be classified into three categories: wood-based, mineral-based (often also energy-based) and service industries.

Bhutan has ratified the Basel Convention, however, the regulatory regime does not address any of the articles of the Convention. The environmental guidelines mention about hazardous waste from industries. There is lack of systematic collection, treatment and disposal system of this waste. Bhutan has basic testing facilities for waste water which needs to be upgraded and strengthened to address hazardous waste. Bhutan has banned import of all kinds of scrap, plastic waste, second-hand equipment and reconditioned cars.

There is a need for development of a policy, legislation & guidelines for hazardous wastes. The hazardous waste management needs include need for inventorization and identification of technology options for disposal of hazardous wastes, training and awareness programmes for policy makers and all stakeholders.

India

India is located in Southern Asia, bordering the Arabian Sea and the Bay of Bengal, between Burma and Pakistan and has a total area of 3,287,590 sq. km with a land area of 2,973,190 sq. kms, and a water surface of 314,400 sq. km. India's economy encompasses traditional village farming, modern agriculture, handicrafts, a wide range of modern industries, and a multitude of support services. According to the estimates made about 4.4 million tons of hazardous waste is generated within the country.

The policies and legislations in the area of hazardous wastes are in place. However, there is a need to strengthen the implementation agencies through capacity building and technology support. There is a strong need to strengthen the industrial capacity to minimise and efficiently manage their hazardous wastes and the non-government machinery including the

awareness of the public since they play an important role in the monitoring and public awareness in sensitive issues like hazardous wastes.

Maldives

Republic of Maldives is an archipelago situated in the Indian Ocean between South of the equator and 8° North latitudes. The country stretches 823 km north to south and 130 km east to west. The country is surrounded by Sri Lanka on the East and India on the North. There are 1,190 islands in Maldives out of which only 200 islands are inhabited. The wastes generated are broadly classified into four kinds, i.e. residential, commercial, business and construction waste. Batteries and Other Hazardous Waste (OHW) containing waste oil, medical waste, Insecticides, Pesticides and waste chemicals comprise the hazardous waste.

The needs of the country in the areas of hazardous waste management covers a broad spectrum of activities such as policy development, Implementation, compliance and monitoring. There is also a need for building capacity to ensure compliance and establish a system of waste separation, collection, transportation and disposal in Maldives. Training and awareness creation emerged as an important activity to initiate the process of hazardous waste management.

Nepal

Nepal is roughly rectangular in shape. The country's landmass stretches 885 km from east to west and has a non-uniform width of 193 km north to south. It has a total land area of 147,181sq. km and an estimated population of 21.84 million as in 1998. The recyclable wastes such as non-ferrous metal scrap, used lead-acid batteries, used oil etc. were taken illegally into India for recycling. However, these wastes being hazardous and covered under the Basel Convention, transboundary movement is not permitted even for recycling.

The environmentally sound management of hazardous wastes is sought to be regulated through various provisions of the EPA, 1997. Specific standards, authorisation for management and handling and requirements of environmentally sound management of hazardous wastes are not yet put in place. Recyclable hazardous wastes such as lead-acid batteries, non-ferrous metallic scrap, waste oil/used oil etc. may be going illegally to India for recycling. This is not allowed under the Basel Convention and MoPE do not permit import or export of hazardous wastes. Several areas were identified for training needs in the country.

Pakistan

Islamic Republic of Pakistan lies between 23-35 to 37- 05 north latitude and 60-50 to 77- 50 east longitude touching the Hindukush Mountains in the north and extending from the Pamirs to the Arabian Sea. Pakistan extends along either side of the historic Indus River , bordering on India , China , Afghanistan and Iran . Pakistan 's 796,095 square kilometers of territory include a wide variety of landscapes, from arid deserts to lush, green valleys to stark mountain peaks. The country has an expanding industry. Cotton, Textiles, sugar, cement, and chemicals play an important role in its economy. Solid waste in Pakistan is generally composed of plastic and rubber, metal, paper and cardboard, textile waste, glass, food waste, animal waste etc. Hazardous hospital and industrial waste are being simply treated as ordinary waste.

The National Environmental Policy of 2005 provides an overarching framework for addressing the environmental issues facing Pakistan. The need of the country in the areas of hazardous waste management covers the activities such as policy development, Implementation, compliance and monitoring. There is also a need for building capacity to

ensure compliance and establish a system of waste separation, collection, transportation and disposal in Pakistan. Training and awareness creation were also identified as important activities to manage the hazardous waste in the country.

Sri Lanka

Sri Lanka is an island strategically located in Indian Ocean between 6^{o}-10^{o} N Latitude and 80^{o}-82^{o} East longitude. The maximum length from North to South is 432 Kilometers while maximum breadth from East to West is 224 Kilometers. Sri Lanka has diverse group of industries, which have been classified, into micro, small, medium and large-scale industries. These include sectors like food & beverage, textile, apparel & leather products, wood & wood products, pulp, paper and paper products, chemical, petroleum, plastic and rubber, non metallic products, basic products and fabricated metal products.

Though the hazardous waste management law is presently enforceable in Sri Lanka, the lack of implementation is on account of absence of the basic treatment and disposal facilities. The regulatory regime makes it mandatory that all industries having pollution potential must have the necessary approval license from the CEA or designated body (i.e. local councils for low polluting industries, BOI for BOI industries). There is a need to raise awareness of industry to ensure compliance and capacity building of all regulatory agencies in terms of infrastructure development mainly related to identification and testing of hazardous waste. It was also revealed that there is a need for developing a system of hazardous waste separation, collection, transportation and disposal in Sri Lanka.

1. Introduction

1.1 Objective:

The South Asia Co-operative Environment Programme (SACEP) has been nominated as the host institution for the proposed Basel Convention Regional Centre (BCRC) for Training and Technology Transfer. The main goal and objective of the centre is to strengthen the capacity of the governments of the South Asia region to implement the Basel Convention both in terms of complying with the technical requirements for the environmentally sound management of hazardous wastes as well as the legal and institutional aspects of implementation of the convention.

The first phase of this initiative was to carry out a needs assessment for training in environmentally sound management of hazardous wastes in the countries of the South Asia region, to help in developing a comprehensible programme to address these needs.

1.2 Scope of Work:

The scope of work was to conduct a needs assessment study for the countries Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka. This task would be accomplished by liasoning with the respective countries and contacting the appropriate government and industry representatives and compiling that information through the assistance of local and regional experts. This would consist of the first phase of the study.

- To identify the needs of the countries: Afghanistan, Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, for training in environmentally sound management of hazardous wastes, through field visits.
- To identify and priortise technology needs for the environmentally sound management of hazardous wastes.
- To identify the relevant institutions with whom the proposed BCRC to be established at SACEP can collaborate for environmentally sound management of hazardous wastes.
- To identify a pool of experts to implement a hazardous waste management system and the accessibility to appropriately qualified individuals suitable for a hazardous waste management training of trainers programme.
- To identify other bilateral programmes related to hazardous waste management and cleaner production.
- To raise an awareness among the member countries of SACEP regarding the proposal to establish the Basel Convention Regional Centre in SACEP, Colombo, Sri Lanka.

1.3 Short Description of the Basel Convention:

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted in 1989 and entered into force on 5 May 1992. The Convention is the response of the international community to the problems caused by the annual world-wide production of hundreds of millions of tonnes of wastes. These wastes are hazardous to people or the environment because they are toxic, poisonous, explosive, corrosive, flammable, eco-toxic, or infectious.

This global environmental treaty strictly regulates the transboundary movements of hazardous wastes and provides obligations to its Parties to ensure that such wastes are managed and disposed of in an environmentally sound manner. The main principles of the Basel Convention are:

- Transboundary movements of hazardous wastes should be reduced to a minimum consistent with their environmentally sound management.
- Hazardous wastes should be treated and disposed of as close as possible to their source of generation.
- Hazardous waste generation should be reduced and minimized at source.

In order to achieve these principles, the Convention aims to control the transboundary movement of hazardous wastes, monitor and prevent illegal traffic, provide assistance for the environmentally sound management of hazardous wastes, promote cooperation between Parties in this field, and develop Technical Guidelines for the management of hazardous wastes.

1.4 Approach and Methodology:

The approach that was adopted involved

- The review of existing documents and information sought from member countries
- Contact key government organisations and personnel involved with the hazardous waste management in the respective country
- Meet industry representatives to get the industry perspective for the management of hazardous waste in the country
- Interact with major Non-governmental organisations involved with hazardous waste management
- Meet with bilateral donor agencies that have programmes in the country on the hazardous waste management.
- Collect information from interviews, reports or other documents and collate this information to compile a report.

The initial needs assessment was carried out by India for six countries namely Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka in the region based on the scope of work and discussions held with the participating countries. This was further extended to seek information from the rest of two countries namely Afghanistan and Pakistan to complete the task of needs assessment for all the member countries of SACEP. The report of the needs assessment of Afghanistan and Pakistan is given in Annex 1 and the rest of the countries which was conducted by India given in Annex 2.

Annex 1

Establishment of the Basel Convention Regional Centre for South Asia at SACEP, Colombo, Sri Lanka

Needs Assessment Report Afghanistan and Pakistan

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Afghanistan

Country Profile

Afghanistan lies between 29°35' and 38°40' northern latitude and between 60°31' and 75°00' eastern longitude on the mountainous and desert areas where the Iranian Plateau borders with the mountainous systems of Central Asia. Afghanistan is bounded on the north by Turkmenistan (744km), Uzbekistan (137km) and Tajikistan (1206km), on the northeast by China(96km), on the south and east by Pakistan (2412km) and on the west by Iran (925km). The country's area is 653000 sq. km. The Settled population in 2003-2004 according to CSO Estimated Population of Afghanistan Gazetteer amounted almost (20691400).

Agriculture is the main branch of the country's economy, it employs nearly 85 per cent of the population and produces about two-thirds of the national income. Land cultivation is concentrated in oases and valleys, and live-stock breeding has a semi-nomadic character. Irrigated lands yield a major portion of the country's crop production. Half of the improved lands, however, still suffer from a shortage of water. The construction of the present irrigation systems in Afghanistan began after 1945, but only one – the Jalalabad system – is effective from an economic point of view.

Approximately 80% of the population of Afghanistan directly relies on the natural resource base of the country to meet its daily needs. In 2003, the UNEP post-conflict environmental assessment in Afghanistan found that many livelihoods are under threat by the alarming degree of environmental degradation caused by a combination of conflict, poverty, population growth and survival tactics. Already, the lack of basic natural resources, such as clean water or trees, has lead to the collapse of many rural livelihoods, turning many people into environmental refugees and increasing population pressures in urban centres. The decline in the country's natural resource based has increased vulnerability to natural disasters and food shortages, thereby further increasing poverty and decreasing opportunities for sustainable livelihoods. Human health is also directly threatened by pollution hotspots and inadequate waste management and sanitation practices. Key aspects of Afghanistan's current state of the environment include the following:

Urban Environment. In the urban environment, human health is being placed at risk by poor solid and liquid waste management practices and a lack of uncontaminated drinking water and sanitation infrastructure. Adequate landfills do not exist in any towns and cities, and no measures are being taken in relation to existing dumpsites to prevent groundwater contamination or reduce toxic emissions arising from the burning of solid waste. Furthermore, many polluting industrial activities are being undertaken without regard for environmental protection or the health of workers.

Surface and Groundwater. Water is the key to the health and well-being of the Afghan people. Approximately 75-80% of the population requires consistent access to water to maintain agricultural production. The damage to the water resources of the country is immense. Drought and uncoordinated and unmanaged extraction of both ground and surface water resources has severely depleted the available water resource base resulting in a water quantity crisis. Similarly, water quality is threatened by contamination from waste dumps, chemicals and open sewers. Due

to mismanagement of surface water, many of Afghanistan's wetlands are completely dry and no longer support wildlife populations or provide agricultural inputs.

Soils. The soils of Afghanistan are one of the most important foundations for the Afghan economy. They are the basis for agriculture and animal husbandry, and at the same time support the growth of natural vegetation. However, due to decades of overuse and poor management, many of the soils are slowly eroding and land productivity is being reduced. Some of the degradation is so severe that recovery cannot take place without human intervention. One of the most threatening impacts arising from loss of soil and vegetation is desertification and increased flood risk.

Air. Dust and vehicle emissions (exacerbated as a result of the use of lowgrade hydrocarbons) in Afghanistan's urban areas are the main factors adversely affecting air quality. Current assessments of vehicle density in the country amount to 500 000 cars, 30 000 buses and 50 000 trucks – figures that are growing rapidly. During late autumn and winter, air quality is worsened by domestic emissions arising from increased use of ovens, stoves and open fires. Electricity shortages and a lack of fuelwood mean that households resort on occasions to burning packaging materials, often resulting in the release of toxic emissions.

If the current environmental problems in Afghanistan are not addressed, the following impacts can be expected.

- Existing chemical contamination of air, soil and water resources at pollution hotspots will threaten human health and undermine workforce stability and economic productivity.
- Vulnerability to natural disasters and food shortages will increase, which will hinder development efforts and compound humanitarian crises.
- Unequal distribution of water resources could lead to severe water scarcity in some regions, threatening human livelihoods, creating environmental refugees, compounding adverse humanitarian conditions and increasing regional tensions.
- The adverse environmental impacts of reconstruction and development projects will create a large set of new environmental problems and impacts to livelihoods if not regulated and mitigated. Addressing these problems will have significant long-term financial implications for the government of Afghanistan.
- Unsustainable use of water resources could threaten agricultural production and food security, as well as wetland ecology and biodiversity.
- Mismanagement of municipal, industrial and military wastes could lead to further contamination of air, soil, and water resources (with adverse impacts on human health and well-being, as well as the environment) and to the creation of new pollution hotspots.
- Continued deforestation combined with livestock grazing and water scarcity will lead to increased soil erosion, desertification and reduced fertility and ecosystem services.
- Continued loss of vegetation and green cover and mismanagement of soil will lead to floods, mudslides, deterioration of groundwater quality, and rapid run off of water during the wet season.
- Continued declines in biodiversity and increased listing of endangered species due to habitat loss and the lack of an effective protected areas system.

- Environmental refugees could be created due to land degradation and resource scarcity.
- Environmental investments may be conducted in an overlapping and non-coordinated way leading to inefficiency, redundancy and non-optimal use of limited resources.
- Citizens of Afghanistan will lack basic environmental information on the key problems faced by the country, and on the location of pollution hotspots.
- Donors, UN agencies and the international community will lack information on the key environmental investment needs for 2007 and beyond.

Regulatory Framework

Till December 2005, Afghanistan did not have a single environmental protecting legislation in place. Eighteenth of December 2005, the cabinet approved legislation that for the first time gives Afghanistan the legal power it needs to begin bettering its environment. Known as the Environment Act, the law clarifies administrative roles at the national level and coordination with provincial authorities. It spells out frameworks for managing natural resource conservation and biodiversity, drinking water, pollution control, and environmental education. Equally as important, say its supporters, the law provides tools for enforcement.

Institutional Framework

The recent establishment of an environmental function within the centralized government system reflects Afghanistan's development priorities. Still a nascent function, environment has changed organizational location and structure since its inception. In 2002, the new function was first housed in the Ministry of Irrigation, Water Resources and Environment (MIWRE) as the Department of Environment. In January 2005, the Department of Environment was separated from MIWRE and was subsequently declared an independent Department of Environment. In May 2005 the environmental function was given the status of an independent National Environmental Protection Agency (NEPA). NEPA has overall responsibility for environmental protection issues. NEPA is working on creating three forums: a broad-based National Environmental Advisory Council consisting of ministers, provincial governors, tribal leaders, religious leader, and others; a Council of Eminent Persons that will extend membership to prominent national and international personalities to spearhead campaigns for the environment; and an Inter-ministerial Committee for Environment.

Need Assessment

Afghanistan is not a signatory of Basel convention and there is no legal framework to address generation, storage, treatment, transport, disposal and transboundary movement of hazardous wastes. There is a lack of skilled manpower in regulatory institutions to ensure compliance.

Policy Development Needs

National Environment Protection Agency and other regulatory bodies including customs need technical support in the following areas.

- Signatures, Ratification and transcription of Basel Convention into national Law
- Need for the appointment of competent authority/ Focal Point
- Need for National Definition/ classification of hazardous waste
- Specific Waste and Hazardous Waste Management Law
    - Legislation/ Guidelines for Generation/storage/handling/ transportation and disposal of hazardous wastes
    - Legislation/ Guidelines for export/Import/Illegal trade of hazardous waste
- Guidelines for monitoring/control of hazardous waste
- Guidelines for recovery/recycle and reuse
- Development of list of banned Items (List A&B)
- Notification/ Consent Procedures For Export Of Hazardous Waste
- Notification/ Consent Procedures For Import Of Hazardous Waste
- Notification/ Consent Procedures For Hazardous Wastes In Transit

Development Of Custom Procedures

Policy Enforcement Needs

There is a need for capacity building of all regulatory agencies at all levels both in terms of capacity building and infrastructure development related to skill level and identification and testing of hazardous waste.

- Need to develop Institutions at the national and district level
- Need to develop other institutions having role in compliance: Customs/ Police/ Judiciary
- Need to develop national control system for transboundary movement of Hazardous Waste
- Need to Identifying ports of entry and transit points
- Need to Harmonize procedures of clearance and checking by customs (Annex VIII & IX)
- Need to develop infrastructure for identification, testing, temporary storage, handling and disposal of hazardous waste
- Need for strengthening available lab for testing of hazardous waste
- Need for provision of financial guarantees and bonds for transboundary movement to ensure recovery of cost in case of forced return or disposal.
- Need for procedures, data gathering system, information analysis and information sharing between enforcing agencies.

Training Needs

The shortage of skilled manpower in Afghanistan makes training needs as one of the most important areas to address the needs for policy development, enforcement and hazardous waste management.

1. Senior Level Program: For directors rank and above

2. Mid – Level Program: This would include planning officers and/ or environmental unit officers from each line ministries
3. Field and Technical Level Program: Participants should include environmental personnel from major private and state owned organizations. This program is directed at staff responsible for implementing environmental initiatives.

Pakistan

Country Profile

Pakistan, officially the Islamic Republic of Pakistan is a republic in South Asia, marking the region where South Asia converges with Central Asia and the Middle East. It lies between 23-35 to 37- 05 north latitude and 60-50 to 77- 50 east longitude touching the Hindukush Mountains in the north and extending from the Pamirs to the Arabian Sea. Pakistan extends along either side of the historic Indus River , bordering on India , China , Afghanistan and Iran . Pakistan 's 796,095 square kilometers of territory include a wide variety of landscapes, from arid deserts to lush, green valleys to stark mountain peaks. Pakistan is an arid country with rainfall ranging from 80 mm in the southern parts to 1600 mm in the North. From the coast and the mouth of the Indus , the country extends some 1,7000 km northwards to the mountains of Himalayas , Hindu Kush and Karakorum range . Pakistan has a coastline of around 1,046 km and an Exclusive Economic Zone of 196,000 sq.km in the Arabian Sea.

Pakistan is the sixth most populous country in the world. The total population is 132.35 million according to population census 1998.

The country has an agricultural economy with a network of canals irrigating a major part of its cultivated land. Wheat, cotton, rice, millet and sugar cane are the major crops. Among fruits: mangos, oranges, bananas and apples are grown in abundance in different parts of the country. The main natural resources are natural gas, coal, salt and iron. The country has an expanding industry. Cotton, Textiles, sugar, cement, and chemicals play an important role in its economy.

Regulatory Framework

Environmental Policy and Plan

In 1992, the Government approved the National Conservation Strategy (NCS), which is also called as Pakistan's Agenda 21. All reports regarding strategies, policies and programmes for sustainable development are to be drawn up on the basis of the NCS. The NCS has set out a programme to bring the country on to a path of sustainable development.

The National Environmental Policy of 2005 provides an overarching framework for addressing the environmental issues facing Pakistan, particularly pollution of fresh water bodies and coastal waters, air pollution, lack of proper waste management, deforestation, los of biodiversity, desertification, natural disasters and climate change. It also gives directions for addressing the cross sectoral issues as well as the underlying causes of environmental degradation and meeting international obligations.

Environmental Laws and Regulations

Pakistan ratified the Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal in 26 July 1994.

Pakistan enacted the Environment Protection Act in 1997, to replace the Pakistan Environmental Protection Ordinance of 1983. The other important laws and regulations are; National Environmental Quality Standards (Self-Monitoring and Reporting by Industries Rules, 2001); Self-Monitoring and Reporting by Industries Rules, 2001-Amended; National Environmental Quality Standards (Environmental Laboratories Certification) Regulations, 2000; National Environmental Quality standards; S.R.O.549 (I)/2000; S.R.O.742 (I)/93; Environmental Samples Rules, 2001; Pakistan Biosafety Rules 2005; Provincial Sustainable Development Fund Board (procedure) Rules, 2001; The pollution Charge for Industry (Calculation and Collection) Rules, 2001; Environmental Tribunal Rules, 1999; Pakistan Environmental Protection Agency (Review of IEE/EIA) Regulations;

Provincial Sustainable Development Fund (Utilization) Rules, 2003; Hazardous Substance Rules, 2003 (Draft); National Resettlement Policy, March 2002 (Draft); Project Implementation And Resettlement of Affected Persons Ordinance 2001; Hospital Waste Management Rules, 2005 and; National Biosafety Guidelines.

According to Section 2(xl) of the Pakistan Environmental Protection Act – 1997, "waste" means any substance or object which has been, is being or is intended to be, discarded or disposed of, and includes liquid waste, solid waste, waste gases, suspended waste, industrial waste, agricultural waste, nuclear waste, municipal waste, hospital waste, used polyethylene bags and residues from the incineration of all types of waste.

National definition of hazardous waste used for the purpose of transboundary movements of waste exists in Pakistan. The following is the definition of the hazardous wastes as described in Pakistan's Environmental Protection Act 1997:

"Hazardous waste" means waste which is or which contains a hazardous substance or which may be prescribed as hazardous waste, and includes hospital waste and nuclear wastes;"

"Hazardous substance" means:

(a) substance or mixture of substance, other than a pesticide as defined in the Agriculture Pesticides Ordinance, 1971 (II of 1971), which, by reason of its chemical activity or toxic, explosive, flammable corrosive, radioactive or other characteristics causes, or is likely to cause, directly or in combination with other matters; an adverse environmental effect; and
(b) any substance which may be prescribed as hazardous substance.

In Pakistan there are no wastes other than those pursuant to Art. 1 (1)a and/or Art. 1 (1)b of the Basel Convention that require special consideration when subjected to transboundary movement.

Restrictions on Transboudary Movement

The amendment to the Basel Convention (Decision III/1) has been implemented in Pakistan. Pakistan restricts the export of hazardous wastes and other wastes for final disposal.

According to Section 14 (Handling of Hazardous Substances) of Pakistan Environmental Protection Act – 1997 "subject to the provisions of this Act, no person shall generate, collect, consign, transport, treat, dispose of, store, handle or import any hazardous substance except; (a) under a license issued by the Federal Agency and in such manner as may be prescribed; or (b) in accordance with the provisions of any other law for the time being in force, or of any international treaty, convention, protocol, code, standard, agreement or other instrument to which Pakistan is a party."

Pakistan has no restrictions on the export of hazardous wastes and other wastes for recovery. The country restricts the import of hazardous wastes and other wastes for final disposal. According to section 13 of Pakistan Environmental Protection Act – 1997, "No person shall import hazardous waste into Pakistan and its territorial waters, Exclusive Economic Zone and historic water." Import Trade and Procedure Order, 2000, inter-alia, also bans import of hazardous wastes as defined and classified in Basel Convention except where import is specifically authorized by the Federal Government. Pakistan has also prepared a national Profile on Chemical Management in Pakistan – 2000 to provide information on registered hazardous chemicals being imported or produced locally. In addition, the mechanism of Prior Informed Consent (PIC) is being strengthened to monitor inflow of hazardous substances into Pakistan in accordance with UNEP/London guidelines.

Pakistan restricts the import of hazardous wastes and other wastes for recovery.

1) According to section 13 of Pakistan Environmental Protection Act – 1997, "No person shall import hazardous waste into Pakistan and its territorial waters, Exclusive Economic Zone and historic water.

2) Import, Trade and Procedure Order, 2000, inter-alia, also bans import of hazardous wastes as defined and classified in Basel Convention except where import is specifically authorized by the Federal Government.

3) Pakistan has also prepared a national Profile on Chemical Management in Pakistan – 2000 to provide information on registered hazardous chemicals being imported or produced locally.

4) In addition, the mechanism of Prior Informed Consent (PIC) is being strengthened to monitor inflow of hazardous substances into Pakistan in accordance with UNEP/London guidelines.

Status of Hazardous Waste Management

At present, it is estimated that, 54,888 tons per day of solid waste generated in Pakistan. The rate of waste generation on average from all type of municipal controlled areas varies from 0.283

kg/capita/day to 0.613 kg/capita/day or from 1.896 kg/house/day to 4.29 kg/house/day in all selected cities. Solid waste in Pakistan is generally composed of plastic and rubber, metal, paper and cardboard, textile waste, glass, food waste, animal waste etc. The detailed physical composition of waste is given bellow.

Physical composition of waste (% weight) in selected cities

Cities	Faisalabad	Karachi	Hyderabad	Peshawar	Quetta
Plastic & Rubber	4.80	6.40	3.60	3.70	8.20
Metals	0.20	0.75	0.75	0.30	0.20
Paper	2.10	4.10	2.40	2.10	2.20
Card board	1.60	2.40	1.50	1.90	1.30
Rags	5.20	8.40	4.70	4.30	5.10
Glass	1.30	1.50	1.60	1.30	1.50
Bones	2.90	3.00	2.00	1.70	2.00
Food waste	17.20	21.00	20.00	13.80	14.30
Animal waste	0.80	3.00	5.80	7.50	1.70
Leaves/grass	15.60	14.00	13.50	13.60	10.20
Wood	0.70	2.25	2.25	0.60	1.50
Fines	43.00	29.70	38.90	42.00	44.00
Stones	4.60	3.50	3.00	7.30	7.80

Source: www.environment.gov.pk/PRO_PDF/PositionPaper/Brief-SWM-%20Pak.pdf

Hazardous hospital and industrial waste are being simply treated as ordinary waste. Open burning of waste especially non-degradable components like plastic bags are adding to air pollution.

Industrial Scenario

The industrial sector is a major contributor to water pollution, with high levels of BOD, heavy metals, and toxic compounds. Only 30 industries have installed water pollution control equipment, and most are working at a very low operational level. Priority industrial sectors for pollution control are medium-to-large-scale textile industries and small-scale tanneries and electroplating industries. Each day the textile industries discharge about 85,000 m^3 of wastewater with a high BOD, while the electroplating industries discharge about 23,000 m^3 of highly toxic and hazardous wastewater.

Need Assessment for Environmentally Sound Management of Hazardous Waste

Following areas are identified as needs with respect to the implementation of Basel:

- Training of policy makers and enforcement officers

This group requires training in the areas of:

- Relevant existing laws and regulations associated with hazardous wastes, in Pakistan
- International laws on hazardous wastes and transboundary movement
- Guidelines and safe practices for management of hazardous wastes including storage, treatment, transportation and disposal
- Implementation of regulations governing hazardous waste generation, storage, treatment and disposal
- Training on identification, assessment and preparation of sites for hazardous waste disposal
- Training on data management and reporting of hazardous wastes

- Hazardous Waste Management Needs

Inventorization

- Inventories the chemicals which are imported
- Carry out a hazardous waste survey to identify hazardous waste that are generated from different sectors
- Characterization of Hazardous Waste example
- Strengthening of Codification/ Labelling procedures for hazardous waste
- National Statistics for Hazardous Waste

Technology Options

- Identification of technology options for hazardous waste management
- Develop guidelines for hazardous waste minimization
- Develop procedures for recovery, recycle and reuse of hazardous waste
- Identification of Cleaner Production & Technology options that are practical in the Pakistan

- Monitoring illegal traffic
- Financial Assistance
  - Assistance to develop hazard criteria, test methods, improvement of customs procedures, notification and consent protocol/procedure and preparation of inventories of hazardous waste streams.
  - Prioritisation of activities in relation to hazardous wastes produced in the country particularly with reference to waste minimasation/recycling, treatment, storage and disposal facilities (TSDF), emergency response and linkage to industry.
  - Data management systems
  - Development of infrastructure laboratories

Annex 2

FINAL REPORT

Needs Assessment for Training of Technology in Environmentally Sound Management of Hazardous Wastes in the SAARC Region

Submitted to

ASIAN AND PACIFIC CENTRE FOR TRANSFER OF TECHNOLOGY, NEW DELHI

NOVEMBER 2001

INTERNATIONAL RESOURCES GROUP

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Executive Summary

The Asian and Pacific Centre for Transfer of Technology (APCTT) has been nominated as the host institution for a proposed Sub-Regional Training Centre (SRTC) for Hazardous Waste Management and Technology Transfer Under the Basel Convention. Technical and Financial assistance for the establishment of the proposed centre will be provided by the Canada-India Environmental Institutional Strengthening Project funded by the Canadian International Development Agency. The main goal and objective of the centre is to strengthen the capacity of the governments of the SAARC region to implement the Basel Convention both in terms of complying with the technical requirements for the environmentally sound management of hazardous wastes as well as the legal and institutional aspects of implementation of the convention.

Under the first phase of this initiative, a needs assessment for training in environmentally sound management of hazardous wastes in countries of the SAARC region was carried out by the consultants. The findings of this needs assessment study would aim to help in developing a comprehensive program to address these needs.

The scope of work for the consulting team was to conduct a needs assessment study for the countries Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka. This task was accomplished by visiting the respective countries and contacting the Basel convention focal point, appropriate government, industry representatives and NGOs to collect the relevant information and compiling that information through the assistance of local experts. The approach adopted by the consultants to carry out the needs assessment of the six countries was based on the scope of work and discussions with the APCTT. The approach that was adopted involved the review of existing documents with the APCTT, New Delhi and travel to the different countries and meet key government organisations and personnel involved with the hazardous waste management in the respective country.

The consulting team collected data on the country's economy, environmental regulatory regime, legislative framework, status of hazardous waste generation and management and specific needs with respect to policy development, development of legislation, enforcement of legislation, training needs and the prioritisation of these needs. Conclusions and recommendations were formulated for each country. The reports on the countries covered have been presented in alphabetical order.

Bangladesh is one of the youngest countries, born only in 1971. With an area of about 144,000 sq. km, Bangladesh is situated between latitudes 20 degrees 34' and 26 degree 38' north and longitudes 88 degree 01' and 92 degree 41' east. Bangladesh signed the Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention) on the 22nd of March 1989 but there has been limited progress towards the implementation of the mandate of the convention. It shares almost all of it's land boundaries with India and a little with Burma. Discussions with key relevant organisations and officials revealed that the current status of environment related legislation is still not comprehensive and there is no specific legislation to address hazardous waste issues. It was observed that the capacity of the relevant authorities to implement the existing legislation was also weak and therefore there is a distinct need for capacity augmentation of these authorities. It was felt that the industry groups

responsible for most of the indigenously generated hazardous wastes are aware of the implications of their operations on the environment and occupational health issues of workers. The first essential step required for the country in it's efforts to strengthen the management and monitoring of hazardous wastes would be to develop a comprehensive policy addressing all aspects of hazardous wastes. The capacity building of the enforcement authorities would be required in several areas. Staffing is required in several areas including inspection staff, testing staff, communication staff, training staff, research staff and database management and administrative staff. This would facilitate enforcement and help inventorise the generation and movement in the country and even transboundary movement of hazardous wastes. Significant work needs to be done in the area of categorisation of hazardous wastes and their inventorisation as such data is not present with the enforcement agencies.

One of the most important factors in the management of hazardous wastes is the awareness and fear of the legislative and enforcement mechanism. Alongside of this there is a need for the development of adequate infrastructure for testing, storing, handling and monitoring of hazardous wastes to address enforcement. The need for the training of personnel in different departments and organisations is of utmost necessity to update them of the latest trends and understandings of issues related to hazardous wastes.

Bhutan is a landlocked country in Indian subcontinent located between latitudes 26°45'N and 28°10'N and between longitudes 88°45'Eand 92°10'E. The total land area of the country is 46,500 square kilometers with maximum latitudinal and longitudinal distance of 170 and 300 kilometers respectively. The Bhutanese economy is based on agriculture and (renewable) natural resources. Most of the population (85%) are engaged in farming and forestry. The country has large mineral resources, but they are not easily accessible and the share of mining and quarrying of GDP is about 2%.

Industrial Development has been one of the major focus of the Royal Government of Bhutan. The major advantage of developing the industrial sector is the availability of low-cost energy from hydropower and the use of available raw materials. The most important industrial activities in Bhutan can be classified into three categories: wood-based, mineral-based (often also energy-based) and service industries.

Bhutan has banned import of all kinds of scrap, plastic waste, second-hand equipment and reconditioned cars. It was informed that 11 to 10 tons per day of solid waste is generated in Thimphu. This waste is not segregated and it is a mixture of all kinds of waste. A small recycling market exists in Thimphu where scavengers recover items like metal scrap and used oil. Recovery of waste oil is practiced and it is sold on cost recovery basis in Thimphu. However, it was informed that about half of this used oil waste finds its way to Thimphu river and the battery waste is transported to South Bhutan near the Indian border.

Bhutan is not a signatory to the Basel convention, therefore, the regulatory regime does not address any of the articles of the Convention. However, the environmental guidelines mention about hazardous waste from industries. The waste from urban centres is not segregated and is disposed off in an unsystematic manner. Sometimes, this waste is burned in open. There is lack of systematic collection, treatment and disposal system of this waste. Bhutan has basic testing facilities for waste water which needs to be upgraded and strengthened to address hazardous waste.

There is a need for policy development starting from signing/ ratification of Basel Convention, definition of hazardous waste, development of legislation & guidelines, notification and consent procedures to penal provisions. The need for policy enforcement includes development of capacity of institutions, formulation of uniform identification and testing procedures and information collection, analysis and dissemination. The hazardous waste management needs include need for inventorization and identification of technology options for disposal of hazardous wastes. The policy and hazardous waste management needs catalyses training needs for four types of target audience, which include Policy developers, policy implementers, industry and public. The major recommendations for training needs are Training for Basel Convention Implementation/ Policy, Developing/Strengthening Legislative Frameworks and Guidelines and Policy Enforcement. These is also a need for training for Hazardous Waste Management Needs

The policy makers and implementers require awareness and advanced training for the above. The industry/ commercial and business establishment and NGOs require awareness training for four different types of training and an advanced training in the area of Hazardous Waste Management.

India is located in Southern Asia, bordering the Arabian Sea and the Bay of Bengal, between Burma and Pakistan and has a total area of 3,287,590 sq. km with a land area of 2,973,190 sq. kms, and a water surface of 314,400 sq. km.

India's economy encompasses traditional village farming, modern agriculture, handicrafts, a wide range of modern industries, and a multitude of support services. 67% of India's labour force works in agriculture, which contributes 25% of the country's GDP. Services accounts for 18% of the work force and industry for the balance.

The data for the exact quantity of hazardous waste generated in the country still eludes the Ministry of Environment and Forests although the legal procedures require the producers of hazardous waste to report the nature and quantity of such wastes. One of the constraints pointed out is the definition of wastes of certain categories and therefore the subjectivity for waste quantification.

The current needs of the country for various areas of hazardous waste management are diverse. These range from needs for awareness at all levels, implementation of regulations, development and utilisation of technology and better management and disposal practices. The most important need is the strengthening of the institutional structure for implementing of the regulatory framework. The current laws and regulations governing hazardous waste are fairly adequate but the implementation of these is rather poor. The regulatory institutions need a financial resources to enable them to function more efficiently and therefore bring about a tangible improvement in the management of hazardous waste. The regulatory bodies also need financial assistance to develop in house knowledge base that can be used to train other institutions and the public.

Industry is the principal generator of hazardous wastes followed by medical facilities. There is a strong need to strengthen the industrial capacity to minimise and efficiently manage their hazardous wastes. There is also a need to strengthen the non-government machinery including the awareness of the public since they play an important role in the monitoring and public awareness in sensitive issues like hazardous wastes. In the end

the needs to strengthen the judiciary to be aware of the hazardous waste handling legislation that would assist them in their efforts in preside over cases of this nature.

Republic of Maldives is an archipelago situated in the Indian Ocean between South of the equator and 8° North latitudes. The country stretches 823 km north to south and 130 km east to west. The country is surrounded by Sri Lanka on the East and India on the North. There are 1,190 islands in Maldives out of which only 200 islands are inhabited.

The wastes are generated mainly from Male & Villingili Islands in Islands. These islands are the center of major commercial and domestic activities in Maldives. The solid waste generated in Male is broadly classified into four kinds of wastes, i.e. residential, commercial, business and construction waste. The hazardous waste has been classified into two major groups namely Batteries and Other Hazardous Waste (OHW) containing waste oil, medical waste, Insecticides, Pesticides and waste chemicals. The present disposal practices do not address the hazardous waste management.

The current needs of the country for various areas of hazardous waste management covers a broad spectrum of activities starting from policy development, Implementation, compliance and monitoring. Since policy development is the first step for developing framework for regulatory regime, training needs relevant to policy development should be taken up as the first priority in Maldives. There is also a need to develop the capacity of the industry to ensure compliance. The major observations during the study indicated that there is an urgent need for developing a system of waste separation, collection, transportation and disposal in Maldives. The shortage of skilled manpower in Maldives makes training needs as one of the most important areas to address the needs for policy development, enforcement and hazardous waste management. After legislation relevant to hazardous waste is in place, the training needs relevant to strengthening of the institutions should be taken up to ensure compliance. It may be summarised that the judiciary and non-governmental organisations also need to be involved in the initiative to provide hazardous waste awareness to ensure adequate checks and balances in the command and control regime.

Nepal is roughly rectangular in shape. The country's landmass stretches 885 km from east to west and has a non-uniform width of 193 km north to south. It has a total land area of 147,181sq. km and an estimated population of 21.84 million as in 1998.

Prior to 1950, municipal solid wastes solid wastes were locally managed in urban areas including Kathmandu valley. Solid waste management in both industrial and domestic sector has been a cause of great concern in urban areas of Nepal. In Kathmandu valley solid waste management and resource mobilisation centre (SWMRMC) was established in mid 1980's. Municipal solid wastes are collected, transported and disposed off through efforts of SWMRMC and municipalities. Industrial solid wastes: The total solid waste generated by different industries is estimated to be 22,000 tons per year. In general the major solid waste generating industries are leather, canning, sugar and distilleries. It was learnt that recyclable wastes such as non-ferrous metal scrap, used lead-acid batteries, used oil etc. are generally taken illegally to India. These wastes being hazardous and covered under the Basel Convention, transboundary movement is not permitted even for recycling.

The environmentally sound management of hazardous wastes is sought to be regulated through various provisions of the EPA, 1997. Specific standards, authorisation for

management and handling and requirements of environmentally sound management of hazardous wastes are not yet put in place. Recyclable hazardous wastes such as lead-acid batteries, non-ferrous metallic scrap, waste oil/used oil etc. may be going illegally to India for recycling. This is not allowed under the Basel Convention and MoPE do not permit import or export of hazardous wastes.

Several areas were identified for training needs in the country. These were: training of enforcement officers, development of infrastructure laboratories, monitoring illegal traffic, assistance to develop hazard criteria, test methods, improvement of customs procedures, notification and consent protocol/procedure and preparation of inventories of hazardous waste streams. Training was also felt to be required for the prioritisation of activities in relation to hazardous wastes produced in the country particularly with reference to waste minimasation/recycling, treatment, storage and disposal facilities (TSDF), emergency response and linkage to industry, information dissemination and coordination with voluntary organisations for public participation and data management systems.

Sri Lanka is an island strategically located in Indian Ocean between 6^{o}-10^{o} N Latitude and 80^{o}-82^{o} East longitude. The maximum length from North to South is 432 Kilometers while maximum breadth from East to West is 224 Kilometers.

The major exports of Sri Lanka are agriculture & industrial products and minerals while major imports are consumer products, intermediate and investment goods. Sri Lanka has diverse group of industries, which have been classified, into micro, small, medium and larger-scale industries. These include sectors like food & beverage, textile, apparel & leather products, wood & wood products, pulp, paper and paper products, chemical, petroleum, plastic and rubber, non metallic products, basic products and fabricated metal products.

Though the hazardous waste management law is presently enforceable in Sri Lanka, the lack of implementation is on account of absence of the basic treatment and disposal facilities. However, the generation of hazardous waste continues and disposal of the waste (liquid and solid) takes place alongside the other waste disposal practices. It has been reported that the total amount of hazardous waste generated in Sri Lanka is about 40,617 tonnes per annum out of which 25% is inorganic waste, 36% is organic waste, 4% is other waste and the remaining 36% is oil waste from motor vehicles.

The regulatory regime makes it mandatory that all industries having pollution potential must have the necessary approval license from the CEA or designated body (i.e. local councils for low polluting industries, BOI for BOI industries). The license, which is called Environmental Protection License (EPL) is issued to industries subject to their conforming to the stipulated emission or discharge standards specified by the CEA.

The key issues include strengthening of capacity of existing institutions. There is a need to raise awareness of industry to ensure compliance. There is a need for capacity building of all regulatory agencies in terms of infrastructure development mainly related to identification and testing of hazardous waste. The major observations during the study indicated that there is an urgent need for developing a system of waste separation, collection, transportation and disposal in Sri Lanka.

The comparative needs assessment for each country was carried out in two areas mainly Policy and hazardous waste management. The policy needs was broken down into policy development and policy enforcement. Policy development needs were evaluated on three major criteria: signatory to Basel convention, Hazardous waste legislation and criteria/ guidelines/ standards. The policy enforcement was evaluated on Institutional Capacity and Compliance issues. The hazardous waste management needs was further classified into Inventorization, status of notification, consent procedures and protocols, technology needs and emergency response procedures. Inventorization has been evaluated based on identification and classification of waste. Notification, Consent procedures and Protocols have been evaluated based on existence of Notification and consent procedures and protocols. Hazardous waste management needs have been evaluated into storage, treatment technologies and existence of environmentally sound management programs (ESM). ESM has been further evaluated based on recovery, recycle, clean technology/ cleaner production. The following tables summarize the comparative needs for each country.

POLICY NEEDS ASSESSMENT

Country/ Needs	**Policy Development**					
	Signatory to Basel	**Hazardous Legislation**				**Criterion/ guidelines /standards**
		Export/ Import	**Generation**	**Storage/ handling**	**Disposal**	
India	√	√	√	√	√	√
Bangladesh	√	Partial	Partial	Partial	Partial	Partial
Maldives	√	Partial	X	X	X	X
Sri Lanka	√	Under revision	√	√	√	√
Nepal	√	Partial	X	X	X	Partial
Bhutan	X	X	X	X	X	Partial

POLICY NEEDS ASSESSMENT

Country/ Needs	**Policy Enforcement**						
	Institutional Capacity				**Compliance**		
	Organisation		**Infrastructure**		**Consent**	**Notices**	**Impounding**
	National	**Provincial**	**Identified**	**Testing**			
India	√	√	Partial	Partial	√	√	√
Bangladesh	√	Partial	Partial	Partial	X	X	X
Maldives	√	Partial	X	X	X	X	X
Sri Lanka	√	√	Partial	Partial	√	√	Partial
Nepal	√	X	X	X	X	√	X
Bhutan	√	X	X	X	X	X	X

TRAINING NEEDS ASSESSMENT - POLICY (AWARENESS TRAINING)

Country/ Needs	Awareness Training			
	Policy Makers	Implementers	Industry	Public
India	Limited	Limited	√	√
Bangladesh	√	√	√	√
Maldives	√	√	√	√
Nepal	√	√	√	√
Bhutan	√	√	√	√
Sri Lanka	√	√	√	√

TRAINING NEEDS ASSESSMENT - POLICY (ADVANCED TRAINING)

Country/ Needs	Advanced Training			
	Policy Makers	Implementers	Industry	Public
India	Limited	√	Limited	X
Bangladesh	√	√	√	X
Maldives	√	√	√	X
Nepal	√	√	√	X
Bhutan	√	√	√	X
Sri Lanka	Limited	√	Limited	X

TRAINING NEEDS ASSESSMENT - POLICY (SPECIALIZED TRAINING)

Country/ Needs	Specialized Training			
	Policy Makers	Implementers	Industry	Public
India	Limited	√	X	X
Bangladesh	√	√	X	X
Maldives	√	√	X	X
Nepal	√	√	X	X
Bhutan	√	√	X	X
Sri Lanka	√	√	X	X

HAZARDOUS WASTE MANAGEMENT NEEDS

Country/ Needs	Inventorisation	
	Identification	Classification
India	Partial	√
Bangladesh	X	X
Maldives	X	X
Sri Lanka	Partial	Partial
Nepal	X	X
Bhutan	X	X

HAZARDOUS WASTE MANAGEMENT NEEDS

Country/ Needs	Hazardous Waste Management / technology							Emergency response
	Storage	Hazardous Waste Treatment			Environmentally Sound Management			
		Land Filling	Incineration	Others	Waste minimisation	Recycle /Reuse	Cleaner Prod./ tech	
India	√	Partial	X	X	Partial	Partial	Partial	X
Bangladesh	X	X	X	X	X	X	X	X
Maldives	X	Partial	X	X	X	X	X	X
Sri Lanka	X	X	X	X	X	X	X	X
Nepal	X	X	X	X	X	X	X	X
Bhutan	X	X	X	X	X	X	X	X

TRAINING NEEDS ASSESSMENT - HAZARDOUS WASTE MANAGEMENT (AWARENESS TRAINING)

Country/ Needs	Awareness Training			
	Policy Makers	Implementers	Industry	Public
India	Limited	Limited	√	√
Bangladesh	√	√	√	√
Maldives	√	√	√	√
Nepal	√	√	√	√
Bhutan	√	√	√	√
Sri Lanka	√	√	√	√

TRAINING NEEDS ASSESSMENT - HAZARDOUS WASTE MANAGEMENT (ADVANCED TRAINING)

Country/ Needs	Advanced Training			
	Policy Makers	Implementers	Industry	Public
India	Limited	√	Limited	X
Bangladesh	√	√	√	X
Maldives	√	√	√	X
Nepal	√	√	√	X
Bhutan	√	√	√	X
Sri Lanka	Limited	√	Limited	X

TRAINING NEEDS ASSESSMENT - HAZARDOUS WASTE MANAGEMENT (SPECIALIZED TRAINING)

Country/ Needs	Specialized Training			
	Policy Makers	Implementers	Industry	Public
India	Limited	√	X	X
Bangladesh	√	√	X	X
Maldives	√	√	X	X
Nepal	√	√	X	X
Bhutan	√	√	X	X
Sri Lanka	√	√	X	X

1. Introduction

1.1 Objective:

The Asian and pacific Centre for Transfer of Technology (APCTT) has been nominated as the host institution for the proposed Sub-Regional Training Centre (SRTC) for Hazardous Waste Management and Technology Transfer Under the Basel Convention. Technical and Financial assistance for the establishment of the proposed centre will be provided by the Canada-India Environmental Institutional Strengthening Project funded by the Canadian International Development Agency. The main goal and objective of the centre is to strengthen the capacity of the governments of the SAARC region to implement the Basel Convention both in terms of complying with the technical requirements for the environmentally sound management of hazardous wastes as well as the legal and institutional aspects of implementation of the convention.

The first phase of this initiative is to carry out a needs assessment for training in environmentally sound management of hazardous wastes in the countries of the SAARC region. The findings of this needs assessment study would help in developing a comprehensible programme to address these needs.

1.2 Scope of Work:

The scope of work for the consulting team was to conduct a needs assessment study for the countries Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka. This task would be accomplished by visiting the respective countries and contacting the appropriate government and industry representatives and compiling that information through the assistance of local experts. This would consist of the first phase of the study.

- To identify the needs of the countries: Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka, for training in environmentally sound management of hazardous wastes, through field visits.
- To identify and priortise technology needs for the environmentally sound management of hazardous wastes.
- To identify the relevant institutions with whom the proposed SAARC - Regional Training Centre (SAARC-SCTC) at APCTT can collaborate for environmentally sound management of hazardous wastes.
- To identify a pool of experts to implement a hazardous waste management system and the accessibility to appropriate qualified individuals suitable for a hazardous waste management training of trainers programme.
- To identify other bilateral programmes related to hazardous waste management and cleaner production.
- To raise an awareness in Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka regarding the proposal to establish the SAARC-SRTC at APCTT, New Delhi, India.
- To submit the needs assessment report of Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka to APCTT.

1.3 Short Description of the Basel Convention:

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted in 1989 and entered into force on 5 May 1992. The Convention is the response of the international community to the problems caused by the annual world-wide production of hundreds of millions of tonnes of wastes. These wastes are hazardous to people or the environment because they are toxic, poisonous, explosive, corrosive, flammable, eco-toxic, or infectious.

This global environmental treaty strictly regulates the transboundary movements of hazardous wastes and provides obligations to its Parties to ensure that such wastes are managed and disposed of in an environmentally sound manner. The main principles of the Basel Convention are:

- Transboundary movements of hazardous wastes should be reduced to a minimum consistent with their environmentally sound management.
- Hazardous wastes should be treated and disposed of as close as possible to their source of generation.
- Hazardous waste generation should be reduced and minimized at source.

In order to achieve these principles, the Convention aims to control the transboundary movement of hazardous wastes, monitor and prevent illegal traffic, provide assistance for the environmentally sound management of hazardous wastes, promote cooperation between Parties in this field, and develop Technical Guidelines for the management of hazardous wastes.

1.4 Approach and Methodology:

The approach adopted by the consultants to carry out the needs assessment of the six countries was based on the scope of work and discussions with the APCTT. The approach that was adopted involved

- The review of existing documents with the APCTT, New Delhi
- Travel to the different countries and meet key government organisations and personnel involved with the hazardous waste management in the respective country
- Meet industry representatives to get the industry perspective for the management hazardous waste in the country
- Interact with major Non-governmental organisations involved with hazardous waste management
- Meet with bilateral donor agencies that have programmes in the country on the hazardous waste management.
- Collect information from interviews, reports or other documents and collate this information to compile a report.

1.5 Structure of Report:

This report has been prepared following structure:

The objective, scope of work, requirements of the Basel Convention, approach and methodology are presented in the first chapter.

The chapters 2 to 7 present the status of respective countries in alphabetical order. These chapters are structured to reflect the country profile giving broad economic outline of the country and it's geographical and socio-economic scenario etc. The next section deals with the existing regulatory regime that governs the management of hazardous waste in the country. These include laws and regulations that address issues related to hazardous wastes. The status of hazardous wastes in the country outlines the current status of indigenous generation, in the country and presents statistics on the quantity, sources and types of hazardous wastes. The section on the assessment of needs is divided into four sub sections viz: technology needs, training needs, financial needs and needs prioritisation. Technology needs looks at specific technologies for addressing the needs in a country. These may be in terms of specific industrial sectors responsible for generating hazardous wastes or generic technology needs. Training needs of the country provides an outline of the different areas of training required by the different groups and identifies the potential trainers that could act as faculty for these training courses. The section on financial needs essentially looks at the different areas which would require financial assistance to implement and these could range from capacity development in terms of training to infrastructure like setting up of laboratories. The prioritisation of needs is country specific as the different countries have different immediate needs depending on their current status of Basel convention implementation.

Lastly the conclusions and recommendations outlines the observations of the various aspects of hazardous waste management and suggests recommendations for each country.

2. Bangladesh

2.1 Country Profile:

As a modern nation-state, Bangladesh is one of the youngest, born only in 1971. With an area of about 144,000 sq. km, Bangladesh is situated between latitudes 20 degrees 34' and 26 degree 38' north and longitudes 88 degree 01' and 92 degree 41' east. The country is bordered by India on the east, west and north and by the Bay of Bengal on the south. There is also a small strip of frontier with Burma on the south-eastern edge. The land is a deltaic plain with a network of numerous rivers and canals. Hilly regions on the north-east and south-east with an average elevation of 244m and 610m respectively mark a variation to the general topography of the country. The highest point (1230m) is located at the south-eastern extremity of the erstwhile district of Chittagong Hill Tracts. The Capital Dhaka has an area, 202 sq. miles/522 Sq. km. There are 6 divisions; Barisal, Chittagong, Dhaka, Khulna, Rajshahi, and Sylhet. The population of Bangladesh is around 135 million (1999), with urban population at 24%, an annual population growth at 1.9%,adult litracy rate at 41% and life expectancy at 59 years. The religious demography is Muslim (88.3 percent), Hindu (10.5 Percent), Buddhist (0.6 percent), Christian (0.3 percent) and Animists and believers in tribal faiths.

Bangladesh has a typical tropical monsoon climate marked by sweltering heat and high humidity for the major part of the year. The average annual temperature ranges from 18.9 to 29.0 Celsius (65 F 85 F). Annual rainfall varies from 160cm to 200cm in the west, 200cm to 400cm in the south-east and 250cm to 400cm in the north-east. Roughly two-thirds of Bangladesh is fertile arable land and a little over 10% remains forested. The economy is largely agricultural, with the cultivation of rice the single most important activity. GNP size (1999) stood at US$ 47 billion while the per capita GNP at the same period was UD$ 370. Major impediments to growth include frequent cyclones and floods, a rapidly growing labor force that cannot be absorbed by agriculture, inadequate power supplies, and slow progress towards various necessary reforms. Natural hazards remain a major worry. Recently, severe floods, lasting from July to October 1998, endangered the livelihood of more than 20 million people. Bangladesh's major exports are in Readymade garments, frozen foods and leather where export earnings in 1999-2000 stood at 4,352, 344 & 199 million US$ respectively.

2.2 Regulatory Framework:

The existing regulatory framework that affect the control and movement of hazardous wastes include:

- The Coastguard Act, 1994, provides for constant vigil of illegal traffic and dumping of hazardous wastes in the territorial waters of Bangladesh. These wastes could be in the form of
  - Wastes coming as contaminants of imported food grains, vegetable oils, sugar etc.
  - Washings, ballast water, oil spills, sanitary wastes from incoming ships.
  - Refuge from trawlers etc.

- Environment Conservation Act, 1995 defines hazardous wastes as those substances which by their inherent chemical and physical properties, are such that their manufacture, storage, discharge or unregulated transportation can cause damage to the environment. The Act provides for making proper assessment of the harm caused to the ecology by various specific activities and taking the necessary corrective measures by concerned persons, agencies and organisations.
- Environment Conservation Rules, 1997: provides for environmental quality standards for emissions and disposal of effluents as well as various other industrial, municipal and household wastes.
- Import Policy Order. 1993-95 governs the import of materials in to the country and controls the entry of hazardous wastes as well.

Bangladesh became a party to the Basel Convention through signing on and ratification on 22.03.89 and 30.06.93 respectively.

Decisions are taken through inter-Ministerial Consultations involving the Ministry of Environment and Forests, the Ministry of Commerce, the Ministry of Industry, the Ministry of Agriculture, the Ministry of Health and their respective agencies. Decisions are, however, taken by the cabinet when there is disagreement among the Ministries and Departments on a particular issue. Involved are also the Customs department, Agricultural workers, Health workers, Industrial Entrepreneurs, Environmental workers, Coast guard, and Bangladesh Rifles.

2.3 Status of Hazardous Waste Management:

Generation of Hazardous wastes by amount and types

Type	Amount (MT/day)
Municipal and household wastes (in 4 major cities of Dhaka, Chittagong, Rajshahi and Khulna)	2,180
Leather (tanning)	83,000
Textile (dyeing)	60,000
Pulp & Paper	128,000
Fertilizer	233,403
Chemicals	230,00
Pharmaceuticals	256
Pesticide	22,911
Rubber	28,956
Plastic	230,000
Re-rolling	98,583
Clinical	110

Source: Paper by Mr. Alamgir Mohammed Monsurul Alam (Sr. Assistant Secretary, Ministry of Environment and Forests) & Ahmed-Al-Farooque (Director Department of Environment) presented at Sub Regional Training Seminar for the implementation of Basel Convention 15-19 March 1999, Colombo, Sri Lanka.

One of the issues of concern that Bangladesh had faced in recent times is the well publicised case of the import of Zincoxysulphate Fertilizer in 1991 from the United States that was contaminated with Cadmium and Lead. Of the 6000 tonnes imported, 1000 tonnes were used by rice growers before the contamination was detected and further use stopped. The rest of the material is now stored in warehouses in Chittagong and Khulna.

2.4 Identification and Assessment of Needs:

2.4.1 Technology needs:

Technology for the management of hazardous wastes in Bangladesh is in several areas but none of these are unique to the country. The major industries that contribute to indigenously generated hazardous wastes are those in leather, ship-breaking, hospitals, fertilizers and textiles to an extent. The technology needs in these industries are easily available in several developing countries and in use in many countries in the developing world. Industrial hazardous waste management technology needs therefore primarily revolves around the industries specified. There is a need to adopt hazardous waste disposal sites in the country. These sites must be well selected, prepared and managed with care. Technology for the safe handling of hazardous wastes and equipment for the same. The segregation of hospital waste and it's ultimate disposal through incineration or other methods needs to be taken up immediately. Technology needs in the areas of testing and monitoring of hazardous wastes is another important aspect! The enforcement agencies at the central, provincial and ports needs to have adequate testing facilities to ascertain the nature and toxicity of the material.

2.4.2 Training and awareness needs:

Training is one of the most important needs to address the hazardous waste management. An accurate assessment of training needs is critical and specific areas of training, selected personnel in the country who can be faculty for training and identification of target groups from specific organisations to receive training is essential. Training and awareness are essential for 3 major groups of people.

The first group of organisations that may be identified for receiving training consists of those in the regulatory regime. These organisations may be associated with the development of policy, implementation of the legal requirements for hazardous waste consisting of members from:

- Ministry of Environment and Forests
- Department of Environment
- Ministry of Law, Justice and Parliamentary Affairs
- The judiciary
- Ministry of Shipping
- Customs and other nodal regulatory agencies

This group requires training in the areas of:

- Relevant existing laws and regulations associated with hazardous wastes, in Bangladesh
- International laws on hazardous wastes and transboundary movement
- Guidelines and safe practices for management of hazardous wastes including storage, treatment, transportation and disposal
- Implementation of regulations governing hazardous waste generation, storage, treatment and disposal.

Faculty for training of personnel associated with the training of policy makers could be members from:

- The Ministry of Environment and Forests
- Department of Environment
- Ministry of Law, Justice and Parliamentary Affairs
- Judiciary
- Ministry of Shipping
- Ministry of Commerce
- Federation of Bangladesh Chambers of Commerce and Industry
- Bangladesh Environmental Lawyers Association
- Select Non-government organisations
- Consultants both from within and outside the country

Note: due to the wide range of training needs within the group, the faculty for one sub group could often be a member of another sub group within the group. For instance a target group consisting of members of the Department of Environment could have a faculty from the Ministry of Environment and Forests and vice versa.

The second group of training recipients would be those associated with industry. This group would include members from industry who generate hazardous wastes, members from industries that handle and treat hazardous wastes and members from Industry associations. This group requires training in the areas of:

- Laws and regulations in Bangladesh associated with hazardous wastes, relevant to industries that generate, handle, store, transport or dispose such materials
- Guidelines and safe practices for management of hazardous wastes including storage, treatment, transportation and disposal
- Specific training for management of technologies for hazardous wastes
- Guidelines for export and import of hazardous wastes
- Guidelines for obtaining financial assistance for management of hazardous wastes
- Training on identification, assessment and preparation of sites for hazardous waste disposal
- Training on data management and reporting of hazardous wastes

The faculty for training of this industry based group could consist of members from the following list of organisations:

- Ministry of Environment and Forests
- Select consulting firms
- Federation of Bangladesh Chambers of Commerce and Industry
- Select personnel from industry
- Engineering Colleges
- Select engineering and technology transfer consultants
- Multi and bi-lateral agencies

The next group would consist of non-government organisations and selected participants from the public. This group requires awareness of the regulatory regime that governs the hazardous waste generation and management as well the effects of exposure to hazardous wastes. This would require training in the following areas:

- Awareness on potential sources of hazardous waste generation from specific sources
- Awareness of symptoms of exposure to hazardous wastes and access to medical attention
- Awareness on public rights on exposure to hazardous wastes
- Awareness on Public Interest Litigation filed to date on hazardous waste exposure
- Awareness of institutional framework to report irregularities on hazardous waste handling and disposal practices by industry

The faculty for training of this group could consist of members from the following list of organisations:

- Ministry of Environment and Forests
- Select consulting firms
- Select non-government organisations
- Ministry of Health and Family Welfare
- Other associations or organisations associated with public health.

2.4.3 Financing needs

The financing needs for the management of hazardous wastes in the country would predominantly be in the areas of capacity building at all levels. As it has been discussed in the earlier section, the existing legislation on the identification, inventorisation, management, transport and disposal of hazardous wastes is still not clearly defined. The specific areas where investment would be required could be in the following areas:

- Augmenting the existing legislation to make a comprehensive framework to address all aspects related to hazardous wastes, including indigenous generation and control of import.
- Capacity building within the existing regulatory institutional framework to conduct in-house awareness training and implementation of the legal requirements for hazardous wastes.
- Strengthening the institutional capacity for enforcement of environmental legislation particularly the control of hazardous wastes
- Development of a central and zonal level organisations specifically for the management of hazardous waste including the monitoring, assessment, training, research and awareness to institutions and the public.
- Strengthening of the academic institutions for research and development of technologies for hazardous waste management.
- Identification, preparation and management of hazardous waste disposal sites.
- Financing needs for assisting industries acquire technologies for hazardous waste management
- Development and implementation of a municipal solid waste management plan including the segregation and safe handling of the hospital wastes.

2.4.4 Needs prioritisation

The sections on the different needs in the area of hazardous wastes indicate the current status and situation in the country. While the industrial mix of the country is still relatively

in a nascent stage of development and fairly uncomplicated by a complex mix of industry and waste types, the development of the economy and opportunities for entrepreneurs would change the situation significantly in the near future. Currently the major organised industry sectors that generate, or have the potential to generate hazardous wastes are restricted to leather, fertilizer, pesticides, ship breaking, batteries etc. The prioritisation of needs for the country however is an effort to identify the several needs and rank them in a logical order of importance and significance. Based on discussions and perusal of reference material on the subject, the primary and utmost need was felt in the development of a comprehensive legislative structure to address all aspects of environment and pollution control. Specific legislation needs to be developed with standards and guidelines for industry and waste types and their management. Unless this first step is taken the enforcement of legislation will not yield the desired results. The second most important need would be to strengthen the enforcement mechanism. This need translates to institutional capacity building in terms of manpower, training and knowledge building, database development and management, reporting systems, tracking, testing and monitoring abilities and enforcement. To bring about the fulfilment of such needs a wide range of activities need to be carried out including training, procurement, contracting, communication infrastructure development and implementation plan development and enforcement. The next level of needs are those that are associated with industry directly. It is important for industry to appreciate the key role they play in the development of the country but also realise that they cannot shrug off responsibility of it's environmental responsibilities. There is a need to work collaboratively with industry, to involve them in the decision making process and emerge with the best solutions given the ground level realities and cost implications. There is a need to explore the opportunities to adopt technologies that are effective and affordable. Last but not the least, there is a need to encourage the non-government mechanism by spreading public awareness on the issues related to hazardous wastes. The public needs to be aware of the identification of pollution and hazardous wastes, their vulnerability and implication of exposure, reporting channels for observed irregularities and possible legal recourse.

2.5 Conclusions and Recommendations:

Bangladesh signed the Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention) on the 22nd of March 1989 but there has been limited progress towards the implementation of the mandate of the convention. Bangladesh is interestingly poised in geographic terms and also in it's stage of economic development. It shares almost all of it's land boundaries with India and a little with Burma. Bangladesh has an active sea port at Chittagong which acts as it's major point of export and imports. Discussions with key relevant organisations and officials revealed that the current status of environment related legislation is still not comprehensive and there is no specific legislation to address hazardous waste issues. It was observed that the capacity of the relevant authorities to implement the existing legislation was also weak and therefore there is a distinct need for capacity augmentation of these authorities. It was felt that the industry groups responsible for most of the indigenously generated hazardous wastes are aware of the implications of their operations on the environment and occupational health issues of workers. However, they are not proactively making efforts to address these issues in light of the comprehensive legislation and enforcement status. Industry is struggling to remain cost competitive with other countries and therefore wary of any unforced investments. The

first essential step required for the country in it's efforts to strengthen the management and monitoring of hazardous wastes would be to develop a comprehensive policy addressing all aspects of hazardous wastes. Without this framework, the enforcers would find little success in dealing with the generators and transporters of hazardous wastes. The first need for the country would be to develop a comprehensive legislation that encompasses all aspects of the environment. The capacity building of the enforcement authorities would be required in several areas. These could include staffing, as the required staffing requirements of the authorities need to be assessed and the positions filled by competent personnel. Staffing is required in several areas including inspection staff, testing staff, communication staff, training staff, research staff and database management and administrative staff. This would facilitate enforcement and help inventorise the generation and movement in the country and even transboundary movement of hazardous wastes. Significant work needs to be done in the area of categorisation of hazardous wastes and their inventorisation as such data is not present with the enforcement agencies.

The primary recommendations that could be made have already been discussed in earlier sections of this chapter. However, some of the key recommendations are repeated here. The management of hazardous wastes and environmental pollutants in general is only brought about by a combination of forces that work in tandem. These forces that bring about a change in the way environmental management issues are perceived in society come from different quarters and the gradual process of evolution of society to respond to these needs takes it's own time. Perhaps the most important factor is the awareness, respect and fear of the legislative and enforcement mechanism. Thus a comprehensive legislative framework must be in place to keep industry and other sections in check. This will allow the enforcement authorities to do their job more effectively. Alongside of this legal and enforcement side the development of adequate infrastructure for testing, storing, handling and monitoring of hazardous wastes. The need for the training of personnel in different departments and organisations is of utmost importance to keep them abreast of the latest trends and understandings of issues related to hazardous wastes. The strengthening of the non-government sector is also important as it brings in the public perception and awareness aspects to management of hazardous wastes. Bangladesh has the advantage of learning from the mistakes and success stories of other countries that have passed through this phase of development. Cross-border experience sharing could significantly reduce the time of implementation of these recommendations.

3. Bhutan

3.1 Country Profile:

Bhutan is a landlocked country in Indian subcontinent located between latitudes 26°45'N and 28°10'N and between longitudes 88°45'Eand 92°10'E. The total land area of the country is 46,500 square kilometers with maximum latitudinal and longitudinal distance of 170 and 300 kilometers respectively. Bhutan has a population of 657,548 with a growth rate of 3.1% and balanced male to female ratio. The population density is 14.1% with 79% population residing in rural areas. The urban population is believed to grow from approx. 15% of the total population in 1995 to approx. 40% by the year 2015 (assuming that half of the population growth will take place in urban areas). Bhutan is bordered by India in the South and by the Tibetan autonomous region of China in the north and northwest. The country has three climatic zones. The southern belt has a hot and humid climate with temperatures ranging from 15° to 30° Centigrade with rainfall ranging from 2,500 to 5,000 mm. The central region has a cool temperate climate with average annual rainfall of 1,000 mm. The northern region experiences a severe alpine climate with annual rainfall of around 400 mm. Bhutan receives most of the rainfall during summer months from south west monsoon. The country follows monarchy with executive, legislature and judiciary supporting its administration. The executive consists of a cabinet with seven ministries and eleven autonomous bodies governing Bhutan. The legislature consists of a national assembly with 150 members out of which 105 are elected members. The judiciary consists of high court consisting of eight judges and twenty district courts. Administratively, there are twenty districts and 202 blocks in the country. The dzongkhag administrator heads each district for running civil administration and development activities. Thimphu in Western Bhutan is the capital with an estimated population of 30-40,000. The other main urban settlements are Gelephu, Phuentsholing and Samdrup Jongkhar, all of them in the south.

The number of industrial establishment is 6,000 out of which the number of production and manufacturing establishments is 506. Manufacturing industries account for about 11% of GDP. The large export oriented industries include cement, ferro-alloy and calcium carbide. The fastest growing sector in Bhutan is electricity generation. Bhutan has a rich potential of hydropower, estimated at more than 20,000 MW. Bhutan has a free-trade arrangement with India. In terms of value, Bhutan exports 94% of its output and imports 70% of its requirements from India. The other trading partners include Japan, Germany, Singapore, Thailand, Denmark and USA. The major exports include vegetable and fruit products, mineral products, wood products and handicrafts. The major imports include machinery and mechanical appliances, medicines & pharmaceuticals, chemicals, mineral oil & fuels and plastic products.

The GDP of Bhutan (at current prices) in 1999 has been estimated to be about US$ 424 million with agriculture having a share of about 34%. The per capita GDP was about US$ 610 in 1999 which is one of the highest in South Asia. In 1999 the economy grew close to 6% led by agriculture production, mining & quarrying, manufacturing sector, finance , insurance and real estate, transportation & communication, construction and electric power generation as the major growth sectors. The Bhutanese currency Ngultrum (Nu) is pegged to the Indian Rupee at par. Inflation, ranged between 7 to 8 %.

Bhutan had negative balance of payment of about US$22 million during fiscal year 1998-99. However, it had US$ 258.8 million as foreign currency reserves. Bhutan has an airport at Paro and it is linked by land route to India through Phuntsholing.

3.2 Regulatory Framework:

Natural Environment Policies, Plan and Activities
The salient features of Bhutan's national environment policy are summarised below.

1. Improving existing, and introducing new, legislation and policies to ensure sustainable utilization of natural resources.
2. Preparation of master plans for different sectors of the economy e. forestry, power and roads.
3. Use of economic incentives to encourage sustainable utilization.
4. Increasing involvement of community and NGOs in planning and implementation of environmental activities.
5. Building on existing resource management practices, rather than adopting new control mechanisms.
6. The creation of a National Environment Secretariat and establishment of an Environment Trust Fund in the 9th Five Year Plan.

The National Environment Commission (NEC) was formed in 1990. NEC secretariat formulated the national strategies for environmental management in Bhutan, which has been outlined in the document, "National Environmental Strategy for Bhutan". The strategy defines three main avenues of sustainable economic development, expanding hydropower, increasing agricultural self-sufficiency, and expansion of the industrial sector. The strategy proposes actions to be taken to ensure that these areas for development are continued without irreversible damage to nature. In addition to the three main avenues presented, the other areas, relevant to environmental management include resource based mechanisms for financial sustainability, preparing for rapid urbanisation, gender issues etc.

Existing Environmental Legislation

Since the major focus is on developmental projects and industrialization, Bhutan made an attempt to incorporate Environmental criteria, in particular EIAs, into the planning process. NECS has developed Environmental Assessment Act and EIA guidelines for six major sectors and Environmental Codes of Practice (ECOP) for four different activities. In addition, the majority of Bhutan's environmental legislation concerns the conservation of forests and the protection of wildlife and wildlife habitat, a law concerning mining, Water and Sanitation Rules (July 1995) covering drinking water and waste water.

Environmental Legislation

1. National Forest Policy 1974
2. Land Act,1992
3. Forest and Nature Conservation Act 1995
4. Forest Rules and Regulations (under Revision)
5. Social Forestry Rules, 1996
6. Act on Road Safety & Transport (under Revision)
7. Municipal Act (under revision)

8. Water and Sanitation Rules 1995
9. Rule No. 15 – Rules and Regulations for the Establishment and Operation of Industrial Ventures in Bhutan 1995
10. The Mining and Minerals Management Act of 1995
11. Export/ Import Law
12. Environmental Assessment Act, 2000

Environmental Guidelines

- Bhutanese Environmental Assessment, Sectoral Guidelines – Strategic Environmental Assessment, Feb. 1999
- Bhutanese Environmental Assessment, Sectoral Guidelines – Mining and Mineral Processing, Feb. 1999
- Bhutanese Environmental Assessment, Sectoral Guidelines – Forestry, Feb. 1999
- Bhutanese Environmental Assessment, Sectoral Guidelines – Hydropower, Feb. 1999
- Bhutanese Environmental Assessment, Sectoral Guidelines –Power Transmission Lines, Feb. 1999
- Bhutanese Environmental Assessment, Sectoral Guidelines – New and Existing Industries, Feb. 1999
- Bhutanese Environmental Assessment, Sectoral Guidelines – Highways and Roads, Feb. 1999
- Ambient/ Discharge Standards and Environmental Sampling Manual

Environmental Codes of Practice in Urban Areas

- ECOP for Solid Waste Management
- ECOP for Sewage and Sanitation Management
- ECOP for Urban Roads and Traffic Management
- ECOP for Hazardous Waste Management (Waiting fir final Approval)

Bhutan has signed UN Framework Convention on Climate Change and Convention on Biological Diversity. It is not a signatory to “Basel Convention on the Control of Transboundary Movements of Hazardous Waste and Their Disposal".

Organization & Institutions

Environmental management in Bhutan is implemented through the various sectors. NEC is a national policy and regulatory agency with a mandate to preserve and sustain country’s natural resources. The commission is a high level, cross sectoral body of senior ministers and officers under the chairmanship of Minister of Agriculture. The objectives and strategies of NEC during eight plan are summarized below.
Objectives:

- Serve as an environmental advisor to the government on matters related to sustainable development
- Formulate a national environment strategy
- Institutionalize the Environmental Assessment Process
- Enhance knowledge and understanding of environmental matters and sustainability in Bhutanese society
- Ensure sustainable use of natural resources

- Maintain biological diversity in Bhutan and preserve indigenous crops and domestic animal species
- Maintain essential ecological processes and life support system.

Strategies:

- Formulation of National Environmental Action Plan
- Formulation of National Environmental Protection Act
- Formulation of Sectoral Environmental Assessment Guidelines
- Formulation of Initial Environmental Examination Guidelines
- Formulation of Environmental Quality Standards
- Formulation of Industrial Waste Management Protocol

Other Ministries

The Ministry of Trade and Industry (MTI), is responsible for environmental control of industries and mines. The ministry will have to report to the NEC on the performance in relation to environmental management, also the NEC can require specific measures to be taken. The Ministry of Agriculture (MOA) is responsible for implementation of activities under its domain, such as fulfilling the Forestry and Land Acts and their requirements for environmental management. The MOA is also responsible for operation of the National Parks through its Nature Conservation Section (NCS) and for watershed management. The roles and responsibilities of other agencies and ministries have been summarized in the following table

Roles and responsibilities of agencies associated with Environmental Management

S. No.	Name of Agency	Function	Responsibility
1.	National Environment Commission	Regulatory	Policy, Regulations & Implementation Policy, Regulations & Implementation
2.	Ministry of Health & Education	Execution	Medical Waste, Environmental Education
3.	Ministry of Trade & Industry	Regulatory	Establishment of Industry
4.	Ministry of Agriculture	Regulatory	Environmental Issues related to Land and water resources
5.	Ministry of Communication	Regulatory	Advisory Role
6.	Royal Civil Service Commission	Execution	HRD
7.	Thimphu City Corporation	Execution	Municipal Waste in Thimphu & Urban Environment
8.	Phuntsholing City Corporation	Execution	Municipal Waste in Phuntsholing & Urban Environment

It can be inferred that there is no umbrella act in Bhutan. Similarly, there is no legislation covering hazardous waste in any form in Bhutan. Environmental Assessment guidelines relevant to industries identify hazardous waste with respect to particular sectors for which basic standards have been fixed. Customs department also has powers to

impound items, which are banned from export and import. However, the list of banned waste is not defined.

3.3 Status of Hazardous Waste Management:

Industrial Development has been one of the major focus of the Royal Government of Bhutan. The major advantage of developing the industrial sector is the availability of low-cost energy from hydropower and the use of available raw materials. The most important industrial activities in Bhutan can be classified into three categories: wood-based, mineral-based (often also energy-based) and service industries. In addition, there appears to be a significant potential for agro-industries and industrialised production of mineral (potable) water for the export markets in the South. Major industries and new industrial activities are concentrated in South and South West Bhutan. Efforts are currently being made to put the existing industrial activities under control, in particular the mining activities and the larger industries in the south-west. There is no statistics available on storage, generation, transportation and disposal of hazardous waste in Bhutan. An idea of type of waste generated/ stored in Bhutan can be obtained by studying the statistics of industry, export & import items and other activities having potential of generating hazardous wastes. The number and type of industry/ manufacturing sector/ other sectors having potential for hazardous waste generation has been summarized in following tables.

Industry profile having potential of generating hazardous waste

S. No.	Industry	Number
1.	Mining	5
2.	Manufacturing	374
3.	Chemical	1
4.	Mineral Products	31
5.	Others	75
6.	Total	486

Manufacturing sector having potential of generating hazardous waste

S.No.	Manufacturing/Mining Sectors	Numbers	Type of Haz. Waste
1.	Cement	4	Waste Containing Aklali & Chlorides
2.	Food Processing	39	Pesticide Residue
3.	Textiles	8	VOC, Heavy Metals & Solvents
4.	Fibre Board	1	Formalin, VOC &Ash
5.	Calcium Carbide/ Ferro Silicones	2	Phenol, Sulfiles, Cn, As & Slag Containing Heavy Metals
6.	Limestone & Gypsum	5	Contaminated Mine Waste water containing nitrates, As, Cd, Cr, Fe, Acids, Zinc & Waste Oils
7.	Coal		
8.	Industrial Building Material		

Statistics of export and Import of certain items having potential of generating hazardous waste

S.No.	Exports/ Imports	Value
1.	Exports – Mined Products, Food Products, Chemicals, Handicrafts, FerroSilicones	4,460 Million Nu.
2.	Mineral Oils, Medicines, Plastic & Rubber Products, Machinery & Mechanical Appliances, Finished Wood Products	6,988 Million Nu.

Statistics of other items in Bhutan having potential of generating hazardous waste

S.No.	Other Sectors	Quantity/ Number	Hazardous Waste
1.	Registered Vehicles	2659	Used Oil, Lead Acid Batteries
2.	Hospitals	28	Medical Wastes
3.	Pesticides Supplied to Farmers	123,129 Kg	Pesticides

Bhutan has banned import of all kinds of scrap, plastic waste, second hand equipment and reconditioned cars. It was informed that 11 to 10 tons per day of solid waste is generated in Thimphu. This waste is not segregated and it is a mixture of all kinds of waste. It has been estimated that the urban population is believed to reach 500000 by 2020. Considering this population growth rate as the basis, the total solid waste, which would be generated, has been estimated to be about 50 tons per day in Thimphu.

The major composition of Hazardous waste could be as follows:

- Batteries
- Waste Oil
- Medical Waste
- Insecticides/ Pesticides/ Waste Chemicals
- Heavy Metals

There is an urgent need to identify, characterize and inventorize the hazardous waste in Bhutan.

Institutional Framework

The two city corporations in Phuntsholing and Thimphu are responsible for solid waste collection and disposal. However, Solid Waste/ Hazardous Waste is not systematically collected, treated and disposed both in Thimphu and Phuntsholing.

The major NGOs operating in Bhutan are as follows:
- The Royal Society for Protection of Nature (RSPN)
- The National Women's Association of Bhutan
- Bhutan Chamber of Commerce & Industry (BCCI)
- WWF Bhutan Program

BCCI and RSPN has programs addressing municipal solid waste and industrial waste.

Present Disposal Practices

Land filling

There is only one landfill site, which is located about 9 kilometers away from Thimphu where all types of waste from Thimphu are disposed. At first waste is collected at Thimphu by Thimphu City Corporation and then it is transported to this landfill site. It was informed that there is no segregation of waste and waste is dumped at the landfill site. There is no monitoring of this landfill site.

Incineration

Incineration is also practised in some of the hospitals in Bhutan.

Other Practices

Unregulated burning of garbage in dumpsters, ditches, and alongside road. Ex. Burning of plastic materials, waste oils, tires, chemicals etc.

Environmentally Sound Management of Hazardous Waste

A small recycling market exists in Thimphu where scavengers recover items like metal scrap and used oil. Recovery of waste oil is practiced and it is sold on cost recovery basis in Thimphu. However, it was informed that about half of this waste finds its way to Thimphu river and the battery waste is transported to South Bhutan near the Indian border.

At present, a DANIDA funded program having cleaner technology component is being implemented in Bhutan for Capacity Building of Division of Geology and Mines and the Division of Industries. Under Cleaner Technology Pilot Program environmentally acceptable production and performance will be implemented in new industries. New procedures for environmental assessment is being formulated and enforced.

Bilateral/ Multilateral Projects

Bilateral and Multilateral projects and programs which are being implemented in the area of Environment in Bhutan are described in table below:

Recent Completed, On-going or Approved Bilateral/ Multilateral funded Environmental Projects

Donor	Project	Duration	Mill. Nu.
WWF	Biodiversity Conservation and Protected Area Management	1993-96	24.4
Denmark	Urban Sewerage and Water Supply *	1993-96	510.5
Germany	Integrated Forest Management	1994-96	15.2
Denmark	PCAL Occupational Health and Safety	1995-96	13.2
Denmark	NEC Secretariat	1990-97	70.8
Denmark	Land Use Planning	1992-97	144.9
UNDP	Forest Resources Management and Institutional Capacity Development	1992-97	80.2
Austria	Integrated Forest Management Phase II	1993-97	161.9
Switzerland	Integrated Forestry Development	1994-97	68.7
ADB	Preparation of Environmental Guidelines	1996-97	10.3
UNDP/GEF	Biodiversity Action Plan	1996-97	4.1
UNDP	Capacity 21	1996-98	24.6
UNDP/GEF	Greenhouse Gas	1996-99	10.5
Netherlands	Black Mountain Biodiversity Conservation	1994-00	149.0
World Bank & Switzerland	Third Forestry Development	1994-01	313.3
UNDP/GEF	Integrated Management of Jigme Dorji National Park	1997-01	63.1
Netherlands	Integrated Sustainable Development	1997-02	129.1
Bhutan Trust Fund	Environmental Conservation	1991-	809.6
Netherlands	Sustainable Forest Management	pipeline	34.2
European Union	Wang Watershed Management		360.0

- The Urban Sewerage and Water Supply was originally considered an environmental project. Future Danish assistance in this area is now considered under the urban development sector due to the up-coming Danish assisted Urban Sector Development Program.

It can be inferred that majority of bilateral and multilateral funds have addressed “green” sector while “brown” sector on waste management, pollution abatement and urban environment management has received very little funds.

3.4 Identification and Assessment of Needs:

The environment management will be under stress due to increased population pressure and the rapidly expanding urban sector, which will demand heavy urban environment investments, e.g. in sanitation and drinking water. Bhutan does not have an adequate legal basis for its environmental policies. There is a lack of institutional capacity both at national and provincial level and the legal expertise required to draft the extensive body of legislation. There is an urgent need for an umbrella act or a framework law to lay down authority for planning, implementation and enforcement of environmental regulation within a wide range of areas.

Bhutan is not a signatory of Basel convention and there is no legal framework to address generation, storage, treatment, transport, disposal and transboundary movement of hazardous wastes. There is a lack of skilled manpower in regulatory institutions to ensure compliance. The basic testing facilities for environmental parameters exist in Ministry of Agriculture, Ministry of Health and Education and Ministry of Communication. There is no inventory of hazardous waste though there are industries generating hazardous wastes in Bhutan ex. Process waste water from medium sized textile mills may contain toxic organics, phenols and metals such as copper & chromium. The treatment technologies are very basic and do not address the existing status. ex. There is only one landfill site about 9 km. Away from Thimpu, which caters to municipal waste (commingled with hazardous waste) from Thimpu.

Some of the needs, which have been identified, are summarized below.

3.4.1 Policy Development Needs

National Environment Commission and other regulatory bodies including customs need technical support in the following areas.

- Signatures, Ratification and transcription of Basel Convention into national Law
- Need for the appointment of competent authority/ Focal Point
- Need for National Definition/ classification of hazardous waste
- Specific Waste and Hazardous Waste Management Law
    - Legislation/ Guidelines for Generation/storage/handling/ transportation and disposal of hazardous wastes
    - Legislation/ Guidelines for export/Import/Illegal trade of hazardous waste
- Guidelines for monitoring/control of hazardous waste
- Guidelines for recovery/recycle and reuse
- Development of list of banned Items (List A&B)
- Notification/ Consent Procedures For Export Of Hazardous Waste
- Notification/ Consent Procedures For Import Of Hazardous Waste
- Notification/ Consent Procedures For Hazardous Wastes In Transit
- Development Of Custom Procedures
- Strengthening Of Guidelines to return the Hazardous Waste

- Guidelines For Dealing With Abandoned Hazardous Waste
- Penal Provisions And Sanctions For The Illegal Traffic In Hazardous Waste

Policy Enforcement Needs

There is a need for capacity building of all regulatory agencies at national and district level both in terms of capacity building and infrastructure development related to skill level and identification and testing of hazardous waste. There is a partial need for capacity building of all regulatory agencies to deal with compliance issues mainly related to consent, closures/ notices and Impounding of hazardous waste. Some of the needs assessed for policy enforcement are summarised below.

- Need to develop Institutions at the national and district level
- Need to develop other institutions having role in compliance: Customs/ Police/ Judiciary
- Need to develop national control system for transboundary movement of Hazardous Waste
- Need to Identifying ports of entry and transit points
- Need to Harmonize procedures of clearance and checking by customs (Annex VIII & IX)
- Need to develop infrastructure for identification, testing, temporary storage, handling and disposal of hazardous waste
- Need for strengthening available lab for testing of hazardous waste
- Need for provision of financial guarantees and bonds for transboundary movement to ensure recovery of cost in case of forced return or disposal.
- Need for procedures, data gathering system, information analysis and information sharing between enforcing agencies.

3.4.2 Hazardous Waste Management Needs

There is an urgent need for developing a system of waste separation, collection, transportation and disposal in Bhutan. Some of the practices to dispose hazardous waste in Bhutan include dumping of comingled waste at the landfill site. There is no monitoring of this landfill site. Unregulated burning of garbage in dumpsters, ditches, and alongside road. Ex. Burning of plastic materials, waste oils, tires, chemicals etc. is practised in Thimphu. Half of the oil waste finds its way to Thimphu river and the battery waste is transported to South Bhutan near the Indian border. The ministry needs a technical support to carry on inspection and advice for the disposal of hazardous wastes. The ministry of health and education needs a technical support to carry on inspection and advice for the disposal of medical wastes. There is a need for raising awareness to promote waste recovery, reduction and recycling. There are some institutions in Bhutan which have limited capacity to test and characterize hazardous waste. The efforts of NGOs are not focused on hazardous waste management. Some of the identified hazardous waste management needs are summarized below.

Inventorization

- Need for Identification/ characterisation/ codification/ labeling of Hazardous Waste example: Industry, Agriculture, Mining Sector, hospital and other sectors
- Need for National Statistics for Hazardous Waste
- Need for Statistics of Hazardous Waste dumping sites

Technology Options

- Need for dentification of technology options for storage/ land-filling/ incineration
- Need for Other Technology Options
- Need for Guidelines/ procedures for waste minimization/ Recovery/ Recycle/ Reuse
- Need for Cleaner Production & Technology

The identified needs could be addressed if the country has necessary infrastructure and skilled manpower to operate it. At present, shortage of skilled and semi-skilled manpower is one of the major constraints of environmentally sound development in the country. The tertiary level education exists in the country. There is one technical institution awarding diploma and degree in civil engineering. Considering the requirement of the country there is a need to strengthen the existing institutions and develop other Environmental Institutions. These include

- Royal Institute of Management
- National Resources Training Institute
- Bhutan Forest Institute
- Royal Technical Institute
- Royal Bhutan Polytechnic
- Teachers Training College
- Royal Institute of Health Sciences
- National Institute of Education

3.4.3 Training Needs

The shortage of skilled manpower in Bhutan makes training needs as one of the most important areas to address the needs for policy development, enforcement and hazardous waste management. At present Asian Development Bank technical assistance project has identified and developed Environmental Assessment Training for three types of target audience as given below.

1. Senior Level Program: For directors rank and above
2. Mid – Level Program: This would include planning officers and/ or environmental unit officers from each line ministries
3. Field and Technical Level Program: Participants should include environmental personnel from major private and state owned organizations. This program is directed at staff responsible for implementing environmental initiatives.

According to present requirements, the government has identified the need to increase staff strength of EA division of NEC from 3 to 5 with each one having either a degree or diploma in environment related field and the head having a masters degree in an environmentally related field. There is a need for other officials of line ministries to attend awareness training on EA process and procedures. The basic idea is to groom different

target audience from line ministries, NEC and city corporations into trainers to develop indigenous capacity for imparting training in environment. Since the major focus is on EA process, the issues related to hazardous waste management are not addressed. So there is a need for training to address these issues. There are four types of target audience, who have been identified for receiving training, which include policy makers, implementers, industry and public. The first group of organizations that may be identified for receiving training consists of those in the regulatory regime ex. Officials of NEC, line ministries and city corporations. This group requires training in the areas of:

Training for Basel Convention Implementation/ Policy

1. Training for policy strengthening including definition and classification of hazardous waste.
2. Training for transcription of obligations of Basel Convention into National Law.

Training for Developing/ Strengthening Legislative Framework

3. Training for development of National Legislation/ Guidelines – Generation, Storage/ Handling (Loading/ Unloading/ Transit), Transportation and Disposal of Hazardous Wastes
4. Training for developing of National Legislation/ Guidelines –Export/ Import/ Illegal Trade
5. Training for development of List of Banned Items (List A &B)

Training for Developing/ Strengthening Guidelines

6. Training for development of National Guidelines – Monitoring & Control of Hazardous Waste
7. Training for developing of National Guidelines for Environmentally Sound Management of Hazardous Waste (Recovery, Recycle & Reuse)
8. Training for developing of National Guidelines for notification/ consent procedures for export/ import/ in transit of Hazardous Waste
9. Training for developing of National Guidelines for return of / abandoned Hazardous Waste
10. Training for strengthening penal provisions and sanctions for the illegal traffic of hazardous waste

Training for Policy Enforcement

11. Training for Capacity Building of the institution at the national/ district levels
12. Training to develop national tracking and control system for transboundary movement of hazardous waste
13. Training for harmonization of procedures of clearance and checking by customs
14. Training for identification and uniform testing procedures of hazardous waste
15. Training for developing procedures for data gathering, information analysis and information sharing between enforcing agencies.

Training for Hazardous Waste Management Needs

16. Training for Identification, Characterization, coding & labelling of Hazardous Waste
17. Training for Identification of technology options for storage

18. Training for identification of Hazardous Waste disposal sites, Procedures and Decommissioning.

The trainers for the above group could be local/ international consultants, international regulatory agencies, donors and experts from different countries having relevant experience.

The second group of training recipients would be those associated with industry. This group would include members from industry who generate hazardous wastes, members from industries that handle and treat hazardous wastes and members from BCCI. This group requires awareness training in the areas of:

- Training for Developing/ Strengthening Legislative Framework
- Training for Developing/ Strengthening Guidelines
- Training for Policy Enforcement
- Training for Hazardous Waste Management Needs

This group also requires advanced training in the area of Hazardous Waste Management Needs. Other miscellaneous training required by this group include

- Guidelines for obtaining financial assistance for management of hazardous wastes
- Training on data management and reporting of hazardous wastes

The third group would consist of Non-government organizations ex. RSPN, BCCI. This group requires awareness of the regulatory regime that governs the hazardous waste generation and management as well the effects of exposure to hazardous wastes. This would require training in the following areas:

- Training for Developing/ Strengthening Legislative Framework
- Training for Developing/ Strengthening Guidelines
- Training for Policy Enforcement
- Training for Hazardous Waste Management Needs

The trainers for both the above groups could be regulators or officials from NEC/ line ministries/ city corporations.

The fourth group would consist of members of the judiciary that preside over cases related hazardous waste issues between the state and the private/public entity. The awareness training needs of this group would be in the areas of:

- National laws and regulations on hazardous wastes including import and exports of the same
- International regulations on hazardous wastes
- Citizens rights on exposure to hazardous wastes
- Financial and legal liability of offenders

The faculty of this group could comprise of members from:
- NEC
- NGOs

3.4.4 Needs prioritisation

Bhutan needs for various areas of hazardous waste management covers a broad spectrum of activities starting from policy development, Implementation, compliance and monitoring. The evaluation of different types of needs in the above sections gives an idea of priority for training needs for Bhutan. Training needs relevant to policy development should be taken up as the top priority with the help of national and international consultants and agencies. After legislation relevant to hazardous waste is in place, the training needs relevant to strengthening of the institutions should be taken up to ensure compliance. This type of training needs could be addressed with the help of local trainers from regulatory agencies, line ministries and city corporations. There is a strong need to strengthen the industrial structure to minimize and optimally manage their hazardous wastes. These needs could be addressed by sharing information, technology, providing incentives and assistance to treat and dispose hazardous wastes. Once the capacity of regulators and polluters is developed, there is a need to develop the capacity of judiciary and NGOs to maintain adequate checks and balances and efficacy of the regulatory regime. Trainers from local regulatory agencies, industries and consultants could address these needs.

3.5 Conclusions and Recommendations

Bhutan is a land locked country with possible entry either through air route or land route passing through India. The country has small population with high per capita GDP. The economic base is dependent on agriculture though it does have self-sufficiency in food. Bhutan has medium to heavy industrial base in terms of mining and manufacturing. Manufacturing industries account for about 11% of GDP. The large export oriented industries include cement, ferro-alloy and calcium carbide. The fastest growing sector in Bhutan is electricity generation. The major exports include vegetable and fruit products, mineral products, wood products and handicrafts. The major imports include machinery and mechanical appliances, medicines & pharmaceuticals, chemicals, mineral oil & fuels and plastic products. India is the major trading partner of Bhutan. Bhutan's national policy on environment resulted in the formation of National Environment Commission, an autonomous body, in 1990 to advise and regulate environmental affairs. NEC formulated Bhutan's National Strategy on Environment and subsequently action plans were formulated as part of 7^{th} and 8^{th} national plan respectively. The focus of these plans was on green issues. However, 8^{th} plan mentions about industrial development. The regulatory regime focussed on nature conservation and environmental assessment of developmental projects. Similarly, the majority of bilateral and multilateral aid focussed on Green issues rather than brown issues related to industries. Bhutan is not a signatory of Basel convention. The regulatory regime does not address any of the articles of this convention. However, the environmental guidelines mention about hazardous waste from industries. The waste from urban centres is not segregated and is disposed off in an adhoc manner. Sometimes, this waste is burned in open. There is lack of systematic collection, treatment and disposal system of this waste. Bhutan has basic testing facilities for waste which needs to be strengthened.

This indicates a need for policy development starting from signing/ ratification of Basel convention, definition of hazardous waste, development of legislation & guidelines,

notification and consent procedures to penal provisions. The need for policy enforcement includes development of capacity of institutions, formulation of uniform identification and testing procedures and information collection, analysis and dissemination. The hazardous waste management needs include need for inventorization and identification of technology options for disposal of hazardous wastes. The policy and hazardous waste management needs catalyses training needs for four types of target audience, which include Policy developers, policy implementers, industry and public. The major recommendations for training needs are summarized below.

1. Training for Basel Convention Implementation/ Policy
2. Training for Developing/ Strengthening Legislative Framework
3. Training for Developing/ Strengthening Guidelines
4. Training for Policy Enforcement
5. Training for Hazardous Waste Management Needs

The policy makers and implementers require awareness and advance training for the above five types of training. The industry/ commercial and business establishment and NGOs require awareness training for the last four types of training and an advanced training in the area of Hazardous Waste Management Needs.

4. India

4.1 Country Profile:

Located in Southern Asia, bordering the Arabian Sea and the Bay of Bengal, between Burma and Pakistan India has a total area of 3,287,590 sq. km with a land area of 2,973,190 sq. kms, and a water surface of 314,400 sq. km. With a size slightly more than one-third the size of the United States and with land boundaries of 14,103 Km it's neighbours are Bangladesh, Bhutan, Burma, China, Nepal and Pakistan with whom it shares boundaries of 4,053, 605, 1,463, 3,380,1,690 and 2,912 kilometres respectively. It's coastline stretches for approximately 7,000 kilometres.

India is the second most highly populated country in the world with an estimated population of 1,000,848,550 (July 1999 est.). The population growth rate is at 1.68%, the birth rate is 25.39 births/1,000 population and the death rate is 8.5 deaths/1,000 population (1999 est.). Life expectancy at birth stands at 63.4 years and the overall sex ratio is 1.07 male(s)/female (1999 est.). The major ethnic groups: Indo-Aryan 72%, Dravidian 25%, Mongoloid and other 3% and the major groups are Hindu 80%, Muslim 14%, Christian 2.4%, Sikh 2%, Buddhist 0.7%, Jains 0.5%, other 0.4%. English enjoys associate status but is the most important language for national, political, and commercial communication, Hindi the national language and primary language of 30% of the people. There are 15 official languages and the literacy rate stands at 52%.

The Federal Republic government with it's capital in New Delhi the Legal system based on English common law. The 28 states and 7 Union Territories are governed by legislative assemblies and governors respectively.

India's economy encompasses traditional village farming, modern agriculture, handicrafts, a wide range of modern industries, and a multitude of support services. 67% of India's labour force works in agriculture, which contributes 25% of the country's GDP. Services accounts for 18% of the work force and industry for the balance. Production, trade, and investment reforms since 1991 have provided new opportunities for Indian businesspersons and an estimated 300 million middle class consumers. India's exports, currency, and foreign institutional investment were affected by the East Asian crisis in late 1997 and 1998; but capital account controls, a low ratio of short-term debt to reserves, and enhanced supervision of the financial sector helped insulate it from near term balance-of-payments problems. Energy, telecommunications, and transportation bottlenecks continue to constrain growth.

The major Industry sectors are textiles, chemicals, food processing, steel, transportation equipment, cement, mining, petroleum and machinery. The major agricultural products are rice, wheat, oilseed, cotton, jute, tea, sugarcane, potatoes; cattle, water buffalo, sheep, goats, poultry and fish. The primary exports are textile goods, gems and jewellery, engineering goods, chemicals, leather goods; while the primary imports are crude oil and petroleum products, machinery, gems, fertilizer and chemicals.

The trade in the country is primarily through it's vast network of 62,915 km (12,307 km electrified; 12,617 km double track) and 3,319,644 km of rail and highway respectively. The primary ports in the country are Calcutta, Chennai (Madras), Cochin, Jawaharal

Nehru, Kandla, Mumbai (Bombay), Vishakhapatnam. There are also 230 small and large airports.

4.2 Regulatory Framework:

The Policy Statement on the Abatement of Pollution issued by the government of India in 1992 reiterated the commitment of the government of India towards Waste Minimization and Control of Hazardous Wastes.

Hazardous Waste Management and Handling Rules (2000), as amended. The HW Rules of 1989 also control the import of hazardous wastes from any part of the world into India. Under the HWM Rules of 1989, the MoEF and the SPCB are the two recognised statutory organizations to ensure effective approval of import of hazardous wastes in the country. The Rules also require that hazardous wastes be packed and labelled during transport and that they will be deposited in waste disposal sites selected by the state government after an environmental impact assessment study. Under section 11, application for import of the hazardous wastes is processed by the concerned by the respective SPCB before providing license. Under the new amendment of HWM Rules of 2000, List A and B of the Basel convention were introduced as Schedule 3 of the HWM Rules including the provisions relating to illegal traffic.

The newly amended Hazardous Waste Rules lays down stringent curbs on imports and exports of hazardous wastes. The amended rules say that hazardous metal and non-metal wastes arriving in India will be treated illegal if it is found that proper permission for the purpose was not obtained from the relevant authorities. In such cases, the material will be shipped back within 30 days to the exporter or exporting country or shall be disposed of within 30 days from the date of off landing in case the re-export is not possible. Any importer wishing to import hazardous wastes must fill in the necessary information in Form 6 along with a fee of Rs. 30,000 for imports of up to 500 tonnes (extra Rs. 5000 for every additional 500 tonnes) to the SPCB/CPCB 125 days in advance.

As per Rule 11 of HW Rules of 1989,import of wastes from any country to India shall not be permitted for dumping and disposal. However, import of such wastes may be allowed for processing or reuse as raw material, after each case has been examined on merit by the State Pollution Control Board. The SPCBs will examine applications from importers and forward such applications with it's recommendations and requisite stipulations for safe transport, storage and processing/ disposal to the MoEF. As per the HW Rules, 1989/2000,permissions to importers / exporters will be granted by the MoEF only, under Rules 13 (3) and 14 (3). Under Rule 13 (3), which applies to Hazardous wastes into India, the MoEF must satisfy itself that the importer has environmentally friendly / appropriate technology for reprocessing; that the importer has the capability to handle and reprocess hazardous wastes in an environmentally sound manner; and that the importer has adequate facilities for treatment and disposal of wastes generated. Under Rule 14 (3), the MoEF must also consider and approve applications sent by exporters of consignments of hazardous wastes to India (Rule 11 of the unamended HW Rules, 1989).

Schedule 4 of the HW Rules, 1989/2000

S. No.	Authority/(ies)	Duties and Corresponding Rule
1.	Ministry of Environment and forests, under the Environment (protection) Act, 1986	i. Identification of hazardous wastes as per Rule 3 ii. Permission to exporters as per rule 14(3) iii. Permission to importers as per Rule 13(3)
2.	Central Pollution Control Board constituted under the Water (Prevention and Control of Pollution) Act, 1974	i. Coordinate activities of the State Pollution Control Boards and ensure implementations of the conditions of imports ii. Monitor the compliance of the conditions of authorization, import and export. iii. Conduct training courses for authorities dealing with management of hazardous wastes iv. Recommend standards for treatment, disposal of waste, leachate and specifications of materials v. Recommend procedures for characterisation of hazardous wastes
3.	State Pollution Control Boards constituted under the Water (Prevention and Control of Pollution) Act, 1974	i. Grant and renew authorisation under rule 5(4) and rule 8 ii. Monitor the compliance of the various provisions and conditions of authorisation iii. Forward the application for imports by importers as per rule 13(1) iv. To review matters pertaining to identification and notification of disposal sites
4.	Directorate General of Foreign Trade constituted under the Foreign Trade (Development & regulation) Act 1992	i. Grant licence as per rule 13(5) ii. Refuse licence for hazardous wastes prohibited for imports under the Environment (protection) Act, 1986
5.	Port Authorities and Customs Authorities under the customs Act, 1962	i. Verify the documents as per rule 13(6) ii. Inform the ministry of Environment and Forests, Govt. of India of any illegal traffic as per rule 15 iii. Analyse wastes permitted for imports and exports iv. Train officials on the provisions of the Hazardous Wastes Rules and in analysis of hazardous wastes

The following are the major amendments of the Hazardous Waste (Management & Handling) Rule made in the year 2000:

- The schedule listing 18 categories of wastes in the Hazardous Wastes (Management & Handling) Rules, 1989 has now been substituted with 3 schedules.
  - Schedule 1 describes the processes and waste streams generating hazardous waste. Units operating these processes are now subject to the rules.
  - Schedule 2 lists the concentration limits of constituents in the wastes. This concentration limit is to be used for classification/characterisation of waste stream as hazardous/non-hazardous in case of dispute.
  - Schedule 3 provides a separate list of wastes subject to export and import, similar to the Basel Convention Annexure VIII and IX
- Responsibility for identification of sites for establishment of Common Treatment, Storage and Disposal Facilities (CTSDF) and individual TSDF now rests with the occupier, industrial association and the State Government alone.
- Provisions relating to import and export for hazardous waste for recycling has been expanded to describe in detail the procedure being followed. Requirements of re-

export under the Basel Convention of illegal traffic of waste has also been incorporated.

- Rules of design, setting up and closure of landfill facilities elaborated.
- A manifest system for tracking hazardous waste from the point of generation to the disposal site introduced
- Authorities responsible for regulation of imports and exports and monitoring the implementation of provisions of the rules have been mentioned in schedule 4, and
- A fee for authorisation and import has been prescribed

The Basel Convention on the control of Transboundary Movement of Hazardous wastes and disposal was signed by India on 15th March 1990 that was ratified and acceded in 1992. A ratification of this convention obliges India to address the problem of transboundary movement and disposal of dangerous hazardous wastes through international cooperation. However, as per the Basel convention India can not export hazardous wastes listed in Annex VIII of the Basel convention from the countries that have ratified the ban agreement. However, the convention agreement does not restrict the import of such wastes from countries that have not ratified the Basel convention. It is through the orders of the Hon. Supreme court that the import of such wastes is now banned in the country.

Batteries (Management and Handling) Rules, 2001 apply to every manufacturer, importer, re-conditioner, assembler, dealer, recycler, auctioneer, consumer and bulk consumer involved in manufacture, processing, sale, purchase and use of batteries or components thereof. Under these rules there are responsibilities of the manufacturer, importer, assembler and re-conditioner, registration of importers, customs clearance of imports of new lead acid batteries, procedure for registration/ renewal of registration of recyclers and also responsibilities of consumer or bulk consumer and responsibilities of auctioneers.

Registration Scheme: for users of hazardous waste recyclers possessing EST and ESM facilities for disposal of wastes. With effect from December 31, 1999, the auction of old/used lead-acid batteries and non-ferrous metals shall be regulated. Only those enlisted will be allowed to participate in auctions. These participants also need to possess valid consents under

A) Water (Prevention and Control of Pollution) Act 1974,
B) Air (Prevention and Control of Pollution) Act, 1981
C) Hazardous Waste (Management & Handling) Rules 1989, and
D) Comply with the standards under the Environment (Protection) Act, 1986

Criterion documents: in order to facilitate implementation of Solid Waste regulation the following documents have been issued by the MoEF /CPCB:

- Guidelines for management of hazardous wastes - MoEF 1992
- Guidelines for setting up of operating facilities -
- Ready Reckoner for Hazardous Waste Management - 1998
- Criterion for Hazardous Waste landfills - 2000
- Code of practice for environmentally sound management of lead acid batteries, zinc ash/skimmings & waste oil - CPCB June 2000

Besides, The Andhra Pradesh Pollution control Board has also brought out guidelines for hazardous waste TS & D operations in the state.

4.3 Status of Hazardous Waste Management:

The data for the exact quantity of hazardous waste generated in the country still eludes the Ministry of Environment and Forests although the legal procedures require the producers of hazardous waste to report the nature and quantity of such wastes. One of the difficulties pointed out earlier has been the definition of wastes of certain categories and therefore the subjectivity for waste quantification.

The following table shows the approximately value of the HW generated. It is, however, possible that some of the units have closed down or are working above or below the mentioned quantities. In addition, only those units have been considered that are registered with the SPCBs or are authorized to operate by the concerned authorities.

State-wise Status of no. of Units generating Hazardous Waste, and quantities generated in waste types.

S. No	State	No. of Districts		No. of Units generating HW		Quantity of waste generated (Waste Type) in TPA			
		Total	HW units	Authorised	Total	Recyclable	Incinerable	Disposal	Total
1	Andhra Pradesh	23	22	478	501	61820	5425	43853	111098
2	Assam	23	8	18	18	-	-	166008	166008
3	Bihar	55	12	31	42	2151	75	24351	26578
4	Chandigarh	1	1	37	47	-	-	305	305
5	Delhi	9	9	-	403	-	-	-	1000
6	Goa	2	2	25	25	873	2000	5869	8742
7	Gujarat	24	24	2984	2984	235840	34790	159400	430030
8	Haryana	17	15	42	309	-	-	31046	32559
9	Himachal Pradesh	12	6	71	116	-	63	2096	2159
10	Karnataka	27	25	413	454	47330	3328	52585	103243
11	Kerala	14	11	65	133	93912	272	60538	154722
12	Maharashtra	33	33	3953	3953	847436	5012	1155398	2007846
13	Madhya Pradesh	61	38	183	183	89593	1309	107767	198669
14	Orissa	30	17	78	163	2841	-	338303	341144
15	J&K	14	5	-	57	-	-	-	1221
16	Pondicherry	1	1	15	15	8730	120	43	8893
17	Punjab	17	15	619	700	9348	1128	12233	22745
18	Rajasthan*	32	27	90	344	52578	6747	81285	140610
19	Tamil Nadu	29	29	1088	1100	193507	11564	196002	401073
20	Uttar Pradesh	83	65	768	1036	36819	61395	47572	145786
21	West Bengal	17	9	234	440	45233	50894	33699	129826
	Total	**524**	**374**	**11192**	**13023**	**1728011**	**184122**	**2518353**	**4434257**

Note: The figures for Rajasthan are as per the Rajasthan SPCB

- The table indicates that the country generates approx. 4.4 mn. Tonnes of HW per year. Whereas, as per the order statement of the Secretary, MoEF there is 0.7 mn. Tonnes per year. Discrepancy of such measure is noticeable.
- The quantities of HW reported by the SPCB and the MoEF differ widely as examplified for Rajasthan.

Category of HW generated in Rajasthan	HW Generated (in TPA)	
	As per MoEF	As per Rajasthan SPCB
Recyclable	9,697	52,578
Incinerable	17,587	6,747
Disposal	95,023	81,285
Total	**122,307**	**140,610**

- The total figures of HW generated in the country annually has come down from 9 million tonnes (Jan. 2000) to 8 Million tonnes (Feb. 2000) and further to 4.4 million tonnes in May, 2000. These figures indicate a caution in the acceptance of such figures as reported and an urgent introduction of standard practices for such inventory goals.

Quantity of Waste Generated Category-wise as defined in the Hazardous Wastes (Management and Handling) Rules, 1989.

Waste category	Andhra Pradesh	Assam	Bihar	Chandigarh	Delhi	Goa	Gujarat	Haryana	Himachal Pradesh	Karnataka	Kerala	Maharashtra	Madhya Pradesh	Orissa	Jammu & Kashmir	Pondicherry	Punjab	Rajasthan	Tamil Nadu	Uttar Prdesh	West Bengal	**Total**
1	60	-	0.145	-	-	-	215	240	-	-	-	3394	3638	3137	-	-	31	1.2	88	52	-	**10857**
2	2207	-	-	-	-	-	58	-	-	-	-	7156	5	16	-	1710	9	217	376	177	255	**12186**
3	24412	115	12150	-	-	2136	6004	2655	-	-	-	11708	46076	138567	-	6000	1603	8807	11215	11804	41144	**324396**
4	1800	1075	1095	-	-	8	1139	116	-	-	-	2821	3392	6509.76	-	-	2920	3537	8892	2240	1313	**36857**
5	1404	-	-	-	-	-	11108	-	63	-	-	6930	25	-	-	-	-	1954	206	3718	213	**25621**
6	-	-	-	-	-	-	3338	3	-	-	-	2418	81	-	-	-	-	205	3175	4891	-	**14111**
7	155	-	34	-	-	3	-	-	-	-	-	5672	307	15	-	-	29	7.2	50	1919	80	**8271**
8	11213	-	-	-	-	-	-	52	-	-	-	27775	1860	1.2	-	5	2302	507	18	3	23	**43759**
9	-	-	1015	-	-	-	129779	122	-	-	-	29595	-	-	-	-	2828	146	-	118	-	**163603**
10	2039	3340	4933	-	-	326	8393	1980	-	-	-	14778	21372	13447.8	-	6	-	12716	9003	74129	29171	**195634**
11	3544	275	2435	-	-	-	16481	-	-	-	-	4900	1574	733	-	-	9092	582	2250	495	25265	**67626**
12	34230	455	635	-	-	3722	217787	3677	2096	-	-	1651972	93797	415.31	-	-	-	75623	279286	41832	21972	**2343036**
13	6805	-	-	-	-	75	6513	-	-	-	-	7768	-	200.41	-	1052	-	-	-	-	1	
14	480	53	3183	-	-	-	-	1140	-	-	-	239	150	60	-	120	-	10.7	3352	96	1	**8885**
15	2725	-	-	-	-	2000	3863	22	-	-	-	2	3	-	-	-	2151	200	-	612	20	**11598**
16	2043	160695	1056	-	-	-	6298	22381	-	-	-	21761	26217	173914.5	-	-	1750	6931	74531	2080	8447	**508105**
17	17767	-	53	-	-	22	18820	-	-	-	-	152540	-	4021.05	-	-	-	8053	7763	382	1135	**210556**
18	214	-	-	-	-	450	234	-	-	-	-	56422	-	106.37	-	-	-	21568	115	1238	786	**81133.3**
Total	**111098**	**166008**	**26579**	**305**	**1000**	**8742**	**430030**	**32559**	**2156**		**154722**	**2007846**	**198669**	**341144**	**1221**	**8893**	**22745**	**140610**	**401073**	**145786**	**129826**	

The waste categories described above refer to the following categories of wastes:

Waste Categories	Types of Wastes	Regulatory Quantities
Waste category no. 1	Cyanide Wastes	1 kilogramme per year calculated as cyanide
Waste category no. 2	Metal finishing wastes	10 kilogrammes per year the sum of the specified substance calculated as pure metal
Waste category no. 3	Waste containing water soluble chemical compounds of lead, copper, zinc, chromium, nickle, selenium, barium, and antimony.	10 kilogrammes per year the sum of the specified substance calculated as pure metal.
Waste category no. 4	Mercury, Arsenic, Thallium and Cadmium bearing wastes.	5 kilogrammes per year the sum of the specified substance calculated as pure metal.
Waste category no. 5	Non-hydrogenated hydrocarbons including solvents	200 kilogrammes per year calculated as non-halogenated hydrocarbons.
Waste category no. 6	Halogenated hydrocarbons including solvents	50 kilogrammes per year calculated as halogenated hydrocarbons.
Waste category no. 7	Wastes from paints, pigments, glue, varnish and printing ink.	250 kilogrammes per year calculated as oil emulsions
Waste category no. 8	Wastes from dyes and dye intermediates containing inorganic chemical compounds	200 kilogrammes per year calculated as inorganic chemicals
Waste category no. 9	Wastes from dyes and dye intermediates containing organic chemical compounds	50 kilogrammes per year calculated as organic chemicals
Waste category no. 10	Waste oil and oil emulsions	1,000 kilogrammes per year calculated as oil and oil emulsions
Waste category no. 11	Tarry wastes from refining and tar residues from distillation and pyrolytic treatment	200 kilogrammes per year calculated as tar
Waste category no. 12	Sludges arising from the treatment of waste waters containing heavy metals, toxic organics	Irrespective of any quantity
Waste category no. 13	Phenols	5 kilogrammes per year calculated as phenols
Waste category no. 14	Asbestos	200 kilogrammes per year calculated as asbestos
Waste category no. 15	Wastes from the manufacturing of pesticides and herbicides	5 kilogrammes per year calculated as pesticides and their intermediate products.
Waste category no. 16	Acid/Alkaline/Slurry	200 kilogrammes per year calculated as Acid/Alkalies
Waste category no. 17	Off-specification and discarded products	Irrespective of any quantity
Waste category no. 18	Discarded containers and container liners of hazardous and toxic wastes	Irrespective of any quantity

It is difficult to accurately predict the future trend of hazardous waste generation and management in the country. There are several factors which would influence the quantity

of hazardous waste generation. These factors would include but not be restricted to the trend of new projects and industries being set up in the country, the technologies that would be used in these new industrial set ups, the enforcement of regulations controlling hazardous waste management and disposal and the import of hazardous wastes. While the setting up of new industries and the use of clean technologies are expected to offset each other to an extent, the total quantity of hazardous wastes generated per year in the country is likely to increase. Therefore the implementation of regulatory controls to check the disposal patterns of hazardous wastes. Several studies have been conducted by national and international organisations to assess the current status of hazardous wastes in the environment. Areas adjoining industrial zones are most vulnerable and seem at maximum risk of being highly contaminated.

The current status of the institutional framework involved in the policy making, regulatory framework development and implementation and the transboundary movement of hazardous wastes Is briefly highlighted below.

Some of the issues of special concern for India include the recycling of Zinc, Lead, and waste oil. India has a primary production of Zinc at 142,000 TPA and a secondary production at 40,000 TPA from recycling. The recycling of Zinc in India is done both my large as well as small-scale industries who do not have the infrastructure to install proper control facilities to prevent environmental fall outs. The recycling of lead is another issue of concern in India. Lead is recycled mainly for batteries. The collection of disposed batteries is done primarily by the unorganised sector and recycling of lead for batteries is mostly done without adequate measures to prevent environmental fall outs. The workers are at maximum health risk from exposure. The process also involves the drainage of spent sulphuric acid which is a serious concern. Used oil are hazardous primarily due to the heavy metals in them like lead, zinc, copper, cadmium, chromium, nickel and high concentration of PAH's such as benzopyrenes which are carcinogenic. The Indian Institute of Petroleum estimates that the Indian lube oil market is approximately 1,000,000 tonnes of which 65% is utilised by the automotive sector.

4.4 Identification and Assessment of Needs:

The identification and assessment of needs is essentially in the following areas:

4.4.1 Technology needs:

The assessment of technology needs to manage hazardous waste in the country is essentially categorised into four major areas. In addition to the specific physical and chemical methods used to reduce toxicity or the amount of hazardous waste , these are the also four main approaches to the disposal of hazardous waste:

- Secure Chemical landfill - Ground water pollution is principally caused by diffusion of water through rainfall and snow melt into the refuge of the landfill. Water dissolves water soluble pollutants and encourages microbiological decay which releases even more contaminants. This mix is called leachate. Modern sanitary landfills have liners of plastic and clay, leachate collection systems and leachate storage facilities designed to contain and treat the leachate. This type of disposal is relatively safe for the present. However, problems are created when the landfill becomes full. They must be permanently closed with low permeability caps which can be expensive.

Landfill gas can be created by the anaerobic decay of food waste, paper and wood. This gas is composed of carbon dioxide and methane. Methane can concentrate in this enclosed structure to cause explosions and flash fires. Therefore, blowers and header pipes must be installed to collect landfill gas, which can also be expensive.

- Controlled incineration - This is increasing in use because it has few by products. However, the temperature must be maintained at 750-3,000 degrees F to completely combust all hazardous waste. Proper incineration eliminates toxic compounds completely. Heat from combustion can be used to generate energy. The biggest drawback to this alternative, however, is the cost. For this reason, there is still limited use of this technology .
- Bioremediation - Microbes can be used to decompose organic toxic compounds in water and soil. This is a very effective and safe method to convert hazardous waste into non-toxic substances. Bioremediation is currently being employed to clean up oil spills as in the Valdez spill. Some types of filamentous fungi that work on land and water hazardous waste are Penicillin, Aspergillus, Mucor, and Sacchromyces
- Plants - Plants can also be employed to breakdown or concentrate hazardous wastes. Lead can be absorbed from the soil by plant root if a chelating agent is first added to the soil to release the lead from the soil particles. The plants can then be disposed of accordingly. Radioactive wastes can also be absorbed by plants (example sunflowers at Chernobyl). This method is relatively new in hazardous waste treatment and currently expanding in use. The major problem arises when animals have access to these plants (contaminated food supply) or when conditions are not favorable for plant growth as in winter. In the natural environment, plants have always played a critical role in contaminant pick-up, The salt marshes surrounding the bay is one example of this.
- Hermit Storage - This is a long term sealed storage of those hazardous wastes that cannot be land filled or incinerated.

4.4.2 Training and awareness needs:

Training needs is one of the most important areas to address the hazardous waste management. Assessment of training needs is essential for specific areas of training, selected personnel in the country who can be faculty for training and identification of target groups from specific organisations to receive training. Training and awareness are essential for 4 major groups of people.

The first group of organisations that may be identified for receiving training consists of those in the regulatory regime. These organisations may be associated with the development of policy, implementation of the legal requirements for hazardous waste consisting of members from the Ministry of Environment and Forests, Central Pollution Control Board, State Pollution Control Boards, Customs and other nodal regulatory agencies. This group requires training in the areas of:

- international laws on hazardous wastes and transboundary movement
- guidelines and safe practices for management of hazardous wastes including storage, treatment, transportation and disposal
- implementation of regulations governing hazardous waste generation, storage, treatment and disposal.
- Waste mininisation and cleaner production
- Methodologies for waste characterisation

The faculty for training of this group could consist of members from the following list of organisations:

- Ministry of Environment and Forests
- Central Pollution Control Board
- State Pollution Control Boards
- Port Trust of India
- Directorate General - Factory Advice Services & Labour Institutes
- Central Board of Excise and Customs
- Administrative Staff College of India (ASCI)
- Select consulting firms
- Select Non-government Organisations
- Confederation of Indian Industry
- Federation of Indian Chambers of Commerce and Industry
- National Environment Engineering Research Institute
- Indian Institute of Science
- Indian Institute of Technology (ies)

Note: considering the wide range of training needs within the group, the faculty for one sub group could often be a member of another sub group within the group. For instance a target group consisting of members of the Central Pollution Control Board could have a faculty from the Ministry of Environment and Forests.

The second group of officials would be those associated with industry. This group would include members from industry who generate hazardous wastes, members from industries that handle and treat hazardous wastes and members from Industry associations. This group requires training in the areas of:

- Indian laws and regulations associated with hazardous wastes, relevant to industry generating, handling, storing, transporting or disposing such materials
- Guidelines and safe practices for management of hazardous wastes including storage, treatment, transportation and disposal
- Specific training for technologies to manage hazardous wastes
- Guidelines for export and import of hazardous wastes
- Guidelines for obtaining financial assistance for management of hazardous wastes
- Training on identification, assessment and preparation of sites for hazardous waste disposal
- Training on data management and reporting of hazardous wastes

The faculty for training of this group could consist of members from the following list of organisations:

- Ministry of Environment and Forests
- Central Pollution Control Board
- State Pollution Control Boards
- Port Trust of India
- Central Board of Excise and Customs
- Administrative Staff College of India (ASCI)
- Select consulting firms
- Select Non-government Organisations
- Confederation of Indian Industry
- Federation of Indian Chambers of Commerce and Industry

- National Environment Engineering Research Institute
- Indian Institute of Science
- Indian Institute of Technology (ies)

The third group would consist of Non-government organisations and selected participants from the public. This group requires awareness of the regulatory regime that governs the hazardous waste generation and management as well the effects of exposure to hazardous wastes. This would require training in the following areas:

- Awareness on public rights on exposure to hazardous wastes
- Awareness on Public Interest Litigation filed to date on hazardous waste exposure
- Awareness of institutional framework to report irregularities on hazardous waste handling and disposal practices by industry
- Awareness of symptoms of exposure to hazardous wastes and access to medical attention

The faculty for training of this group could consist of members from the following list of organisations:

- Ministry of Environment and Forests
- Central Pollution Control Board
- State Pollution Control Boards
- Select consulting firms
- Select non-government organisations
- Directorate of Public Health
- Inspector of Factories

The fourth group would consist of members of the judiciary that preside over cases related hazardous waste issues between the state and the private/public entity. The awareness training needs of this group would be in the areas of:

- National laws and regulations on hazardous wastes including import and exports of the same
- International regulations on hazardous wastes
- Citizens rights on exposure to hazardous wastes
- Financial and legal liability of offenders

The faculty of this group could comprise of members from:

- International court of justice
- Ministry of Environment and Forests
- Central and State Pollution Control Boards
- Select Non-government Organisations

4.4.3 Financing needs

The financing needs for hazardous waste management can be categorised in to several segments. These include financing needs for awareness training, treatment, research and development for indigenous technologies and development of disposal sites. Within these areas the following activities would require financial assistance.

- Capacity building within the existing regulatory institutional framework to conduct in-house awareness training and implementation of the legal requirements for hazardous wastes.
- Development of a central and state level organisation specifically for the management of hazardous waste including the monitoring, assessment, training, research and awareness to institutions and the public.
- Strengthening of the academic institutions for research and development of technologies for hazardous waste management.
- Identification, preparation and management of hazardous waste disposal sites.
- Financing needs for assisting industries acquire technologies for hazardous waste management

4.4.4 Needs prioritisation

The current needs of the country for various areas of hazardous waste management are many and quite diverse. These range from needs for awareness at all levels, implementation of regulations, development and utilisation of technology and better management and disposal practices. Among these the prioritisation of needs in terms of sequence of requirement and importance, would place some ahead of others. The most important need of the hour is the strengthening of the institutional structure for implementing of the regulatory framework. The current laws and regulations governing hazardous waste are fairly adequate but the implementation of these is rather poor. The regulatory institutions need a financial boost to enable them to function more efficiently and therefore bring about a tangible improvement in the management of hazardous waste. The regulatory bodies also need financial assistance to develop in house knowledge base that can be used to train other institutions and the public. The next level of needs that require immediate attention is industry. Industry is the principal generator of hazardous wastes followed by medical facilities. There is a strong need to strengthen the industrial structure to minimise and better manage their hazardous wastes. These needs could be addressed by sharing information, technology, providing incentives and assistance to treat and dispose hazardous wastes. Next in line would be the needs to strengthen the non-government machinery including the awareness of the public. The non-government organisations play an important role in the monitoring and public awareness in sensitive issues like hazardous wastes. In the end the needs to strengthen the judiciary to be aware of the hazardous waste handling legislation that would assist them in their efforts in preside over cases of this nature.

4.5 Conclusions and Recommendations:

India is strategically placed in South Asia and has both sea and land entry and exit points that can carry hazardous wastes. As a developing economy it's entrepreneurs are always looking for opportunities often at the expense of the environment. These factors put India at great risk of causing long term damage to the country's resources like water and soil by contamination. The sheer size of the country and it's dealing with hazardous wastes also makes India stand out as an important country in terms of volumes of hazardous wastes generated in the region. The recent changes made to Hazardous Waste Management and Handling Rules in the year 2000 stands testimony to the fact that the evolution of the regulatory framework is an ongoing process. While the country aligns itself to the changing economy and it's globalisation it is also aligning itself to the growing global concern for hazardous wastes. As a signatory to the Basel Convention

India has demonstrated it's desire to proactively identify and address it's concerns of transboundary movement of hazardous wastes. In the light of these parameters that paint the picture of India's current status for hazardous wastes, there are certain gaps that are clearly visible in the awareness, machinery and the finance that govern hazardous waste management. the chapter has briefly outlined the current status of generation, needs in technology, training, finance and the prioritisation of these needs. Indian industry is growing at an average rate of nine percent and the rate of growth of generation of hazardous wastes too can be expected to increase. Whether this growth will be commensurate with the industrial growth will depend on factors such as new industry mix, clean technologies and implementation of regulatory control. In order to mitigate this growth in hazardous wastes this needs assessment holds utmost importance.

The recommendations to be made for the management of hazardous wastes would essentially be specifically applicable to the target groups that are involved in different ways. These groups and their specific recommendations are:

Recommendations to those involved in the Management/handling of indigenously generated hazardous wastes:

- Units generating hazardous wastes must have authorisation based on the predefined requirements, for operating and comply with the conditions of that authorisation.
- Industry needs to keep itself constantly updated on changing rules and regulations applicable to them.
- Industry needs to identify best technology and management options for minimising hazardous waste generation and disposal.
- Industry should collaborate with MoEF and CPCB for exploring opportunities for sharing information for mutual benefit.
- Development of common facilities for TS & D of hazardous wastes.

Recommendations for those involved in the enforcement of regulations concerned with the Management/handling of indigenously generated hazardous wastes:

- The State Pollution Control Board (SPCB) should have a checklist to ensure that all criterion are met before authorisation is given and renewed only when conditions prescribed by the SPCB have been observed by the occupier, and proper measures for the protection of health of workers have been taken and a record of compliance has been maintained.
- The regulatory regime needs to ensure that all expansions of existing hazardous waste generating/handling projects or new projects follow the basic parameters of Clean production.
- The MoEF should bring all initiatives in the country for clean and cleaner production on one common platform to avoid overlapping in efforts and assist in the setting up of targets.
- Environmental surveillance squads should concentrate on hazardous waste generating units more than others.
- The CPCB should publish a clear definition of hazardous wastes, compile a national inventory of such wastes and consider developing a state and national level computer enabled data base.
- The CPCB should develop and maintain a data base of all legal and illegal hazardous waste dump sites and have comprehensive assessment and analysis of the sites to determine environmental fall outs.

- Comprehensive restoration plans with financial estimates need to be drawn out by the SPCB and forwarded to the CPCB, for sites with significant environmental fall outs. This may then be collated to formulate a national plan.
- Capacity building in terms of infrastructure and skilled manpower required for enforcement

Recommendations for those involved in the transboundary movement of hazardous wastes (Basel convention):

- Review and prepare a list of banned and allowable hazardous wastes that enter or leave Indian borders
- The MoEF must ensure that the ports and customs are well versed with the HW Rules, Basel Convention guidelines, adequately trained to identify and assess the materials passing through their gateways and have access to appropriate infrastructure.

5. Maldives

5.1 Country Profile:

Republic of Maldives is an archipelago situated in the Indian Ocean. There are 1,190 islands in Maldives out of which only 199 islands are inhabited, 88 islands which have been developed as exclusive resort islands. The total area of the country is 90,000 sq.km, out of which only 0.331% is land.

The country has a warm and humid type tropical climate with maximum and minimum temperature ranging from 30.7 • C to 25.7 • C. The country receives an mean annual rainfall of 1868.9 mm.

The total population of the country was estimated to be 270,101 in the year 2000 with a growth rate of 1.88. The male to female ratio is about1.05. The country has a democratic form of government with a constitution based on Islamic Sharia.
The islands are formed into 26 natural atolls but they are divided into 19 administrative regions. The currency of the country is Maldivian Rufiyaa (RF) with an exchange rate of MRF 12.85 to a dollar. Malé is the major sea port while the International airport is located at Hulhule island.

The major industries in Maldives can be broadly classified into two major sectors, i.e. traditional and a modern sector. The major industries in the country are tourism, fishing and shipping. The major exports are tuna & reef fish while consumer goods, capital goods and petroleum are the major imports. The traditional sector consists of boat building, mat-weaving, rope-making, black-smithing, handicraft and other cottage industries. The main activities in the modern sector include fish canning, manufacturing of garments, production of PVC pipes, construction of fibre glass boats, production of cleaning fluids, and bottling of aerated water. Other enterprises such as boat yards, transport services, electrical and mechanical workshops, carpentries and brick-making units are also significant.

The bulk of Maldives' imports are from Singapore UAE, India, Sri Lanka, Hong Kong and Japan. The major commodities imported are consumer goods, petroleum products and intermediate/capital goods. Maldives exports goods to Sri Lanka, UK, US, Germany, Japan and Thailand. The major export items are skipjack, tuna, canned fish, salted and dried fish and apparel and clothing accessories. Except of Sri Lanka and India, which together constitute 18% of Maldives', total trade, Maldives' trade with other SAARC countries is negligible.

The GDP as estimated in 1999 stood at 267 Million USD (at 1985 constant prices). The Maldives' economy grew by 4.2 percent in 2000, compared to 8.2 percent in 1995–1999. This slowdown was because of under-performance in two key sectors, fisheries and tourism and high oil prices during this period. Consumer price inflation averaged negative 1.1 % in 2000, as prices of food and other commodities declined relative to 1999.The fiscal deficit as a percentage of GDP fell from 6.6 percent in 1999 to 4.1 percent in 2000, because of expenditure-reducing measures and higher revenues. Continued borrowings by the government from the Maldives Monetary Authority have increased the total government debt to 15.1 percent of GDP in 2000. Exports increased

by 13.2 percent in 2000, largely because of increases in the export value of fish products despite a reduction in total fish catch. Imports decreased by 1.0 percent because of the economic slowdown, resulting in a narrowing of the trade deficit from 67.6 percent of GDP in 1999 to 53.3 percent in 2000 and a decline in the current account deficit from 11.1 percent of GDP in 1999 to 4.6 percent in 2000. The overall balance of payments also improved as a result of an increase in foreign grants and loans. Foreign exchange reserves recorded a slight decline to an estimated 3.7 months' equivalent of imports in November 2000 from 3.9 months' equivalent in November 1999. The total external debt position improved slightly from 36.6 percent of GDP in 1999 to 36.2 percent in 2000, comprised almost entirely of medium- and long-term debt. The debt service ratio of 3.9 percent in 1999 was maintained in 2000.

5.2 Regulatory Framework:

Environmental Policy & Action Plans

According to fifth National Development plan of Maldives, the objectives of environment policy are given below.

- The future planning is for sustainable development, and sound environmental assessment is an integral part of national, regional, and sectoral master plan formulation exercises.
- That all existing and future development activities are subject to sound environmental management regimes and practices.
- That all new major projects, including major public infrastructure and private development projects, are subject to effective environmental impact assessment procedure prior to approval.
- There are institutional arrangements to ensure that sustainable development can be achieved.
- All existing and future development activities are designed and managed to minimize the negative impact of environment on human health.

The major objectives of Environmental Policy are developed into the National Environment Action Plan (NEAP). NEAP aims to help the Government to maintain, manage and improve the environment of the country, including the marine and ocean area and the resources contained within the exclusive economic zone. In 1989 the first National Environmental Action Plan was developed forming a base for future actions to prevent environmental hazards. The second National Environmental Action Plan (NEAP-II), which was released in1999, gives a comprehensive framework for the next six years to ensure environmental protection and sustainable development in the Maldives.

Environmental Legislation

The first National Environment Action Plan formulated in 1989 addressed environmental planning and management needs of the country. During this period the regulatory and institutional framework for environmental protection was established through the enactment of The Environment Protection and Preservation Act (law 4/93) in April 1993. The regulatory regime relevant to hazardous waste prevailing in Maldives is given below.

1. The Environmental Protection and Preservation Act of the Maldives (act 4/93)

It is an umbrella act, which prescribes the management and control of hazardous waste. The People's Majlis enacted this act, in April 1993. Act 4/93 consist of:

Clause 1: Introduction

Clause 2: Concerned government authorities shall provide necessary guidelines and Advice

Clause 3: Environment Ministry responsible for formulating policies as well as rules and Regulations

Clause 4: Environment Ministry shall identify and designate protected areas and nature Reserves.

Clause 5: Environment impact assessment mandatory for any new projects

Clause 6: Power to terminate developments causing significantly detrimental environmental impacts

Clause 7: Disposal of waste, oil and poisonous substances shall be regulated;

Clause 8: Disposal and transboundary movements of hazardous wastes banned;

Clause 9: Fines for damage to the environment;

Clause10: Compensation for environmental damage that may take place

Clause 7& 8 describes provisions for hazardous waste management. Clause 8 states that permission should be obtained from the Ministry of Transport and Shipping at least 3 months in advance for any transboundary movement of such wastes through the territory of Maldives. Clause 9 makes a provision for minor offences ranging from Rf. 5 to Rf. 500 while up to a maximum ceiling of Rf. 100,000,000 for major offences.

2. Other laws governing the area of environment include:

- Law prohibiting disposal of waste into Northern harbour of Malé', Law No: 33/78
- Law on mining, aggregate from Malé' coastal zone , Law No: 34/78
- Law on prohibiting extraction of soil and coral from Malé', Law No: 55/78
- Law on mining, coral, sand and aggregate, Law No: 77/78
- Maldives Fisheries Law, Law No: 5/87
- Wreckage Law, Law No: 8/96
- Tourism Law, Law No: 15/79
- Export and Import Law, Law No: 31/79

The tourism regulations prescribe garbage control and solid waste management in tourist sector. Malé municipality provides a regulation, which prescribes cleansing and solid waste management of the inhabited islands.

3. International Environmental Agreements signed by the Maldives for hazardous waste

Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal (1989)

4. Environment Impact Assessment

An Environment Impact Assessment (EIA) is mandatory in the Maldives for all new development projects that may have a significant impact on the environment. EIA in the Maldives is implemented through the Environmental Protection and Preservation Act of Maldives (4/93). The legislation provides the basic framework for the EIA process in the country and the EIA procedures are laid out in the form of guidelines. At present, the type and size of projects that will automatically require an EIA has not been identified and it is implied that projects and activities will be evaluated on a project specific and site specific basis. According to the guidelines the Ministry would seek the advice of the National Commission on the Protection of the Environment and other concerned parties in the review process. There are various licensing agencies authorised to issue an official permit to the action proponent to implement the proposed action. The main licensing agencies in the country are: Ministry of Trade and Industries; Ministry of Fisheries, Agriculture and Marine Resources; Ministry of Tourism, and Ministry of Atolls Administration.

5. Import Regulations

Import Licensing : Import operations may be conducted only after being registered and licensed at the Ministry of trade and Industries. All goods may be imported under an open general license system.
Counter trade: There is no known specific government regulations or requirements governing this type of transaction. An importer, however, may request it for a specific transaction.

Documentation: IATA and/or ICAO (plus all other applicable national and/or international regulations) rules governing labeling and packaging of dangerous and restricted goods as well as issuance of the special shipper's certificate required under IATA rules for such items (airlines will supply this form). ICAO rules may also require documents covering such shipments (airlines will supply this form if so required).

6. Other Trade Related Regulations

Food/Health/Safety Regulations: No known regulations in these areas exist in Maldives.

Labeling/Packing of Hazardous Material: Adhere to UN recommendations for the labeling and packing of hazardous materials in a standardized manner and style. If goods are going forward by air, IATA and/or ICAO regulations regarding packaging, labeling, and documentation must be met (the international airline chosen can assist in explaining the latest measure). For goods going forward by boat, the latest IMO requirements usually have to be met.

Organization & Institution

Ministry of Home Affairs, Housing and Environment

The Ministry of Home Affairs, Housing and Environment are responsible for environmental affairs in Maldives. The environment related work of the Ministry is divided into Environment Section and Environment Research Center. The major functions of this ministry are as follows;
Undertake policy planning and implement necessary measures to preserve and protect environment of Maldives

- Provide the necessary guidance and advice on environmental protection in accordance with the prevailing conditions and needs of the country
- Assessment of the state of the environment in Maldives
- Development and implementation of national environment action plan
- Preparation and implementation of national environmental legislation
- Formulate policies, as well as rules and regulations regarding the environment in areas that do not already have a designated government authority to carry such functions
- Participation in international environmental conventions and implementation of commitments contained therein
- Designate protected areas and natural reserves and draw up the necessary rules and regulations for their protection and preservation
- Determine the projects that need environmental assessment, formulate the guidelines for environmental impact assessment and implement them
- Terminate any project that has an undesirable impact on the environment
- Ensure enforcement of the law and impose fines and penalties for damage to the environment
- The program areas of Environment Section are Law & Policy, Finance & Administration, Internal Audit, Planning, Impact Assessment, Biodiversity, Climate Change, Beach Erosion, Information & Awareness, Pollution & Waste.

National Commission for Protection of the Environment (NCPE)

The National Commission for Protection of the Environment (NCPE), which was appointed by the President in 1989, plays an advisory role to the Minister of Environment. The Commission is composed of high-level representatives from relevant government departments. At present, the Commission is comprised of 12 members.

The mandate of the NCPE include:

- Involvement in assessment, planning and implementation of activities of the Maldives that affect the environment and activities to protect the environment,
- Advising on tackling environmental problems, and ensuring that the environmental protection component is included in development projects.

The roles and responsibilities of government agencies responsible for Hazardous Waste are given in the following table

Roles and Responsibilities of government agencies responsible for Hazardous Waste

S. No.	Name of the Agencies	Function	Responsibility
1.	Ministry of Home Affairs, Housing and Environment	Regulatory	Harmful Waste, Waste of municipality
2.	Ministry of Atolls Administration	Regulatory	Waste of Inhabited Islands
3.	Ministry of Construction & Public Works	Execution	Disposal of Waste
4.	Ministry of Tourism	Regulatory	Waste of tourist Resort
5.	Ministry of Health	Regulatory	Hospital Waste
6.	Ministry of Trade and Industry	Regulatory	Package Material, Export for Recycle
7.	Malé Municipality	Execution	Collection in Malé Public Areas
8.	Maldives Housing & Urban Development Board	Execution	Collection in Villingi Public Area
9.	Island Office	Execution	Coordination in Inhabited Islands

It can be summarized that besides Ministry of Home Affairs, Housing and Environment, five other ministries, Ministry of Atolls Administration, Ministry of Construction & Public Works, Ministry of Tourism, Ministry of Ministry of Trade and Industry and Ministry of Health all have roles in regulations and execution of environmental legislation.

5.3 Status of Hazardous Waste Management:

The bulk of solid and hazardous wastes are generated in the central region of the country. The islands at this region have major commercial and domestic activities in Maldives. Malé the capital and Villingili is a satellite island of Malé
The solid waste generated in Maléis broadly classified into four kinds of wastes, i.e. residential, commercial, business and construction waste. The amount of waste generated is given in the following table

Total waste generated in Maldives

Year	Total Waste Generation in Malé & Villingili (ton/d)	Total Waste Generation in Inhabited Island (ton/d)	Total Waste Generation in Resort Islands (ton/d)	Total Waste Generation in Maldives (ton/d)	Daily Total Waste Disposal Amount (ton/d)	Total Waste Generation in Maldives (ton/y)	Annual Waste Disposal Amount (ton/y)	Accumulated Waste Disposal Amount in Thilafushi (ton)
1998	174.5	136.9	70.7	382.1	196.8	139,463	71,843	71,843
2000	190.2	155.0	81.5	426.7	214.8	155,760	78,410	225,141
2005	236.0	208.3	112.8	557.1	270.0	203,355	98,547	676,294
2008	265.7	244.3	134.7	644.8	306.3	235,340	111,818	998,220
2010	286.9	270.7	150.6	708.1	332.3	258,468	121,291	1,236,005

Source: Ministry of Home Affairs, Housing and Environment

Hazardous waste, which constitutes a part of Solid waste, is one of the key environmental issues in Maldives. The generation and composition of solid waste is given in table -----.

Generation and Composition of Solid Waste in Maldives

	Total Waste Generation in Male & Villingili (ton/y)		Total Waste Generation in Inhabited Island + Resort Island(ton/y)		Total Waste Generation in Maldives (ton/y)	
Year	1998	2010	1998	2010	1998	2010
Organic Waste	37157	64083.05	58120.77	123884.2	95277.77	187967.25
Inorganic Waste	26407.75	40434.7	17447	29634	43854.75	70068.7
Hazardous Waste	127.385	208.05	151.475	224	278.86	432.05
Total	63692.135	104725.8	75719.245	153742.2	139,463	258468

Source: Ministry of Home Affairs, Housing and Environment

The major composition of Hazardous waste is as follows:

- Batteries
- Waste Oil
- Medical Waste
- Insecticides/ Pesticides/ Waste Chemicals

The hazardous waste has been classified into two major groups namely Batteries and Other Hazardous Waste (OHW) containing waste oil, medical waste, Insecticides, Pesticides and waste chemicals. These wastes are getting mixed with general municipal waste in the ratio of 0.2% by weight. The hazardous waste from Malé & Villingili consists of 35% batteries and 65% of OHW, while the hazardous waste from Inhabited Island and Resort Island consists of 64% batteries and 34% OHW respectively.

Institutional Framework

Malé municipality, two private companies and some 30 individuals carry out the collection of solid waste in Malé. Malé Municipal has the primary responsibility for collection services of the residential waste while it also supervises, monitor and transport all other types of waste to landfill site except construction waste.
At present, the system of door-to-door private collection services of business and commercial waste is in operation. This service caters to only 15% of total business and commercial solid waste generated in Malé. This solid waste is transported by the waste generator or by the contractors to a transfer station, managed by Malé Municipal Corporation.
Ministry of Construction and Public Works (MCPW) is responsible for supervising and monitoring of the construction waste in Maldives.
There are three major NGO's mainly Blue Peace, VESHI and Vashan mainly involved in formulation of National Environmental Action Plan, cleaning sea side, raising public awareness through TV/ Radio and opening waste recycling markets at school.

Present Disposal Practices

Land filling

There is only one landfill site where all types of waste are disposed since 1991. At first solid waste is collected at Malé depot managed by Ministry of Construction and Public Works. This solid waste is then transported and dumped into Thilafushi landfill. The waste is dumped in a pit and when it is filled it is covered with top soil. Besides domestic waste, the dumped waste also includes construction waste consisting of concrete debris, excess sand, demolition and waste woods, waste sand bags, leftover of pipe, fittings and steel bars. Open burning of garbage in Thilafushi prior to land filling is also practised. The waste oils mainly lubricants from automobiles and vessels, which is transported to Thilafushi is burnt at site without proper procedures. In January, 1998, 2400 litres of waste oil was transported to Thilafushi.

Incineration

Incineration is also practised in some of the resort islands. These were supplied under the Norwegian government scheme being implemented since 1994. There are four hospitals, which incinerate their hospital waste.

A small recycling market exists in Malé where scavengers recover items like coconut shells, copper (Electrical Wire), broken electrical appliances, machines, cans, bottles, sacks, clothes and toys. Coconut shell is used as fuel for burning in hotels. Bottles are sold after washing while metal scrap is mainly exported to India. The total amount of recovered material is about 2,848 kg out of which only 190 kg is reusable and recyclable. The reusable and recyclable items account for only 0.1 % of the total solid waste collected at the transfer point. No program of cleaner production or technology is being implemented in Maldives.

5.4 Identification and Assessment of Needs:

The key issues include strengthening of environmental policy, involving policy development and policy enforcement. The other issues include hazardous waste management needs, which include Inventorisation, Technology Options and development of infrastructure for hazardous waste management. The major observations include the inadequacy of existing regulatory system and institutions to address hazardous waste management and its transboundary movement. There is no act or regulation to prescribe technical aspects of Hazardous waste, Solid waste, Hospital waste, sea transportation of waste from resorts, Malé and Villingi and other inhabited islands to landfill site existing at Thilafushi. Some of the needs, which have been identified, are summarized below.

5.4.1 Needs for Policy Development

Ministry of home affairs, housing and environment and other regulatory bodies including customs need technical support in the following areas.

- National Definition of Hazardous waste
- National classification of hazardous waste
- Transcription of obligation of Basel Convention into National Law
- Specific Waste and Hazardous Waste Management Law
  - Legislation/ Guidelines for Generation, storage/handling and disposal
  - Legislation/ Guidelines for export/Import/Illegal trade
  - Legislation/ Guidelines for transportation of hazardous waste
- Guidelines for monitoring/control of hazardous waste
- Guidelines for recovery/recycle and reuse
- Development of list of banned Items (List A&B)
- Notification/ Consent Procedures For Export Of Hazardous Waste
- Notification/ Consent Procedures For Import Of Hazardous Waste
- Notification/ Consent Procedures For Hazardous Wastes In Transit
- Strengthening Of Custom Procedures
- Strengthening Of Guidelines to return the Hazardous Waste
- Guidelines For Dealing With Abandoned Hazardous Waste
- Penal Provisions And Sanctions For The Illegal Traffic In Hazardous Waste

Needs for Policy Enforcement

There is a need for capacity building of all regulatory agencies in terms of infrastructure development mainly related to identification and testing of hazardous waste. There is a partial need for capacity building of all regulatory agencies to deal with compliance issues mainly related to consents, closures/ notices and Impounding of hazardous waste. Some of the needs assessed for policy enforcement are summarized below.

- Strengthening of Institutions at atoll level
- Identifying ports of entry and transit points
- Harmonization of procedures of clearance and checking by customs (Annex VIII & IX)
- Infrastructure For Identification, Testing, Temporary Storage, Handling And Disposal Of Hazardous Waste
- Accredited Lab For Testing Of Hazardous Waste
- Uniform Testing Procedures For Customs
- Provision of financial guarantees and bonds for transboundary movement to ensure recovery of cost in case of forced return or disposal.
- Strengthening of procedures, data gathering, information analysis and information sharing between enforcing agencies.

5.4.2 Hazardous Waste Management Needs

The major observations during the study indicated that there is an urgent need for an integrated solid and hazardous waste management system. The Ministry of Home Affairs, Housing and Environment and other relevant agencies need technical support to develop an integrated waste management system in the Maldives. There is a need for public education for raising awareness to promote waste recovery, reduction and recycling. There is no institutions in Maldives which has capacity to test and characterize hazardous waste. There is no institutions in Maldives which has capacity to test and characterize hazardous waste. The efforts of NGOs are not focused on hazardous waste management. Some of the identified hazardous waste management needs are summarized below.

Inventorization

- Inventories the chemicals which are imported
- Carry out a hazardous waste survey to identify hazardous waste that are generated from different sectors
- Characterization of Hazardous Waste example
- Strengthening of Codification/ Labelling procedures for hazardous waste
- National Statistics for Hazardous Waste

Technology Options

- Identification of technology options for hazardous waste management in small islands states
- Develop guidelines for hazardous waste minimization
- Develop procedures for recovery, recycle and reuse of hazardous waste
- Identification of Cleaner Production & Technology options that are practical in the Maldives

The identified needs can be addressed if the country has necessary infrastructure and skilled manpower to operate it. At present, shortage of skilled and semi-skilled manpower is one of the major constraints of environmentally sound management in the country. There is no tertiary education existing in the country to cater the field of hazardous waste and related areas.

5.4.3 Training Needs

The shortage of skilled manpower in Maldives makes training needs as one of the most important areas to address the needs for policy development, enforcement and hazardous waste management. Four major groups of people who have been identified for receiving training include policy makers, implementers, industry and public. The first group of organizations that may be identified for receiving training consists of those in the regulatory regime. These organizations may be associated with the development of policy, implementation of the legal requirements for hazardous waste and consists of members from the Ministry of Home Affairs, home and Environment, Ministry of Atolls Administration, Ministry of Construction & Public Works, Ministry of Tourism, Ministry of Health, Ministry of Trade and Industry and Malé Municipality This group requires training in the areas of:

Training for Basel Convention Implementation/ Policy

1. Training for policy strengthening including definition and classification of hazardous waste.
2. Training to familiarize with the Basel Convention
3. Training for transcription of obligations of Basel Convention into National Law.

Training for Developing/ Strengthening Legislative Framework

1. Training for development of National Legislation/ Guidelines – Generation, Storage/ Handling (Loading/ Unloading/ Transit), Transportation and Disposal of Hazardous Wastes
2. Training for strengthening of National Legislation/ Guidelines –Export/ Import/ Illegal Trade
3. Training for development of List of Banned Items (List A &B)

Training for Developing/ Strengthening Guidelines

1. Training for development of National Guidelines – Monitoring & Control of Hazardous Waste
2. Training for strengthening of National Guidelines for Environmentally Sound Management of Hazardous Waste (Recovery, Recycle & Reuse)
3. Training for strengthening of National Guidelines for notification/ consent procedures for export/ import/ in transit of Hazardous Waste
4. Training for developing of National Guidelines for return of / abandoned Hazardous Waste
5. Training for strengthening penal provisions and sanctions for the illegal traffic of hazardous waste

Training for Policy Enforcement

1. Training for Capacity Building of the institution at the national/ atoll levels
2. Training to develop national tracking and control system for transboundary movement of hazardous waste
3. Training for harmonization of procedures of clearance and checking by customs
4. Training for identification and uniform testing procedures of hazardous waste
5. Training for developing procedures for data gathering, information analysis and information sharing between enforcing agencies.

Training for Hazardous Waste Management Needs

19. Training for Identification, Characterization, coding & labelling of Hazardous Waste
20. Training for Identification of technology options for storage
21. Training for identification of Hazardous Waste disposal sites, Procedures and Decommissioning.

Considering the lack of skilled manpower in the country to address the above training needs, the country urgently needs to train locals to address these need.
The second group of training recipients would be those associated with industry. This group would include members from industry who generate hazardous wastes, members from industries that handle and treat hazardous wastes and members from Industry associations. This group requires awareness training in the areas of:

- Training for Developing/ Strengthening Legislative Framework
- Training for Developing/ Strengthening Guidelines
- Training for Policy Enforcement
- Training for Hazardous Waste Management Needs

This group also requires advanced training in the area of Hazardous Waste Management Needs. Other miscellaneous training required by this group include

- Guidelines for obtaining financial assistance for management of hazardous wastes
- Training on data management and reporting of hazardous wastes

Considering the lack of skilled manpower in the country to address the above training needs, the country urgently needs to train locals to address this need.

The third group would consist of Non-government organizations and selected participants from the public. This group requires awareness of the regulatory regime that governs the hazardous waste generation and management as well the effects of exposure to hazardous wastes. This would require training in the following areas:

- Training for Developing/ Strengthening Legislative Framework
- Training for Developing/ Strengthening Guidelines
- Training for Policy Enforcement
- Training for Hazardous Waste Management Needs

The fourth group would consist of members of the judiciary that preside over cases related hazardous waste issues between the state and the private/public entity. The awareness training needs of this group would be in the areas of:

- National laws and regulations on hazardous wastes including import and exports of the same
- International regulations on hazardous wastes
- Financial and legal liability of offenders

The faculty of this group could comprise of members from:

- International court of justice
- Local Regulators
- NGOs

5.4.4 Needs prioritisation

The current needs of the country for various areas of hazardous waste management covers a broad spectrum of activities starting from policy development, Implementation, compliance and monitoring. The evaluation of different types of needs in the above sections gives an idea of priority for Maldives. Since policy development is the first step for developing framework for regulatory regime, training needs relevant to policy development should be taken up as the first priority in Maldives. After legislation relevant to hazardous waste is in place, the training needs relevant to strengthening of the institutions should be taken up to ensure compliance. At this stage, the capacity of the industry should be developed to ensure compliance. There is a strong need to strengthen the industrial structure to minimize and better manage their hazardous wastes. These needs could be addressed by sharing information, technology, providing incentives and assistance to treat and dispose hazardous wastes. Once the capacity of regulators and polluters is developed, there is a need to develop the capacity of judiciary and NGOs to maintain adequate checks and balances and efficacy of the regulatory regime.

5.5 Conclusions and Recommendations

Maldives is an archipelago, which is strategically located between shipping lines in South Asia. The country has small. The country does not have a heavy industrial base and relies on tourism and fish exports as major sources of revenue. Maldives imports consumer goods, petroleum products and medium/ intermediate capital goods. The economy of Maldives is restricted by lack of skilled manpower and restricted resource base. The major trading partners of Maldives are countries in Gulf, South East Asia, Europe and South Asia mainly India & Sri Lanka. It has both sea and air entry and exit points. Environmental awareness started in Maldives after it faced threat of flooding from high tides and rising sea level. This resulted in the formulation of national environmental policy and national environmental action plans. The first plan resulted in developing legislative framework for addressing basic environmental issues resulting in enactment of umbrella act, while the second plan, which came into existence in 1999 addresses environmental protection and sustainable development. The institutional framework to ensure compliance was also put in place during the first environmental action plan. Maldives is signatory to Basel convention but lacks the legislative framework and infrastructure to ensure compliance. Though, the umbrella act has provisions for hazardous waste, there is no national definition and classification of hazardous waste. There is no legislation exclusively for hazardous waste while other environmental regulations and import regulations address issues related to hazardous waste to some extent. In addition to Ministry of Home affairs, housing and Environment, six other ministries and three local bodies are involved in implementing and compliance of environmental regulatory regime. The solid waste in Maldives is generated from residential, business and commercial establishment in Malé and Villingili islands, resorts

and other inhabited islands. It is estimated that the solid waste generation will increase by 66% within a decade by 2010 while there will be a disposal of only 53% of this waste if the existing facilities are used. The hazardous waste has been projected to constitute only 0.2% of the total solid waste. The existing disposal facilities include the landfill site at Thilafushi island and incinerators on some resorts.

This indicates a need for policy development starting from definition of hazardous waste, development of legislation & guidelines, notification and consent procedures to penal provisions. The need for policy enforcement includes development of capacity of institutions, formulation of uniform identification and testing procedures and information collection, analysis and dissemination. The hazardous waste management needs include need for inventorization and identification of technology options for disposal of hazardous wastes. The policy and hazardous waste management needs catalyses training needs for four types of groups, which include Policy developers, policy implementers, industry and public. The major recommendations for training needs are summarized below.

1. Training for Basel Convention Implementation/ Policy
2. Training for Developing/ Strengthening Legislative Framework
3. Training for Developing/ Strengthening Guidelines
4. Training for Policy Enforcement
5. Training for Hazardous Waste Management Needs

The policy makers and implementers require awareness and advance training for the above five types of training. The industry/ commercial and business establishment and NGOs require awareness training for the last four types of training and an advanced training in the area of Hazardous Waste Management Needs.

6. Nepal

This chapter has been researched and presented by Dr. D B Boralkar, Assistant Secretary, Central Pollution Control Board, New Delhi.

6.1 Introduction

His Majesty's Government (HMG) in Nepal is taking steps towards sustainable development with policies in place regarding environmental management. It has been recognised that environmental issues must not be neglected in the process of economic and infrastructure development. Current environmental problems in Nepal emerge from land degradation, depleting forest resources, unplanned urban development, discharge of untreated effluent/emission and disposal of solid wastes (industrial, domestic and biomedical) without adequate consideration of the environment protection.

Most of the legal provisions on environment management are very new and while some require setting up of environmental standards others require extended rules and regulations for enforcement and necessary institutional setting. In January 1997, Nepalese Parliament enacted the Environment Protection Act, 2053 (1997 A.D.) [Act No. 24 of 1997] which provides regulatory regime for environment protection. HMG is also committed to various multilateral environmental agreements. Among others, Basel Convention on Control of Transboundary Movement on Hazardous Wastes and the Disposal (1989) has been adopted and is in force since January 1997. The obligation under the Basel Convention include protection of environment and adoption of measures for safe transport, disposal and management of hazardous wastes including control on illegal traffic of hazardous wastes.

6.2 Physiography & Climate

Physiography: Nepal is roughly rectangular in shape. The country's landmass stretches 885 km from east to west and has a non-uniform width of 193 km north to south. It has a total land area of 147,181sq. km and an estimated population of 21.84 million as in 1998. It lies within the sub-tropical to the mountainous region at 26°22' to 20°27' N latitudes and 80°4' to 88°12' E longitudes, with an altitude that ranges from 90 m to 8,848 m. The country is landlocked and is bordered by India in the East, West and South and China in the North.

Geographically, Nepal represents a transitional mountain area between the fertile Gangetic Plain of India and the arid plateau of Tibet, China. The country is rich in ecological diversity with slightly over 80 per cent of the land covered by rugged hills and mountains. From the low-lying Terai plains in the south, where elevation in some places is less than 100 m above sea level, the landscape rises through a maze of values and spurs culminating in the majestic heights of the Great Himalayas, including the Mount Everest – the highest peak in the world.

Nepal lies within the subtropical monsoon climatic system. Due to its varied topography there is a wide climatic variation. With altitude being a guiding factor in climatic classification, five different types of climates are present in Nepal. They include sub-tropical monsoon, warm and cool temperature, alpine, and tundra climate.

6.3 Environmental Trends

The recent population estimate show a total of 23.45 million people with a growth rate of 3.66%. Population distribution in the physiographic zones and the development region greatly differ. This proportionate population distribution could be attributed to unequal distribution of resources, difficult topography, disparity in income and social development and inadequate basic facilities. Rapidly growing urban areas are affected by shortage of basic services resulting into the degradation of environmental quality.

A steady improvement in the health status of people can be seen in decline infant mortality rate. However, there is prevalence of different types of diseases such as gastro-enteritis, hepatitis, dysentery, respiratory diseases and health related problems which indicate inadequate implementation of environmental pollution control measures. It is reported that due to increase in the safe drinking water supply, the number of deaths due to water borne infection have declined over the years.

6.4 Environmental Issues

6.4.1 Green house gases (GHG): Major sources of GHG in relation to land use and soil borne sources are carbon dioxide, methane and nitrous oxide. It is estimated that in 1992, the CO_2 emission was 3,54,000 tons due to combustion of fuels. Release of GHG's from other sources and its impact on environment is yet to be analysed.

6.4.2 Cholorofluro Carbon (CFC): A National programme to check CFC-12 has been endorsed by the HMG in 1999. According to a survey in 1996, a total of 52 tons of CFC-12 and HCFC have been utilized in Nepal and per capita consumption of ozone depleting substances (ODS) is only about 0.0013 kg used in refrigeration and air conditioning. Although Nepal does not produce ODS, the consumption rate is on the increase. Inadequate control measures may result in increased consumption of CFC-12 which is predicted to reach up to 85 tons by the year 2010.

6.4.3 Water and water quality: Nepal has more than 6000 rivers with considerable flow variations, sediment loads and deposition. Annual mean stream flow for the snow-fed major river system is estimated to be about 4930 m3/s . This amounts to 70% of total annual surface runoff. About to 60-85% of the annual surface runoff occur during monsoon period. The annual runoff from Nepal is about 222 billion m3/s with a mean runoff co-efficient of 0.777 (as of 1993). Both surface and groundwater are potential sources for irrigation and drinking purpose. Use of groundwater for drinking water is extensive. Estimated runoff of the rivers in Nepal is presented in Table 1.

Sporadic studies on water quality indicate degradation in the quality of river and drinking water. There is biological contamination in drinking water. The Bagmati river, which drains the Kathmandu valley, is among highly polluted at different stretches due to discharge and/or disposal of organic and inorganic wastes. The water is unfit for human consumption. From Thapathali to Chovar and downwards, the river is severely polluted. According to a report from Nepal Water Supply and Sewerage Corporation in 1997, only 26,141 households in

Kathmandu have connection to public sewerage. The remaining household discharge their sewage into septic tanks, latrines or directly into the river systems. The public sewerage is also directly drained into both the Bagmati and the Vishnumati rivers.

According to a report (1995), in Kathmandu, the quality of drinking water is inferior due to presence different contaminants such coliform bacteria, iron and ammonia. The amount of iron in drinking water in some cases exceeds WHO standards. The drinking water also contains high ammonia which may be attributed to the composition of organic matters such as sewage, animal waste and biomass near water sources. Chloride varies from moderately high to very high. Sodium and potassium ratio is less than 10%, which again suggest pollution due to sewage and solid wastes.

In general, watershed degradation is common phenomenon in Nepal. Some of the environmental causes are landslides and floods, degradation of forests and land in the watersheds, deposition of sediments in canal system and river and change in water quality.

Wetlands: About 0.731 million ha of land is covered by wetlands, including water bodies of different sizes and characteristics. Wetlands are highly fertile and productive systems. They provide habitat to over 180 species of fishes and a number of water dependant birds and other animals. Wetlands are also rich in aquatic angiosperms which provide food for human beings, fodder for animals and feed for birds. Nepal's wetlands are facing degradation primarily due to eutrophication caused mainly by increased pollution [due to discharge of untreated effluents] and damming.

6.4.4 Land degradation: Land resource base supports the livelihood of majority of people. In general, land use category includes agriculture, forests and posture, snow cover and other lands. According to a recent study, 39.6% of the total area is covered by forests which include 29% forests and 10.6% shrub land. Land-use pattern in Nepal is presented in Table 2. Land-use changes have occurred from both natural processes as well as human activities. Throughout the hill region, soil loss from cultivated and grazing land are major factors in declining soil fertility.

6.4.5 Energy: Traditional and commercial sources such as fuel wood, fossil fuel, agriculture residues, animal waste, solar power and hydropower are used. Yearly energy consumption and percentage share by fuel type is presented in Table 3.

6.4.6 Solid wastes:

Municipal solid wastes: Prior to 1950, solid wastes were locally managed in urban areas including Katmandu valley. In due course of time the quantity of solid waste generated has increased and there is haphazard disposal and dumping in nearby open spaces. Solid waste management in both industrial and domestic sector has been a cause of great concern in urban areas of Nepal. In Katmandu valley solid waste management and resource mobilisation centre

(SWMRMC) was established in mid 1980's. Municipal solid wastes are collected, transported and disposed off through efforts of SWMRMC and municipalities.

A sample survey of 31 private hospitals in Katmandu valley revealed hospitals to generate 191 kg of waste per day (1997). Generation of waste in the health institutions in approximately 5.71 kg per patient per day, out of which nearly 30% is hazardous in nature. Due to lack of separate regulations for managing hospital wastes, they are mixed with municipal refuse. Some of the organic wastes from household are used for composting / vermiculture. Efforts on recycling and reuse of wastes have also been initiated by the government and non-government sectors, for example:

- farmers use restaurant wastes to feed pigs and cattle;
- butchers are producing organic manure from slaughter house wastes;
- used paper is recycled by industries; and
- some industries have recycling facilities for metal, glass, plastic and rubber.

Industrial solid wastes: The total solid waste generated by different industries is estimated to be 22,000 tons per year. In general the major solid waste generating industries are leather, canning, sugar and distilleries. It was learnt that recyclable wastes such as non-ferrous metal scrap, used lead-acid batteries, used oil etc. are generally taken illegally to India. These wastes being hazardous and covered under the Basel Convention, transboundary movement is not permitted even for recycling.

Outdated pesticides: It was given to understand that 74 MT of outdated pesticides, insecticides, herbicides etc. are lying in Nepal. The material is also not properly stored and there are not facilities for its destruction in an environmental sound manner. Outdated pesticides are hazardous wastes and also persistent organic pollutants covered under the Basel Convention as well as Convention on POPs.

6.4.7 Air pollution:

Air quality: Change in the quality of outdoor and indoor air is an emerging concept in both urban and rural areas of Nepal. Regular emission is the major cause for deteriorating air quality in urban areas. Vehicular emission is much aggravated by substandard or adulterated fuel, narrow and poorly maintained roads, poor traffic management, old vehicles and poor vehicular maintenance. More recently conditions have further deteriorated due to heavy vehicular traffic in major towns, such as Kathmandu, Pokhra, Birat Nagar and Bir Ganj. Among the vehicles, buses, trucks, tempos and two stroke motor cycles are probably the contributor of vehicular emissions. One third of vehicles tested during June 1996 to May 2000 failed to comply with the existing standards (Table 4).

Ambient air quality in Kathmandu indicates that the exception of total suspended particles (TSP) and particulate matter (PM^{10}), other criteria pollutants are well below the WHO guidelines as presented in the table given below:

Parameters	Monitoring Time (hour)	Monitoring Years and Level			
		1993*	1995**	1997***	1998**
Total Suspended Particulate (TSP)	24	241	NA	NA	950
	8	342			
Particulate Matter (PM_{10})	24	104	637.5	172.98 to 2336.14	NA
	8	99			
	1 minute				
Nitrogen dioxide (NO_2)	24	26	NA	NA	NA
	8	39			
Sulphur dioxide (SO_2)	24	36	NA	NA	NA
	8	48			
Carbon monoxide (CO)	Spot analysis	<10 (PPM)	NA	NA	NA

*Devkota, 1993 (continuous monitoring & average avalue)
** NESS, 1995 / 1998 (Grab sampling – personal communication)
*** Leaders Nepal 1997 ($PM_{7.7}$) (Grab sampling for ten minutes)
NA: Not available

Industries also play a major role in increasing the load of air pollutants. According to a report (1994), there are 3156 air polluting industries which emit almost 76,400 tons of TSP matter annually. Air pollution load due to stack emission from industries is presented in the table given below:

Boiler Type	Boiler	Stack loss (%)		Emission of Pollutants (g/m^3)					
		Min	Max	CO		NO_x		SO_2	
				Min	Max	Min	Max	Min	Max
Furnace Oil	2	8.89	9.18	122	241	239	250	872	1588
Diesel Oil	10	3.86	9.75	0	308	94	203	105	419
Kerosene Oil	6	3.0	6.2	0	34	96	181	10	26
Rice Husk	7	67	90[x]	41	7803	66	289	0	86[xx]

Note: [x] Gross Efficiency
[xx] Fuel mixed with charcoal

Sporadic studies have been conducted to assess impact of indoor air pollution on human health in Nepal. One of the studies (1985) indicated prevalence of chronic bronchitis to be a maximum of 29% in Jumla (mid western development region) and 8% in mid hill

region of urban Kathmandu. The study also revealed that women spend 20% of their work time in cooking activities and are exposed to smoke which is the cause of acute respiratory tract infections and chronic bronchitis. Indoor air pollution in industries also cause a consideration threat to the health workers.

6.4.8 Water pollution:

Domestic sewage and industrial effluents are major contributors of water pollution. Haphazard growth in urban areas and inadequate sewerage facilities have accelerated the disposal of domestic liquid waste without any treatment. Almost all the urban areas have no wastewater treatment facilities. The cumulative effects of wastewater discharge have a striking negative impacts, particularly, in the river flowing through the Kathmandu valley. The holy river of the Bagmati is biologically dead due to discharge such domestic and industrial wastewater in the stretch flowing through urban areas.

As per report (1994), industrial wastewater is directly discharged into the terrestrial and aquatic systems without any treatment. This contains high load of oxygen demanding waste, disease causing agents, synthetic organic compounds, plant nutrients, inorganic chemicals & minerals and sediments. Industrial pollution load scenario in Nepal is presented below:

Industrial Pollution Load Scenario in Nepal

Development Region	Parameters				
	TSP (ton)	Waste water Volume (m^3)	BOD (ton)	TSS (ton)	Solid waste (ton)
Kathmandu valley	37857	2100000	1150	1417	1421
CDR excluding valley	19950	2160000	1284	2317	8622
EDR	6626	3450000	1424	3614	9560
WDR	5505	699000	1054	1350	1615
MWDR	2610	43000	336	300	287
FWDR	3835	105000	493	593	378
Total	**76,383**	**8,556,997**	**5,741**	**9,591**	**21,883**

Characteristics of wastewater from various categories of industries in Nepal is presented below:

Characteristics of Industrial Wastewater

Maximum observed values											
Sector / Source	Samp-le size	PH	Conduct-ivity (ms/cm)	Salinity (./.)	Temp (°C)	TDS (mg/l)	BOD (mg/l)	COD (mg/l)	TSS (mg/l)	O/G (mg/l)	PE
Iron and steel galvanizing											
Pickling waste	3	154	2.39	1.1	44.4	2850	n.a.	96	30	n.a.	
Soap manufacturing											
Combine final outlet	3	14	153	220	43.8	174800	8220	33500	17400	90	822
Pulp and paper	2										
Black liquor		10.4	39	15.2	32.9	31350	32450	13600	15200	2200	
White liquor		9.34	1290*	1.9	35.7	9000	1824	9833	2044	50	
Vegetable oil/ghee											
Neutralisation wash	4	9.08	4.1	4.1	48.8	10850	4717	5320	5350	580	2000
Textile											
Combine final outlet	4	6.36	2210*	0.1	33.4	2210	732	5750	140	9.8	4392
Brewing											
Combine final outlet	2	8.04	521*	0.1	29.4	278	514	725	90	n.a.	1542
Distillery Spent wash	1	4.4	18.13	10.9	84.5	18550	13040	54000	11230	n.a.	9540
Beverage/soft drink											
Combine final outlet	3	9.05	2.7	1.3	33.2	1236	196	300	66	1.4	720
Food processing											
Combine final outlet	3	4.91	863*	0.2	36.7	350	2372	3800	1200	12.4	1423
Leather tanning											
Combine final outlet	3	13.58	3	1.4	29	9900	1035	6500	8267	1230	1035
Carpet dyeing	4										1142
Light spent dye bath		4.71	2.62	1.4	84.2	1072	648	860	280	4.2	
Dark spent dye bath		4.82	5.08	2.8	82.1	3595	2208	2300	400	5.8	
Carpet washing	4										416
Sulphuric +acid		1.02	21.6	13.1	27.1	1200	184	456	672	4	
Caustic soda wash		14	10.4	6	28.6	4531	230	540	320	8.7	
Sulphuric acid wash		1.07	19.87	12	28.1	4115	210	620	294	5.5	
Detergent wash		2.53	2.85	1.4	28.1	316	207	330	132	4.4	

6.4.9 Noise pollution: Surface transportation is predominant source of noise pollution in urban areas. Old and poorly maintained vehicles further adds to the problem. As per report in 1997, highest noise level of 101.9 dB prevailed in high traffic areas in Kathmandu. The mean values of noise levels range from 67 to 75 dB in public places and 74.5 dB in residential-cum-commercial areas. Noise levels in Kathmandu is presented in the table given below:

Noise Level in Kathmandu

Areas	Equivalent Noise level Leq	Noise Level Exceeded %			
		LN_{10}	LN_{50}	LN_{95}	LN_{max}
High Traffic	78.97	80.97	75.34	69.04	97.11
Low Traffic	75.21	78.0	71.96	64.62	94.19
Public Places	69.67	72.0	67.04	62.34	86.82
Residential and Commercial Places	74.52	77.02	70.44	63.38	92.27

6.4.10 Environmental awareness and communication: HMG recently introduced formal environment education in primary, secondary and tertiary levels. Various forms of media are also involved in creating environmental awareness. Ministry of Population & Environment is implementing number of public awareness activities through mass media such as, radio televisions, cinema halls and print media. Informal group meetings, training workshops and seminars are also organised. The Ministry is also implementing advocacy programmes aimed at policy makers and journalists. Besides, a number of voluntary organisations are involved in creating public awareness about environmental issues. The following table gives a glimpse of public awareness activities in Nepal.

Public Awareness Activities

Radio Programmes	Regular Programmes, special/occasion programmes and sport announcements.
Inter-personal	Seminars, workshops, training, talk programmes, essay contests, special youth and women-specific programmes
Print Materials	Booklet, pamphlet, newsletter, feature article, magazine, wall newspapers, wall calendar/diary, manual and information kits,
Audio-Visuals	Film/slide exhibition.
Television Programmes	Documentary, telefilm, occasional programmes and spot announcements.
Indigenous Media	Drama comedy and folk songs.
Public Advertising	Mass rallies, display boards, stickers and printed vests, T-shirts.

6.5 Policy, Legislation And International Commitments

6.5.1 Policy initiatives:

Development planning through five-year plans incorporated various environment related policies and programmes. The concept of ecological balance and economic development by giving primary emphasis to conservation and development of water shed was introduced in 1975. National forest policy was formulated in 1976. Environment friendly policies were further elaborated in the five year plan during 1985-90 and for the first time a national policy on environment management and national conservation strategy was incorporated in this plan. Emphasis was also laid on the importance of public participation in decision making process. Process of internalising the environmental impact assessment (EIA) system in economic development plans and programmes was introduced in 1992. A national environmental policy and action plan was prepared in 1993 to facilitate integration of environmental aspects in the development process.

The current (ninth) five year plan (1997-2002) encompasses principles of sustainable resources, some policy directives of the ninth plan are:

- priority to environmental programmes involving women and poverty stricken classes of people;
- special programmes for environment conservation in remote area;
- involvement of NGOs in environmental education;
- training and research on pollution control, solid waste management etc.;
- development of environmental management information system; and
- implementation of environmental standards.

Action plans: In order to implement environmental programme in the development planning, Nepal environmental policy and action plan (NEPAP) has been prepared and is also endorsed by the Environment Protection Council [chaired by the Prime Minister] in 1993. The number of actions are proposed in the following five prominent areas:

- sustainable management of natural resources;
- population, health and poverty;
- safeguarding the national heritage;
- mitigation of adverse environmental impacts; and
- legislation, institution, education and public awareness.

Since 1993, several institutions have continued the incorporation of selected environment related activities in programme planning and implementation, however, much of the actions still remain to be implemented. Regulatory agency with infrastructure for monitoring, evaluation and enforcement of pollution control and environment protection standards is yet to be established.

6.5.2 Environmental legislation:

The constitution of Nepal (1990) indicates the need for environmental conservation in the Directive Principles of the State. According to Article 26(4) of the Constitution, *the State shall give priority to the protection of the environment of the country and also*

prevent damage due to physical development activities by making people conscious of environmental cleanliness, and by making special arrangements for the protection of rare animal species, forests and vegetation. Article 26(3) provides for adoption of a policy for mobilising natural resources of the country in a manner which will be sustainable and beneficial to the interest of the country.

Following the establishment of Ministry of Population & Environment (MoPE) in 1995, the *Environmental Protection Act (EPA) 1996* and the *Environment Protection Rules (EPR), 1997* came into existence. This legislation aims, among other things, for environment conservation through internalisation of the environment assessment system, pollution control and prevention. 200 types of developmental activities have been included for the process of environmental impact assessment. There is also provision for environmental permit system, compliance of environmental standards, penalties for violations, establishment of laboratories and environmental inspectors to inspect and report on implementation. Public consultations on environmental assessment is a legally binding obligations. Most of the legal provisions are very new and some require setting up of environmental standards while other require extended rules and regulations for enforcement.

6.5.3 International commitments:

Nepal has joined international community through adoption and implementation of environment related resolutions enshrined in various multilateral environmental agreements. Nepal is Party to several international conventions and is committed to legally binding and legally not binding instruments thereunder. Some of the major conventions are given below:

S.No.	Name of the Convention	Date of entry into force
1.	UN Convention on Dessertification, 1994	January 1997
2.	Basel Convention, 1989 (hazardous wastes)	January 1997
3.	Vienna Convention, 1985 (protection of Ozone layer)	October 1994
4.	UNFC on Climate Change, 1992	July 1994
5.	Convention on Biodiversity, 1992	February 1994
6.	Agreement on Aquaculture in Asia Pacific, 1988	January 1990
7.	Convention on Wetlands, 1971	April 1988
8.	Convention on protection of World Cultural and Natural Heritage, 1972	September 1978
9.	CITES, 1973	September 1975
10.	Plant Protection Agreement for South East Asia & Pacific, 1956	August 1965

6.6 Actions And Emerging Issues

6.6.1 Environmental institutions:

National Committee on Man & Biosphere National Committee on Man & Biosphere, 1974. [initiation of environmental activities.]
National Resources Conservation Commission, early 1980s. [integration of issues of natural resources in sectoral programmes.]

Environment & Resources Conservation Division in the Planning Commission, 1987. [integration of environmental issues in development planning.]
Council for Conservation of Natural and Cultural Resources, 1990.
Environment Protection Council, 1992, chaired by the Prime Minister. [advisory body.]
Ministry of Population and Environment, 1992.
Sectoral Ministries and Municipalties are also concerned with minimising environmental pollution.

6.6.2 Economic instruments: Along with policy and legal measures, environmental management is also possible through the introduction of economic tools and instruments to attract various stakeholders to comply with the set of regulations. Though environmental quality standards are yet to be developed in Nepal, few of the economic instruments recently introduced would help minimise environmental damage such as:

Subsidy on gobar gas plants. Interest free loans with a repayment period of 7 years and a direct subsidy of NRs. 5000/- per plant.
Environment Protection Act, 1997 has provision to grant concessions for adoption of waste minimisation techniques.
Fiscal Act, 1999 has provision for tax incentives for manufacture of vehicles operated on electricity or gas or storage batteries.
Imposition of Excise Duty on bricks and polythene bags (based on micron size) from the year 2000-2001. .
Prohibition on import of vehicles not complying with emission norms.

6.6.3 Integration of environmental concerns with economic policies is a challenging task for a developing country like Nepal. The effective implementation of environmental policies, rules and regulations have thus far been limited due to weak institutional structure and associated costs. In this contest, potentially cost effective solutions such as, market based measures and a policy of mixed regulations and incentives are recognised in the HMG. A matrix of environmental policies and strategies in Nepal is presented in Table 5.

6.6.4 Selected programmes:

Persuasion of environmental conservation through formulation of discharge standards. Tolerance limits for industrial effluents discharged into surface waters are in place.
Testing of vehicular emissions in Kathmandu valley. Vehicular pollution control: Auto-exhaust emission standards are laid down in Nepal. Vehicles complying with Euro II norms are only permitted for registration. Copy of Nepal Vehicle Mass Emission Standards, 1999 is placed at Appendix I.

6.7 Industrial Scenario

Department of Industries is responsible for the promotion of industries in Nepal, specially for the development of medium and large industries. These industries are categorised in various production groups such as:

- Food manufacturing
- Beverages

- Tobacco
- Textile
- Leather & Leather Goods
- Paper & Stationary Products
- Other Chemical Products
- Rubber Products
- Plastic Products
- Non-metallic Mineral Products
- Iron & Steel Products
- Electrical Goods

Industrial production of some medium and large industries is presented in the Table 6. Approved capacity, production and capacity utilisation of major industries in the financial year 2000-2001 is given in the Table 7. In all 51 industrial projects were approved during the year 2000-2001 after initial environmental examination (IEE) in the medium and large sector (Table 8).

6.8 Status Of Hazardous Wastes Management

As per section 2(h) of the Environment Protection Act, 1997 "wastes" means the liquid, solid, gas, slurry, smoke, dust, radiated element or substance or similar other materials disposed in a manner to degrade the environment. By implication, this includes hazardous wastes, as also covered in the Basel Convention. The environmentally sound management of hazardous wastes is sought to be regulated through various provisions of the EPA, 1997. Specific standards, authorisation for management and handling and requirements of environmentally sound management of hazardous wastes are not yet put in place.

There is provision for appointment of "Environmental Inspectors" in the EPA, 1997 for effective monitoring and enforcement of regulations, however, institutional arrangement and supporting infrastructure laboratories etc. is not yet in place. There have been sporadic studies on pollution assessment, monitoring and surveys carried out with the support of expert agencies from Nepal and abroad, which is only database available in the country.

There is no separate manpower appointed or allocated exclusively for the purpose of environmentally sound management of hazardous wastes. There are about 97 staff in the MoPE, out of which scientific & technical personnel are about 12. There are six sections in the MoPE as under:

- Policy
- Environment Fund
- Standards, Monitoring and Evaluation
- Pollution Control
- Land Use
- Environmental Impact Assessment

There is provision for establishment of the Environment Protection Authority in the EPA, 1997 but the same is not yet constituted.

It was learnt that recyclable hazardous wastes such as lead-acid batteries, non-ferrous metallic scrap, waste oil/used oil etc. may be going illegally to India for recycling. This is not allowed under the Basel Convention and MoPE do not permit import or export of hazardous wastes. There is, however, proposal to Asian Development Bank for assistance to set up recycling/reprocessing of lead-acid batteries generated in Nepal particularly from automobile and other sectors.

It was given to understand that major hospitals have installed incinerators for biomedical wastes but they may not be strictly as per any standards. Biomedical wastes are covered under the Basel Convention. There are no facilities for environmentally sound management of these wastes.

Household wastes covered under the Basel Convention are handled along with the other the municipal solid wastes. There are no facilities for environmentally sound management of these wastes except that the Kathmandu Municipal Corporation is planning to set up an incinerator. EIA of the project is done and a foreign donor agency is also willing to provide assistance.

Infrastructure facilities and manpower at the Customs Department are not adequate for control of transboundary movement of hazardous wastes.

74 MT of obsolete organo-chlorine pesticides (hazardous wastes as per Basel) are lying in Nepal. There are no facilities for its destruction in an environmentally sound manner. The Ministry of Agriculture proposed to UNIDO for assistance in safe disposal/destruction of obsolete pesticides.

Research Centre for Applied Science & Technology (RECAST) under the Tribhuvan University, Kathmandu with Prof. Tulsi P. Pathak as its Executive Director is identified as Focal Point by Asia Pacific Centre for Technology Transfer (APCTT), New Delhi. Set up in 1973, RECAST is devoted to research & development and education in the field of applied science & technology. RECAST has grouped its human resource and physical infrastructure into various sections, laboratories and field units. The facilities at RECAST require strengthening to adopt training, research and education in the field of environmentally sound management of hazardous wastes. Financial support is must in this regard to augment the resources of RECAST.

6.9 Needs Assessment For Environmentally Sound Management Of Hazardous Wastes

Following areas are identified as needs with respect to the implementation of Basel:

- Training of enforcement officers
- Development of infrastructure laboratories
- Monitoring illegal traffic
- Assistance to develop hazard criteria, test methods, improvement of customs procedures, notification and consent protocol/procedure and preparation of inventories of hazardous waste streams.

- Prioritisation of activities in relation to hazardous wastes produced in the country particularly with reference to waste minimasation/recycling, treatment, storage and disposal facilities (TSDF), emergency response and linkage to industry.
- Information dissemination and coordination with voluntary organisations for public participation.
- Data management systems

Existing technology transfer programmes do not meet the needs. Additional needs with respect to technology transfer in following areas are suggested as under:

- Incineration
- Secured/Engineered Landfill system
- Recycling/reprocessing of hazardous wastes
- Waste Minimisation
- Clean/Cleaner Production methods

Table – 5

A Matrix of Environmental Policy and Strategy for Nepal

	Policy / Strategy	Relevant environmental sectors
1. Incentive mechanism		
i. Using market	Subsidy reduction	e.g. Import of chemical fertilizers
	Targeted subsidies	e.g. Municipal and industrial pollution management, industrial energy efficiency, range-land conservation, forest management, organic fertilizer promotion.
	User fees	e.g. Municipal solid waste management, combine wastewater treatment system
	Deposit refund system	e.g. Mountaineering teams, industrial packaging materials
	Environmental taxes	e.g. Pricing of use of water resources at different levels, pollution tax including ozone depleting substances, biologically-non-degradable items, pesticides and insecticides
ii. Creating markets	Property rights / Decentralisation	e.g. District / Village Development Committees to manage environmental resources at local level
	Tradable permits	e.g. Industrial pollution control / management at Industrial Districts
	International offset system	e.g. Timberline and Churia conservation schemes to safeguard the Himalayas, soil and watershed conservation and carbon sequestration
2. Administrative Mechanism		
i. Environmental regulation	Standards	e.g. Emission, effluent and other physical standards
	Bans	e.g. Import of toxic / hazardous substances as indicated in the Basel Convention, illegal trade of wild animals as mentioned in the CITES
	Permits / quotas	e.g. Import of pesticides / insecticides
ii. Public engagement	Public participation	Village and District Development Committees in resource conservation and management
	Information disclosure	Transparency in total environmental governance

7. Sri Lanka

7.1 Country Profile:

Sri Lanka is an island strategically located in Indian Ocean between 6^{o}-10^{o} N Latitude and 80^{o}-82^{o} East longitude. India is located in the north while Maldives is located in the west of Sri Lanka. The maximum length from North to South is 432 Kilometers while maximum breadth from East to West is 224 Kilometers. The total land area of the country is 65,610 square kilometers. The total population of the country is 19.043 million with a growth rate of 1.4%. The population density is 304 per square kilometers while the male to female ratio of 1.039. The adult literacy rate is 90.7%. The male to female literacy rate is 90.5% while the female literacy rate is 82.4%. Sri Lanka has a tropical type of climate with mean annual temperature ranging from 15 °C to 27 °C and 80 % relative humidity. The country receives rainfall from South West Monsoon starting from May to August and North East Monsoon starting from November to February. The annual rainfall in Southern Sri Lanka ranges from 2500 mm to 5000 mm while the Northern region receives about 1200 mm. Administratively there are 9 Provinces and 25 Districts in the country. Sri Lanka is run by a democratically elected government and Ministry of Forestry and Environment looks after the affairs of Environment. Sri Jayawardena Pura Kotte is the administrative capital of Sri Lanka while Colombo is the commercial capital.. There is one international airport located near Colombo while there is no land route to other country from Sri Lanka.

Rupee is the currency of Sri Lanka with an exchange rate of Rs. 90 to a US$. At present, Sri Lankan economy is under severe strain on account of national security priorities. The GDP real growth for the year 2000 has been estimated to be 4.7% respectively. Interest rates are high indicating high inflation rate and efforts of the government to restrict money supply in the market. Sri Lanka has a reserve of Rs. 105,774 million as of July 2001. The total level of foreign reserves was sufficient to finance 3.6 months of imports (excluding Aircraft). The rate of inflation was 12.2 per cent in June, 2001. Government debt stood at Rs. 1348 billion out of which 54% is domestic debt and 46% is foreign debt. The total outstanding public debt increased by 24.8 per cent compared to the end of April, 2000. During the current fiscal, the agriculture and industrial production decreased by 0.3% and 2.3% as compared to last year. However, the revenues of the government increased by 13% in the current fiscal as compared to last year. The major exports of Sri Lanka are agriculture & industrial products and minerals while major imports are consumer products, intermediate and investment goods. Though the balance of payment during the current fiscal is negative, it indicated decreasing trend on account of higher export earnings and reduced imports in comparison to last fiscal. Export earnings recorded an increase of 2.9 per cent (in US$ terms), reflecting increases in agricultural, industrial mineral and other exports as compared to last fiscal. Industrial exports increased by 0.7 per cent (in US$ terms) mainly due to increases in earnings from food, beverages and tobacco, leather, rubber etc. and other industrial exports. Imports recorded a decrease of 7.5 per cent, reflecting decreases in intermediate and other imports as compared to last fiscal.

Sri Lanka has diverse group of industries, which have been classified, into micro, small, medium and larger-scale industries. These include sectors like food & beverage, textile, apparel & leather products, wood & wood products, pulp, paper and paper products, chemical, petroleum, plastic and rubber, non metallic products, basic products and fabricated metal products. The classification and the number of industries as per Ministry of Industrial Development are given in the following table.

Number of Industries Registered with the Ministry of Industrial Development
(Source: MID - Management Information Division & MID Annual Publications as at April 2000)

Type of Industry	Food & beverage	Textile, apparel & leather products	Wood & wood products	Paper pulp & paper products	Chemical, petroleum, plastic & rubber	Non-metallic products	Basic Metal Products	Fabricated Metal Products	Prodn. e.s	TOTAL
MICRO	65	166	22	50	119	37	8	118	31	**616**
SMALL	49	155	11	35	97	17	8	95	23	**490**
MEDIUM	16	62	05	14	38	07	03	25	12	**182**
LARGE	69	122	03	28	126	25	13	66	25	**477**
TOTAL	**199**	**505**	**41**	**127**	**380**	**86**	**32**	**304**	**91**	**1,765**

Where, Micro industries : investment <2.0 million Rs.
Small industries : 2.0 < investment <10.0 million Rs.
Medium industries : 10.0 < investment <20.0 million Rs.
Large industries : investment > 20.0 million Rs.
Investment = Total assets - (land & building value)

The following table gives the number of projects (industries) as per Board of Investment (BOI) sectoral classification.

No. of BOI projects (industries) as of August 2000

BOI Sector Classification	No. of Industries
1. Food, Beverage & Tobacco	108
2. Textiles, Wearing Apparel & Leather Products	201
3. Wood and Wood Products	19
4. Paper, Paper Products, Printing & Publishing	19
5. Chemical, Petroleum, Coal, Rubber & Plastic Products	91
6. Non-Metallic Mineral Products	43
7. Fabricated Metal, Machinery & Transport Equipment	26
8. Manufacture Products n.e.s	138
9. Non Manufacturing (Services & Horticulture)	302
TOTAL	**947**

7.2 Regulatory Framework:

Environmental Policy and Plan

In 1988, the Government adopted the National Conservation Strategy as the National Policy for conservation of natural resources in Sri Lanka. A separate Ministry for Environment was set up in 1990. Subsequently, a National Environmental Action Plan was prepared in 1994 and updated in 1998 to identify the issues and necessary Policy intervention relating to land and water, forest and biodiversity, coastal and marine resources, industrial and urban pollution and the energy and mineral sectors. The legislative framework for environmental protection and management is summarized in the following sections.

Environmental Laws and Regulations

Sri Lanka ratified the *Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal* with effect from 28 August 1992.

- **Public Nuisance Law**

The nuisance (both public and private) law relating to public nuisances is contained in Section 261 of the Penal Code and section 98 of the Code of Criminal Procedure Act, No 15 of 1979.

- **Sri Lanka Ports Authority Act No 51 of 1979**

Under section 55(9) of this act, any person who pollutes the water of the harbor by overflow or discharge of oil or any other impurity within the limits of any specified port or the approaches to a port shall be guilty of an offence and shall be liable to a fine not exceeding 2,500 rupees or to an imprisonment up to an year or to both punishments.

- **Marine Pollution Prevention Act no 59. of 1981**

This act provides for the prevention, reduction and control of pollution in Sri Lanka waters and to give effects to international contention for the prevention of pollution of the sea.

- **Coast Conservation Act No. 57 of 1981 amended by Act No 64 of 1988**

Coastal management in Sri Lanka was first mandated by the coast conservation act of 1981, which gave the Coast Conservation Department (CCD) primarily responsibilities for;
Policy formulation, planning and research
Administration of permit procedure regulation, coastal development activities
Construction and maintenance of shoreline protection works

- **National Environmental Act No. 47 of 1980 as amended by Acts Nos. 56 of 1988 and 53 of 2000.**

This is the main enactment that was formulated to protect the national environment and to manage it in order to maintain environment quality and to prevent pollution.

Section 23(A) states that:
- The Minister shall determine the prescribed activities for which a license is required
- No person shall carry on any prescribed activity except -
    - (a) under the authority of a license issued by the Authority; and
    - (b) in accordance with such standards and other criteria as may be prescribed under this Act.

There is a new environmental act tabled before the cabinet awaiting implementation. This is termed as the National Environmental Protection Act (NEPA).

List of other Environmental Legislation (both having indirect and direct impact – on Industrial Pollution Control)

- Flood Protection Ordinance No 4 of 1924
- Land development Ordinance of 1935
- Nuisance Ordinance No. 15 of 1862 as amended by act No 57 of 1946
- State Land Ordinance No 8 of 1947
- Soil Conservation Act No 25 of 1951
- The regulations on ionizing radiation protection, Atomic Energy Authority Act No. 19, 1969
- Urban Development Authority Law No 41 of 1978
- Mahaweli Authority of Sri Lanka Act No 23 of 1979
- Mines and Minerals Act No 33 of 1980
- Mines and Minerals Act No 33 of 1980
- Municipal Councils Ordinance No 29 of 1947 amended by act no 61 of 1981
- Natural Resources, Energy and Science Authority of Sri Lanka Act No. 78 of 1981
- Colombo District (Low lying areas) reclamation and development board act No 15 of 1968 amended by act No 52 of 1982
- Fauna and Flora Protection Ordinance No 2 of 1987
- Agrarian Services Act No 58 of 1979 amended by Act No. 4 of 1991
- National Water Supply and Drainage Board Law of No 2 of 1974 amended by Act No 13 of 1992
- Irrigation Ordinance No 32 of 1946, amended by No 48 of 1968 and by No 13 of 1994
- Forest Ordinance No 16 of 1907 as amended by Act No 23 of 1995
- Fisheries and Aquatic Resources Act No 2 of 1996

Existing Environmental Standards related to industrial pollution:

a. Wastewater Discharge Standards

The following standards for wastewater discharge are prescribed in the National Environmental (Protection and Quality) Regulations, No. 1 of 1990 (Gazette Extra-ordinary No. 595/16, dated 2nd February 1990):

(i) General standards for discharge of effluents into inland surface waters
(ii) Tolerance limits for industrial and domestic effluents discharged into marine coastal areas
(iii) Tolerance limits for industrial effluents discharged on land for irrigation purpose (however, the values for hydraulic loading rates for discharge on land is not included in the gazetted standards and the SLSI has specified the loading rates)
(iv) Tolerance limits for effluents from rubber factories discharged into inland surface waters
(v) Tolerance limits for effluents from textile industry discharged into inland surface waters
(vi) Tolerance limits for effluents from tanning industry discharged into inland surface waters and marine coastal areas

In general all activities have to comply with general standards for discharge of effluents unless specific standards for that type of activity have been drafted.

b. Air Emission Standards

Stationery sources of air emission standards have not yet been gazetted. However, these standards are being indicated in the environmental site clearances issued for the proposed facilities.

c. Noise Standards

A set of noise regulations and standards was gazetted in 1996 under the NEA. There are six schedules of standards for different situations such as industrial zones, areas and different activities.

d. Hazardous Waste Management Standards & Guidelines

At present national legislation exist concerning the internal management of hazardous wastes. This legislation has been in force since May 23, 1996 though it has hardly been enforced. The Government of Sri Lanka (GOSL) published, in the Gazette Extraordinary, No.924/13 of May 23, 1996, regulations concerning hazardous wastes. This came as an amendment to the National Environmental (Protection and Quality) regulation, No.1 of 1990, which is the EPL (Environmental Protection License) regulation. With the new amendments the EPL regulations have been redesigned as Part I. The new part II deals with hazardous waste management. This section sets out the requirements to obtain a license from the CEA and specifies the procedures for obtaining such licenses and the conditions attached to them. A schedule within Part II lists out 19 constituents and 9 waste streams and this indicates what should be considered as hazardous wastes. The term hazardous waste is not specifically defined other than by this method in the present act. However, the proposed new environmental act defines the term Hazardous waste as " *those materials, substances and waste which have toxic, corrosive, radioactive, chemically reactive, flammable or explosive characteristics and which are listed by the Agency by Gazette notification from time to time."*

Central Environmental Authority in collaboration with the relevant organisations and under the directions of the National Coordinating Committee for the implementation of the Basel Convention formulated guidelines for the implementation of Hazardous waste management regulations in 1999. These guidelines are broadly compiled according to the following classification.

- Guidelines on safety measures to be adopted during Generation, Collection, Transportation, Storage, Recovery, Recycling and Disposal of Wastes.

    a) Guidelines for the generator of hazardous waste
    b) Guidelines for the collection and transportation of hazardous waste
    c) Guidelines for the operator of hazardous waste storage, Recovery, Recycle, Treatment & Disposal Facility

- Guidelines for the establishment of Waste Disposal Sites
- Operation regarding recycling and recovery of waste

Other legislation governing hazardous waste management are as follows:

a) Import and Export regulations are being drafted and will be finalized after incorporating Ban Amendment (Decision III/I), for control of transboundary movement of hazardous waste.
b) Import and Export Control Act No. 1 of 1969 wherein Special Import License scheme has been introduced relating to security, health, environment and public morals.
c) Customs Ordinance (Chapter 235)
d) Control Pesticides Act, No. 33 of 1980
e) Cosmetics, Devices and Drugs Act. No. 27 of 1980
f) Atomic Energy Authority Act No. 19, of 1969
g) Marine Pollution Prevention Act no 59. of 1981
h) Explosive Act No. 21 of 1956 & No. 33 of 1969, Laws Nos 36 of 1976 & 14 of 1978
i) Food Act No. 26 of 1980
j) Fertilizer Act No. 21 of 1961
k) Consumer Protection Act Nos 1 of 1979 & 37 of 1990
l) Poisonous Opium Act – Dangerous Drugs Ordinance,
m) Petroleum Ordinance, No. 6 of 1887,
n) Motor Traffic Act No. 14 of 1951
o) Motor Traffic (Amendment) Act No. 21 of 1981.

e. Standards on solid waste (non-hazardous)

The Ministry of Forestry & Environment has prepared a document. “National Strategy for Solid Waste Management” which provides guidance for environmentally sound disposal of solid wastes. At present the Local Authorities are charged with the responsibility for managing solid waste under the relevant ordinance and Acts. This strategy is based on the broad policy of waste management from generation to final disposal. It covers, waste avoidance/reduction, source separation of waste, reuse, recycling and thereafter, final disposal of the residual waste in an environmentally sound manner.

Administrative framework

In Sri Lanka, several environmental protection related agencies such as Central Environmental Authority, Coast Conservation Department, National Aquatic Resources Agency, the Marine Pollution Prevention Authority, the Department of Merchant Shipping, Department of Forest Conservation and Department of Wildlife Conservation are placed under different ministries for coordinating the environment protection and management. Institutional framework available for the protection and management of the environment in the country is summarized below.

Institutional framework for the protection and management of the environment

Ministry of Forestry and Environment is the main policy making body while Central Environmental Authority is the body for execution and enforcement of environmental laws. At provincial level, the only provincial Environmental Authority, i.e. North Western Provincial Environmental Authority is responsible for the enforcement of environmental regulations in the North Western Province.

Ministries:
Forestry and Environment
Agriculture
Lands
Fisheries / Aquatic Resources
Irrigation / Power
Housing / urban development
Health
Provincial Councils
Local Government

Government agencies and departments:
Central Environmental Authority (CEA)
Provincial Environmental Authorities
Board of investment (BOI)
National building research organization (NBRO)
Industrial Technology Institute (ITI)
National Water Supply and Drainage Board
National Planning Department
Urban Development Authority (UDA)
Marine Pollution Prevention Authority (MPPA)
Road Development Authority (RDA)
Sri Lanka Land Reclamation and Development Corporation (SLLRDC)
Sri Lanka Standards Institute (SLSI)
Rubber Research Institute (RRI)
Industrial Development Board (IDB)
Government Analyst Department (GAD)
National Engineering Research and Design Centre (NERDC)

Roles & Responsibility of CEA:
National Environmental Act No. 47 of 1980 paved the way for the establishment of the Central Environmental Authority (CEA) in 1981. One of the major functions of CEA is to regulate maintain and control the volume, types, constituents, and effects of waste, discharges emissions, deposits or other sources or sub sources of pollution which are of danger or potential danger to the quality of the environment or any segment of the environment.
It defines a pollutant as any substance whether liquid, solid or gaseous emission, which directly or indirectly

a) Alters the quality of any segment or element of the receiving environment so as to effect any beneficial use adversely, or
b) is hazardous or potentially hazardous to health.

It has been observed that there is significant scope for improvement in the enforcement of regulatory requirements in Sri Lanka. There are limited procedures in place for compliance monitoring in majority of institutions. Some of the reasons that prevents reasonable practices being implemented are lack of communications and exchange of information.

7.3 Status of Hazardous Waste Management:

Though the hazardous waste management law is presently enforceable in Sri Lanka, the lack of implementation is on account of absence of the basic treatment and disposal facilities. However, the generation of hazardous waste continues and disposal of the waste (liquid and solid) takes place alongside the other waste disposal practices. It has been estimated that the total amount of hazardous waste generated in Sri Lanka in 1996 is about 40,617 tonnes per annum (an estimate) out of which 25% is inorganic waste, 36% is organic waste, 4% is other waste and the remaining 35% is oil waste from motor vehicles. The break-up of hazardous waste generation in Sri Lanka in1996 is summarized in the following table.

Waste Type	Tonnes/ Annum
Inorganic Acid	2744
Inorganic Alkalis	4396
Zinc bearing Waste	8.75
Heavy Metal Waste NOS	18.75
Waste Treatment Sludges	271.75
Containers contaminated with Inorganic Materials	1.25
Solid Waste contaminated with inorganic materials	2837.5
Total Inorganic Waste	**10278**
Oil Wastes (Liquid)	2371.25
Oil Wastes (Semi-Solid0	1237.5
Solvent Wastes (non halogenated)	1533.75
Solvent Wastes (halogenated)	1497.5
Waste paints, laquers, varnish etc.	255
Waste Agrochemicals	2857.5
Waste Pharmaceuticals	210
Wood Preservative waste	38.75
PCB, PBB, PCT Waste	6.25
Containers contaminated with organic materials	8.75
Solid waste contaminated with organic materials	4722.5
Total Organic Waste	**14739**
Asbestos Wastes	117.5
Plastic/ Resin Wastes	1482.5
Total Other Wastes	**1600**
Oil Wastes from Motor Vehicles	14000
Grand Total (Hazardous Waste)	**40617**

In addition to above waste, it has been estimated that about 6,600 tonnes per year of medical waste is generated in the country. It has been estimated by CEA that the existing inventory of hazardous waste could reach 90,000 tonnes per annum in the case of moderate growth and 240,000 in case of high growth in the year 2010.

Institutional Framework

Sri Lanka has institutional structure both at national and provincial level. However, at the provincial level there is a need for capacity building to enforce compliance. The municipal waste at Colombo comes under the responsibility of municipal council. The list of prominent NGOs in Sri Lanka is summarized below.

1. Sri Lanka Journalists Forum (SLEJF)
2. United Nations Association of Sri Lanka (UNASL)
3. Wildlife & Nature Protection Society of Sri Lanka
4. Environmental Law Centre
5. Natural Forest Conservation Society
6. Sarvodaya Women's Movement
7. The Swarna Hansa Foundation
8. Environmental Foundation Limited
9. Sri Lanka Association for Advancement of Science
10. Parisarikayo
11. Ceylon Bird Club
12. Young Zoologist Association
13. Sri Lanka National Science Foundation
14. March for Conservation

Source: UNEP Report on Sri Lanka

Present Disposal Practices/ Procedures

All industries having pollution potential must have the necessary approval license from the CEA or designated body (i.e. local councils for low polluting industries, BOI for BOI industries). The license, which is called Environmental Protection License (EPL) is issued to industries subject to their conforming to the stipulated emission or discharge standards specified by the CEA. This scheme came into effect from 1990. In the North Western Province where a separate Provincial Environmental Authority exists and is responsible for enforcement of environmental regulations.

Storage

Temporary storage facilities are only available in some of the industries.

Landfilling

Several sites for hazardous waste disposal have been identified by a study carried out by Environmental Research Management in association with Engineering Consultants Limited and ERM (Sri Lanka). Further, a committee has been appointed by the Cabinet of Ministers to develop guidelines and negotiate with the private sector investors to participate in hazardous waste treatment and disposal facility.

Incinerators

The concept of incineration is poorly understood in Sri Lanka. Although hospitals have incinerators but their efficiency of operation is a big question mark. It was informed that there are instances a low rate combustor was installed to obtain the EPL and this has been the main reason. Ex saw mills and apparel industry.

Some incinerators were operated on a contract basis. The majority of the incinerators were manually fed. Generally, back yard fires, moving the solid waste away and then setting fire appear to be some bad practices, which are followed.

Composting

Hotels and some food industries release organic waste along with other waste to third party contractors who says that the material is being used in composting. These composting operations may not be of satisfactory nature due to limited technology awareness. Many local council attempts in large scale composting have had partial success only.

Recycling

Recycling industry is poorly organized in Sri Lanka. The recycling practices are quite common with plastic manufacturers. It was informed that some recyclers seems to have developed a close link with some industries where the solid waste is given and recycled pellets are purchased back again. In these cases however, no checking of properties such as MFI had been done and the user mainly relies on understanding and the earlier results. Paper recycling is also affected due to the absence of deinking facility. Paper collection again is done in a disorganized manner and relies mainly on the informal sector.

Cleaner Technology/ Cleaner Production

Project SMED is a project of the Federation of Chamber of Commerce & Industry of Sri Lanka and the Friedrich - Nauman - Stiftung of Germany. It is the executing agency on Cleaner Production/ Technology in Sri Lanka. Ministry of Industrial Development and Project SMED have been successful in establishing a Cleaner production centre with UNIDO assistance.

Others

Waste segregation was practiced in some industries. In the pesticide formulating industry still the collection and storage of old stocks continue. Only some of the hospitals follow a segregated solid waste collection scheme. In common treatment plants the sludge is either discharge in the open or to dumps that are provided. Primary sludge from the plant operations also is dumped into these open spaces. Sludge generation at industrial sites are becoming frequent as more and more industries are carrying out wastewater treatment. In some cases sludge is dewatered while in other cases where sludge is not dewatered it appears that contractors are transporting the material to external disposal sites. There are also possibilities of waste exchange between different agencies.

Domestic/ Bilateral and Multilateral Funding

It was informed that at present no bilateral or multilateral program is being implemented to address hazardous waste management. Earlier UNIDO had carried out waste minimization programs. The World Bank had funded a pre feasibility study on hazardous waste management to establish waste treatment and disposal facilities. Pollution Control and Abatement Funds are available with National Development Bank to encourage

recyling efforts under e-friends loan scheme. One such interesting enterprise was making paper from elephant dung. About 7 plastic recycling efforts had been supported by the loan scheme.

7.4 Identification and Assessment of Needs:

The existing institutional and technical capacity of Sri Lanka is not adequate to implement hazardous waste legislation. The key issues include strengthening of capacity of existing institutions. There is a need to raise awareness of industry to ensure compliance. Some of the needs, which have been identified, are summarized below.

7.4.1 Needs for Policy Development

Ministry of Forestry & Environment and other regulatory bodies including customs need technical support in the following areas.

- Development of list of banned Items (List A&B)
- Strengthening of guidelines for obligations, duties and responsibilities
- Notification/ Consent Procedures For Export Of Hazardous Waste
- Notification/ Consent Procedures For Import Of Hazardous Waste
- Notification/ Consent Procedures For Hazardous Wastes In Transit
- Strengthening Of Custom Procedures
- Strengthening Of Guidelines To Return The Hazardous Waste
- Guidelines For Dealing With Abandoned Hazardous Waste

7.4.2 Needs for Policy Enforcement

There is a need for capacity building of all regulatory agencies in terms of infrastructure development mainly related to identification and testing of hazardous waste. There is a partial need for capacity building of all regulatory agencies to deal with compliance issues mainly related to consents, closures/ notices and Impounding of hazardous waste. Some of the needs assessed for policy enforcement are summarized below.

- Strengthening of Institutions at provincial level
- Identifying ports of entry and transit points
- Harmonization of procedures of clearance and checking by customs (Annex VIII & IX)
- Infrastructure For Identification, Testing, Temporary Storage, Handling And Disposal Of Hazardous Waste
- Accredited Lab For Testing Of Hazardous Waste
- Uniform Testing Procedures For Customs
- Provision of financial guarantees and bonds for transboundary movement to ensure recovery of cost in case of forced return or disposal.
- Strengthening of procedures, data gathering, information analysis and information sharing between enforcing agencies.

7.4.3 Hazardous Waste Management Needs

The major observations during the study indicated that there is an urgent need for developing a system of waste separation, collection, transportation and disposal in Sri Lanka. Some of bad practices followed include no checking of properties such as MFI by the recycler in recycled plastic waste. Back yard fires are commonly followed. The CEA needs a technical support to carry on inspection and advice for the disposal of hazardous wastes and medical wastes. There is a need for public education for raising awareness to promote waste recovery, reduction and recycling. Some of the identified hazardous waste management needs are summarized below.

Inventorization

- Characterization of Hazardous Waste
- Strengthening of Codification/ Labelling procedures for hazardous waste

Technology Options

- Identification of technology options for storage, Land filling, Incineration and others
- Strengthening of Guidelines for waste minimization
- Strengthening of Procedures for Recovery, Recycle and Reuse
- Identification of Cleaner Production & Technology options

The identified needs can be addressed if the country has necessary infrastructure and skilled manpower to operate it. At present, shortage of skilled and semi-skilled manpower is one of the major constraints of environmentally sound development at provincial level in the country. Some of the institutions where capacity can be built to address human resource problems are given below.

1. University of Moratowa
2. University of Peradeniya
3. Industrial Technology Institute (ITI)
4. University of Colombo
5. Open University of Sri Lanka
6. University of Kelaniya

ITI has advanced capability and capacity to test hazardous waste. However, the industry sources inform the high cost of testing discourages industry to get the sample tested. The first three universities impart environmental education as part of civil engineering, environment management and environmental science courses.

7.4.4 Training Needs

The shortage of skilled manpower in Sri Lanka makes training needs as one of the most important areas to address the policy development, enforcement and hazardous waste management needs ex. A USAEP study indicated that 29 industries had some environmental expertise within the operations staff while 128 industries indicated that they do not possess any expertise in this subject area. Four groups of target audience who have been identified for receiving training include policy makers, implementers at provincial level, industry and public. The first group of organizations that may be

identified for receiving training consists of those in the regulatory regime. These groups may include members from the Ministry of Forestry & Environment, Provincial ministries, CEA, Department of Customs and provincial authorities. This group requires training in the areas of:

Awareness Training for Basel Convention Implementation/ Policy

Training for Developing/ Strengthening Legislative Framework

1. Training for strengthening of National Legislation/ Guidelines –Export/ Import/ Illegal Trade
2. Training for development of List of Banned Items (List A &B)

Training for Developing/ Strengthening Guidelines

3. Training for development of National Guidelines – Monitoring & Control of Hazardous Waste
4. Training for strengthening of National Guidelines for Environmentally Sound Management of Hazardous Waste (Recovery, Recycle & Reuse)
5. Training for strengthening of National Guidelines for notification/ consent procedures for export/ import/ in transit of Hazardous Waste
6. Training for developing of National Guidelines for return of / abandoned Hazardous Waste
7. Training for strengthening penal provisions and sanctions for the illegal traffic of hazardous waste

Training for Policy Enforcement

8. Training for Capacity Building of the institution at the national/ provincial levels
9. Training to develop national tracking and control system for transboundary movement of hazardous waste
10. Training for harmonization of procedures of clearance and checking by customs
11. Training for identification and uniform testing procedures of hazardous waste
12. Training for developing procedures for data gathering, information analysis and information sharing between enforcing agencies.

Training for Hazardous Waste Management Needs

13. Training for Identification, Characterization, coding & labelling of Hazardous Waste
14. Training for Identification of technology options for storage
15. Training for identification of Hazardous Waste disposal sites, Procedures and Decommissioning.

The second group of training recipients would be those associated with industry. This group would include members from industry who generate hazardous wastes, members from industries that handle and treat hazardous wastes and members from Industry associations. This group requires awareness training in the areas of:

- Awareness training on Legislative Framework
- Awareness training for Policy Enforcement
- Training for Hazardous Waste Management Needs

This group also requires advanced training in the area of Hazardous Waste Management Needs. Other miscellaneous training required by this group include

- Guidelines for obtaining financial assistance for management of hazardous wastes

The third group would consist of Non-government organizations and selected participants from the public. This group requires awareness of the regulatory regime that governs the hazardous waste generation and management as well the effects of exposure to hazardous wastes. This would require training in the following areas:

- Training for Policy Enforcement
- Training for Hazardous Waste Management Needs

The fourth group would consist of members of the judiciary that preside over cases related hazardous waste issues between the state and the private/public entity. The awareness training needs of this group would be in the areas of:

- National laws and regulations on hazardous wastes including import and exports of the same
- International regulations on hazardous wastes
- Citizens rights on exposure to hazardous wastes
- Financial and legal liability of offenders

7.4.5 Needs prioritisation

The current needs of the country for various areas of hazardous waste management covers activities starting from policy Implementation, compliance and monitoring. The evaluation of different types of needs in the above sections gives an idea of priority for Sri Lanka. Current laws and regulations governing hazardous waste are fairly adequate but the implementation of these is rather poor. The regulatory institutions need a financial boost to enable them to function more efficiently and therefore bring about a tangible improvement in the management of hazardous waste. The regulatory bodies also need financial assistance to develop in house knowledge base that can be used to train other institutions and the public.

The next level of needs that require immediate attention is industry. Industry is the principal generator of hazardous wastes followed by medical facilities. There is a strong need to strengthen the industrial structure to minimise and better manage their hazardous wastes. These needs could be addressed by sharing information, technology, providing incentives and assistance to treat and dispose hazardous wastes.
The capacity of NGOs and Judiciary needs to be developed to check and rectify the command and control regime.

7.5 Conclusions & Recommendations

Sri Lanka is an island, which is strategically located between shipping lines in South Asia. The country has diverse industrial base starting consisting of micro, medium and heavy industry. At present, Sri Lankan economy is under severe strain on account of national security priorities and drought conditions in some of the provinces. Interest rates

are high indicating high inflation rate and efforts of the government to restrict money supply in the market. The total level of foreign reserves is sufficient to finance 3.6 months of imports (excluding Aircraft). The rate of inflation was 12.2 per cent in June, 2001. In 1988, the Government framed a National Policy for conservation of natural resources in Sri Lanka. A separate Ministry for Environment was set up in 1990. Subsequently, a National Environmental Action Plan was prepared in 1991 and updated in 1994 and in 1998 to identify the issues and necessary Policy intervention relating to land and water, forest and biodiversity, coastal and marine resources, industrial and urban pollution and the energy and mineral sectors. The country has an adequate legislative framework to address Hazardous Waste Management. However, the major gaps have identified in the implementation of the legislative framework. Lack of resources, poor skill level and inadequate capacity of the existing institutions have been identified as the major constraints. At present about 40,617 tonnes per annum of hazardous waste is generated in Sri Lanka, which have been projected to reach reach 90,000 tonnes per annum in the case of moderate growth and 240,000 in case of high growth in the year 2010. In addition, 6,600 tonnes of medical waste is generated in the country every year. Inadequacy and lack of testing facilities, lack of awareness, lack of adequate storage, treatment and disposal technology and lack of resources are some of the major constraints identified for non-compliance of regulatory regime. The need for policy enforcement includes development of capacity of institutions, formulation of uniform identification and testing procedures and information collection, analysis and dissemination. The hazardous waste management needs include need for identification of technology options for disposal of hazardous wastes. The policy and hazardous waste management needs catalyses training needs for four types of groups, which include Policy developers, policy implementers, industry and public. The major recommendations for training needs are summarized below.

1. Training for Strengthening Legislative Framework
2. Training for Strengthening Guidelines
3. Training for Policy Enforcement
4. Training for Hazardous Waste Management Needs

The policy makers and implementers require awareness and advance training for the above four types of training. The industry/ commercial and business establishment and NGOs require awareness training for the above four types of training and an advanced training in the area of Hazardous Waste Management Needs. The capacity of NGOs and Judiciary needs to be developed to check and rectify the command and control regime through awareness training in policy enforcement.

Annexure 1: Checklist For Needs Assessment as per Basel Convention

Policy Development

- Signatory to Basel Convention
- Ratification of the convention
- Existence of the competent authority/ Focal Point
- National Definition of Hazardous waste
  (Article 1.1 B & Article 3 of Basel Convention)
  - Annex I
  - Annex II
  - Others wastes as defined by governments
- National classification of hazardous waste
- Availability of National Policy on Hazardous Waste
- Transcription of obligation of Basel Convention into National Law
- Specific Waste and Hazardous Waste Management Law
  - Legislation for Generation
  - Legislation for storage/ handling
  - Legislation for disposal
  - Legislation for export/Import/Illegal trade
  - Legislation for transportation of hazardous waste

- Guidelines for generation of hazardous Waste
- Guidelines for storage/handling
- Guidelines for disposal
- Guidelines for export/Import
- Guidelines for monitoring/control of hazardous waste
- Guidelines for prevention of illegal trade
- Guidelines for recovery/recycle and reuse
- Development of list of banned Items:
  Annex VIII list A

  List A (Article 1, 1(a))

  - A1 Metal and metal bearing waste
  - A2 Wastes containing principally inorganic constituents, which may contain metals and organic materials.
  - A3 Wastes containing principally organic constituents, which may contain metals and organic materials.
  - A4 Wastes which may contain either inorganic or organic constituent

Annex IX List B

List B (Article 1, 1(a))

- B1 Metal and metal bearing waste
- B2 Wastes containing principally Inorganic constituents, which may contain metals and organic materials.
- B3 Wastes containing Principally organic constituents, which may contain metals and organic materials.
- B4 Wastes which may contain either inorganic or organic constituent

Article 6, 7,8 & 9.

- Existence of guidelines for obligations, duties and responsibilities
- Existence of notification procedures for export of Hazardous waste
- Existence of notification procedures for import of Hazardous waste
- Existence of notification procedures for Hazardous wastes in transit
- Existence of consent procedures for export of Hazardous waste
- Existence of consent procedures for import of Hazardous waste
- Existence of consent procedures for Hazardous wastes in transit
- Existence of custom procedures
- Existence of guidelines for loading of Hazardous waste
- Existence of guidelines for unloading of Hazardous waste
- Existence of guidelines for transportation of Hazardous waste
- Existence of guidelines to return the Hazardous waste
- Existence of guidelines for dealing with abandoned Hazardous waste
- Existence of Penal provisions and sanctions for the illegal traffic in Hazardous waste

Policy Enforcement

- Existence of Institutions at the national level
- Existence of Institutions at the provincial level
- Roles and Responsibilities of Institutions
- Existence of other institutions having role in compliance:

  Customs
  Port
  Police
  Judiciary

- Availability of national control system for transboundary movement of Hazardous Waste
- Identifying ports of entry and transit points
- Harmonization of procedures of clearance and checking by customs (Annex VIII & IX)
- Availability of infrastructure for identification, testing, temporary storage, handling and disposal of hazardous waste
- Availability of accredited lab for testing of hazardous waste

- Existence of uniform testing procedures for customs
- Provision of financial guarantees and bonds for transboundary movement to ensure recovery of cost in case of forced return or disposal.
- Existence of procedures, data gathering, information analysis and information sharing between enforcing agencies.

Hazardous Waste Management Needs

Inventorization

- ***Identification of Hazardous Waste example: Industry, Agriculture, Mining Sector, hospital and other sectors***
- Characterization of Hazardous Waste example: Industry, Agriculture, Mining Sector, hospital and other sectors
- Codification/ Labelling procedures for hazardous waste
- National Statistics for Hazardous Waste
- Statistics of Hazardous Waste dumping sites

Technology Options

- Identification of technology options for storage
- Identification of technology options for Landfilling
- Identification of technology options for Incineration
- Other Technology Options
- Guidelines for waste minimization
- Procedures for Recovery
- Procedures for Recycle
- Procedures for Reuse
- Cleaner Production & Technology

Annexure 2: List of Personnel Met

Country: Bangladesh
Person assigned: Bodhisatya Datta, IRG
Organisations met: Ministry of Environment and Forests, Department of Environment, Ministry of Health, Bangladesh Centre of Advanced Studies, Bangladesh Environmental Lawyers Association, Bangladesh Unnayan Parishad, members of industry.

Country: Bhutan
Person assigned: Amit Jain, IRG
Organisations met: Ministry of Agriculture, Bhutan Chamber of Commerce and Industry, National environment Commission, Royal Society for the protection of Nature, Bhutan Consultants and Research, Planning Commission, SAARC Tuberculosis Centre, National Planning Department.

Country: India
Person assigned: Sanjay Srivastava & Bodhisatya Datta, IRG
Organisations met: Central Pollution Control Board, Ministry of Environment and Forests, Confederation of Indian Industry, Toxic Links, USAEP, USAUID, World Bank, ADB, CIDA, NPC and HPC.

Country: Maldives
Person assigned: Amit Jain, IRG
Organisations met: Ministry of Home Affairs Housing and Environment, Male Municipal Corporation.

Country: Nepal
Person assigned: Dr. D B Boralkar, Assistant Secretary, Central Pollution Control Board
Organisations met: Research Centre for Applied Science and Technology, Tribhuwan University, Ministry of Industry, Department of Industry.

Country: Sri Lanka
Person assigned: Amit Jain, IRG
Organisations met: Ministry of Science and Technology, Ministry of Forestry and Environment, Central Environmental Authority, Sri Lanka Integrated Industrial Support Programme, Small and Medium Enterprise Developers, Environment and Management Lanka, US-AEP, Industrial Technology Institute.

Annexure 3: Additional data on Nepal

TABLE – 1

Estimated Runoff of the Rivers

S.No.	River	Length (km)	Drainage Area in Km		Estimated Runoff in m^3/sec	
			Total	Only in Nepal	From all Basins	From Nepal only
1.	Mahakali	223	15,260	5,410	730	260
2.	Karnali	507	44,000	41,550	1440	1360
3.	Babai	190	3,270	3,270	95	95
4.	West Rapti	257	6,500	6,500	160	160
5.	Narayani	332	34,960	30,090	1820	1570
6.	Bagmati	163	3,610	3,610	180	180
7.	Sapta Koshi	513	60,400	28,140	1670	780
8.	Kankai	108	1,575	1,575	83	83
9.	Other Rivers		21,432	21,432	851	851
			1,91,007	1,41,577	7029	5339
(i)	Mean specific Runoff (m^3/sec/Km^2)				0.0368	0.0377
(ii)	Annual Runoff (billion m^3)				222	169000
(iii)	Converted Effective Precipitation (mm/year)				1161	1189
(iv)	Average Annual Precipitation in Nepal 9 mm/year)					1530
(v)	Mean Runoff Coefficient					0.777

Table – 2
Land Use Pattern

S.No.	Land Use	Total	Per Cent
1.	Cultivated Land	3,052	21
2.	Non-cultivated Land inclusions	998	7
3.	Grass Land	1,745	12
4.	Forested Land / Forests Plantation	5,518	37
5.	Shrub Land / Degraded Forests	706	5
6.	Other Land	2,729	18
	Total	**14,748**	**100**

Table – 3
Yearly Energy Consumption and Percentage Share by Fuel Type

Year	Energy Consumption						
	Fuelwood (MT)	**Agri Res (MT)**	**Animal Waste (MT)**	**Coal (MT)**	**Petroleum (KL)**	**Elect (GWh)**	**Total (GJ**
1984/85	9,.465 (73.22)	2,105 (12.21)	1,850 (9.30)	145 (1.68)	147 (3.10)	287 (0.53)	2,16,525
1985/86	9,669 (73.36)	2,137 (12.32)	1,878 (9.39)	17 (0.19)	139 (3.21)	320 (0.39)	2,17,806
1986/87	9,769 (72.77)	2,281 (12.74)	1,898 (9.19)	91 (1.02)	177 (3.67)	382 (0.53)	2,24,866
1987/88	9,953 (72.61)	2,414 (13.20)	1,9178 (9.10)	84 (0.92)	171 (3.46)	449 (0.51)	2,29,602
1988/89	10,142 (72.18)	2,554 (13.63)	1,938 (8.97)	76 (0.81)	185 (3.69)	479 (0.52)	2,35,358
1989/90	10,256 (71.69)	2,707 (14.19)	1,959 (8.90)	12 (0.13)	223 (4.30)	525 (0.79)	2,39,633
1990/91	10,503 (70.89)	2,868 (14.49)	1,979 (8.68)	81 (0.82)	230 (4.26)	589 (0.85)	2,48,190
1991/92	10,780 (69.07)	3,031 (14.56)	2,000 (8.33)	92 (0.88)	293 (6.25)	652 (0.90)	2,61,416
1992/93	10,979 (68.80)	3,207 (15.07)	2,021 (8.24)	110 (1.04)	359 (5.96)	694 (0.89)	2,70,915
1993/94	11,460 (69.11)	3,288 (14.87)	2,094 (8.21)	104 (0.094)	353 (5.96)	706 (0.91)	2,77,768
1994/95	11,715 (68.71)	3,418 (15.03)	2,124 (8.10)	113 (0.99)	382 (6.190	781 (0.99)	2,85,600

Table – 4

Vehicular Emission Test Results

[5 June 1996 to 13 May 2000]

Vehicles	Petrol Operated	Diesel Operated	Total	Standard	
				Complied	Failed
Government	2,907	4,187	7,094	5,258	1,836
Corporation	954	1,929	2,883	2,005	878
Private	39,616	21,373	60,989	46,768	14,221
Diplomatic	2,086	3,375	5,461	4,493	968
Service / Rent	43,550	11,414	54,964	38,297	16,667
Tourism	1,578	2,749	4,327	3,344	983
Total	90,691	45,027	135,718	100,165	35,553

Table – 4A

Vehicular Emission Test Results

[5 June, 1996 to 13 May, 2000]

S.No.	Type of Vehicle	Standard		Total
		Complied	**Failed**	
1.	Car	51,939	12,313	64,252
2.	Jeep	14,943	5,701	20,644
3.	Van	11,689	4,932	16,621
4.	Petrol operated Tempos	13,288	5,174	18,462
5.	Diesel operated Tempos	239	1,327	1,566
6.	Minibus	4,314	2,591	6,905
7.	Mini-Truck	1,315	1,593	2,908
8.	Bus	1,974	1,119	3,093
9.	Truck	456	800	1,256
10.	Crane	8	3	11
	Total	**100,165**	**35,553**	**135,718**

Annexure 4: Bilateral and multilateral projects in Maldives

Bilateral/ Multilateral Projects

Bilateral and Multilateral projects and programs which are being implemented in the area of Environment in Maldives are described in the table below.

Bilateral and Multilateral projects and programs in the area of Environment

Description	Status / Completion date	Funding Agency
Strengthening the Environmental Information Management Capabilities Including Dissemination of Information for Environmental Awareness	On going / June 1999	NORAD
National GHG Inventory and Vulnerability Assessment for Maldives: A Climate Change Enabling Activity	On going / 2001	GEF
National Biodiversity Strategy and Action Plan and Country Report to the COP	On going	GEF
Waste Management Project - Credit financing scheme from Norwegian government to supply incinerators and sewage treatment plants to tourist resorts	1994/ Ongoing	NORAD
Implementation of Male' Deceleration on Control and Prevention of Air Pollution and its Likely Transboundary Effects for South Asia	On going / December 1999	UNEP
Maldives Protected Areas Systems Project	Ongoing / August 2002	AusAID

Waste Management Project addresses hazardous waste disposal to some extent. This project is a mixed credit-financing scheme from Norwegian government to supply incinerators and sewage treatment plants to tourist resorts. The total cost of the projects is US$2.7 million for installing 70 units. Under this scheme, 15% of the cost of the unit has to be paid to the supplier in advance. Half of the remaining 85% are a grant and the remaining is a loan to be paid in ten instalments over a five-year period.