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SCHOOL OF SCIENCE AND TECHNOLOGY

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NATIONAL OPEN UNIVERSITY OF NIGERIA

MAIN COURSE

ESM 405
ENVIRONMENTAL PROTECTION AGENCIES CASE STUDIES

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UNIT 1: Definition of Terms

1.0 INTRODUCTION

You leave in a place, relate with people, perform various activities where you live, you eat, drink, excrete, breathe, move about either on foot or by some means of transportation, deposit waste etc. So, when you reside in a place that is comfortable, you are happier and able to think amongst other activities which are of immense benefit to all. This unit starts by exposing you to basic issues in this course; such as environment, environmental protection, and environment protection agency. Thereafter, the key concept which is environmental protection agency will be elaborated.

2.0 **OBJECTIVES**

At the end of this unit, you are expected to be able to;

(i) Define an environment
(ii) Explain the concept of environmental protection
(iii) List the benefits of environmental protection agencies

3.0 DEFINITION OF BASIC CONCEPTS

3.1 ENVIRONMENT

What is an environment?

Various definitions have been given to the concept of environment. The definitions given could be based on the type of environment being described e.g. social, economic, physical, climatic, religious etc. In the context of biology, some definitions have been given below:

1. Environment is the surrounding atmosphere or condition for existence.
2. Environment is an essential natural process or an outcome of occurrence.

3. Environment is the totality of circumstances surrounding an organism or group of organisms, especially:
    a. The combination of external physical conditions that affect and influence the growth, development, and survival of organisms
    b. The complex of social and cultural conditions affecting the nature of an individual or community.

4. Environment comprises all of the biotic and abiotic factors that act on an organism, population, or ecological community and influence its survival and development. Biotic factors include the organisms themselves, their food, and their interactions. Abiotic factors include such items as sunlight, soil, air, water, climate, and pollution. Organisms respond to changes in their environment by evolutionary adaptations in forms and behaviour.

From the various definitions, we could see that generally, the environment encompasses all that is living and non-living, their relationships and how man is affected by these relationships. It is also important to note that if our environment is to be good and fit for living for present and for future generations, there is the need for the environment to be protected. This is defined in the Brundltand's definition of sustainable. In this next session, you will learn the importance of environmental protection.

Definition of environmental protection

Environmental protection is a practice of protecting the environment, an individual, organization from harm or from degradation, for the benefit of the natural environment and (or) humans. Due to the increased pressures of population and new technological advancement, industrial revolution, the physical environment and the biological life forms are being degraded (i.e. the built environment and the natural environment), sometimes permanently. The biophysical environment is the complex of biotic, climatic, and edaphic factors that act upon an organism and determine its form and survival, and how it adapts itself in the process. If the influence of the factors mentioned above influence the biophysical environment, it is pertinent to establish the sustainability of the environment and also determine the level of pressure and activity placed on it by man.
Other definitions:

- ✓ Environmental protection is a practice of protecting the environment, on individual, organisational or governmental level, for the benefit of the natural environment and (or) humans.

- ✓ The environmental movement, a term that includes the conservation and green movements, is a diverse scientific, social, and political movement for addressing environmental issues.

- ✓ A review of the government's success in tackling pollution, and scenes of ongoing public and private efforts to protect the environment by preventing pollution and recycling waste.

- ✓ means taking an action, or a relinquishment from an action that facilitates reservation or restoration of natural balance

4.0 CONCLUSION

The protection of the environment is important for the healthy state of a place. The protection of the wildlife, forests, land, air and water will enhance the state if the environment for future

5.0 SUMMARY

In this unit, you have learnt about the various definitions of the environment and environmental protection.

6.0 TUTOR MARKED ASIGNMENT

a. In your own words, how would you define the environment?
b. Why does the environment need to be protected?

7.0 REFERENCES AND OTHER MATERIALS

en.wikipedia.org/wiki/Environmental_Protection (assessed Sept 2011)
www.mofa.go.jp/j_info/japan/video/pamph.html(assessed Sept 2011)
www.mos.gov.pl:1092/english/docs/Definitions_gb.doc (assessed Sept 2011)

UNIT 2: CONCEPT OF ENVIRONMENTAL PROTECTION

1.0 INTRODUCTION

Following the understanding of the environment and environmental protection from unit 1, we now go in depth to understand the concept of environmental protection which will be discussed

in this unit. The reasons why land, air, water, biodiversity and humans need to be protected are explained.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- Define environmental protection
- Give reasons why the environment needs to be protected
- Outline some basic ways of protecting the environment

3.1 ENVIRONMENTAL PROTECTION

Environmental protection is a practice of caring for the environment, on individual, organizational or governmental levels, for the benefit of the natural environment and future generations. Following the increase in global population, the demand for natural resources increases and consequently pollution increases. When this happens, there is environmental degradation, which could be temporal or permanent. The degradation of land, air or water has continued to generate conflicts among various communities in various regions all over the world, in areas where there were no alternatives to environmental management or there were no structures in order to provoke environmental protection. This could be seen in the case of the Niger Delta region of Nigeria where agricultural practices have grounded over the years as a result of effluent/gaseous discharges released into the environment from oil and gas industries operating within the region.

Furthermore, there are other numerous industries that churn out into the atmosphere, greenhouse gases, hazardous wastes, other types of waste (e.g. packaging, agricultural, construction) toxic pollutants, radioactive waste materials, chemical components of various types (organic and inorganic) that have left the state of the environment worse off that it normally should be.

Urbanization has cumulated pollution activities leading to deforestation, bush burning, over abstraction of resources, non-protection of biodiversity leading to their extinction, and unsustainable practices such as bush burning, over abstraction of mineral resources to mention a few environmental degradation issues. This goes to show that protecting the environment means more than preventing pollution and cleaning up litter. It is also about ensuring that businesses continue to improve their manufacturing practices which include product design,

technology and operations. In this way, businesses can reduce their pollutants while also cutting costs and improving productivity through this way.

UNPO defines environmental protection as a means to protect and preserve (indigenous) peoples' natural habitat and resources in order to safeguard the unique and independent cultures from threats posed by 'development', oppressive regimes and environmental degradation. The concept behind environmental protection entails the close relationship between a society and its natural environment. The interactions between the environment and the people create a unique web of interdependent connections that in turn create a distinct ecosystem.

Benefits of environmental protection

- Minimizes decay of natural and social environment
- It aims to reduce poverty
- Reduces disharmony/conflict in the community

In most countries, a lot of money has been spent on protecting the environment following governmental regulations, environmental rights' groups and individual/community efforts.

Primary and manufacturing industries spent $6.8 billion on environmental protection in 2002—24% more than in 2000. This increase was partly driven by new environmental regulations and industries' efforts to reduce pollutants like GHG emissions.

Businesses spent just over $1 billion to reduce GHG emissions in 2002. The oil and gas industry led the spending at $245 million, followed closely by the pulp, paper and paperboard industry, at $242 million. The private sector invested $428 million in 2002 for prevention and control of water pollution. It also spent $1.5 billion to protect air quality—75% of that spending was by the oil and gas, electric power, and petroleum and coal products industries. Businesses invested $1.4 billion in pollution prevention equipment, as well as $907 million in pollution abatement and control systems for treating wastes.

In 2002/2003, the Canadian government spent $6.9 billion on pollution abatement and control systems, of which $2.9 billion went to sewage collection and disposal and $2.0 billion went to waste collection and disposal. Local governments spent 92% of these allocated expenditures.

The federal government spent another $349 million, in 2003/2004, on research and development for pollution prevention and environmental protection—$200 million more than it spent in 1995/1996 for this purpose.

3.0 CONCLUSION

The practice of taking care of the environment is not restricted to the government or to corporate organizations alone. Individuals and communities at various levels have the ability and the responsibility to cater for the environment in order to sustain it for the present and for the future generations.

5.0 SUMMARY

We have learnt the various definitions of the environment and understood the concept of environmental protection and the benefits of protecting the environment.

8.0 TUTOR MARKED ASSIGNMENT

1. In your own words, define environmental protection.
2. What are the benefits of environmental protection?

9.0 REFERENCES AND OTHER MATERIALS

en.wikipedia.org/wiki/Environmental_Protection (assessed Sept 2011)

www.mofa.go.jp/j_info/japan/video/pamph.html(assessed Sept 2011)

www.mos.gov.pl:1092/english/docs/Definitions_gb.doc (assessed Sept 2011)

http://www.environmental-protection.org.uk/(assessed Sept 2011)

Unit 3 History of Environmental Protection

1.0 INTRODUCTION

You will recall in unit 2 you how you learnt about the various definitions of environmental protection. In this unit, you will learn about its history and how various movements, individuals, human rights groups contributed to ensure that cases of environmental degradation were brought to the open. It is following these cases that policies/laws regarding environmental protection were enacted by governments and governmental bodies were set up to implement them.

2.0 OBJECTIVES

At the end of this unit, you should be able to:

- Give a brief history of environmental protection in the US
- List some environmental issues that led to the establishment of the environmental movements
- Identify some personalities whose perspectives on the environment are still being studied

3.0 History of Environmental Protection

Brief Origin of Environmental Protection

The concern for environmental protection occurred over the years in various forms and in numerous places throughout the world- including the Middle East and Europe. The concern came in the form of movements in response to various environmental pollution which co-opted members from the government, private individuals and various interest groups who will discuss the issues of air contamination, water contamination, soil contamination, solid waste mishandling, and environmental assessments of certain localities in the Middle East (Gari,2002).

In Europe, the Industrial Revolution gave rise to modern environmental pollution as it is generally understood today. The emergence of great factories and consumption of immense quantities of coal and other fossil fuels gave rise to unprecedented air pollution and the large volume of industrial chemical discharges added to the growing load of untreated human waste (Fleming et.al 2006). The first large-scale, modern environmental laws came in the form of the British Alkali Acts, passed in 1863, to regulate the deleterious air pollution (gaseous hydrochloric acid) given off by the Leblanc process, used to produce soda ash. Environmentalism grew out of the amenity movement, which was a reaction to industrialization, the growth of cities, and worsening air and water pollution.

In 1962, *Silent Spring* written by American Biologist Rachel Carson was published. The book cataloged the environmental impacts of the indiscriminate spraying of well known synthetic pesticide Dichlorophenyl tricholoroethane (DDT) in the US and questioned the logic of releasing large amounts of chemicals into the environment without fully understanding their effects on ecology or human health. The book suggested that DDT and other pesticides may cause cancer and that their agricultural use was a threat to wildlife, particularly birds (Carson, 1962). The resulting public concern led to the creation of the United States Environmental

Protection Agency in 1970. The Agency subsequently banned the agricultural use of DDT in the US in 1972. The limited use of DDT in disease vector control continues to this day in certain parts of the world and remains controversial. The book's legacy was to produce a far greater awareness of environmental issues and interest into how people affect the environment. With this new interest in environment came interest in problems such as air pollution and petroleum spills, and environmental interest grew. New pressure groups formed, notably Greenpeace and Friends of the Earth.

In the 1970s, the Chipko movement was formed in India; influenced by Mohandas Gandhi, they set up peaceful resistance to deforestation by literally hugging trees (leading to the term "tree huggers"). Their peaceful methods of protest and slogan "ecology is permanent economy" were very influential.

Up until the late 1970s various environmental movements emerged and brought about changes in public policy and individual behaviours. Protection of natural resources is referred to as Environmental Conservation/Preservation.

On an international level, concern for the environment was the subject of a UN conference in Stockholm in 1972, attended by 114 nations. Out of this meeting developed UNEP (United Nations Environment Programme) and the follow-up United Nations Conference on Environment and Development in 1992. Other international organizations in support of environmental policies development include the European Environment Agency (EEA) and the Intergovernmental Panel on Climate Change (IPCC).

In the late 19th century and early 20th century, the costs of environmental negligence resulting in diseases as well as widespread air and water pollution, were exposed in the United States, and a wider awareness emerged following the Second World War. During this period, the environmental movement emerged bringing about Protectionists and Conservationists. The Protectionists wanted the land and nature left alone for its own sake while the Conservationists wanted to manage natural resources for human use.

During the 1950s and 1970s, series of environmental damage caused by anthropogenic activities were recorded including the oil tanker *Torrey Canyon* which went aground off the southwest coast of England in 1967; In 1969 oil spilled from an offshore well in California's Santa Barbara Channel; In 1971, the conclusion of a law suit in Japan drew international attention to the effects of decades of mercury poisoning on the people of Minamata Bay. (REF)

Nuclear Production

Technological accomplishments such as nuclear proliferation provided new insights and reasons for concern over the Earth's seemingly small and unique place. Some nuclear accidents occurred at the Third Mile Island on 28 March 1979, the Chernobyl on 26 April 1986, the earthquake and nuclear crisis in Fukushima Daiichi Nuclear Power Station on 11 March 2011 which is still very fresh in the minds of all.

A month after the earthquake, Nuclear officials put the nuclear crisis in Fukushima Daiichi Nuclear Power Station in the same category of severity as the Chernobyl disaster. (New York Times, 2011) According to various news reports, many Japanese and Western experts argued that inconsistent, non-existent, unenforced regulations played a role in the accident. Following the accident, the Japanese Government is looking to establish a "caution zone" of about 12-mile radius around the Nuclear Power plant and one which would be legally enforced.

Chernobyl Nuclear Explosion

The accident at the Chernobyl nuclear power plant occurred on 26 April 1986. The explosion and the fire released large quantities of radioactive contamination into the atmosphere, which spread over much of Western Russia and Europe. It is considered the worst nuclear power plant accident in history. The accident occurred during an experiment scheduled to test a potential safety emergency core cooling feature, which took place during the normal shutdown procedure. The nuclear accident had an impact on drinking water following high level of radioactivity particularly, Iodine, Caesium and Strontium even many weeks after the accident. Flora and fauna were also affected, most people suffered from acute radiation sickness. (REF)

It is in following these challenges as a result of environmental degradation and the dearth of the ecosystem that led to the recognition of environmental protection by various governments and that understanding led to the placement of restraints on activities that caused environmental degradation.

History of Environmental Protection Agency in Nigeria

In Nigeria, environmental awareness/consciousness became public interest in 1988 when a German Ship, THE LINE, dumped toxic wastes at Koko fort in Delta State of Nigeria, before it was removed back to EURIPE in the same ship. Before the ship was moved back, series of deaths had been recorded and which were traced back to the containers bearing the toxic wastes. (REF)

The country was before this incident, ill-equipped to manage-such environmental crisis, as there were no institutional capacity and legislation to address such matters. Consequent upon the Koko toxic waste episode, was the promulgation of the Harmful waste Decree 42 of 1988,

which facilitated the establishment of the Federal Environmental Protection Agency (FEPA) through Decree 58 of.1988 and 59 (amended) of 1992. FEPA was charged with the overall responsibility for environmental management and protection. It is on record that by the establishment of FEPA, Nigeria became the first African country to establish a national institutional mechanism for environmental protection. FEPA and other relevant Departments in other Ministries were merged to form the Federal Ministry of Environment in 1999, but without an appropriate enabling law on enforcement issues. This situation however, created a vacuum in the effective enforcement of environmental laws, standards and regulations in the country.

4.0 CONCLUSION

The history of environmental protection is necessary in order to appreciate the works that were done in the past by various people at various times and in various circumstances. It sets up a forum by which precedents can be built and new studies made. It also creates an avenue for future research and development.

5.0 SUMMARY

In this unit, you have learnt about the brief history of environmental protection and the contributions made by various individuals or groups to the establishment of the concept of environmental protection. You have also learnt that environmental protection came to be, as a result of the contributions of willing and committed individual with a strong moral ethic on the environment who were capable of bringing to light the dangers caused the land, air, water and human beings.

6.0 TUTOR MARKED ASIGNMENTS

a) Give a brief history of environmental protection in the US

b) List some environmental issues that led to the establishment of the environmental movements

7.0 REFERENCE

1. Carson, Rachel (2002) [1st. Pub. Houghton Mifflin, 1962]. *Silent Spring*. Mariner Books. ISBN 0-618-24906-0.
2. New York Times (2011) http://topics.nytimes.com/top/news/international/countriesandterritories/japan/index.html)

3. www.wikipedia.org

Module 2: Environmental Protection Agencies

Unit 1: Roles of Environmental Protection Agency

Unit 2: Environmental Protection Agencies in selected countries

Unit 1: Roles of Environmental Protection Agency

CONTENTS

1.0 Introduction

The general functions of Environment Protection Agencies vary from country to country and on different circumstances. However, their roles are all aimed at protecting, preventing damage or enhancing the environment such as land, air, water, animals and human beings, with the end objective of achieving sustainable development.

2.0 Objectives

By the end of this unit, you should be able to:

- List the various roles of environmental protection agencies
- Identify reasons for carrying out certain environmental protection activities

3.0 Main Content

3.1 Role of Environment Protection Agencies

The creation of the Environment Protection Agencies provided the opportunity for more coherent and integrated environmental protection and enhancement.

The broad roles of environmental protection agencies include:

- ensuring compliance to regulations
- providing guidance to industries/businesses that could impact on the environment
- issuing permits
- planning and carrying out scientific research

Other roles are listed below:

- to regulate industrial processes with the greatest pollution potential to ensure that best available techniques (or technology) not entailing excessive cost (BATNEEC) are used to prevent or minimise pollution to the environment as a whole

- to regulate the disposal of radioactive waste and (except on nuclear licensed sites) the keeping and use of radioactive material and accumulation of radioactive waste

- to regulate the treating, keeping, movement and disposal of controlled waste to prevent pollution of the environment or harm to human health, in a manner which is proportionate to the threat posed

- to preserve or improve the quality of rivers, estuaries and coastal waters through its powers to regulate, prevent, mitigate or remedy pollution to water

- to take any necessary action to conserve, redistribute, augment and secure proper use of water resources

- to exercise a general supervision over all matters relating to flood defence;

- to promote the conservation and enhancement of inland and coastal waters, and their use for recreation

- to maintain or improve non-marine navigation

- to regulate the remediation of contaminated land designated as special sites

- to administer, in accordance with regulations on producer responsibility, registration of businesses and exemption schemes, and monitoring and enforcement of associated obligations.

- to assemble environmental data, from its own monitoring and other sources, so it can carry out its functions and form an overview of the general state of environmental pollution

- to report on the state of contaminated land and, as necessary, produce site specific guidance to local authorities on dealing with contaminated land
- to monitor pollution of freshwater, groundwater and the sea
- to publish information about the demand for water and available resources
- to survey flood defenses and flood risk areas
- to follow developments in technology for preventing or reducing pollution
- to monitor radioactivity in the environment which might lead to exposure of the public from non-food pathways
- to carry out vulnerability assessments and emergency response plans
- to register pesticides to protect crops, animals, and humans from harmful biological organisms
- to enforce rules for storage and disposal of pesticides and pesticide applicator certification program

4.0 Conclusion

The environment protection agency is a regulatory body which plays key roles in protecting and enhancing the environment. The roles range from management, waste disposal, monitoring pollution, research and development, documentation of environmental data, maintenance, environmental awareness creation and regulation of industrial activities.

4.0 Summary

In this unit, you have learnt about the various roles of environment protection agencies. This knowledge helps you to understand how complicated and important the role of environmental protection agency is.

6.0 Tutor-Marked Assignment

1. Mention five roles of environmental agency that is related to pollution control
2. Mention five roles of environmental protection agency that is related to sustainable development

7.0 References/Further Readings

Adriaanse A. (1993) Environmental Policy Performance Indicator. The Hague: Ministry of Housing , Physical Planning and the environment.

OECD (1994) Environmental Indicator. Paris OECD

1990 Constitution of the Federal Republic of Nigeria

Federal Environmental Protection Act of 1988

UNIT 2: Environmental Protection Agencies in Selected Countries

1.0 INTRODUCTION

In the previous units, you have had an understanding of the history of environmental protection and the generic roles of environmental protection agencies. In this unit, you will learn about the different environment agencies from selected countries including Nigeria.

2.0 OBJECTIVES

At the end of this unit, you are expected to be able to

a. identify the roles of environmental protection agencies from selected countries
b. list out the similarities between the environment agencies

3.0 MAIN CONTENT

Environment Protection Agencies

The environment protection agency is a body which is responsible for environmental protection. In order to sustain environmental resources, to defend its use and prevent excessive activities that pollute the environment and degrade it, it is important that there are designated bodies that will have the sole responsibility of regulation. This form of regulation could be through compliance, regulation, guidance and enforcement. As such, many national governments placed restraints on activities that caused environmental degradation through governmental, quasi- governmental and non-governmental organizations. There are International environmental protection organizations, as the United Nations Environment Programme which coordinates United Nations' environmental activities especially in developing nations. In this unit, you will learn more about the various environment protection agencies in the United Kingdom (England and Wales, Scotland), United States, Ghana, South Africa, Kenya, Egypt and Nigeria.

3.1 UK ENVIRONMENT AGENCY

In the United Kingdom, the Environment Agency (EA) has the mandate to protect the environment for England and Wales. The Environment Agency, has the vision
"*a healthy, rich and diverse environment in England and Wales, for present and future generations"*.
The EA vision-themes for the future include:

1. A better quality of life.
2. An enhanced environment for wildlife.
3. Cleaner air for everyone.
4. Improved and protected inland and coastal waters
5. Restored, protected land with healthier soils.
6. A 'greener' business world.
7. Wiser, sustainable use of natural resources.
8. Limiting and adapting to climate change
9. Reducing flood risk

The Environment Agency works to encourage ever more effective environmental stewardship by industry and all other sectors. The Agency maintains essential flood defences, water resources and river navigation structures; restore and improve the land and wildlife habitats; monitor and assess the environment; make widely available data and information that we collected.

The Environment Agency and its partners aim to rise to the challenges of sustainable development by responding through the following activities:

- raising awareness of sustainable development issues;
- meeting challenging targets set by Government, the European Union and international
- agreements for reducing pollution, protecting human health and improving environmental quality;
- improving and simplifying the UK's approach to environmental regulation;
- improving the efficiency of inspection, monitoring and information provision;
- working together better, by making partnerships with business, public bodies and
- community organisations a central part of our activities;
- working to raise awareness of how to reduce environmental impacts;
- continuing to encourage the courts to impose tougher penalties for environmental crime;
- helping people and organisations of all kinds, including industry and communities,

- to reduce the production of waste and pollution;
- becoming a more efficient organisation, targeting work where it will be most beneficial and taking into account costs and benefits; and
- planning for likely climate changes, to minimise risks from threats such as increased flooding.

3.2 SCOTTISH ENVIRONMENTAL PROTECTION AGENCY

The Scottish Environment Protection Agency (SEPA) is Scotland's environmental regulator. Their main role is to protect and improve the environment. They do this by helping business and industry to understand their environmental responsibilities, enabling customers to comply with legislation and good practice and to realise the many economic benefits of good environmental practice. SEPA protects communities by regulating activities that can cause harmful pollution and by monitoring the quality of Scotland's air, land and water. The regulations implemented cover the keeping and use, and the accumulation and disposal, of radioactive substances.

SEPA is a non-departmental public body, accountable through Scottish Ministers to the Scottish Parliament. Through the workforce of 1,300 employees, SEPA covers a range of specialist areas including chemistry, ecology, environmental regulation, hydrology, engineering, quality control, planning, communications, business support and management functions.

Furthermore, SEPA publishes a wide range of publications and environmental reports, delivers Scotland's flood warning system, helping to implement Scotland's National Waste Strategy and controlling, with the Health and Safety Executive, the risk of major accidents at industrial sites.

3.3 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

The **U.S. Environmental Protection Agency** (**EPA** or sometimes **USEPA**) is an agency of the federal government of the United States charged with protecting human health and the environment, by writing and enforcing regulations based on laws passed by Congress.[2] The EPA was proposed by President Richard Nixon and began operation on December 3, 1970. The agency is led by its Administrator, who is appointed by the president and approved by Congress. The EPA is not a Cabinet department, but the administrator is normally given cabinet rank. As at 2011, the agency has approximately 18,000 full-time employees and more than half

of their staff are engineers, scientists, and environmental protection specialists; other groups include legal, public affairs, financial, and computer specialists.

The agency conducts environmental assessment, research, and education. It has the primary responsibility for setting and enforcing national standards under a variety of environmental laws, in consultation with state, tribal, and local governments. It delegates some permitting, monitoring, and enforcement responsibility to U.S. states and Native American tribes. EPA's enforcement powers include fines, sanctions, and other measures.

The agency also works with industries and all levels of government in a wide variety of voluntary pollution prevention programs and energy conservation efforts. The USEPA regulates water, air, land, endangered species, and hazardous wastes

3.4 GHANA ENVIRONMENTAL PROTECTION AGENCY

Ghana Environmental Protection Agency is the leading public body for protecting and improving the environment in Ghana. Their mandate is to make sure that air, land and water are looked after by everyone in today's society, so that tomorrow's generations inherit a cleaner, healthier world.

There are offices across Ghana working on and carrying out Government policy, inspecting and regulating businesses and reacting when there is an emergency such as a pollution incident.

The **mission statement** of the EPA of Ghana is:

- *to co-manage, protect and enhance the country's environment, in particular, as well as seek common solutions to global environmental problems.*

The accomplishment of the mission is to be achieved inter alia through:

- *An integrated environmental planning and management system established on a broad base of public participation, efficient implementation of appropriate programmes and technical services, giving good counsel on environmental management as well as effective and consistent enforcement of environmental laws and regulations. The EPA is an implementing Agency, a regulatory body and catalyst for change towards sound environmental stewardship*.

Vision:

A country in which all section of the community value the environment and strive to attain sustainable development, with sound and efficient resource management, taking into account social and equity issues.

3.5 DEPARTMENT OF ENVIRONMENTAL AFFAIRS, REPUBLIC OF SOUTH

AFRICA

Vision: *A prosperous and equitable society living in harmony with our natural resources.*

Mission: *To create a prosperous and equitable society that lives in harmony with our environment*

Strategic Objectives:

- To protect, conserve and enhance our environment, natural and heritage assets and resources.
- Proactively plan, manage and prevent pollution and environmental degradation to ensure a sustainable and healthy environment.
- Provide leadership on climate change adaptation and mitigation.
- Contribute to sustainable development, livelihood, green and inclusive economic growth through facilitating skills development and employment creation
- Contribute to a better Africa and a better world by advancing national environmental interests through a global sustainable development agenda.

Values: **The Department of Environmental Affairs, Republic of South Africa are** guided by the following values: (PIPS)

- To become a truly **People-Centred** organisation that responds to the needs of all South Africans.
- To achieve the highest levels of **Integrity** premised on professionalism, quality, sevice excellence, honesty, transparency, trust.
- To enhance organisation **Performance** through productivity, efficiency, effectiveness, innovation and continuous improvements.
- To ensure the **Sustainability** of the organisation and its sectors through amongst others, maximised impact, return on investment, continuity and knowledge management.

Each of the department's five branches include Environmental Quality and Protection; Oceans and Coasts; Biodiversity and Conservation; Chief Operating Officer; International Co-Operation and Resources; Corporate Affairs.

3.6 NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY, KENYA

The core functions of National Environment Management Authority, Kenya are to:

A Section of Nairobi River

- coordinate the various environmental management activities being undertaken by the lead agencies
- promote the integration of environmental considerations into development policies, plans, programmes and projects, with a view to ensuring the proper management and rational utilization of environmental resources, on sustainable yield basis, for the improvement of the quality of human life in Kenya.
- take stock of the natural resources in Kenya and their utilization and conservation.
- establish and review land use guidelines.
- examine land use patterns to determine their impact on the quality and quantity of natural resources.
- carry out surveys, which will assist in the proper management and conservation of the environment.
- advise the Government on legislative and other measures for the management of the environment or the implementation of relevant international conventions, treaties and agreements.
- advise the Government on regional and international conventions, treaties and agreements to which Kenya should be a party and follow up the implementation of such agreements.
- undertake and coordinate research, investigation and surveys, collect, collate and disseminate information on the findings of such research, investigations or surveys.

- mobilize and monitor the use of financial and human resources for environmental management.
- identify projects and programmes for which environmental audit or environmental monitoring must be conducted under this Act.
- initiate and evolve procedures and safeguards for the prevention of accidents, which may cause environmental degradatIon and evolve remedial measures where accidents occur e.g. floods, landslides and oil spills.
- monitor and assess activities, including activities being carried out by relevant lead agencies, in order to ensure that the environment is not degraded by such activities. Management objectives must be adhered to and adequate early warning on impending environmental emergencies is given.
- undertake, in cooperation with relevant lead agencies, programmes intended to enhance environmental education and public awareness, about the need for sound environmental management, as well as for enlisting public support and encouraging the effort made by other entities in that regard.

Environmental training and awareness creation

3.7 MINISTRY OF STATE FOR ENVIRONMENTAL AFFAIRS-EGYPTIAN ENVIRONMENTAL AFFAIRS AGENCY

The principal functions of the Agency include:

- Formulating environmental policies.

- Preparing the necessary plans for Environmental protection and Environmental development projects, following up their implementation, and undertaking Pilot Projects.
- The Agency is the National Authority in charge of promoting environmental relations between Egypt and other States, as well as Regional and International Organizations.

For the Agency to realize its aims it has to undertake the following tasks:

- Preparing draft legislation and decrees related to the fulfillment of its objectives
- Preparing state of the environment studies and formulating the national plan for environmental protection and related projects.
- Setting the standards and conditions to which applicants for construction projects must adhere before working on the site and throughout operations
- Setting the rates and proportions required for the permissible limits of pollutants.
- Periodically collecting national and international data on the actual state of the environment and recording possible changes.
- Setting the principles and procedures for mandatory Environmental Impact Assessment (EIA) of projects.
- Preparing Environmental Contingency Plans and supervising their implementation.
- Participating in the preparation and implementation of the national and international Environmental Monitoring Programs and employing data and information gained thereof.
- Establishing Public Environmental Education Programs and assisting in their implementation.
- Coordinating with other empowered authorities for the control and safe handling of dangerous substances.
- Managing and supervising the natural reserves of Specially Protected Areas.
- Following up the implementation stages of International Conventions concerned with the environment.
- Suggesting an economic mechanism, which encourages the observation of pollution prevention procedures.
- Implementing pilot projects for the preservation of natural resources and the protection of the environment against pollution.

- Listing of national establishments and institutions, as well as experts qualified to participate in the preparation and implementation of environmental protection programs, and coordinating measures with the Ministry in charge of international Cooperation to ensure that projects funded by donor organizations and states are compatible with environmental safety.
- Participating in the preparation of an integrated national plan for the coastal zone management of the Mediterranean and the Red Sea areas.
- Participating in the preparation of a plan to prevent illegal entry into the country of dangerous and polluting substances and waste.
- Preparing an annual report on the state of the environment to be submitted to the President and the Cabinet of Ministers.

3.8 ENVIRONMENTAL PROTECTION AGENCIES IN NIGERIA

The Federal Ministry of Environment coordinates all environment protection activities in Nigeria. Prior to Federal Ministry of Environment, the Federal Environmental Protection Agency was the coordinating body for environmental protection in Nigeria for numerous regulating agencies such as :

- Federal Ministry of Health
- Federal Ministry of Labour & Productivity
- Federal Ministry of Solid Minerals
- The 36 States Ministries of Environment
- The 36 States Ministries of Physical Planning & Urban Development
- The 36 States Ministries of Health
- Waste Management Authorities
- Local Government Authorities
- National Environmental Standards and Regulations Enforcement Agency (NESREA)
- Energy Commission of Nigeria
- National Oil Spill Detection and Response Agency
- Nigerian Nuclear Regulatory Authority
- Department of Petroleum Resources
- Nigerian Maritime Administration and Safety Agency
- Nigerian Ports Authority
- Environmental Health Officers Council
- Standards Organisation of Nigeria

- National Food & Drugs Administration Control Agency

3.8.1 FEDERAL ENVIRONMENT PROTECTION AGENCY (FEPA)

FEPA was created by Decree 58 of 1988 as the overall body charged with the responsibility of protecting the environment in Nigeria in cooperation with Federal and State Ministries, Local Governments and statutory bodies

Its functions include establishing and prescribing national guidelines, criteria and standards for:

a) water quality
b) air quality and atmospheric protection
c) noise levels
d) gaseous emissions and effluent limits
e) ozone protection

The agency was also empowered to monitor and control hazardous substances, supervise and enforce compliance

In 2007, FEPA and its functions were taken over by the newly created **The National Environmental Standards And Regulations Enforcement Agency (NESREA)**

3.8.2 Functions of some Regulatory Agencies in Nigeria

THE NATIONAL ENVIRONMENTAL STANDARDS AND REGULATIONS ENFORCEMENT AGENCY (NESREA)

NESREA was established by an Act of the National Assembly in 2007. The Act repealed FEPA Act of 1988

NESREA is a parastatal of the Ministry of Environment charged with the responsibility of enforcing environmental Laws, regulations and standards and deterring people, industries and organization from polluting and degrading the environment.

NESREA's mandate includes the following:

- Enforcement of environmental standards, regulations, rules, laws, policies and guidelines
- Protection and development of the environment, biodiversity conservation and sustainable development in Nigeria
- Liaison with relevant stakeholders within and outside Nigeria
- Developing guidelines, regulations and standards on the environment other than in the oil & gas sector

The Agency has powers to:

- prohibit processes and use of equipment or technology that undermine environmental quality
- conduct field follow-up of compliance with set standards and take procedures prescribed by law against any violator
- establish mobile courts to expeditiously dispense cases of violation of environmental regulation

NATIONAL OIL SPILL DETECTION RESPONSE AGENCY (NOSDRA)

NOSDRA is a parastatal of the FME established by Act No. 15 as the Institutional framework to implement National Oil Spill Contingency Plan (NOSCP) of 2001

The mandate of NOSDRA includes the following:

a. Surveillance and ensuring compliance with all existing environmental legislation and detection of oil spills in the petroleum sector;

b. receiving reports of oil spillages and co-ordinates oil spill response activities throughout Nigeria;

c. co-ordinating the implementation of the plan for the removal of hazardous substances as may be issue by the Federal Govt.;

d. promoting technical co-operation between Nigeria and Member States of the West African Sub-region;

e. strengthening the national capacity and regional action to prevent, control, combat and mitigate marine pollution;

f. encouraging regional cooperation among Member States of West African sub-region and in the Gulf of Guinean for combating oil spillage and pollution in our contiguous waters.

DEPARTMENT OF PETROLEUM RESOURCES (DPR)

DPR enforces safety and environmental regulations in the oil & gas industry and ensures that operations conform to national and international industry practices and standards.

DPR published the Environmental Guidelines and Standards for the Petroleum Industry in Nigeria (EGASPIN) 2002 empowering the Director of Petroleum Resources to issue permits for all aspects of oil-related effluent discharges from point sources (gaseous, liquid and solid), and oil-related project development.

EGASPIN also provides that environmental permits shall be issued for existing and new sources of effluent emission.

EGASPIN contains a list of activities in the oil and gas sector requiring environmental assessment. (e.g. seismic operations; oil and gas field developments onshore, nearshore, offshore and deepshore; hydrocarbon processing facilities; construction of waste treatment; and/or disposal facilities)

4.0 CONCLUSION

The protection of the environment is key to achieving a healthy nation. In order to do this effectively, the environment protection agencies need to carry out various functions that will ensure not only the sustainability of the environment but also maintain ecological balance which is conducive to plants and animals alike.

5.0 SUMMARY

In this unit, you have learnt about environment protection agencies selected from various countries including Nigeria. You have also noted that each country has her own unique way of coordinating environment protection activities. You learnt also that Nigeria has various regulatory agencies which report to the Federal Ministry of Environment.

6.0 TUTOR MARKED ASSIGNMENT

1. Why do we have environmental protection agencies in each country?
2. What roles do the coordinating bodies play in ensuring environmental protection?
3. Research into the activities of other regulatory protection agencies not discussed in this unit.

7.0 REFERENCES

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National Environment management Authority, Kenya http://www.nema.go.ke/(assessed September 2011)

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Ghana Environmental Protection Agency http://www.epa.gov.gh/site/index.php(assessed September 2011)

Module 3: Environmental Laws/Regulations

Unit 1: Overview of Nigerian Environmental Laws/Regulations

Unit 2: Nigerian Environmental Laws/Regulations

Unit1: Overview of Environmental Laws and Regulations

1.0 Introduction

In the previous units, we have established the need to protect the environment and also identified the body responsible for protecting it. To do this effectively, environmental laws had to be established in order that standards are laid down for compliance by individuals, organisations or nations which will be used to protect the environment. Non-compliance to these laid down laws could result in some penalty commensurate with the offence.

2.0 Objectives

By the end of this section you should be able to

i) Define environmental legislation
ii) Trace the history of environmental legislation in Nigeria and name the main agencies involved in Legislating the environment
iii) Discuss the history of International Environmental Legislation with reference to some conventions and protocols

3.0 Main Content

3.1 Environmental Legislation

- A law is generally defined as a way of regulating human behavior.
- For the purpose of law, environment is defined along the terms of it's physical components including air, water, space, land, plants and wildlife.

Environmental laws/ legislation is that law or legislation which relates primarily to the protection of the whole or part of the physical components of the environment.

Laws which relate primarily to the public health or particular groups of individuals such as consumers or workers are covered under public health or occupational health laws.

Regulation of Environmental Protection can be achieved by the use of regulations.

Regulation is the application of rules and procedures to achieve a measure of control over the activities of individuals and organizations.

These regulations may exert :

1. Anticipatory controls
    - Outright bans (e.g. Ban of CFCs)
    - Prohibition unless notified (e.g. use of certain nature reserve),
    - Prohibition unless registered (e.g. waste disposal),
    - Prohibition without licence (e.g. importation of chemicals)

2. Continuing Controls –continuous controls of activity such as control of factory premises by agencies such as NESREA, LASEPA, OGEPA

3.2 Environmental Standards

Effective environmental control requires standards which may be

1. Target Standards: These are also called Environmental quality standards and are set by reference to particular targets and include

- emission standards- standardizes what is emitted
- process standards- standardizes a whole or part of processes used
- product standards- standardizes characteristics of the final product

2. Source Standards: These are set by reference to the source

Environmental legislation and policies are enacted to protect the health and safety of the general public from adverse interference with environmental resources arising from human and industrial activities. They prescribe minimum standards and grant statutory approvals/permits. Non- compliance with legislation may attract prosecution, imposition of fines and/or imprisonment.

3.3 Development of Environmental Legislation and Agencies in Nigeria

Prior to 1988, there were no laws to in force to regulate industrial pollution or hazardous waste. Existing environmental legislation only focussed on the protection and conservation of economically important natural resources (E.g. Oil Pipeline Act 1956, Forestry Act 1958, Mineral Oil (Safety) Regulations 1963, Oil in Navigable Waters Act 1968). Generous concessions were granted by Federal & State governments to business promoters to establish industries with little or no attention paid to the pollution generated from their operational activities. The Koko toxic waste incident of 1988, in which barrels of toxic waste were imported by a Business man, and dumped in Koko(Delta State), changed this trend and resulted in the FEPA Decree(now an Act) of 1988 and the creation of FEPA (Federal Environmental Protection Agency).

FEPA

FEPA was created by Decree 58 of 1988 as the overall body charged with the responsibility of protecting the environment in Nigeria in cooperation with Federal and State Ministries, Local Governments, statutory bodies.

Its functions include establishing and prescribing national guidelines, criteria and standards for:

a) water quality

b) air quality and atmospheric protection

c) noise levels

d) gaseous emissions and effluent limits

e) ozone protection

The agency was empowered to monitor and control hazardous substances, supervise and enforce compliance.

National Policy on the Environment of 1998

A National Policy on the environment was promulgated in 1998.

The goals of the policy are:

a. secure a quality of environment adequate for good health and well-being
b. conserve & use environmental resources for the benefit of present & future generations
c. restore, maintain and enhance the ecosystem
d. raise public awareness and promote understanding of the environment
e. collaboration with other countries and international agencies on environmental protection

Nigeria's Agenda 21

Nigeria's Agenda 21 Programme seeks to:

a. integrate environment into development planning at all levels of government and the private sector
b. commence a transition to sustainable development
c. address sectoral priorities, plans, policies & strategies for the major sectors of the economy
d. foster regional and global partnerships

National Environmental Standards and Regulations Enforcement Agency (NESREA)

In 1999 FEPA was scrapped and its functions taken over by the newly created Federal Ministry of Environment. In 2007 the National Assembly established the National Environmental Standards and Regulations Enforcement Agency (NESREA), a parastatal of the Ministry of Environment. NESREA Act repealed FEPA Act of 1988. NESREA now has the responsibility of enforcing environmental Laws, regulations and standards and deterring people, industries and organizations from polluting and degrading the environment.

NESREA's mandate includes the following:

- Enforcement of environmental standards, regulations, rules, laws, policies and guidelines
- Protection and development of the environment, biodiversity conservation and sustainable development in Nigeria
- Liaison with relevant stakeholders within and outside Nigeria
- Developing guidelines, regulations and standards on the environment other than in the oil & gas sector

NESREA has powers to:

- prohibit processes and use of equipment or technology that undermine environmental quality

- conduct field follow-up of compliance with set standards and take procedures prescribed by law against any violator
- establish mobile courts to expeditiously dispense cases of violation of environmental regulation

Other regulatory agencies include

State EPA's such as OGEPA (Ogun State Environmental Protection Agency), RISEPA (Rivers State Environmental Protection Agency) LASEPA (**Lagos State Environment Protection Agency) and KASEPPA (**Kano State Environmental Planning and Protection Agency)

Kano State Environmental Planning and Protection Agency

The **Kano State Environmental Planning and Protection Agency** (KASEPPA) is a government agency in Kano State, Nigeria that is responsible for issues concerning the environment in the state. Functions include planning urban centers, control of development in urban centers, provision of amenities, conveniences and infrastructures and other functions necessary for healthy and orderly urban growth. KASEPPA is responsible for ensuring that public land is not illegally allocated to individuals, and destroys illegally constructed buildings. The agency has called on traditional rulers in the state for assistance in achieving this goal.The agency supports entrepreneurs who wish to construct and operate public toilets. KASEPPA allocates the site on which the toilets are to be built, provides building plans and supervises construction. The agency also provides and reinforces hygiene guidelines.[6] The agency has fixed standards for building designs and site selection. The objective is to safeguard ground water from pollution and ensure a healthy environment. The agency assists in ensuring that urban waste from these toilets and other sources is put to good use by farmers, particularly in the vicinity of Kano city.

LAGOS STATE ENVIRONMENT PROTECTION AGENCY (LASEPA)

LASEPA was established by Edict No. 9 of 1996 and its functions

include the following :

- Carry out tests on insecticides, herbicides and other agric chemicals
- Monitor and control disposal of solids, gaseous and liquid wastes
- Monitor and control all forms of environmental degradation from agric, industrial and govt. operations
- Set, monitor and enforce standards & guidelines on vehicular emission
- Survey and monitor surface, underground and potable water, air, land and soil environments
- LASEPA powers under the law include the following :

- Demand from organisations to produce permits, licence, certificate or any other document required under the Edict
- Examine any appliance or device used in relation to environmental protection
- Apply enforcement measures to combat environmental degradations in manufacturing premises and govt. operations
- Enter and search vehicles, tents and other structures in any manufacturing or business premises
- Perform test and take samples of substances found any premises searched

LASEPA is also empowered to make regulations & standards on:

- Pollution control of water, air noise and land
- Effluent treatment
- Erosion control
- Nature conservation
- Waste management options

OFFENCES & PENALTIES FOR ENVIRONMENTAL OFFENCES

The various environmental legislation & regulations e.g. NESREA Act, LASEPA Edict, Harmful Wastes Acts, etc imposes penalties for any person or corporate bodies in breach of their respective provisions in the form of:

Fines, Imprisonment, Sealing off of the offending facility or organisation, Directors & Managers may also attract personal liability for environmental offences

Department of Petroleum resources (DPR) enforces safety and environmental regulations in the oil & gas industry and ensures that operations conform to national and international industry practices and standards.

Standards Organization of Nigeria (SON) implements, audits and certifies ISO 14000Standards in Nigeria. The ISO 14000 family addresses "Environmental Management". This means what the organization does to minimize harmful effects on the environment caused by its activities, and to achieve continual improvement of its environmental performance.

3.4 International Environmental Regulation

Following the Stockholm Conference in 1970, many countries established Ministries of Environment and environmental Legislation began to increase. There was also growing recognition that that pollution does not respect land borders and pollution from one country crosses to another. In addition phenomena such as the green house effect, global warming were identified. As such there was a need to develop international environmental legislation. This has resulted in the signing of various treaties under the umbrella of various international organisations such as the United Nations (UN).

The most common treaties called Conventions include

- UN Law of the Sea (1986)
- UN Convention on Biological Diversity (1992)
- UN Framework Convention on Climate Change (1994)

- UN Convention to Combat Desertification (1997)
- Vienna Convention for the Protection of the Ozone Layer (1988)
- Stockholm Convention on Persistent Organic Pollutants (2001, 2004)
- Basel Convention on the Trans-boundary Movement of Hazardous Wastes
- Bamako Convention on the Ban of the Import into Africa and the Control of Tran boundary Movement and Management of Hazardous Wastes within Africa

Subsidiary agreements called Protocols include

- Montreal Protocol on Substances that deplete the Ozone Layer (1987)
- Cartagena Protocol on Bio-safety (2003)
- Kyoto Protocol to the Framework Convention on Climate Change (2004)

4.0 Conclusion

Environmental legislation is a fairly new and emerging field when compared to other aspects of law. It is still evolving In Nigeria and as such the agencies charged with this function are many and continue to evolve. Despite this, it is important to understand the basis for the environmental laws and the agencies involve, as stiffer penalties are currently being applied for flaunting environmental laws or polluting the environment. Furthermore, there is a move to organize an International Legal system once the problems associated with the various conventions and protocols are ironed out.

5.0 Summary

Environmental laws/ legislations are those laws or legislations which relate primarily to the protection of the whole or part of the physical components of the environment. Regulation is the application of rules and procedures to achieve a measure of control over the activities of individuals and organizations **.**These regulations may exert anticipatory control or continuing control.

Effective environmental control requires standards. FEPA was created by Decree 58 of 1988 and charged with the responsibility of protecting the environment. In 1999 FEPA was scrapped. In 2007 the National Assembly established the National Environmental Standards and Regulations Enforcement Agency (NESREA), a parastatal of the Ministry of Environment. Following the Stockholm Conference in 1970, many countries established Ministries of Environment and Environmental Legislation has increased.

6.0 Self assessment question

a. What incident necessitated environmental legislation in Nigeria and what was Government's response.

b. List 3 agencies involved in Legislating the environment in Nigeria and discuss their functions.

Tutor marked Assessment Question

Environmental legislation was introduced formally in Nigeria in 1988. As the Senior Special Assistant to the Commissioner of Environment in your state, Evaluate the present state of

legislation, Discuss the impact (If any) this legislation has had on the environment and propose a plan for improving the impact.

7.0 References

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ESM 431 Environmental Health and Safety

Unit 2: Nigerian Environmental Laws/Regulations

CONTENTS

1.0 Introduction

In Nigeria, there are many already existing Government laws and regulation guiding the environment. These laws and regulations vary according to the resource being identified and the need.

1. Objective

At the end of this unit, you should be able to:

- Identify the sources of various environmental laws and regulations in Nigeria.
- Get acquitted with various environmental laws in the country

3.0 Main Content

The role of legislation in inducing responsible attitudes and behaviours towards the environment cannot be overlooked. Legislation serves as an effective instrument for environmental protection, planning, pollution, prevention and control. The following provides a summary of Nigerian legislation on the environment.

CONSTITUTION OF THE FEDERAL REPUBLIC OF NIGERIA (1999)

The constitution, as the national legal order, recognizes the importance of improving and protecting the environment and makes provision for it. Relevant sections are:

- Section 20 which makes it an objective of the Nigerian State to improve and protect the air, land, water, forest and wildlife of Nigeria.
- Section 12 establishes, though impliedly, that international treaties (including environmental treaties) ratified by the National Assembly should be implemented as law in Nigeria.
- Section 33 and 34 which guarantee fundamental human rights to life and human dignity respectively.

Federal Solid and Hazardous Waste Management Regulations (1991).

- Section 1 makes it an obligation for industries to identify solid hazardous wastes which are dangerous to public health and the environment and to research into the possibility of their recycling.
- Section 20 makes notification of any discharge to the Agency mandatory.
- Section 108 stipulates penalties for contravening any regulation.

Environmental Impact Assessment (EIA) Act. CAP E12, LFN 2004.

An Environmental Impact Assessment (EIA) is an assessment of the potential impacts whether positive or negative, of a proposed project on the natural environment: The EIA Act, as it is informally called, deals with the considerations of environmental impact in respect of public and private projects.

Sections relevant to environmental emergency prevention under the EIA include:-

- Section 2 (1) requires an assessment of public or private projects likely to have a significant (negative) impact on the environment.
- Section 2 (4) requires an application in writing to the Agency before embarking on projects for their environmental assessment to determine approval.
- Section 13 establishes cases where an EIA is required and

- Section 60 creates a legal liability for contravention of any provision.

The Nigerian Urban and Regional Planning Act CAP N138, LFN 2004

The Urban and Regional Planning Act is aimed at overseeing a realistic, purposeful planning of the country to avoid overcrowding and poor environmental conditions. In this regard, the following sections become instructive:-

- Section 30 (3) requires a building plan to be drawn by a registered architect or town planner.
- Section 39 (7) establishes that an application for land development would be rejected if such development would harm the environment or constitute a nuisance to the community.
- Section 59 makes it an offence to disobey a stop-work order. The punishment under this section, is a fine not exceeding N10, 000 (Ten thousand naira) and in the case of a company, a fine not exceeding N50, 000.
- Section 72 provides for the preservation and planting of trees for environmental conservation.

Land Use Act CAP 202, LFN 2004

The Land Use Act 2004, places the ownership, management and control of land in each state of the federation with the Governor. Land is therefore allocated with his authority for commercial, agricultural and other purposes.

Harmful Waste (Special Criminal Provisions) Act CAP H1, LFN 2004
The Harmful Waste Act prohibits, without lawful authority, the carrying, dumping or depositing of harmful waste in the air, land or waters of Nigeria. The following sections are notable:

- Section 6 provides punishment such as life imprisonment for offenders as well as the forfeiture of land or anything used to commit the offence.
- Section 7 makes provision for the punishment accordingly, of any conniving, consenting or negligent officer where the offence is committed by a company.
- Section 12 defines the civil liability of any offender. He would be liable to persons who have suffered injury as a result of his offending act.

Hydrocarbon Oil Refineries Act, CAP H5, LFN 2004

The Hydrocarbon Oil Refineries Act is concerned with the licensing and control of refining activities. Relevant sections include the following:-

- Section 1 prohibits any unlicensed refining of hydrocarbon oils in places other than a refinery.
- Section 9 requires refineries to maintain pollution prevention facilities.

Oil In Navigable Waters Act, CAP 06, LFN 2004

The Oil in Navigable Waters Act is concerned with the discharge of oil from ships. The following sections are significant:-

- Section 1 (1) prohibits the discharge of oil from a Nigerian ship into territorial waters or shorelines.
- Section 3 makes it an offence for a ship master, occupier of land, or operator of apparatus for transferring oil to discharge oil into Nigerian Waters. It also requires the installation of anti-pollution equipment in ships.
- Section 6 makes punishable such discharge with a fine of N2, 000 (Two thousand naira).
- Section 7 requires the records of occasions of oil discharge.

Associated Gas Re-Injection Act, CAP 20, LFN 2004

The Associated Gas Re-Injection Act deals with the gas flaring activities of oil and gas companies in Nigeria. The following sections are relevant to pollution prevention:-

- Section 3 (1) prohibits, without lawful permission, any oil and gas company from flaring gas in Nigeria.
- Section 4 stipulates the penalty for breach of permit conditions.

The Endangered Species Act , CAP E9, LFN 2004
This Act focuses on the protection and management of Nigeria's wildlife and some of their species in danger of extinction as a result of overexploitation. These sections are noteworthy:

- Section 1 prohibits, except under a valid license, the hunting, capture or trade in animal species, either presently or likely to be in danger of extinction.
- Section 5 defines the liability of any offender under this Act.
- Section 7 provides for regulations to be made necessary for environmental prevention and control as regards the purposes of this Act.

Sea Fisheries Act, CAP S4, LFN 2004.

The Sea Fisheries Act makes it illegal to take or harm fishes within Nigerian waters by use of explosives, poisonous or noxious substances.
Relevant sections include the following:-

- Section 1 prohibits any unlicensed operation of motor fishing boats within Nigerian waters.
- Section 10 makes destruction of fishes punishable with a fine of N50,000 or an imprisonment term of 2 years.
- Section 14 (2) provides authority to make for the protection and conservation of sea fishes.

Inland Fisheries Act, CAP I10, LFN 2004

Focused on the protection of the water habitat and its species, the following sections are instructive:

- Section 1 prohibits unlicensed operations of motor fishing boats within the inland waters of Nigeria.

- Section 6 prohibits the taking or destruction of fish by harmful means. This offence is punishable with a fine of N3, 000 or an imprisonment term of 2 years or both.

Exclusive Economic Zone Act, **CAP E11, LFN 2004.**

The Exclusive Economic Zone Act makes it illegal to explore or exploit natural resources within the Exclusive zone without lawful authority. The Federal Government regulates the activities of the Exclusive Zone.

Oil Pipelines Act, CAP 07, LFN 2004

The Oil Pipelines Act and its Regulations guide oil activities. The following sections are pertinent;

- Section 11 (5) creates a civil liability on the person who owns or is in charge of an oil pipeline. He would be liable to pay compensation to anyone who suffers physical or economic injury as a result of a break or leak in his pipelines.
- Section 17 (4) establishes that grant of licenses are subject to regulations concerning public safety and prevention of land and water pollution.

Oil Pipelines Regulations (Under Oil Pipelines Act)

- Section 9 (1) (b) establishes the requirement of environmental emergency plans.
- Section 26 makes punishable any contravention with a fine of N500,000 and/or an imprisonment term of six months.

Petroleum Act, CAP P10, LFN 2004

The Petroleum Act and its Regulations remain the primary legislation on oil and gas activities in Nigeria. It promotes public safety and environmental protection. The following sections are relevant:

- Section 9 (1) (b) provides authority to make regulations on operations for the prevention of air and water pollution.

REGULATIONS

Petroleum Drilling And Production Regulations:

- Section 17 (1) (b) places restrictions on licensees from using land within fifty yards of any building, dam, reservoir, public road, etc.
- Sections 23 and 27 prohibits, without lawful permission, the cut down of trees in forest reserves.
- Section 25 establishes that reasonable measures be taken to prevent water pollution and to end it, if it occurs.

Petroleum Products and Distribution Act, **CAP P12, LFN 2004**

Under this Act, the offence of sabotage which could result in environmental pollution is punishable with a death sentence or an imprisonment term not exceeding 21 years.

Territorial Waters Act, CAP T5, LFN 2004.

The Territorial Waters Act makes punishable any act or omission committed within Nigerian waters which would be an offence under any other existing law.

Nuclear Safety and Radiation Protection Act, CAP N142, LFN 2004

The Act is concerned with the regulation of the use of radioactive substances and equipment emitting and generating ionizing radiation. In particular:

- Section 4 provides authority to make regulations for the protection of the environment from the harmful effects of ionizing radiation.
- Section 15 and 16 makes registration of premises and the restriction of ionizing radiation sources to those premises mandatory.
- Section 37 (1) (b) allows an inspector verify records of activities that pertain to the environment.
- Section 40 clarifies that the same regulations guiding the transportation of dangerous goods by air, land or water should also apply to the transportation of radioactive substances.

Nigerian Mining Corporation Act. CAP N120, LFN 2004

The Act has authority to engage in mining refining activities and to construct and maintain roads, dams, reservoirs, etc. In particular:

- Section 16 creates a civil liability on the corporation for the physical or economic damage suffered by any person as a result of its activities.

River Basins Development Authority Act, CAP R9, LFN 2004

The River Basins Development Authority is concerned with the development of water resources for domestic, industrial and other uses, and the control of floods and erosion.

Animal Diseases (Control) Act, CAP A17, LFN 2004

The Animal Disease (Control) Act makes it an offence to import any animal, hatching egg or poultry into Nigerian except under a permit. The following sections are relevant:
Section 5 provides an inspector with the authority to take emergency measures where necessary.
Section 10 stipulates penalties for contravening any regulation.
Section 13 requires owners of trade animals to possess a movement permit and ensure the fitness of their animals.
Section 20 provides authority to make regulations that prevent and control the spread of animal diseases.

Water Resources Act, CAP W2, LFN 2004

The Water Resources Act is targeted at developing and improving the quantity and quality of water resources. The following sections are pertinent:
Section 5 and 6 provides authority to make pollution prevention plans and regulations for the protection of fisheries, flora and fauna.
Section 18 makes offenders liable, under this Act, to be punished with a fine not exceeding N2000 or an imprisonment term of six months. He would also pay an additional fine of N100 for everyday the offence continues.

The Federal National Parks Act, CAP N65, LFN 2004

The National Parks Act is concerned with the establishment of protected areas used for resource conservation, water catchments protection, wildlife conservation and maintenance of the national eco-system balance.

Module 4: CASE STUDIES OF EIA AND EAR

Unit 1: Environmental Impact Statement: 105 KM Highway Corridor in the State of Durango, Mexico

Unit 2: Environmental Appraisal of Bodhghat Hydroelectric Development Project

Unit 3: Case study of EIA of Midlands Dam Project, Mauritius

Unit 4: Case study of an EIA in Finland, development of Highway 1 (E18)

Unit 5: EAR Case Study on Post-Construction Environmental Impact Audit Study of Kali Gandaki "A" Hydroelectric Project

Unit 1: **Environmental Impact Statement: 105 km Highway Corridor In The State Of Durango, Mexico**

CONTENTS

1. Introduction
2. Objectives
3. Main Content
4. Conclusion
5. Summary
6. Tutor-Marked Assignment
7. References/Further Readings

1.0 Introduction

The project involved the construction of a two-lane highway in the State of Durango. The average right of way will be 60m wide to allow for future expansion to four lanes. The highway will be built to high specifications and will have intersections, bridges, crossings for roads, railroads, pedestrians and cattle and minor drainage works. The area required will be 632.61ha.

The main cities by which the highway will link are Durango (with 348,000 inhabitants) and El Salto (39,000). There are localities neighbouring the corridor that vary in size and number of inhabitants. The aim of the project is to facilitate the transportation of people and regional produce to the Pacific coast. The surrounding environment has dry and temperate climates that support desert vegetation, stands of conifers and other trees and irrigated and rainfed agricultural areas. There are several rivers of varying flows and small streams. The topography is highly varied with large canyons, plateaus, hills and plains.

The Environmental Impact Assessment for this project was prepared in accordance with Mexican environmental legislation. The statement was evaluated and reported by the competent federal authorities. When the assessment was carried out during the planning phase and it was possible to propose impact prevention and mitigation measures that could be considered and applied by the project proponent in the implementation phase.

In addition to complying with current federal legislation and regulations, a professional study identified not only the potential impact of future work but furthermore, suggested that certain design aspects of the project be revised.

1.0 Objective

At the end of this unit, the students should be able to:

- identify the environmental issues encountered in the EIA study.
- discuss the challenges and the type of mitigation proposed

PROCESS AND PROCEDURAL CONTEXT

Mexico is a North American and Latin country with several years' experience in the application of federal, state and municipal government environmental policies on different levels. There has been progress in mitigating environmental impact, due to the fact that preventive policies have been recognized as an important tool in the correction of existing environmental imbalances.

In Mexico, the General Ecological Balance and Environmental Protection Act and the Environmental Impact Regulations establish which projects must be assessed. Highways and communication routes must be analyzed to anticipate the environmental impacts that their construction and operation will generate.

The project proponent must implement not only the mitigation and other measures proposed in the study but also the recommendations and/or conditions established by the authorities in the report. The Federal Attorney General for Environmental Protection must ensure that the project proponent complies with the terms of the report. In this case, the Federal Highways Bureau is in the process of implementing a system of internal oversight to verify that works constructors quantify the cost of each project's mitigation measures and any conditions imposed at the time of approval, and implement them.

The environmental study for this highway project was prepared based on the 'guidelines for the development and presentation of the environmental impact statement in the general modality referred to in articles 9 and 10 of the Regulation to the General Ecological Balance and Environmental Protection Act in the field of Environmental Impact', and the special guidelines for federal highways issued for such purpose by the National Ecology Institute.

The different chapters of the study contain the following information:

• general information on the project proponent and the consultant preparing the EIS; a description of the planned works;

• a description of the physical, biological and socioeconomic environment;

• factors of the project relating to land use and protected natural areas regulation of environmental impacts; and

• mitigation measures and programmes to reforest and/or restore of affected areas.

Various laws, regulations, highway construction standards and official Mexican standards relating to the protection of forest areas, soils, protected plant and animal species, in addition to regional, municipal and sectorial development plans and programmes were revised.

APPROACH TAKEN

One of the first activities carried out was the collection and analysis of the available bibliographic and cartographic information which provided detailed information on the works to be built in the project and, on the other, the characteristics of the physical and chemical, biological and socioeconomic environment of the area. In this phase, materials provided by the Highway Project Department were used – mainly aerial photographs of the highway corridor, and information on structures, drainage work, pavements, location of quarries and surplus material dumping sites, etc.

The aerial photographs allowed identification of the settlements along the corridor, farming and grazing land, scrub land, woods, forestry trails, quarries in use and physical features such as canyons, rivers and streams.

The necessary information was ordered, classified and selected; only the information pertinent for the study was used.

The purpose of the field visits was to:

• learn about the prevailing environmental characteristics along the corridor;

• verify the existence of farming and forestry;

• observe quarries in use and locate those proposed;

• observe the conditions of existing settlements;

• identify types of vegetation and dominant species;

• corroborate bibliographic and cartographic information related to geological aspects, soils, and surface and underground currents; and

• talk with local informants and with persons performing other studies related to the highway.

The identification and evaluation of environmental impacts was performed with the help of checklist and map overlay methodologies. A list of activities for the site preparation, construction, operation and maintenance phases were drawn. The second list included the climatic, edaphic, hydrological, geological, biological (plants and animals), landscape and socioeconomic characteristics of the area of influence and the region.

Assessing impacts

Overlaying different types of maps allowed the projected works to be correlated with environmental characteristics such as:

- types of vegetation and soils that will be affected by clearing the right of way;
- types of vegetation and farming in the area affected by the construction of gravel access roads;
- rivers and streams that will suffer increased sediment as a result of the mining of quarries and the construction of the highway;
- types of vegetation and surface currents that will be affected by the location of dumping sites for excess material not used in the construction;
- places where cuts will be made and intersections and bridges built; and
- privately and commonly owned land that will be affected.

In addition, the project's area of influence was highlighted on a map, showing the aforementioned correlations but mainly concentrating on an exhaustive analysis of the direction of flow of the area's surface currents. This map can be considered as the result of the integrated approach to impact analysis.

Desk and field work were carried out by an interdisciplinary professional group made up of a Civil Engineer, a Geological Engineer, three Biologists and two Architects.

The main environmental impacts identified were as follows:

• a socioeconomic impact due to affected private and common property lands; and

• impacts on local climate, air, soil, surface water, geomorphological dynamic, vegetation, wildlife, landscape and inhabitants due to such action as clearing, cuts, the mining of quarries, the operation of machinery and equipment, the installation and operation of crushing and asphalt producing plants, and the creation of dumping sites.

The impacts could take the form of :

• changes in local climate;
• the presence of suspended particles, gas, smoke and noise;

• an increase in proneness to soil erosion;
• an increase in solid particles suspended in rivers and streams, and the silting up of water courses;
• an alteration of the natural pattern of drainage;
• an intensification of erosion and sedimentation processes;
• changes in the original topography and stability of the terrain;
• a loss of tree stands, desert scrub and crops;
• the destruction of wildlife habitats and the creation of barriers to movement;
• a visual impact due to changes in the landscape mainly in mountain areas due to the height of cuts and embankments, and the extraction of construction material; and
• soil pollution due to accidental spills of fuel, grease and oil in machinery and equipment operating yards.

For each of the above impacts the phases of the project in which they could arise and the specific place or area affected were identified and their corresponding mitigation measures were proposed. The impacts were graded by intensity and extension; reversibility; duration, and whether they were adverse or beneficial, cumulative, avoidable or unavoidable.

RESULTS AND IMPLICATIONS

Once the EIS was completed, it was delivered to the project proponent who had it revised. In accordance with the study's results, proposed measures to be taken and conclusions, the proponent determined that some aspects of the project design should indeed be analyzed once more and modified to avoid significant environmental impacts. This was the case of the proposed sites for dumps, that would have been located in canyons, streams, rivers, Pinus and Quercus woods and areas of desert scrub, among other sites.

A study was also proposed of the technical and economic feasibility of transporting material remaining after excavation and general earth movement to quarries to be used in restoration work. This analysis has not yet been performed because the construction of the highway was postponed and, therefore, it is not known if the proposals will be taken into account. The project proponent has, however, delivered the environmental impact statement to the National Ecology Institute for review and report. At the time of writing the terms of the report were being examined by the Federal Highways Bureau.

It must be said that although this highway is included in the Communications and Transportation Sector between 1995-2000 Development Programme, it apparently is not currently a priority project which is why a date has yet to be set for its construction.

Projections made before 1994 for the highway kilometres needed by the country and the investments required to build them have not been met partly due to the economic crisis which began towards the end of 1994.

Construction costs exceeded forecasts, tolls charged by lessees were very high and traffic flows turned out to be much lower than forecast. Once again the federal government had to take charge of these highways to avoid damage and to promote use by drivers.

Against this background, it is understandable that priority is being given to what are considered strategic projects. Since there currently is a toll-free highway linking the city of Durango with

the Pacific Coast, an alternative route already exists; but it is not a high-specification link and journey times are considerable due to the difficult topography of the terrain.

In conclusion, it may be said that this particular environmental impact statement was prepared properly and in a highly exhaustive fashion but that the project has not gone ahead due to reasons unrelated to the corresponding environmental report.

LESSONS LEARNT

In Mexico, there have been significant progress made with respect to EIA but much remains to be done in certain areas. For example, assessments must be made in parallel to the planning of projects in order to integrate environmental protection measures and to estimate their potential monetary costs. This goal currently seems unlikely because projects are normally analyzed in the final stages of their design.

The consulting group carrying out an environmental impact statement should participate in the follow-up stage to support the project proponent in the implementation of mitigation measures. This is not the case today because regulations do not require it and the authorities responsible for overseeing compliance with reports do not have adequate resources to supervise all works accepted or conditioned.

Challenges of EIS preparation

There must be greater awareness/understanding of environmental impacts, both on the part of project proponents and certain consulting groups and authorities, of the importance of such studies in preventing harm to the environment. In Mexico the time and money set aside for these studies remains limited and there have been problems with excessive commercialization, poor quality reports, unreliable and often dubious data, and a common attitude of going through the motions. Nevertheless, in recent years the Ministry of Communications and Transportation in particular has set aside extensive funding for the preparation of environmental impact statements for various highway corridors in different states of the country and this has allowed the particular environmental impacts of each one to be identified and the measures to avoid, minimize or compensate for them to be proposed.

Mitigation Approaches

Unfortunately, some highway lessees did not correctly implement the proposed mitigation measures, with the result that the actions they took – for example to stabilise tall and steep faces of cuts using sprayed concrete – are not having the required effect (avoiding rock falls). In this specific case the impact on the landscape is visually catastrophic. Such actions are usually less expensive and more readily achieved than stabilisation using replanting with appropriate species. However, in the long term, their maintenance costs rise considerably. On some highways these errors are being corrected; one short-term goal would be for construction companies to prepare realistic budgets not only for the construction of works but for the implementation of mitigation measures and the restoration of affected areas, such as quarries. In addition there must be much closer oversight both by the project proponent and the competent authorities. In the case of public sectors, there must be a change in the Acquisitions and Public Works Act by loosening the tight restrictions placed on available funding, environmental impact studies and construction projects.

4.0 Conclusion

Highway construction is a major project that requires carrying out and EIA. This case study elucidates the processes, stakeholders and challenges faced by proponents when trying to carry out an EIA study. The implications of certain development/projects are identified and suggestions for mitigation are proposed for the assessment by the EIA regulators.

5.0 Summary

In this unit, you have study the EIA case of a Mexican Highway Construction. You have learnt about the processes, approaches taken, implications of activities, challenges of preparing environmental impact statement and other lessons.

6.0 Tutor-Marked Assignment

1. What are the major areas of discussion highlighted in the study?
2. List the potential impacts identified from the study
3. List and identify the roles of the stakeholders in this study?

7.0 References/Further Readings

Secretaría de Comunicaciones y Transportes. Subsecretaría de Infraestructura. Dirección General de Carreteras Federales. 1995, Manifestación de impacto ambiental modalidad general de 105 km de la carretera Durango-Mazatlán, tramo Durango-El Salto, en el estado de Durango, Final EIS written by Pisanty, L. J. México. 189 p.

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Unit 2: **Environmental Appraisal of Bodhghat Hydroelectric Development Project**

CONTENTS

INTRODUCTION

In this unit, you will study a case of an environmental appraisal carried out on a Hydroelectric power project. It focuses on the implications of the project for the wilderness values of the project area. The study also presents an account of how public pressure, legislative framework and EIA procedures and practices have been effective in arresting a major ecological disaster even when EIA was not a mandatory requirement in India for determining the project feasibility. This case study represents a situation that is unique in the way in which the development projects are generally pursued in developing countries, India included.

In most cases, once a project is conceived, it is pursued to the end without considering environmental impacts. At the most, what is really attempted is the mitigation of the impacts. The mitigation planning rarely takes into consideration the formulation of strategies that can be effective in mitigating all of the social and ecological impacts that are considered to be significant. These assessments which ignore the socioeconomic concerns and biodiversity impacts of the project often fail to produce a timely decision on the project implementation. Consequently, this project has been amongst those few projects in India that was abandoned even after the project had made a sufficient headway on the grounds that the environmental appraisal failed to justify its recommendation.

2. Objectives

At the end of this unit, you should be able to

- identify the challenges of environmental appraisal
- describe the processes involved in the project
- describe the impacts of the development on the environment

3.0 Main Content

PROJECT BACKGROUND

The Bodhghat project is a river valley project, involving the construction of a major dam on the Indravati River in Bastar district. This project, conceived as a precursor to a series of dams, (Kutru I and II, Nugur I and II, Bhopalpatnam and Inchampalli) was planned on the Indravati River near Barsoor a village (19o12’ latitude and 81o24’ longitude) situated about 100 km from Jagdalpur, the headquarters of the Bastar district (Figure 1).

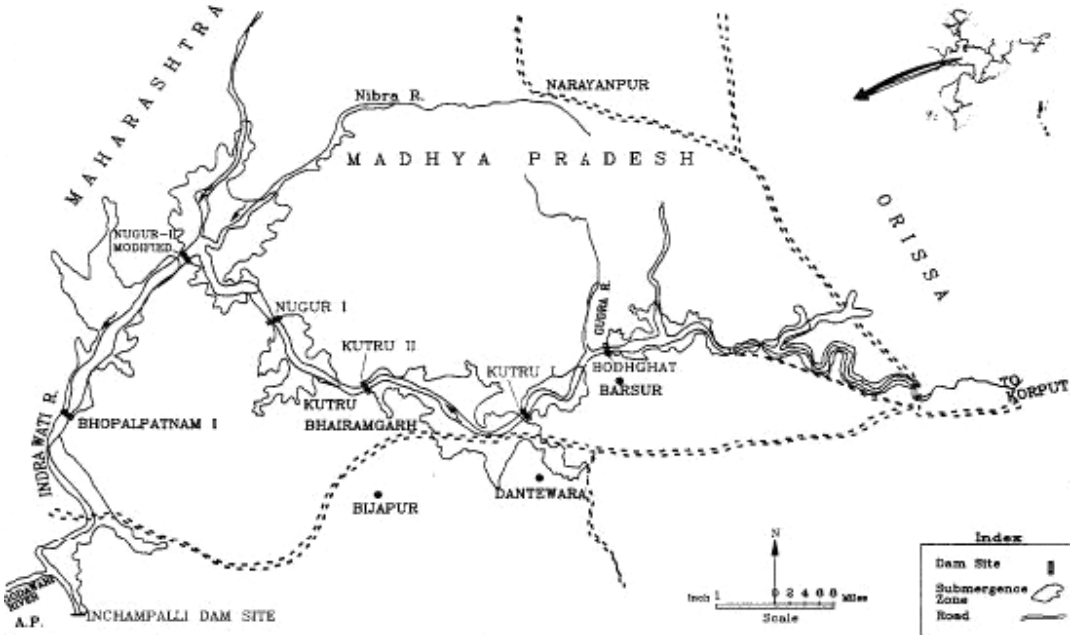


Figure 1: Bodhghat and other proposed dams on the Indravati River

The project involved the construction of the following :

• A composite dam of a total length of 1720 m at the dam top level consisting of a 855 m long and 90 m high concrete gravity dam and fill dams of 500 m and 365 m lengths on the left and right flanks respectively.

• A 3 km long (with 12.5 m diameter) head race tunnel.

• A 5 km long tail race canal.

• A surface powerhouse to support 4 generating units, each of 125 MW.

This project was designed as a peaking station with an installed capacity of 500 MW (4 units of 125 MW) to provide a large peaking potential to the power station of M.P. State. The total land requirement for the project was 13 783 147 ha of which 5 704 332 ha comprised of forest land. The forest area was made up of areas under Reserved Forest, Protected Forest and Undemarcated Forest (also referred to as Orange Areas). The project involved the displacement of nearly 10 000 tribal people from 42 villages.

NATURE AND SCOPE OF ISSUES

• The Bodhghat Dam was particularly regarded as environmentally damaging because its functional effectiveness was directly linked to the projects proposed downstream. Together, these projects could impose a great stress on the ecology of the Indravati Tiger Reserve,

Bhairamgarh Wild Buffalo Sanctuary and other surrounding habitats of Indian wild buffalo (Bubalis bubalis).

• The dam would result in the forced displacement of some 10 000 tribal people whose sustainable way of life based on a mixed economy of agriculture, herding, fishing and forest use would be entirely destroyed.

• The project would also lead to the inundation of a large area of forest, a resource fundamental to tribal people and whose dependency on the resources from forest is almost total and complete. The consequential movement of people into the forest interiors that are currently free from biotic disturbance would pose the major threat to the relatively undisturbed tracts of the forest and the wildlife habitat.

• The project would result in a total loss of 20 000 hectare of wildlife habitats.

• The non availability of cultivable land and the wood lots for meeting the resource needs of people for fuel wood, timber, food and fodder would have adverse effects on people driven from the project area.

• The entire project area, which provides an ideal setting for designation as a 'Biosphere Reserve' owing to its biological richness and its pristine nature, would become open to ecological destruction.

• The Bodhghat project would inevitably lead to the justification and the imposition of Bhopalpatnam, Inchampalli and the other projects located downstream.

PROCESS AND PROCEDURAL CONTEXT

At the time of development of the proposed project, legislation for mandatory EIA did not exist in India. The environmental appraisal of projects till the late seventies was based on a formalized scrutiny of proposals generally conducted by the Department of Environment (DOE). With the promulgation of the Forest Conservation Act in 1980 and the formulation of Environmental Guidelines by DOE for River Valley projects in 1984, and the enforcement of the Environmental Protection Act in 1986, the environmental appraisal of the river valley projects became a more focused effort to ensure the adherence of the developmental planning to the legislative framework that gradually emerged.

This project with an estimated cost of Rs.209.3 crores (equivalent to US$50 million approximately) was accorded investment approval in the year 1979 by the Planning Commission, Government of India. The project was subsequently granted clearance by the Department of Environment (DOE), Government of India, in 1979. The project was to be completed within a period of six years from the date of its approval by the Government of India but could not progress due to the paucity of funds. The Government of India subsequently decided to submit the project for financial assistance from the World Bank and accordingly a revised project report was submitted to the World Bank in April 1983 with revised cost estimates. In 1984, the World Bank approved the loans totalling US$300.4 million to the project after a brief appraisal mission had evaluated the financial and technical aspects of the dam. The project in its revised form was again submitted to the Government of India for clearance from the environmental angle. With the Promulgation of the Forest Conservation Act

(FCA) in 1980, the project was also required to obtain clearance under the FCA. On the insistence of the Department of Forest, the DOE constituted a working group, which visited the site in 1985 for the environmental appraisal of the project. Subsequently, the DOE granted conditional clearance to the project with the provision that the project should be submitted to a professional agency for an independent evaluation of its impacts on the floral and faunal values that are critical for conservation.

In the mean time, the project also came to the limelight in the wake of belated concerns about the ecological balance voiced at the national level in different forums particularly after the controversy over the Silent Valley. The project also led to widespread discontentment amongst the people of the area because of the rehabilitation package that was visualized. Resentment against the dam also started building among the NGOs, the environmental lobbies, welfare societies and individuals who forwarded their representations for stopping the project to the Prime Minister of India. As a result, the Government of India (GOI) was forced to consider all the representations received by the Prime Minister's Office from different agencies/organizations. A special committee was constituted in 1987 under the then Secretary for Environment & Forests, Government of India, to relook at the environmental and social issues related to the project.

At the same time DOE, Government of India, directed the Wildlife Institute of India (WII) to undertake the environmental impact assessment of the project with a view to provide an independent assessment of the impacts on the wildlife and forests. The study was initiated in October 1989 and was completed in April 1990.

APPROACHES TAKEN

Besides adherence and compliance with environmental regulations and guidelines, proactive and participatory methodology on and off field was adopted. For the preparation of EIA report, primary and secondary data and information were generated through systematic field studies. The field studies primarily focused on:

• assessment of the impacts of the project on biophysical environment;

• assessment of the status of wildlife habitats with special reference to wild buffalo habitat;

• assessment of the human dependencies on natural resources of the project area;

• review of the impacts of the project on wildlife values and the socioeconomic status of the resource dependent community; and

• review of the rehabilitation policy for project-affected people.

Field investigations were made at all sites likely to be impacted by the construction of the proposed dam. These included areas under submergence, downstream areas of the dam, and the sites of powerhouse location and the access roads and areas outside the submergence zone, which could ultimately become the receiving area for displaced wildlife and human population.

Consultation with local and national agencies, both governmental and nongovernmental, was used as an aid to supplement the field based data and information.

RESULTS AND IMPLICATIONS

This section highlights the significant findings of ecological assessment and socioeconomic surveys conducted by the team of the Wildlife Institute of India.

Conservation values of the project area

Forests of Bastar fall under 'Southern moist tropical deciduous' and 'Southern tropical dry deciduous' forest types (Champion & Seth, 1968). Bastar forests are unique in the country where sal (Shorea robusta) & teak (Tectona grandis) mixed with bamboo forests occur together on an easy terrain with favourable growing conditions. The forests of the project area are predominantly composed of miscellaneous forests. The upper canopy is distinctly composed of Anogeissus latifolia, Buchanania lanzan, Lagerstroemia parviflora, Garuga pinnata, Chloroxylon swietenia and Cassia fistula. The average height of the forest ranges between 18 to 20 metres and the average tree density is 695 per ha. The dense forests on the slopes and valleys and riparian forests and grasslands along the Indravati and its tributaries form excellent habitats for diverse wildlife.

The forests of the project area are home to a wide variety of wild animals. The area offers an excellent habitat for the carnivores such as tiger (Panthera tigris), leopard (Panthera pardus), hyena (Hyaena hyaena), and jackal (Canis aureus) and the herbivores such as spotted deer (Axis axis), four horned antelope (Tetracerus quadricornis), barking deer (Muntiacus muntjak), Indian bison or Gaur (Bos gaurus) and the critically endangered wild buffalo (Bubalis bubalis). Some of the other mammalian species of conservation importance occurring in the project area include the giant squirrel (Ratuffa indica) and the smooth Indian otter (Lutra perspicillata).

The Indian wild buffalo is an endangered species listed in Red Data Book (IUCN 1994). Its numbers have dwindled dramatically since the early forties in the Central India. Today, four relict populations are known from Bastar district. Of these, two populations occur in the Protected Areas located in the vicinity of Bodhghat and other projects proposed downstream. The largest is in the Indravati National Park with a little less than 100 individuals recorded in 1988. A second population is 60 km upstream on the Indravati river at Bhairamgarh Wildlife Sanctuary comprising of about 10-20 individuals (Divekar & Bhushan, 1988). The wild buffaloes of Bastar are considered to be the purest wild genetic stock and their conservation is therefore critical.

Ecological issues

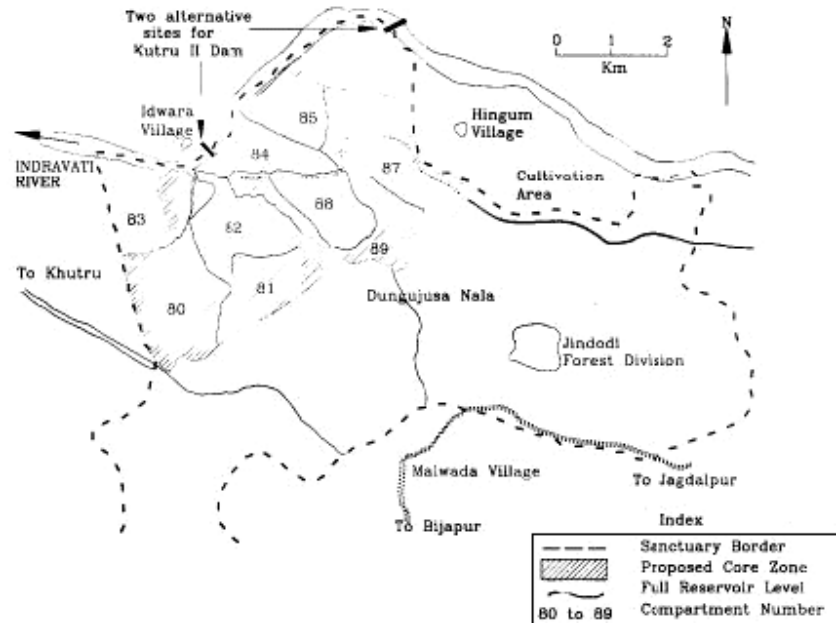


Figure 2: Submergence of the wild buffalo habitat within the Bhairamgarh Wildlife Sanctuary would be an immediate consequence of the Kutru 11 project

Bodhghat Hydroelectric project is expected to cater to the peaking power requirements in the evening. All the four turbines will operate together during the evening hours resulting in heavy discharges that would be many times the rate of normal lean summer discharge. This sudden increase in water discharge would result in the flooding of the grassland habitats within Bhairamgarh Wildlife Sanctuary located 60 km downstream of the project location. Based on daily schedules of the turbine operations and discharges into the river, it is anticipated that the grasslands in Bhairamgarh Sanctuary would be flooded between 8 pm and 11 pm. This would coincide with the main foraging time of wild buffalo in summer, when such river bed grasslands are their critical food resource. The changed water discharge regime due to the project will thus severely jeopardize wild buffalo habitat in Bhairamgarh Sanctuary. This is particularly so because, out of the total areas of the Sanctuary the prime wild buffalo habitat is only about a fourth of this area falling in compartment numbers 80 to 85 and 87 to 89 (Figure 2).

The enormous quantity of water held here in the reservoir of Bodhghat project will naturally be the justification for more downstream hydroelectric projects. It is also a known fact that five hydroelectric projects (Kutru I, Kutru II, Nugur I, Nugur II and Bhopalpatnam) are planned on the stretch of Indravati that is upstream of the proposed major multi purpose project at Inchampalli on the Godavari near its confluence with the Indravati (Refer Fig. 1). From the preliminary details that were made available for these proposed projects (Anon, 1988), it is seen that if Kutru II Dam were constructed at the site proposed near village Idwara, it would almost entirely submerge the prime wild buffalo grassland habitat along the river in the compartments numbered 84 and 85 (Figure 2).

Further, all these five projects are so planned that the discharge level from the tail race of the upstream project would be nearly at the same level as the Full Reservoir Level (FRL) of the immediately succeeding downstream project (Fig. 3). This would mean that almost the entire length of the Indravati River from the location of Kutru 1 project to Bhopalpatnam Dam would

no longer remain natural. The series of reservoirs that would be constructed would completely isolate the areas to the north and west of the Indravati River from those on its south and east. Moreover, almost the entire stretch of the rich riparian wildlife habitat would be submerged. Thus, both from the point of view of the prime habitat loss and the disintegration of movement corridors, this series of dams would cause irreparable damage to the ecology of the area and to the wildlife buffalo in particular.

Socioeconomic issues

The Tribes of Bastar, as any other hill tribes, have an affinity to the forests in which they live. Their sustenance is closely inter-woven with the forests. Over 90 per cent of the people inhabiting the watershed belong to the tribal community that comprises the Bison Horn Maria, Jhoria Muria and Raj Muria Tribes. These tribes inhabiting the project area predominantly derive sustenance from forest resources. A calendar of the activities of the people of the project area establishes the intricate relationship that the people of the project area have with the forest in their immediate surrounds (Table 1).

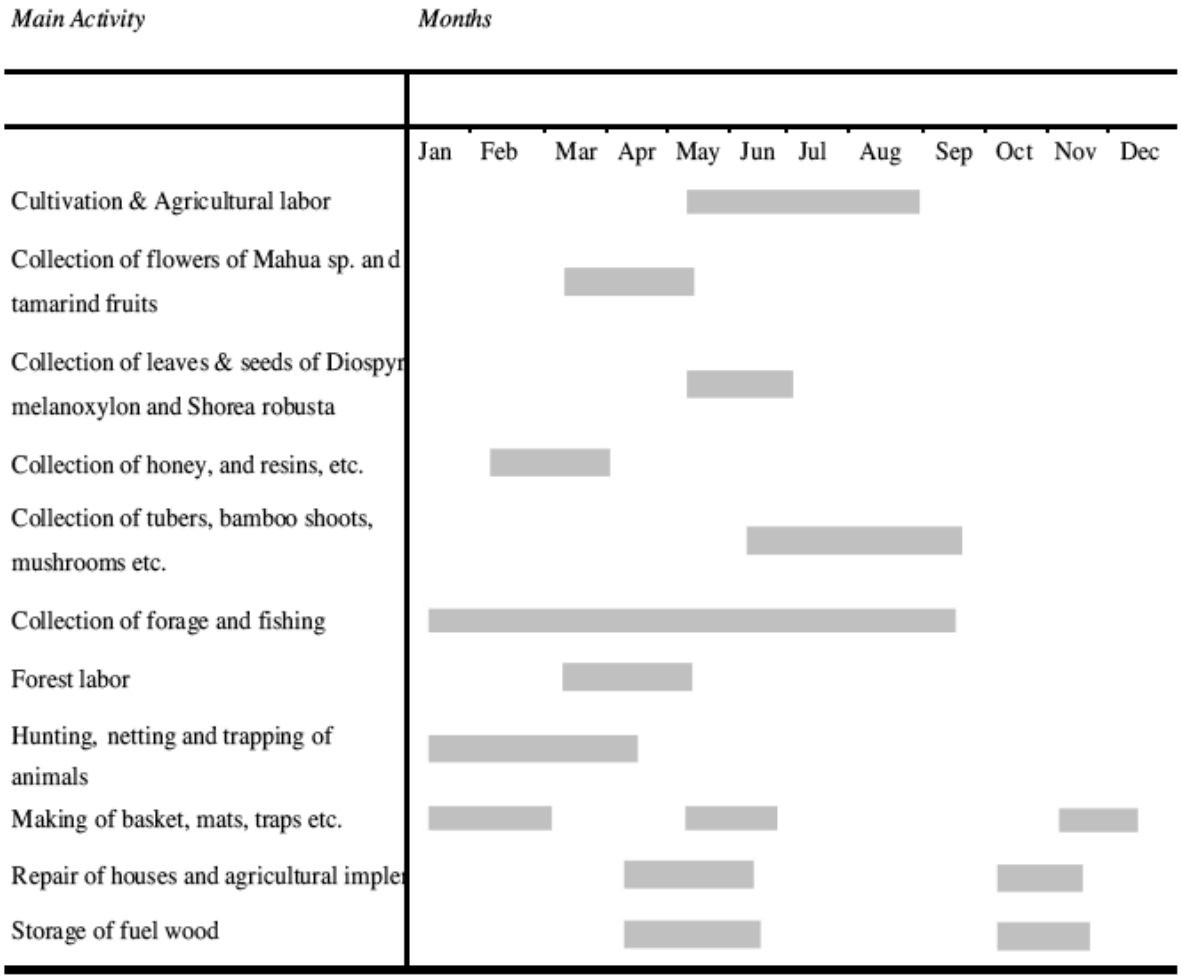


Table 1: Seasonal calendar of the activities of the people in the project area

The results of the socio-economic surveys further indicate that agriculture provides only about 50 per cent of the sustenance. The remaining 50 per cent of sustenance is based on consumption

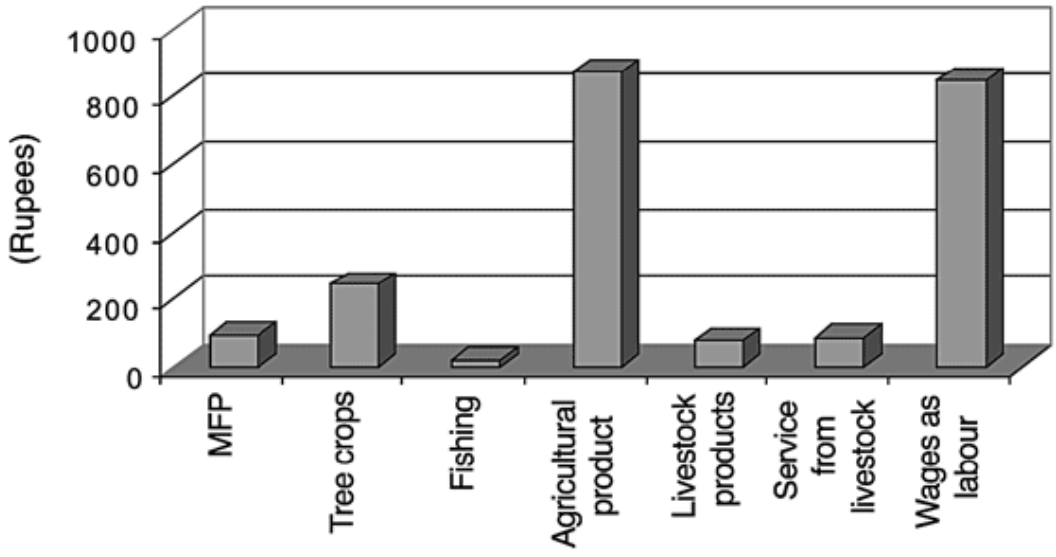
of forest resources and on goods and services provided by the common property resources (Figure 4).

The combined income from the sale of Minor Forest Produce (MFP) and products like baskets, mats, ropes and plates made out of the raw material collected from the forest is insignificant and is variable among the villages located in the forest interiors and the distant villages. The resources of prime importance for consumption are the fuel wood and the forest food (Figure 5). Fish and meat obtained from hunting gathering lifestyle and also through the traditional practice of community hunting (locally referred to as 'Parad') additionally supplements the food resources from the forest.

Dependence on the forest for livestock grazing is almost complete as the total livestock population belonging to the villagers of the project area graze in the forests of the proposed submergence zone. Although estimation of fodder in terms of quantities removed from the forest was not made during the course of our study, fodder beyond doubt constitutes the single largest forest resource on which the people who own the livestock heavily depend.

Since the economic well being of the people of the project area is dependent on the sustenance driven demands from the forest resources, the implementation of the Bodhghat Hydroelectric project would inevitably threaten the existing and intricate relationship of the people with the forest.

The fact that Bodhghat project does not have an irrigation component failed to evince any special interest among the people of the area who would have seen the project in the different light if it would have offered to them irrigation possibilities in its command areas. The obvious scenario that would emerge in the event of the project being implemented is the generation of the power at the project site for transmission to northern industrial districts of M.P. that are completely removed from the project induced impacts and the ground realities. While these northern districts would reap the economic benefits of power-driven industrial expansion, the people of the project would suffer from underdevelopment resulting from the lack of the political will to promote village development programmes in areas likely to be submerged in the event of the project's implementation.



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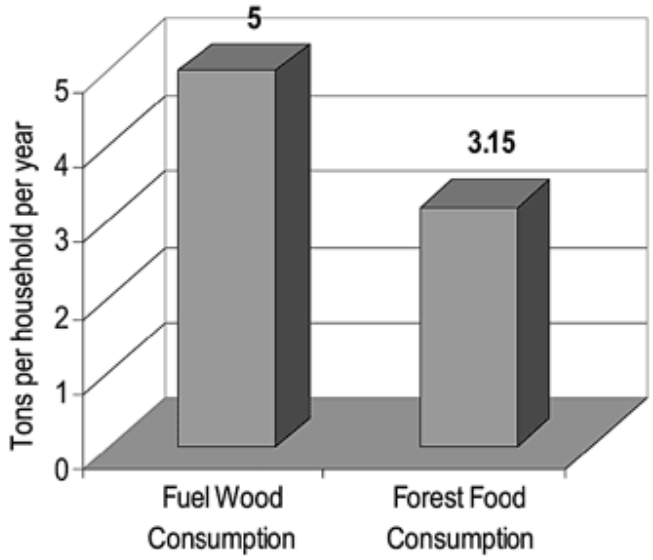
Average income of the people of the project area from different sources



Consumption of major forest resources by the tribal population of the project area

The review of the rehabilitation policy provides another distressing picture because there appears to be a repetition of the blunders that in the past have caused most rehabilitation programmes to suffer from inherent failure to promote productivity of land. The rehabilitation sites for people displaced by the project have been carved out by scarifying the existing areas under the village commons. This would obviously place greater demands for resources on remaining areas under the commons leading to the decline in the productivity of land. This would also lead to a fall in the per capita share of goods and services from common property resources as a larger number of people would be forced to share a much reduced area due to appropriation for rehabilitation.

The smaller agricultural holdings at the new sites would not be able to sustain the people in the long run. This is obvious as the agricultural income from still smaller parcels of land may not suffice to meet other resource needs (MFPs, fodder for livestock, timber for housing and forest food) of the people who would require financial investment in the changed scenario.

Common knowledge and experience of other projects suggest that stressed man-to-land ratio at the rehabilitation sites and resource crises would force people to encroach upon forest interiors that would inevitably become open to biotic pressures (Rajvanshi 1994). The direct impacts of submergence of wildlife habitats and the degradation of remnant habitats due to the sudden influx of people should be considered to be the most obvious implication of the project and one that would severely threaten the integrity of the wildlife habitats and the viability of the populations of some of the highly endangered species of central Indian fauna.

KEY CONCLUSIONS AND IMPLICATIONS

From the EIA studies conducted by the Wildlife Institute of India, it could be concluded that the ecological and social impacts of the Bodhghat project far outweigh its economic benefits. In view of the findings of the ecological and socioeconomic assessment undertaken by the WII team and the independent observations of the Special Committee of the Government of India that visited the project site in 1987, the project could not be granted clearance under the Forest Conservation Act (1980). As a result, even the environmental clearance that was granted on the

condition that the project would have to first obtain clearance under the FCA (1980) was revoked in 1994.

The rejection of the project came in 1994 after a substantial progress was made in the construction activities at the proposed site in the anticipation of the forest clearance coming through. The construction work that was completed prior to the rejection of the project included the construction of storage facilities, township and residential colony, health and educational centre for the staff, downstream bridge across the Indravati River, approach channels to intake structures up to the head race and the two additional tunnels to the head race tunnel. The excavation works that were completed prior to the decision on clearance of the project included powerhouse excavation and the dam foundation.

Lessons Learnt

• The importance of economic and engineering paradigms in development alone can not lead to sustainable development and economic prosperity. A better understanding of the interplay between development and the natural environment in which development takes place is necessary at the time of project planning to ensure environmental security and economic prosperity.

• The environmental impact assessment process highlights the need for paying greater attention to cumulative and synergistic impacts viewed from the standpoint of the ecosystem and the fact that the project will be a precursor to several similar projects in the area.

• The habitat trade-off analysis can be a significant issue in decision making.

• Sustainability principles need to be included in the methodological guidelines for the conduct of EIA and adequate significance needs to be given to biodiversity impact issues.

• Good EIA requires careful handling of the socioeconomic dimension particularly if these are linked to resources that are expected to be diverted to the project.

• The project has little chance of success if it runs counter to, or ignores, the traditions, values and social organizations of the intended beneficiaries or if its objective is too removed from fulfilling their every day needs.

• Public pressure can often help environmental conservation especially if political will is wanting or found wavering.

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4.0 Conclusion

The case studied indicates the importance of carrying out an EIA on a major project. The results indicated that the ecological and social impacts of the Bodhghat project far outweigh its economic benefits. One of the lessons learnt in this case study is that local consultants should be more involved in the development of the methodology and in the assessment as a whole.

5.0 Summary

In this unit, you have learnt about the EIA of a power industry-Bodhghat, India. You have learnt about the processes used, their approach and the implications for carrying out an EIA.

6.0 Tutor-Marked Assignment

1. What are the environmental issues encountered in the project?
2. How where the problems mitigated?
3. What options were available in order to correct future challenges?

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Unit 3: **Case study of EIA of Midlands Dam Project, Mauritius**

CONTENTS

1.0 Introduction

The Midlands Dam project involves the construction of a 42 Mm3 reservoir in two phases (25 Mm3 + 17 Mm3) to enable the transfer of water from the relatively wetter central part of the country to the drier northern districts. As legislative requirements provide for the preparation of an environmental impact assessment for projects that may have adverse effects upon the environment, the proposed development was subjected to the statutory EIA process. The main objective was to provide for a formal mechanism to ensure that the proposed development is environmentally sound and sustainable and that the concerns of all affected parties were thoroughly addressed. It aimed at enhancing project acceptability by maximizing the benefits while minimizing adverse impacts. The process was also encouraged by aid donor agencies and countries as they are increasingly relying on EIAs to arrive at better informed decisions. The reservoir project was initiated in response to the growing demand for water in the northern districts of the island. This region has in fact witnessed an above national average rate of urbanization over the past two decades and present water storage capacity needs to be increased to satisfy future water demand for residential, irrigation and industrial purposes. The dam will

upon completion be the largest in Mauritius and will involve the construction of an embankment-type earth fill dam founded on natural ground, a spillway structure, an outlet canal, and a new road to replace those feeder roads that would be flooded. The project will also entail significant quarrying activities close by to provide for aggregates.

2.0 Objectives:

At the end of this unit, you should be able to:

- identify the challenges of carrying out an EIA
- list the environmental issues and the approaches taken
- explain the relevance of the stakeholders to the project

3.0 Main content

NATURE AND SCOPE OF ISSUES

The dam and reservoir sites involved represent little ecological interest, except as the last known natural habitat for an endemic plant, the Crinum Mauritianum, which has been the focus of research in cancer treatment. The sites also support the last few remaining natural populations of the rush (Juncus Bulbosus) in Mauritius. Water quality issues were, however, considered more significant taking into account national physical development planning proposals to allow urbanization of sections of the reservoir's catchment area. In terms of land conversion, the project was considered to be in line with government policy to convert land presently under tea to more profitable uses. Of the 438 hectares of land that would have to be flooded, 410 hectares are forest/scrub land. With adequate mitigatory measures, environmental protection policies would be largely satisfied. The most sensitive issue, however, related to the relocation of about 240 people, all squatters on an abandoned tea village that would be flooded. The off-site impacts were also considered to be significant enough to warrant investigation. Such impacts related to reduced water flows downstream, increased sewage volumes as a result of improved sanitary facilities, and increased agricultural production following increased availability of irrigation water.

PROCESS AND PROCEDURAL CONTEXT

After nearly two decades of unparalleled and sustained high rates of economic growth, there has been growing concern that the fragile environment of the island may have been severely degraded and that, if corrective actions are not introduced immediately, future economic development may be jeopardized. In the late eighties, the Government adopted an environmental action plan thereby committing itself to sustainable development. Such commitment was further stressed at international meetings and by actively participating in a number of international programmes. The Government's aims are, specifically, to:

• increase efforts to mitigate the adverse effects of environmental degradation;

• monitor environmental performance of industries, commercial concerns and the agricultural sector; take strong and pro-active action on emerging environmental issues facing the nation;

• build partnerships with community groups, non-governmental organizations, business and industries; and

• facilitate public awareness and provide educational opportunities for people to learn about conservation and sustainable human development.

The enactment of the Environment Protection Act (EPA) in 1991 was another milestone in the country's effort towards sustainable development. In line with provisions contained in Section 13 of the Act (as amended in 1993), ElAs are therefore being increasingly introduced into the national decision making process and are basically aimed at alerting the decision-makers to the consequences of the proposed development for the environment. The process is also applied with regard to more vigorous policies enunciated by international funding agencies and aid donor countries who want to ensure that development projects they are funding do not conflict with local environmental protection objectives. This follows Principle 2 of the Rio Declaration on Environment and Development which stresses the responsibility of nations to avoid causing damage to the environments of other nations.

The impact assessment carried out in connection with the project under reference is furthermore structured along several internationally accepted principles which emphasize preventive, holistic, strategic approaches to environmental protection. It is thus guided basically by four principles laid down in the EU Programmes on the environment, namely:

• prevention is better than remedial measures;

• environmental damage should be rectified at the source;

• the polluter should pay the cost of measures taken to protect the environment; and

• environmental policies should form a component of other policies.

EC Directive 85/337 contains information on the methods used in environmental impact assessment. The guidelines laid down by the World Bank have also been extensively utilized to determine the significance of potential impacts of development projects. Finally the principles laid down by local regulations have been adhered to.

APPROACH TAKEN

The impact assessment followed a scoping stage undertaken by a different consultant. Though the findings of the scoping team enabled the EIA team to focus their attention on a certain number of issues, GIBB Environmental (UK) decided to carry out a full project screening exercise. Sessions were arranged with almost all interested parties, which included government departments, NGOs, individual scientists and other consulting firms. A report summarizing the meetings and the findings was produced and circulated among a restricted group of interested parties. Once the Consultant was certain that no significant element was missing, the full EIA was prepared and a draft report produced. The Client was required to submit comments and once feedback was obtained, the report was finalized. As required by law, the final report was submitted to the Department of the Environment for approval. This process included a 21-day public consultation and comment period.

In preparing the report, the Consultant made use of a couple of local consulting firms. This is in line with recommendations of organizations like the World Bank which try to encourage greater

participation of local expertise in major projects with a view to enhancing local capabilities. Other foreign teams were pulled in to constitute a multi-disciplinary team with varying experience and skills. As Mauritius does not have an established and easily accessible environmental base line data bank, the approach adopted was based on the 'best professional judgment' methodology. Such an approach makes the best use of each team member's experience and develops appropriate mitigatory measures to reduce any potentially significant impacts on the environment.

The project does not seem to have generated much controversy and approval was fairly easy to secure. More interestingly, somehow dams and reservoirs are not included in the scheduled list of undertakings requiring full EIAs when the necessary legislation was prepared. Technically this project should not have gone through the EIA process and the Department of Environment was therefore rather confused in dealing with the report. It nevertheless decided to pass the report given that the funding agencies were expecting such an approval before giving their final approval.

RESULTS AND IMPLICATIONS

The EIA study concluded that the project was not in serious conflict with any major national physical or environmental protection policy. The on-site or off-site impacts identified were of varying significance and these could be adequately mitigated to reduce any threat to the environment. The three main areas of potential conflict that were identified are: protection of agricultural land against threat from other uses, protection of vulnerable habitats and rare species, and national physical planning policies that provide for urbanization of sections of the proposed catchment area of the reservoir.

The environmental management plan developed in the assessment specifically called for greater coordination among interested parties to try to monitor certain impacts. Deeper investigation was required to determine how the plant species that has an international importance and that is threatened can best be protected. The report assumes that the plant can be transferred to identical sites elsewhere and returned to the original site once the project is completed. But there is a chance that this procedure fails, in which case the whole reservoir project may be jeopardized. This issue was not dealt with at the EIA stage and it appears that it was conveniently assumed that the plant can be easily propagated.

This is typical of many EIAs prepared worldwide. In fact, many surveys have gathered evidence to show that a large majority of environmental assessments are unsatisfactory. There are numerous explanations for this, but the main argument relies on the premise that the environment is so complex that it is virtually impossible to predict all the impacts of a project. Impacts, in fact, have four main characteristics: they can be on-site (affecting the site where they are generated), off-site (affecting sites away from source), intertemporal (manifesting themselves at a future time) or be a combination of all three. The paucity of data complicates matters and in the absence of reliable data on a number of environmental issues, it is difficult to use most of the methodologies developed so far in environmental impact assessment studies. Of all the environmental impact assessment methods developed so far, the matrix remains the most effective way of determining the significance of the impacts a project may have on the physical and socioeconomic environment.

The analysis of impacts is made with the help of a matrix including on one axis the actions which cause environmental impact and on the other existing environmental conditions that might be affected. This provides a format for comprehensive review to remind the investigators

of the variety of interactions that might be involved. It also helps in the identification of alternatives which might lessen impact. Two aspects of each action come into play:

• the magnitude (degree, intensiveness, or scale) of the impact upon specific sectors of the environment; and

• the significance (weight) of the particular action on the environmental factor under analysis.

While the magnitude of an impact can be evaluated on the basis of facts, evaluation of the significance of impact will be based more on value judgments.

Assessments based on matrices therefore remain at best very subjective. In fact, significance has to be determined against accepted norms and standards. This implies the definition of a threshold, which unfortunately in Mauritius is yet to be precisely determined.

Furthermore the EIA relies on coordination and comprehensive decision making styles for its success. But one has to bear in mind that comprehensive decision-making is faced with two main sets of impediments: one is made up of constraints imposed by existing institutions and attitudes, while the second concerns limits imposed by the way decisions are made in both the government and private sectors. Current institutional biases and thinking run counter to principles of comprehensive decision-making. Integrated environmental management is a multidisciplinary exercise requiring inputs from a whole range of departments and experts.

Expertise means narrow and specialized expertise. A multi-disciplinary team of experts does not, therefore necessarily provide a comprehensive view of an issue. Only a few persons, by training, experience and predilection can engage and promote comprehensive environmental decision-making. The other problems concern the fragmented way in which individual policies evolve. Incremental decision making is considered a more pragmatic approach because of no clear evidence of man's capability for objective rationality. Problems are dealt with one at a time, through trial and error. Other government agencies/departments/ministries are trying hard to retain their independence to make individual decisions.

Lessons Learnt

The whole EIA process with the scoping exercise has proven to be rather inadequate in dealing with broader environmental management issues. The introduction of strategic impact assessment in the process would go a long way to providing the appropriate framework for project-specific assessments to be carried out. Issues related to cumulative effects, greenhouse policies and sustainable development are probably better addressed at the SEA level. The project-specific EIA is also unable to deal with matters such as the cumulative effects of a number of projects of different types. Since the inter-temporal nature of impacts is difficult to comprehend within the EIA of a single project, the introduction of regional environmental plans (REPs) can significantly contribute towards a better coordinated action in environmental management of a region. Such a REP process can also help establish a solid data base by coordinating the collection, storage and the dissemination of data, the paucity of which hinders the proper assessment of impacts due to the absence of an adequate environmental baseline.

Furthermore the local consultants should be more involved in the development of the methodology and the assessment of impacts as a whole. As it is, local expertise is used in marginal tasks only (as in data collection). Such an involvement does not contribute towards local capability development and this is contrary to accepted international principles.

4.0 Conclusion

The case study described the Dam project in Mauritius which was to enable the transfer of water from one part of the country to the other. During the EIA process, water quality issues were considered more important during physical development. The environmental protection regulation, EPA Act (1991), played a key role in ensuring that proposed activities do not harm the environment.

5.0 Summary

In this unit, you have learnt about the EIA case study of a Dam Project in Mauritius. You have learnt about the nature and scope of the project, processes, the approaches taken, the results and the implications of carrying out the EIA.

6.0 Tutor-Marked Assignment

1. Identify the challenges of carrying out the EIA on the Dam project
2. List the environmental issues and the approaches taken to mitigate the problems identified
3. Explain the relevance of the stakeholders to the project

7.0 References/Further Readings

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UNIT 4: Case study of an EIA in Finland, development of Highway 1 (E18)

CONTENTS

1.0 Introduction

The national Highway 1 is part of the European road E18, which is the most important east-west road corridor in Finland. The E18 is a central element of the Nordic Triangle, which links the Nordic capitals to each other, to Russia and to central Europe, and it is part of the TEN network.

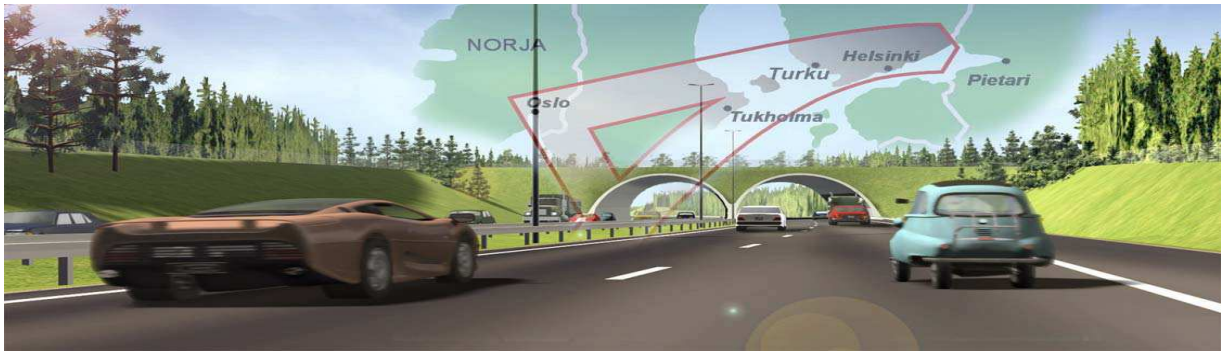
The section of Highway 1 between Salo and Lohja (63 km) is narrow, winding and unsafe. According to the Finnish Road Administration, the road is running short of capacity. Already in the 1960s, the Road Administration began planning to develop this highway to a motorway standard. A preliminary design with several alternatives was completed in 1988 and in 1990 the Ministry of Transport made a decision on a project for a motorway between Salo and Lohja and chose the alternative for the final design. The Road Administration worked on completing the final design during 1992 and 1993, before Finland joined the European Union in 1995 and before the Finnish EIA legislation came into force on 1 September 1994. However, in accordance with the Finnish EIA legislation, this project was still subject to a mandatory EIA.

2.0 Objectives: At the end of this study, you should be able to

- identify the challenges of carrying out an EIA for this project
- list the environmental issues and the approaches taken
- describe the relevance of the stakeholders to the project

3.0 Main content

3.1 Case study of an EIA in Finland, development of Highway 1 (E18)



In the Finnish EIA procedure the developer first prepares an assessment programme, which contains information on the project, alternatives to the project and how the assessment will be carried out. The assessment programme is already subject to public participation. On the basis of further studies and opinions given on the assessment programme, the developer prepares an assessment report where information on the project and the alternatives are presented, together with a comprehensive evaluation of their environmental impacts. This report is again subject to public comment. The report will be attached to decision-making material. The authorities are not allowed to make any decision on a permit or a plan until the assessment procedure has been concluded. The task of investigating environmental impacts falls to the developer. A coordinating authority is responsible for coordination of the assessment procedure, reviewing reports and related duties..

In this particular EIA the coordinating authority was the Uusimaa Regional Environment Centre.
In the EIA Decree there is a detailed list of different project types that always require the assessment procedure. The list is based on the lists in the EIA Directive (85/337/EC with amending 97/11/EC) and the UNECE Convention on EIA in a Transboundary Context (1991).
The EIA procedure can also be applied in individual cases to a project not included on the list or it can be applied to modifications of a completed project that will probably have significant adverse environmental impact. The Ministry of the Environment is responsible for making these case-bycase decisions on whether to apply the assessment procedure. However, for nuclear power projects it is the Ministry of Trade and Industry who makes these decisions.

Screening
In the case of national Highway 1, the Road Administration was not willing to start the whole design process for the road from the beginning, so there were only two main alternatives in the EIA. The first alternative was a 63 km motorway from Salo to Lohja. The details of the alignment were not fixed and there was the possibility that minor changes would be needed in certain places, mostly because of spots with high conservation value. The other alternative was a *do the minimum* alternative, that is, just upgrade the existing roads. Because of the motorway alternative, it was clear that the project was subject to an EIA, in accordance with the Finnish legislation and the EIA Directive.

Identification and scoping
The new road would pass through important natural areas and would cause changes to both the natural landscape and cultural landscape areas. There were also several important groundwater areas, as well as lakes and rivers, to be considered. The scoping was focused on identifying the most sensitive and important areas and on analysing the changes that would result because of the building of the road. The EIA was focused on national and regional impacts. The most important goal was to determine the impacts of a new motorway and the impacts of just

upgrading the existing roads. The feasibility study had already assessed quite comprehensively the local impacts. However, later it was seen that the EIA paid too little attention to the local impacts. In one area with high landscape values there were some alternative alignments proposed and these were assessed in more detail.

According to the Finnish legislation on EIA, the EIA procedure is also subject to public participation. Several different interest groups were consulted and the opinions were very diverse, depending on the interest group or the location of the group. This was also one of the first EIA procedures in Finland and especially nature conservation associations were actively involved in seeing what the EIA procedure meant in practice.

Baseline data

The earlier investigations and traffic forecasts done during the feasibility study were updated and some new supplementary surveys were made. The existing roads were mapped and biotope mapping was done when needed. Groundwater surveys were also updated and more information on the transport of dangerous chemicals was collected. Potential impacts from noise and emissions were assessed closely and there were inquiries and interviews of local people to assess social impacts. Landscape analysis was done in both rural environments and more densely populated villages. Different scenarios were used to look at impacts on community structure and economics: what factors increase economic growth and what kinds of impacts will they have on employment. Additionally, possible changes in the status of local municipalities and in their physical land use planning were studied.

Impact study and assessment

In the Finnish EIA legislation there are requirements for an EIA report. The EIA report covered the environmental aspects that were determined to be the most significant during the scoping phase. A new motorway has significant advantages and disadvantages. The upgrading of the existing roads however will have minor consequences as compared with a totally new motorway. A new motorway will help ease problems on the existing roads, but just upgrading the existing roads will not be an effective solution to traffic problems. In general, the upgrading of existing roads means that the already existing problems will increase and the people living next to the roads will suffer even more. In economic terms, the new motorway was seen to be the better solution. The most significant adverse impact of the new motorway will be the loss of biodiversity. The new motorway will also cause fragmentation in some lake areas, as well as in one important recreation area. Moreover, the motorway will change the landscape especially in rural areas with high cultural values. On the other hand, the new motorway will have a positive economic impact on some municipalities and it will boost development in some villages next to the existing roads. A negative impact though is that some areas that are now quiet areas will be affected by the traffic noise from the new motorway. However, the number of people overall suffering from traffic noise will decrease.

In the EIA it was shown that the upgrading of the existing roads will have significant adverse impacts on some villages next to the existing roads. On the other hand, the upgrading of these roads will allow for the implementation of ground water protection, which will reduce risks of ground water contamination. When completed, the assessment report was subject to public comments. Local municipalities and other authorities were quite satisfied with the assessment report but the general public and the local associations were more critical. They suspected that the EIA favoured the new motorway alternative. The Uusimaa Regional Environment Centre reviewed the report and stated that the EIA had been done in accordance with the Finnish EIA legislation and that it was sufficient. However, the Regional Environment Centre pointed out that the concern about the neutrality of the EIA was not groundless. In its statement, the Centre

suggested guidelines for future environmental studies needed in different planning and permit processes for the motorway.

After the EIA

The EIA was completed in 1996. The Finnish Road Administration proceeded to work on the final design of the project. In 1995 Finland became a member of the EU and it then had to implement the Habitats Directive. During the EIA procedure, the Finnish Nature Conservation Act, which implements the Habitats Directive, was not yet in force and Finnish authorities paid too little attention to species listed in Appendix 4(A) of the Habitats Directive. Some local people found evidence of flying squirrels, which are listed in Appendix 4(A), close to the planned motorway.

The Road Administration ordered a report on flying squirrels for the entire road section. According to the report, 47 occurrences of flying squirrels close to the planned motorway were recorded, of which 29 were in the immediate vicinity of the road. This resulted in a long legal process that delayed even further the construction of the new motorway.

Another surprise was a shooting range located in an area of a proposed interchange. A high concentration of lead was detected in the soil. According to the amended EIA decree, the disposal of heavily leaded soil is subject to a mandatory EIA. This meant a new EIA procedure for the cleaning up and disposal of the leaded soil, which resulted in even more delays. Currently, all the plans for the project have been ratified, there are no more legal proceedings, and the motorway is under construction.

Benefits of the EIA

This particular EIA case was far from ideal. The main problem was that the alignment for the motorway alternative was chosen before the EIA started. This caused misunderstandings among some of the groups involved. There were also discussions with the European Commission about the lack of alternatives in regard to the flying squirrel. Maybe the biggest benefit in this case was that the EIA ensured that environmental issues were taken into account in the planning procedures and the decision-making process. This resulted in modifications to the project, so that it was more environmentally friendly, which made it easier for the project to be accepted, and also more in line with the national legislation. In this case the EIA helped to identify environmentally sensitive areas and significant issues so that they could be taken into account and the adverse impacts could be reduced to an acceptable level. Some positive outcomes of the EIA are: an important recreation area was saved by building a tunnel, most habitats of the flying squirrel were saved by small changes in design, groundwater areas were protected, long sections of the road run through deep rock cuttings and the planned primary measure for noise control is terrain modification. For environmental reasons, landscape bridges have been planned for the longest bank sections.

Surface water runoff from the road area will be treated and there will be controlled channelling of this water into the natural water system. There will be limitations on construction work in waterway sites during the spawning season of fish and the nesting season of birds. This particular case is a good example of how to apply an EIA when the planning procedure and decision-making process have reached the point where it is not possible to start again from the very beginning.

Lessons learnt

An important point is to be sensitive to the new information and not to rely too much on the old information. Nature is dynamic and it is not always easy to identify immediately all the important species listed in the Habitats Directive. If you receive a hint about something, check

it out and don't ignore it. Natura 2000 sites and the species listed in Appendix 4(A) of the Habitats Directive are very important factors in planning and decision-making. Be aware of the legislation. If you have a major infrastructure project, it will take many years, if not decades, to carry it out. When a country becomes a member of the EU, totally new environmental legislation needs to be implemented. This is what happened in Finland. New legislation will probably be applied to some projects, maybe even more than once, and each time new legislation is applied, there is the possibility that new groups will have the right to appeal your project. Don't choose an alternative too early. There should be several alternatives. Try to identify the main interest groups, the impacts of the project, because these are important when looking at different alternatives. A detailed design with obvious alternatives might go to waste and you can lose valuable time if you need to begin the procedure again.

4.0 Conclusion

The case study described the EIA carried out on a Highway development in Finland. The case study identifies the challenges and emphasized the importance of stakeholders during the EIA process..

5.0 Summary

In this unit, you have learnt about the how EIA was carried out by following the methods: pre-EIA and post EIA activities.

6.0 Tutor-Marked Assignment

1. Identify the challenges of carrying out the EIA in this project
2. List the environmental issues and the approaches taken to mitigate the problems identified
3. Explain the relevance of the stakeholders to the project

7.0 Reference Materials

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UNIT 5: EAR Case Study on Post-Construction Environmental Impact Audit Study of Kali Gandaki "A" Hydroelectric Project in Nepal

CONTENTS

1.0 Introduction

In the previous units, you learnt about the various case studies of EIA. Through the studies, you identified the challenges, processes and various approaches adopted during the studies. In this

unit, you will learn about the case study on Environmental Audit, a process which is carried out after a project has been completed.

The post-construction environmental impact audit study was conducted in early 2003 by Environment and Social Studies Department of Nepal Electricity Authority (NEA) as per the contract signed with the Kali Gandaki "A" Hydroelectric Project. This audit study is first of its kind for a large hydropower project and is mainly targeted to fulfil the purpose of Asian Development Bank (ADB) loan covenant.

2.0 Objectives

At the end of this unit, you should be able to:

- list the objectives of carrying out an environmental audit
- describe the process involves in an environmental audit
- Identify the major impacts during the construction and operational phases

3.0 Main Content

The **objectives of the audit study were to:**

- Collect post-construction environmental and social data of the project area;
- Find out the accuracy of the impact prediction;
- Assess actual environmental impacts which occurred due to the implementation of the project;
- Evaluate the variations and the effectiveness of implemented mitigation measures;
- Identify the remedial issues; and
- Suggest the corrective measures

The scope of the study included review and assessment of the project documents, collection of field data, collection of local people's and stakeholders' views, co-ordination of this study with the line ministry, identification of remedial issues with corrective measures and preparation of the audit report. The study has covered three components of the project namely: access road, power generation facilities, and transmission line.

Limitations of the study

Non-availability of proper auditing guidelines has been mentioned as a major limitation of the study. It is also mentioned that the study team did not find the audit guidelines within ADB as well. The other limitations of the study mentioned in the report are:

- Review of all documents accumulated during the entire project period was hardly possible due to limited time for the study;
- Data of different surveys (pre-project and post-project) might not be comparable due to different methodologies adopted;
- The present fish survey was conducted in the month of August and there is no baseline data for this month; and This study lacks dry season data for the fish and water quality in dewatered and reduced flow zones.

Audit Methodologies

Literature review, field-visit, sampling, questionnaire administration, interviews, and group discussions were the main methods adopted by the audit team. The team analysed the data and prepared the draft report. A workshop was organized in Kathmandu to share and discuss the audit findings.

Project Information

Kali Gandaki "A" Hydroelectric Project is located in Syangja district of Western Development Region, about 180 km west from Kathmandu. Project construction started in 1997 and was completed in May 2002. Commercial hydropower production was started from August 2002. The project has an installed capacity of 144 MW. The average annual energy production is about 826 GWh. This is the largest hydropower project constructed so far in Nepal. The project basically has three components: access road, power generation facilities, and transmission line. The access road for the project starts at Batuwa, 82 km from Pokhara (3.5 km south of Galyang Bazar), in Siddartha highway and ends at the left bank of the dam. Length of the access road from Jaipate to powerhouse is 8 km. Total length of the temporary and permanent access roads is about 28.5 km. Two access roads start at Jaipate and provide access to the dam site (Mirme) and powerhouse site (Beltari).

The main power generation facilities are located in the Shri Krishna VDC of Syangja district. The dam in Mirmi is a gated structure which is 44 meters high. The headrace tunnel is 7.4 meters in diameter and is about 5,905 meters long. The surge tank in Beltari is 61.5m high (up to top of the highest wall). The powerhouse lies in the left bank of the Kali Gandaki and is a semi-underground structure housing three francis turbines of 48 MW capacity each. The 132 kV transmission line is spread in four districts namely: Syangja, Palpa, Rupendehi and Kaski. The transmission component is divided into two portions: 44 km double circuit to Butwal. A sub-station was constructed in Lekhnath Municipality of Kaski district whereas the existing Jogikuti sub-station in Butwal was upgraded. The right-of-way of the 132 kV is 9m in each side from the centreline.

Various stakeholders were involved in the audit team as follows: Civil Engineer, Environmental Engineer, Ecologist, Forester,Fish and Wildlife Expert, Socio-economist, Sociologist, ACRP Expert, Hydrologist, Oil Erosion Expert

Major Impacts of Constructional and Operational Phases

The impacts of the projects constructional and operational phases have been mentioned as:

- A5.3 km long (65ha) reservoir has been created due to submergence of grassland, forestland and other lands;
- The diversion of flow from dam site has made the section from Mirmi to Badigad as dewatered section and flow in the riverbed was found almost dry in the month of April 2003;
- The construction and operation of the dam has caused an increase in water level as well as sedimentation level thereby causing serious threat to the Seti Beni Bazar and submergence of Shaligram Sheela (holy stone);
- The scrap materials such as used cement bags, vehicle tires, used drums containing oil etc. were dumped at Thulo Bagar on the left bank of the Kali Gandaki River. This situation calls for water pollution during the high flood season.
- A total of 11 fatalities and 17,234 injuries occurred during the project construction.
- Barrier effect of the dam and prevention of the upward migration of the fish was noticed.
- A total of 6,093 trees of Sal, Saj, Chilune, Sissoo, Khyar, Bakaino Ipil-Ipil was removed.
- In total, for all three components, 371 hectares of land was acquired for placement of project structures and facilities.

- Altogether 1,468 families lost their land (fully or partially). Out of these, 263 families were defined as SPAFs and 1,205 families as PAFs. The SPAFs experienced a loss of 50-60% of their assets and the PAFs lost 25% of their land, and lost fodder trees and
- A total of 221 families lost their houses (65 for access road, 15 for main facilities, 11 for workshop, 126 for transmission line alignment and 1 for Pokhara substation). A total of 21 housesfrom 17 Bote families were acquired.
- Due to impounding of Kali Gandaki and Andhikhola River, most of the present cremation sites along the riverbanks upstream are submerged whereas the cremation sites in the downstream is affected by the reduced flow of Kali Gandaki River.

Audit Findings

Status of mitigation measures is as follows:

- Amandatory release of 4 m3/s, i.e., ten percent of the minimum monthly flow to maintain the downstream aquatic life was proposed in EIA report. During auditing, it was observed that there was no flow from the dam. Furthermore, no additional 2 m3/s water was released on religious days which caused significant impact on downstream religious sites.
- Asiren system to warn people about very high flows is functioning but needs capacity increase to be more effective for long-distance population.
- Bioengineering was introduced but needs to be continued in the access road section.
- More than three hundred thousand plants of different species were planted in the project area. The survival rate has been observed as 40-50% till 2002.
- A fish hatchery has been constructed for producing one million fingerlings, but its effectiveness remains to be seen.
- Payment of appropriate compensation has been made for the loss of land, house and other assets due to implementation of the project.
- An additional rehabilitation grant has been provided at the rate of NRs. 1000/month for 4 months to the affected families. A grant to pay the government registration fee was also provided as an incentive to those affected families who purchased land as replacement.
- The impact on house loss was compensated at replacement cost. Affected households were also provided the construction materials of their old house for reuse.
- The project has provided employment to 2,568 people during construction and 225 people during the operational phase.
- Out of the total allocated sum of NRs. 2.9 million for micro-credit revolving fund only a sum of NRs. 0.62 million was spent in 28 different groups of affected families.
- About 3,000 households have been electrified in 11 VDCs of Syangjha, Gulmi, Parbat and Palpa districts.
- In addition to the committed mitigation works in the EIA report, several community development works on peoples' demand such as the renovation of Jagatra Devi temple, establishment of a primary school for Botes and support to school for room extension etc. were developed.

Outstanding issues

The followings are the outstanding issues as mentioned in the report:

- Preparation of the operational manual for power station regarding the environmental issues such as mandatory release of 4 m3/s, and additional flows of 2 m3/s during religious days;
- Increasing the intensity of the siren;
- A conclusive study about the submergence problem in the Seti Beni Bazar;

- Plantation of 35 hectares in Rupendehi district and 17,415 seedlings in transmission line area;
- Implementation of community forest support programme for Khabar area; and
- Protection work for Seti Beni, housing for the remaining 10 Bote families, agriculture intensification programme, micro-credit revolving fund disbursement, and construction of cremation sheds etc.

Recommended Corrective Measures

The project will have the overall responsibility for managing Kali Gandaki "A" HEP including environmental and social mitigation measures and monitoring. Based on the roles and responsibilities of NEA-ESSD, the environmental works can be effectively carried out by NEA-ESSD, provided that required budget is in place. The estimated cost for the corrective measures for the period of five years is NRs. 37.7 million.

Lessons Learnt

The audit report has mentioned followings as the lessons learned during the study.

- Involvement of international consultants in the environmental issues should be limited.
- Community development works need to be addressed by the project prior to, during and after the project construction.
- All budget allocated for the environmental works must be channelled through the environment wing.
- All mitigation works to be done must be specified and put in the bill of quantities together with the provision of reward and punishment for the contractor.
- Frequent change of high level officials makes it difficult for the continuity of the project.

Study Conclusion

The study has concluded that most of the impacts were predicted accurately during the project formulation stage; environmental and social condition of the project area is good; effectiveness of the contract clauses was slightly more than 50 percent; and outstanding works must be completed as soon as possible.

Exercise: What is the difference between an EIA study and an EAR as carried out in the unit?

4.0 Conclusion

The study showed the environmental audit of a construction project that had been carried out successfully. After auditing, a report is prepared which recommends corrective measures and

5.0 Summary

In this unit, you have learnt about environmental audit through a case study of a Hydroelectric project.You have also identified the various stakeholders, methodologies, and various major impacts during the construction and operational phases.

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8.0 Tutor-Marked Assignment

1. List the stakeholders identified in the project.
2. From the case studied above, why was it necessary to carry out an environmental audit of the project?
3. What were the limitations of the study carried out?

7.0 References/Further Readings

Case study--Post-Construction Environmental Impact Audit Study of Kali Gandaki "A" Hydroelectric Project Annex 1 in A Guide to Environmental Auditing of Hydropower Projects (Assessed Sept 2011) http://www.moenv.gov.np/np/downloads/Environmental%20Auditing%20Guide.pdf (publisher: Government of Nepal Ministry of Environment, Science and Technology Secretariat Complex, Singhdurbar Kathmandu, Nepal

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