

ARBA MINCH WATER TECHNOLOGY INSTITUTE ARBA MINCH UNIVERSITY FACULTY OF WATER SUPPLY & ENVIRONMENTAL ENGINEERING

**Course title; Environmental Impact Assessment Course Code; WSEE** – 5193

Target groups; 5<sup>th</sup> year Irrigation and Water Resource Engineering students

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### **COURSE SYLLABUS**

### **Objective:**

• To present the philosophy and methodology used to assess environmental impacts of water Resources development and to present methods to integrate the EIA and water resources planning processes.

### **Outcomes: Students will be able**

- To know the basic concepts of environment, the need for environmental assessment,
- EIA process, identifies major impacts of water related projects, and review EIA report.
- o To know mitigation measure for environment

### **INTRODUCTION OF EIA**

Introduction of EIA
Historical Reasons of EIA
Need of EIA & Benefits of EIA
Aims & Objectives of EIA
Structure of EIA

## **INTRODUCTION OF EIA**

## **DEFINITION OF EIA**

"ELA is a systematic process to identify, predict and evaluate the environmental effects of proposed actions and projects"

Environmental Impact Assessment is

A formal process for identifying:

- likely effects of activities or projects on the ENVIRONMENT, and on human health and welfare.
- •means and measures to mitigate & monitor these impacts

Environment is broadly interpreted: physical, biological, and social.

The physical, biological, social, economic, cultural, historical and political factors, which are surrounding by the human beings. It includes both the natural and built environments. It also includes human health and welfare. Environment has a lot of components basically known as soil, water, air, forest, ocean etc.

In EIA, the term "impacts" is used instead of "effects of activities."

What is an impact?

## WHAT IS AN IMPACT?

"Any change to the environment or its component that may affect human health or safety, biophysical conditions, or cultural heritage, other physical structure with positive or negative consequences"

The impact of an activity is a deviation (a change) from the baseline situation

that is caused by the activity.



The baseline situation is the existing environmental situation or condition in the absence of the activity.

The baseline situation is a key concept in EIA.

More...

### **THE BASELINE SITUATION**

In characterizing the baseline situation, many environmental components MAY be of interest

The components of interest are those that are likely to be affected by your activity—or upon which your activity depends for its success

Water	Quantity, quality, reliability, accessibility
Soils	Erosion, crop productivity, fallow periods, salinity, nutrient concentrations
Fauna	Populations, habitat
Env Health Disease vectors, pathogens	
Flora	Composition and density of natural vegetation, productivity, key species
Special ecosystem	Key species I <b>s</b>

#### THE BASELINE SITUATION



#### time

This chart of groundwater levels shows both variability and a trend over time.

Both are part of the groundwater baseline situation.

The baseline situation is not simply a "snapshot."

Describing the baseline situation requires describing both the normal variability in environmental components & current trends in these components.

### **TYPES OF IMPACTS & THEIR ATTRIBUTES**

The EIA process is concerned with all types of impacts and may describe them in a number

of ways

- \* Spatial extent
- ✤ Duration
- **Frequency**
- **Reversibility**
- **\* Probability**

Direct & indirect impacts

Short-term & long-term impacts

Adverse & beneficial impacts

**Cumulative impacts** 

But all impacts are not treated equally

Specifically,

It is ESSENTIAL in EIA to focus on the most significant impacts.

Don't waste effort & time analyzing and discussing impacts that are less important.

### WHAT IS AN ACTIVITY?

We are discussing the impacts of What are activities?

# ✓ An activity is:

a desired accomplishment or output

E.g.: a road, Reservoir Construction, seedling production, river diversion to irrigate land, Industry establishment, etc.

#### activities.

# Accomplishing an activity

• •

requires a set of actions

ACTIVITY: market access road rehabilitation

#### **ACTIONS:**

Survey, grading, culvert construction, compaction, etc.

A project or program may consist of many activities

## THE EIA PROCESS

#### Phase I: Initial inquiries

•Understand proposed activities

#### •Screen

•Conduct preliminary assessment (if needed)

Our focus!

### Phase II: Full EIA study (if needed)

- Scope
- Evaluate baseline situation
- Identify & choose alternatives
- Identify and characterize potential impacts of proposed activity and each alternative
- Develop mitigation and monitoring
- Communicate and document

# **Phase 1 of the EIA Process**



#### Phase 1 of the EIA process: UNDERSTAND THE PROPOSED ACTIVITY

Understand the proposed activities

**Why** is the activity being proposed?

What is being proposed?

ALL EIA processes begin with understanding WHAT is being proposed, and WHY.

The question "WHY IS THE ACTIVITY BEING PROPOSED? Is answered with the development objective (D.O.).

"If we don't understand it, we can't assess it!" "increasing access to markets" Is a D.O.

We must understand the <u>Development Objective</u> to identify environmentally sound alternatives

>building a road Not a D.O.!

#### Phase 1 of the EIA process: UNDERSTAND THE PROPOSED ACTIVITY

Understand the proposed activities

Why is the activity being proposed?

What is being proposed?

Once we understand the development objective, we must fully understand WHAT is being proposed.

This includes associated actions!

PRIMARY ACTIVITY: construction of diversion dam & irrigation canal

"Oops. I forgot about the borrow pit."

#### **ASSOCIATED ACTIONS:**

- Survey
- negotiate land tenure
- construct borrow pit
- establish construction camp
- construct temporary diversion structure
- dispose of soil, debris

#### PHASE 1 OF THE EIA PROCESS: SCREEN THE ACTIVITY

# Screen each activity

Based on the **nature** of the activity, what level of environmental analysis is indicated? **SCREENING** is the process of asking a very basic set of questions about the nature of activity.

**These questions:** 

- do NOT require analysis.
- do NOT require detailed knowledge about the proposed sites, techniques or methods

**Example screening questions:** 

Does the activity involve:

- Penetration road building?
- Release of Toxic Pollutants?
- Causes to Diseases?
- Large-scale irrigation?
- Introduction of non-native crop or agro forestry species?

#### PHASE 1 OF THE EIA PROCESS: SCREEN THE ACTIVITY



#### Phase 1 of the EIA process: The Preliminary Assessment

Conduct a Preliminary Assessment

A rapid, simplified EIA study using simple tools

Screening determines whether the preliminary assessment is necessary

The purpose of a preliminary assessment is to provide documentation and analysis that:

- Allows the preparer to determine whether or not significant adverse impacts are likely
- Allows the reviewer to agree or disagree with the preparer's determinations
- Sets out mitigation and monitoring for adverse impacts

#### Phase 1 of the EIA process: The Preliminary Assessment

#### Typical Preliminary Assessment outline

- 1. Background (Development objective, list of activities)
- 2. Description of the baseline situation
- 3. Evaluation of potential environmental impacts
- 4. Mitigation & monitoring
- 5. Recommended Findings

For each activity it covers, a preliminary assessment has 3 possible findings:

- The project is very unlikely to have significant adverse impacts. (EIA process ends)
- •With <u>specified mitigation and</u> <u>monitoring</u>, the project is unlikely to have significant adverse impacts
- The project is likely to have significant adverse impacts (full EIA study is required)

### WHAT IS MITIGATION?

#### Mitigation is. . .

The implementation of measures designed to reduce the undesirable effects of a proposed action on the environment

#### TO ARRIVE AT FINDINGS: IDENTIFY, PREDICT AND JUDGE

Arriving at the FINDINGS in a preliminary assessment requires 3 steps:



Many resources describe the potential impacts of typical small-scale activities.

Determine which potential impacts are likely to become actual, and quantify these impacts to the extent possible.

Judge the significance of potential impacts

3

Determine whether the predicted impacts are indeed significant! THIS WILL OFTEN DEPEND ON HOW EFFECTIVE THE PROPOSED MITIGATION MEASURES ARE!

#### PHASE 2 OF THE EIA PROCESS: THE FULL EIA STUDY

The full EIA study has very similar objectives and structure to a preliminary assessment.

However, the full EIA study differs in important ways:

*\*includes the project as proposed, the no-action alternative at least one other real alternative* 

A formal scoping process precedes the study to Identified issues to be addressed

Analysis of environmental impacts is much more detailed

Alternatives\* must be formally defined. The impacts of each alternative must be identified & evaluated, and the results compared.

Public participation is usually required.

A professional EIA team is usually required.

#### PHASE 2 OF THE EIA PROCESS: THE FULL EIA STUDY

With a few additions, the basic outline of the preliminary assessment is the template for the steps involved in a full EIA study:

- 1. Background (Development objective, list of activities)
- 2. Description of the baseline situation
- 3. Evaluation of potential environmental impacts
- 4. Mitigation & monitoring
- 5. Recommended Findings

# Basic steps of the full EIA study

#### Scope

Evaluate baseline situation

Identify & choose alternatives

Identify and characterize potential impacts of proposed activity and each alternative

**Compare alternatives** 

Develop mitigation and monitoring

### WHO IS INVOLVED IN EIA?

Sponsor of the activity (usually commissions/conducts the EIA)

Regulatory agencies/ Review authorities Broad-based public

Communities (men & women) Civil society Private Sector Public consultation is usually only REQUIRED for full EIA studies.

However, it is good practice for preliminary assessments because:

- Predicting impacts is FACILITATED by broad-based public consultation; Judging significance is very difficult without it.
- Transparency and accessibility require disclosure to stakeholders

### MAKING EIA EFFECTIVE

To be an effective tool for EIA must be:

a integral part of the project development cycle.

#### • Honest

Transparent & accessible

EIA is undertaken early enough to affect project design

Mitigation and monitoring developed in the EIA process is implemented.

The full EIA study must consider real alternatives

Impacts must be assessed honestly.

The EIA products must be clear and accessible to key actors.

### **HISTORICAL REASONS OF EIA**

- Destruction Environmental components leads to destroy of human sustenance on the earth
- Full scale emergencies now exist on a number of issues UNEP
  - Water scarcity,
  - Land degradation,
  - Tropical forest clearance,
  - Species loss and
  - Climate warming
- Many small island states and delta regions of larger countries are vulnerable to natural hazards and threatened by sea level rise due to climate warming
- Other countries are likely to experience increases in water scarcity and associated environmental stresses as a result of climate change

# HISTORICAL REASONS OF EIA

<b>Cornerstone Conferences</b>	Summary
The Rio Declaration on Environment and Development	A set of principles which provide guidance on achieving sustainable development.
Framework Convention on Climate Change	An international treaty to stabilize greenhouse gas concentrations in the atmosphere.
Convention on Biological Diversity	An international convention with three objectives: the conservation of biodiversity, the sustainable use of its components, and the equitable sharing of benefits from genetic resources.
Agenda 21	A global program of action for achieving sustainable development to which countries are "politically committed" rather than legally obligated.

## **NEED OF EIA**

- Reducing the burden of environmental impacts is necessary if development is to become sustainable
- EIA has become of ever increasing importance as a tool for development decision-making
- "Environmental impact assessment, as a national instrument, shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority"
- EIA is applied primarily to prevent or minimize the adverse effects of major development proposals, such as power stations, dams and reservoirs, industrial complexes, etc.
- Projects include dredging activities, road realignment and upgrading, and housing subdivisions 27

## **BENEFITS OF EIA**

- More environmentally sustainable design,
- Better compliance with standards,
- Saving in capital and operating costs,
- Reduce time and costs for approval,
- > Avoids later plan adaptations,
- > Reduces health costs,
- > Increased project acceptance,
- Provide information for decision-making on the environmental consequences of proposed actions; and
- Promote environmentally sound and sustainable development through the identification of appropriate enhancement and mitigation measures.

### **AIMS OF EIA**

- The immediate aim of EIA is to inform the process of decision-making by identifying the potentially significant environmental effects and risks of development proposals
- The ultimate (long term) aim of EIA is to promote sustainable development by ensuring that development proposals do not undermine critical resource and ecological functions or the well being, lifestyle and livelihood of the communities and peoples who depend on them.

### **OBJECTIVES OF EIA**

#### • Immediate objectives of EIA

- Improve the environmental design of the proposal;
- Ensure that resources are used appropriately and efficiently;
- Identify appropriate measures for mitigating the potential impacts of the proposal; and
- Facilitate informed decision making, including setting the environmental terms and conditions for implementing the proposal.

### **OBJECTIVES OF EIA**

### o Long term objectives of EIA

- Protect human health and safety;
- Avoid irreversible changes and serious damage to the environment;
- Safeguard valued resources, natural areas and ecosystem components; and
- Enhance the social aspects of the proposal.

### STRUCTURE OF EIA

- o Law, Policy and Institutional Arrangements
- o Public involvement
- Screening
- Scoping
- Impact analysis
- Mitigation and impact management
- Reporting
- Review of EIA quality
- Decision-making
- Implementation and follow up

**THANK YOU** 

# **LEGAL ASPECTS OF EIA**



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# LEGAL ASPECTS OF EIA

International Environmental Laws
Ethiopian Legislative and Policy context
Ethiopian Policy
Ethiopian Constitution- Articles on Environment

# INTERNATIONAL ENVIRONMENTAL LAWS

#### Introduction

- ✓ Environment: Ecosystem is the Unit part of Environment
- ✓ Ecosystem: The relationship between biotic/Living and abiotic/nonliving things in a particular place over a period of time.
- Environment is derived from French word *Environner* which means Encircle
- ✓ Law = Rules + Regulations
- ✓ Environmental Law : To conserve the Environment and all resources by using Law.
## INTERNATIONAL ENVIRONMENTAL LAWS

#### Why Environmental Law

To conserve the Environment from Pollution > To minimize the Industrial Pollution To control the Greenhouse gases emission > To control Acid rains, Global warming, Climate Changes and Ozone layer depletion > To protect the Natural Resources > To conserve the sustenance of the Living things To protect the Human Health

## INTERNATIONAL ENVIRONMENTAL LAWS

International Law Preparation – Problems

No International Constitution

No International President/ Prime Minister

#### **Law Formational Law Formation**

Disputes between the Countries

- ✓ Water Resources
- Transportation of Pollutants to another country
- ✓ Air Emissions reaching to other countries
- ✓ Increases Global Issues like Green House Effect, Global Warming, Acid Rains, Ozone Layer depletion and Climate Changes

#### **INTERNATIONAL ENVIRONMENTAL LAWS (IEL)**

#### Sources of IEL Formation

#### 1. Conferences/ Symposiums/Conventions

- The world commission on environment and development (WCED
  - relied on an even more succinct approach; it remarks that "the environment is where we live"
- 1972 Stockholm Conference on the Human Environment (UNCHE)
  - "both aspects of man's environment, the natural and man-made, are essential for his wellbeing and enjoyment of basic human rights."
- The 1992 Rio Declaration on Environment and Development
  - environmental needs, environmental protection, and environmental degradation and so on
  - Interestingly it eschews the term entirely in principle, declaring instead that human beings *"are entitled to a healthy and productive life in harmony with nature."*
- The Council of Europe Convention on Civil Liability (Damage resulting from activities)
  - Natural resources both abiotic and biotic, such as air, water, soil, fauna and flora and the interaction between the same factors; property which forms part of the cultural heritage; and the characteristic aspects of the landscape

2. Legal Systems of the individual Nations of the world <sup>2</sup>3.<sup>A</sup>H<sup>220</sup> torical experiences and solutions

## INTERNATIONAL ENVIRONMENTAL LAWS

- It is not intended thereby to indicate the existence of some new discipline based exclusively on environmental perspectives and strategies
- These have played an important role in stimulating legal developments in this field, as we shall observe.
- It has become common practice to refer to international environmental law in this way.
- Environmental law exists at many levels and is only partly constituted by international declarations, conventions, and treaties
- > The bulk of environmental law is statutory
  - encompassed in the enactments of legislative bodies and regulatory
    - generated by agencies charged by governments with the protection of the environment
    - Many countries have included right to environmental quality in their national constitutions

### ETHIOPIAN LEGISLATIVE AND POLICY CONTEXT

Two main types of Legal provision are made for EIA

General environmental or resource management law, which incorporates EIA requirements and procedure; and

An EIA specific law, which can either be comprehensive or take the form of a framework or enabling statute.

### ETHIOPIAN LEGISLATIVE AND POLICY CONTEXT

#### US National Environmental Policy Act (NEPA, 1969)

- The United States was the first to establish EIA legislation with the release of the National Environmental Policy Act in 1969.
- NEPA has been called the Magna Carta of EIA. It is both the founding legislation and remains a pre-eminent statement of the spirit and purpose of EIA. The language in the purpose and declaratory sections of NEPA corresponds to the objectives and principles of sustainability, anticipating by more than 20 years that contained in the Rio Declaration. Section 102 defines the procedural requirement for the preparation of an environmental impact statement (EIS), which have been subject to considerable reinterpretation by the courts.

#### **ETHIOPIAN LEGISLATIVE AND POLICY CONTEXT**

The Constitution (adopted on the 21st of August 1995) requires current and future legislation and the conduct of government to conform to a Bill of Rights.

#### Extracts from the Environmental Policy of Ethiopia

- ✓ Incorporate the full economic, social and environmental costs and benefits of natural resources development.
- ✓ Appropriate and affordable technologies which use renewable resources efficiently shall be adopted, adapted, developed and disseminated.
- ✓ When a compromise between short-term economic growth and long term environmental protection is necessary, then development activities shall minimise degrading and polluting impacts on ecological and life support systems.
- ✓ Regular and accurate assessment and monitoring of environmental conditions shall be undertaken.
- Ensure that environmental impact assessments consider not only physical and biological impacts but also address social, socio-economic, political and cultural conditions.
- ✓ Recognise that public consultation is an integral part of EIA and ensure that EIA procedures make provision for both an independent review and public comment before consideration by decision makers.
- ✓ Establish the necessary institutional framework and determine the linkages of its parts for undertaking, coordinating and approving EIAs and the subsequent system of environmental audits required to ensure compliance with conditions.
- ✓ Develop detailed sectoral technical guidelines in EIA and environmental audits.
- Ensure that preliminary and full EIAs are undertaken by the relevant sectoral ministries or departments, if in the public sector, and by the developer, if in the private sector
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### ETHIOPIAN LEGISLATIVE AND POLICY CONTEXT

#### **Basic Principles as the core of environmental law**

- Recognition of the concept of sustainable development through rational utilization and management of the environment to help improve the living conditions of the society and the maintenance of biodiversity and ecosystem.
- Incorporation of the 'polluter pays principle', in the Pollution Control Legislation and its application in environment legislations.
- Intergeneration of equity in the use of non-renewable resources without compromising the needs of the future generation.
- Awareness and consensus building by promoting the full participation of all citizens in the management and protection of the environment.
- Promotion of market and non market based incentives and benefits by encouraging developer and the public at large to appreciate the harmony between individual and public interest in environmental matters.

Requirement of comprehensive legislation that is supported by efficient institutional mechanisms to implement the complex and multi sectoral issues related to the environment

#### **THE OVERALL POLICY GOAL (EPE)**

To improve and enhance the health and quality of life of all Ethiopians and to promote sustainable social and economic development through the sound management and use of natural, human-made and cultural resources and the environment as a whole so as to meet the needs of the present generation without compromising the ability of future generations to meet their own needs.

### ENVIRONMENTAL POLICY OF ETHIOPIA (EPE)

- Objectives
- key guiding principles
  - shape all subsequent policy, strategy and programme formulations and their implementation
- Sectorial and cross-Sectorial policies
- Environmental elements of other macro policies

#### **ENVIRONMENTAL POLICY OF ETHIOPIA (EPE)**

- The current Directive (97/11/EC) amends the earlier EIA Directive (85/337/EEC) and the key provisions include:
  - Broad definition of the effects to be considered
  - Mandatory application for specified projects
  - Requirement to submit an EIA report
  - Types of information to be provided by developer
  - Outline of alternatives studied and reasons
  - Submission to be made available for public comment
  - Results of consultations and information must be taken into consideration in decision-making
  - Content and reasons for decisions made public detailed arrangements for public consultation to be drawn up by Member States

#### ETHIOPIAN CONSTITUTION- ARTICLES ON ENVIRONMENT

#### Article 43:- The Right to Development

- The Peoples of Ethiopia as a whole, and each Nation, Nationality and People in Ethiopia in particular have the right to improved living standards and to sustainable development.
- Nationals have the right to participate in national development and, in particular, to be consulted with respect to policies and projects affecting their community.
- All international agreements and relations concluded, established or conducted by the State shall protect and ensure Ethiopia's right to sustainable development.
- The basic aim of development activities shall be to enhance the capacity of citizens for development and to meet their basis needs.

ETHIOPIAN CONSTITUTION-ARTICLES ON ENVIRONMENT

#### **Article 44:- Environment Rights**

- All persons have the right to live in a clean and healthy environment.
- All persons who have been displaced or whose livelihoods have been adversely affected as a result of State programmes have the right to commensurate monetary or alternative means of compensation, including relocation with adequate State assistance

## THANK YOU

### RINCIPLES & VALUES



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## Topics

Objectives EIA
 Core Values of EIA
 Guiding Principles of EIA
 Operating Principles of EIA
 Benefits of EIA

## **EIA : OBJECTIVES**

- The primary purpose of EA is to ensure that impacts of projects, policy and programs, etc are adequately and appropriately considered and mitigation measures for adverse significant impacts incorporated when decisions are taken.
- Consequently, an EA serves to bring about:
  - administrative transparency and accountability,
  - peoples participation in planning and decision taking on development that may affect the communities and their environment, and
  - Sustainable development.

### **EIA : Core values**

- *Sustainability* ----- the EA process should result in sustainable development by establishing long-term environmental safe guards.
- *Integrity -----* the EA process will confirm to agreed and established requirements.
- *Utility* -----the EA process will provide balanced, credible information for decision making.
- *Equity----- that* EA ensures fairness in the distribution costs or benefits.

### **EIA : Guiding Principles**

- Early application --- proactive consideration and integration of environmental concerns at the earliest stages of the conceptualization of the projects, programs or policies.
- Participation --- appropriate and timely access and opportunity to the process for all interested and affected parties.
- Issues based the focus of an EA is on the resolution of major issues of significant impacts.
- Consider alternatives all feasible options to a project, policies, programs or its components like site, processes, products, raw materials etc. including the "no go" option should be considered. 22-Apr-20

## **EIA : Guiding Principles**

- Accountability refers to answerability of a proponent, consultant and environmental agencies for their respective roles and responsibilities.
- Flexibility--the assessment process should be able to adapt to deal efficiently with changing circumstances and decision making situation.
- **Credibility-** assessments and reviews are undertaken with professionalism and objectivity.
- Time and Cost-effectiveness- the assessment process, its outcomes and decision taking will ensure environmental protection at the least cost and within reasonable time to society and developer alike.

## **EIA : Guiding Principles**

- **Transparency-** all assessment decisions, and their basis, should be open and accessible to the public.
- Supportive- the review and decision making process should enhance and support sustainable development and environmentally friendly investment efforts.
- Conservation based- the EA process should strive to promote conservation based development. Integrating conservation elements in the development planning that extend beyond conventional impact fixation approach can do this.
- **Practicality---** the information and outputs provided by the assessment process are readily usable in the decision -making and planning

### **EIA : Operating principles**

- EIA is undertaken to:
  - Modify and improve design,
  - Ensure efficient resource use,
  - Enhance social aspects,
  - Identify measures for monitoring and managing impacts,
  - Promote sustainable productivity within the natural and social system capacity,
  - Meet environmental requirements and make continuing improvement in environmental performance,
  - Provide accurate and appropriate information for sound decision

### **EIA : Benefits**

- Benefits of EIAInclude:
  - -More environmentally sustainable design,
  - -Better compliance with standards,
  - -Saving in capital and operating costs,
  - -Reduced time and costs for approval,
  - Avoids later plan adaptations,
  - -Reduces health costs,
  - Increased project acceptance

# THANK YOU

## **EIA: PROCESS**



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## **EIA: PROCESS**

- Pre-screening consultation
- Screening
- Scoping
- Environmental Impact Study
- \* Reviewing
- Decision Making
- \*A Systematic EA follow ups
- Check list

### **GENERAL PROCESS**



#### **PRE-SCREENING CONSULTATION**

### **PRE-SCREENING CONSULTATION**

- Pre-screening is not normally taken as a part of a stage in the EIA process.
- However, its application is recommended in recognition of its importance to enhance the overall effectiveness of the EIA System.
- Pre-screening is a stage where the proponent and the respective environmental or sectoral agencies establish contact and hold consultation on how best to proceed with the EIA.
- The undertaking of a pre-screening consultation is advisable for it saves time and fosters a mutual understanding about the requirement.

## SCREENING

#### SCREENING

- Screening is the processes of determining whether or not a proposal requires EIA and the level at which the assessment should occur.
- At this stage a proponent initiates the process by submitting the project profile or an initial environmental examination report after undertaking an initial environmental assessment, to the relevant environmental agency.

### SCREENING REPORT

- Initial Environmental Examination report, that may describe
  - The proposed activities and its potential impacts,
  - Characteristics of the location (sensitivity of the area),
  - Size (small, medium and large scale),
  - Degree of public interest,
  - Institutional requirement, Environmental enhancement and monitoring considerations,

#### THE OUTCOME OF SCREENING COULD BE ONE OF THE FOLLOWING

#### ➢No EIA required

- Preliminary Assessment (PA) preliminary assessment is applied to:
  - Projects with limited impacts,
  - Projects in which the need of EIA is unclear, and

Proposals with inadequate information
 Full scale EIA – when there is sufficient ground for detail assessment.

## SCOPING

### SCOPING

- Early Step begins once screening completed
- Open, interactive process involves the public
- Lays the foundation of an EIA by identifying
  - Boundaries of the EIA study
  - The information necessary for decision- making
  - Key issues and significant impacts (effects and factors) to be considered

#### THE PURPOSES OF SCOPING

- Involve potentially affected groups,
- Consider reasonable alternatives,
- Evaluate concerns expressed,
- Understand local values,
- Determine appropriate methodologies,
- Establish the terms of reference,

The outcome of scoping is a scoping report or Terms of Reference for undertaking full scale EIA. Both of them require passing through reviewing process.
## **KEY OBJECTIVES OF SCOPING**

- Inform and identify stakeholders
- Find out their concerns
- Consider feasible and practical alternatives
- Identify the main issues and impacts to be studied
- Define the boundaries of the EIA study
- Agree on means of public involvement
- Establish the Terms of Reference

### **GUIDING PRINCIPLES FOR SCOPING**

- Scoping is a process not an activity or event
- Design the scoping process for each proposal
- Start early, as soon as information permits
- Prepare information package on what is expected
- Specify the role of the public in decision-making
- Approach should be systematic; implementation should be flexible
- Document the results to guide preparation of EIA
- Respond to new information and issues as necessary

### SCOPING

- Identify range of concerns
- Evaluate them to determine key issues
- Categorize the impacts that require study
- Establish a strategy for addressing them

### **STAKEHOLDERS IN SCOPING**

- The Proponent
- The competent authority
- the EIA administering body
- Other responsible agencies
- EIA practitioners and experts
- Key stakeholder i.e. those affected by the proposal
- The wider community

## **CONSIDERATION OF ALTERNATIVES**

- Demand alternatives
- Supply or input alternatives
- Activity alternatives
- Location alternatives
- Process alternatives
- Scheduling alternatives
- Technology alternatives

## **OUTLINE TERMS OF REFERENCE**

- Objectives and background to the proposal
- Study area and boundaries
- Alternatives to be examined
- Opportunities for public involvement
- Impacts and issues to be studies
- The approach to be taken
- Requirements for mitigation and monitoring
- Information and data to be included in the EIA report
- Timetable and requirements for completion of the EIA process

# **SCOPING REPORT**

- Scoping report should include as a minimum:
  - -a brief description of the project,
  - -all alternatives identified,
  - issues raised by Impact Assessment
    Partners
  - -description of the public participation

# ENVIRONMNTAL IMPACT STUDY

## **PURPOSE OF EIA**

The purpose of undertaking Environmental Impact Study is to generate sufficient information on significant impacts that enable the preparation of an Environmental Impact Study report, which will be used to determine whether or under what conditions a project should proceed.

# ENVIRONMENTAL IMPACT STUDY INVOLVES

- Impact Prediction
- Impact analysis
- Consideration of alternatives
- preparation of management plan (mitigation, monitoring activities)
- preparation of contingency plan

# CHARACTERISTICS FOR ASSESSMENT OF IMPACTS

- Be carried out with well defined values of significance,
- Compare all feasible alternatives,
- Document the values and beliefs on which judgments are based, and
- Based on acceptable methodology, research and experimental findings.

## IMPACT SIGNIFICANCE CRITERIA INCLUDE:

- Ecological importance,
- Social importance,
- Environmental standards,
- Statistical significance,
- Experimental findings, etc

## **DESIGN OF MITIGATION MEASURES**

 Mitigation seeks to: -find better ways of doing things, -minimize or eliminate negative impacts, enhance benefits, and -protect public and individual rights to compensation,

## **DESIGN OF MITIGATION MEASURES**

- Mitigation options:
  - -alternative ways of meeting the needs,
  - -changes in planning and design,
  - -improving monitoring and management,
  - monetary compensations,
  - performance bond,
  - -replacing, relocating, rehabilitating, etc.

## **DESIGN OF MITIGATION MEASURES**

- Impact management plan should:
  - state policy and standards,
  - indicate environmental effects, the issue and activity required to address it,
  - define responsibilities, provide a schedule of tasks,
  - include a system of reporting,
  - include a system for monitoring and auditing,
  - indicate resources required for completion and where relevant actual costs, including training and equipment needs,
  - describe the proposed mitigation measures,
  - Contain a contingency plan, etc.

- The purpose of review is to examine and determine whether the EIA-report is an adequate assessment of the environmental effects and of sufficient relevance and quality for decision-making.
- Five hard copies and an electronic copy should be submitted to the relevant reviewing authority or agency as the case may be.
- Reviewing conducted at various stages in the EIA processes.

- Reviewing of:
  - -screening report;
  - -scoping report;
  - Terms of Reference (TOR)
  - Environmental impact assessment report,
    and
  - Performance (monitoring or audit) reports at different stages in the project cycle.

- Reviewing may include considerations of the adequacy of:
  - compliance with the "approved TOR",
  - required information,
  - the examination of alternatives, assessment of impacts, appropriateness of mitigation measures and monitoring schemes as well as implementation arrangements,
  - the use of scientific and analytical techniques,
  - the extent of public involvement and reflection of Impact Assessment Parties concerns, and
  - Presentation of the information to decision makers at Regional, Sectoral, and Local levels.

# **DECISION MAKING**

# **DECISION MAKING**

- EIA is an ongoing process of review, negotiations and incremental decisionmaking at various levels of the project cycle, about whether or not the proposal is to proceed, and under what conditions.
- Decision-making should be consultative, participatory and influence others to behave responsibly and sustainably.
- It should also acknowledge and implement mandates and responsibility.

# THE GUIDING PRINCIPLES OF APPROVAL PROCEDURE

- full scale assessment is required where the project is known to have significant adverse environmental impacts,
- preliminary EIA is required where the project may have environmental impacts,
- EIA is not necessary where the project is unlikely to cause significant environmental impacts,
- there is a need to adhere to precautionary principle. When determining the impacts of a project if both beneficial and detrimental effects are on balance, only slightly or arguably beneficial, it should be decided as it is likely to entail a negative significant impact,
- all projects contravening government policies or other legal obligations should be rejected from the outset.
- decisions are to be made in a step wise manner upon a successful implementation of environmental requirements based on stages in EA process and corresponding stages in the project cycle,

### **POSSIBLE DECISIONS INCLUDE**

- Request for supplementary, or new EA report;
- Approval of the EA report or performance reports at various stages in the project cycle;
- Approval of the implementation of the proposal with or without conditions;
- Approval subject to ongoing investigation;
- Rejection;

## **IMPORTANT CONSIDERATIONS OF DECISION MAKING**

- A summary of evaluation is made available to the public;
- Reasons for decision and conditions of approval are made public;
- There is the right of appeal against decision;
- Approval can be reversed or permit can be revoked on the advent of changing circumstances,
- Approval of a proposal can not immune the proponent from being accountable of the occurrence of adverse significant impacts in the course of the implementation of the project, and
- Approval of an EIA report is only mark a simple agreement to the proposal. The culmination of the approval procedure will be the issuance of an Environmental Clearance Certificate 22402 pon the satisfactory trial operation phase.

## SYSTEMATIC EIA FOLLOW-UPS

# SYSTEMATIC EIA FOLLOW-UPS

### Systemic follow-ups activities are needed:

- to ensure that the anticipated impacts are maintained within the levels predicted,
- to see that the unanticipated impacts are managed and or mitigated before they become problems,
- to realize and optimize the benefits expected, and
- to provide information for a periodic review and alteration of impact management plan and enhance environmental protection through good practice at all stages of the project.

# SYSTEMATIC EIA FOLLOW-UPS

- Necessary:
- Environmental Management System, including internal monitoring schemes established,
- External audit conducted,
- Mechanism for regular risk communication designed, etc.



### **ROLES AND RESPONSIBILITIES**

- There are a number of potential role players in an EIA:
  - proponent
  - • consultant
  - interested and affected parties
  - Competent Agency

### PROPONENT

- The proponent is the project applicant (i.e. the developer).
- The proponent is responsible for complying with the requirements of the EIA process.
- The first responsibility of the proponent, however, is to appoint an independent consultant who will act on the proponent's behalf in the EIA process.

## PROPONENT

- The proponent should ensure that the consultant has:
  - expertise in environmental assessment and management;
  - the ability to manage the required participation process
  - the ability to produce reports that are readable, thorough and Informative
  - a good working knowledge of environmental impact assessment and management policies, legislation, guidelines and standards.

## CONSULTANT

- The consultant is responsible for all processes, plans and reports produced while following the EIA process
- The consultant should have adequate access to facilities for storing this information.
- The consultant should also ensure that all of this information is made available to the Competent Agency.
- The consultant must ensure that adequate participation of the Competent Agency and interested and affected parties has been carried out.
- The consultant must ensure that he/she has no vested (financial or otherwise) interest in the proposed development other than ensuring compliance to the EIA process.
- Furthermore, the consultant may not work for the Competent Agency while working for the proponent on a particular application. This is key aspect in ensuring that the findings of the EIA are unbiased  $_{2}a_{n}n_{2}d_{0}$  in the best interest of all stakeholders.

#### **INTERESTED AND AFFECTED PARTIES**

- Interested and affected parties (IAPs) are key to a successful EIA
- Interested and affected parties (IAPs) are responsible for providing input and comments at various stages in the EIA process.
- The input from interested and affected parties should be sought during the scoping phase, in assessing and mitigating impacts and in the review of the EIS.
- In accepting the responsibility to participate, IAPs should ensure that their inputs and comments are provided within the specified (reasonable) time limit set by the proponent and his/her consultant.
- IAPs should not be confined for projects since diversity will enhance the output of the EIA and will ensure a detailed and unbiased assessment is carried out.

### **COMPETENT ÅGENCY**

- The Competent Agency is responsible for ensuring that the proponent/consultant complies with the requirements of the EIA process.
- This may mean regular and effective communication between the authority and the proponent/consultant to provide general guidance on procedure, information and reports required.
- The Competent Agency should also ensure that the authority requirements are adhered to.
- This may mean the involvement of other responsible Authorities (Ex. Agriculture)

## **COMPETENT AGENCY**

- One of the most important functions of the Competent Agency is to evaluate/review and provide decisions on applications.
- The Competent Agency should:
  - ensure that the evaluation/review and decisions provided are done efficiently and within reasonable time, and that the proponent is informed timorously of any delays that may be incurred through the review process; and
- • ensure that the proponent/consultant is informed of any shortfalls in the process as identified through the reviews. 22-Apr-20

## **EIA REPORT SHOULD CONTAIN**

- An executive summary (This summary has to be concise and present and highlight the main issues pertinent to decision making on the project. The summary should be developed in non-technical terms such that it may be readily understood by decision-makers and other stakeholders)
- List of consultants: Names and qualification of members of the study team.
- A description of the development project covering:-
  - – Need
  - objectives
  - technical details
  - - size, location, input and other relevant requirements
- An outline of the main development alternatives.
#### **EIA REPORT SHOULD CONTAIN**

- A description of the baseline environmental, socio-economic and Health conditions such as fauna, flora, habitats, soil, water, air, cultural artifacts, and socio-cultural, socioeconomic and health considerations.
- An account of the prediction and assessment of each impact at all stages of the project cycle for each alternative.
- As much as possible impact prediction should be expressed quantitatively.

#### **EIA REPORT SHOULD CONTAIN**

- Information for each impact must be provided on:
  - the methodology used.
  - the magnitude of immediate and cumulative impacts
  - long and short term (expressed in appropriate units)
  - whether it is adverse or beneficial
  - whether it is reversible or irreversible
  - likelihood of its occurrence "with and without" scenarios
  - the time span for which impacts are predicted and
  - the geographic boundaries selected to define the study area
  - Description of measures to prevent or reduce significant adverse impacts or enhance beneficial
  - effects and an assessment of their likely outcome.

#### **EIA REPORT SHOULD CONTAIN**

- A description of residual impacts which can not be mitigated or can only be mitigated partially.
- A description of proposed monitoring schemes.
- A discussion of potential uses of the environment which will be prevented or rendered less productive due to adverse impacts.
- Description of relevant national and/or international legal reports, and guidelines used. In the absence of Ethiopian standards the EIA should include a description of the standards and an overview as to why a specific standard was used.
- Statement on the extent of involvement.
- Identification of information gaps and uncertainties.
- The budgetary implications and financial measures to be taken to ensure that mitigation measures can be adequately carried out.

## CHECKLIST

#### CHECKLIST

- Simple checklists represent lists of environmental factors (or impacts) which should be addressed;
- however, no information is provided on specific data needs, methods for measurement, or impact prediction and assessment.
- Simple checklists were extensively used in the initial years of EIA studies, and they still represent a valid approach for providing systemization to an environmental impact study.
- Simple checklists of environmental factors and impacts to consider are helpful in planning and conducting an environmental impact study, particularly if one or more checklists for the project type are used.

#### **TYPICAL ISSUES**

- Land Form
- Air/Climatology
- Water
- Solid waste
- Noise
- Plant life
- Animal life
- Land Use
- Natural Resources

- Energy
- Transportation/Traff ic circulation
- Public Service
- Utilities
- Population
- Accident Risk
- Human Health
- Economic

#### **TYPICAL ISSUES**

- Community Reaction
- Aesthetic
- Archeological, Historical and cultural
- Hazardous waste

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## EIA : Impact Assessment Methods



#### **Dr Daniel Reddy Thota**

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### **EIA Methodologies - Introduction**

- EIA Methodologies approaches developed to identify, predict and value changes of an action.
- Reflected in the sequence of activities, steps, as well on the range of environmental issues considered ( physical, chemical, biological, socioeconomic, cultural, landscape values and processes)
- Uses methods and techniques to quantify or to qualify those changes. All aspects and variables can be measured, problem is to value them.

#### **EIA Methodologies - Introduction**

# The development of METHODOLOGIES to assess impacts depend on:

a) The relationships between territorial elements (or characteristics) and the actions
b) The specific measurements and the necessary information to estimate the impacts
c) The mitigation measures, compensation and follow-up

## **Objectives of Methodologies**

- 1) Understand the nature and location of the project and possible alternatives
- 2) Identify factors of analysis and assessment objectives
- 3) Preliminary identification of impacts and scoping
- 4) Baseline studies and evolution in the absence of projects
- 5) Prediction and assessment of impacts and alternatives comparison
- 6) Mitigation
- 7) Monitoring and impacts management

### Desirables of **EIA** Methodologies

- EIA Methods based on equality, openness, costeffectiveness and efficiency approach and should also be:
- **Comprehensive:** Recognize intricate systems and bound complex interrelationships;
- Selective: Pinpoint critical (significant) impacts and eliminate as early as possible unimportant impacts
- **Comparative:** Determine environmental changes resulting from the project compared by that occur under existing conditions;
- **Objective:** Provide unbiased measurements free from political and external influences

#### Finding the significance of impacts



#### Methods of IMPACT analysis

- Experts Judgement
- ✓ Ad hoc Methods
- ✓ Checklists and Matrices
- ✓ Flowcharts and decision trees
- ✓ Sectoral Guidelines
- ✓ Systematic Sequential Approach (SSA)
- ✓ Networks
- Simulation Modeling Workshops
- ✓ GIS and map overlays
- ✓ Spatial Analysis Methods
- ✓ Rapid assessment techniques
- ✓ Contingency analysis

#### The Role of Expert Judgement

- Most methods and techniques for identifying, measuring, and assessing impacts rely on **expert judgement**.
- In fact, many checklists, matrices, and models used in EIA represent decades of experience accumulated by numerous experts.
- The experts themselves are heavily involved in all aspects of the assessment — they are used to help identify the potential for significant impacts, plan data collection and monitoring programs, provide their judgement on the level of significance for specific impacts, and suggest ways of reducing or preventing impacts.

### Choosing a Method

- EIA methods range from simple to complex, requiring different kinds of data, different data formats, and varying levels of expertise and technological sophistication for their interpretation.
- The analyses results produce at different levels of precision and certainty.
- All of these factors should be considered when selecting a method.

### Choosing a Method

- The EIA practitioner is faced with a vast quantity of raw and usually unorganized information that must be collected and analyzed in preparation of an EIA report. The best methods are able to:
  - organize a large mass of heterogonous data;
  - allow summarization of data;
  - aggregate the data into smaller sets with least loss of information; and
  - display the raw data and the derived information in a direct and relevant fashion.

#### Ad hoc Method

- A good example of an ad hoc method is a team of experts assembled for a short time to conduct an EIA.
- Each expert's conclusions are based on a unique combination of experience, training and intuition.
- These conclusions are assembled into a report. Sometimes this is the only required or possible approach.
- In other instances, when more scientific methods are available, it is not sufficient to rely on ad hoc methods

### Ad hoc Method

- It may not encompass all the relevant impacts;
- Because the criteria used to evaluate impacts are not comparable, the relative weights of various impacts cannot be compared;
- It is inherently inefficient as it requires sizeable effort to identify and assemble an appropriate panel of experts for each assessment; and
- It provides minimal guidance for impact analysis while suggesting broad areas of possible impacts.

#### Evaluation of ad hoc method.

Key Area of the Assessment Process	Criteria	L denotes Criteria Completely Satisfied P denotes Criteria Partially Satisfied N denotes Criteria Not Satisfied
	1. Expertise	L
	Requirements	
	2. Data Requirements	L
	3. Time Requirements	L
Cost / Time	4. Flexibility	L
Effectiveness Criteria	5. Personnel Level of	P
	Effort	
	6. Comprehensiveness	N
	7. Indicator-based	N
	8. Discriminative	N
Impact Identification	9. Time Dimension	N
inpact Mentilication	10. Spatial Dimension	N
	11. Commensurate	N
	12. Quantitative	N
Impact Measurement	13. Measures Changes	N
	14. Objective	N
	15. Credibility	P
	16. Replicability	N
	17. Significance-based	N
	18. Aggregation	N
Impact Assessment	19. Uncertainty	N
	20. Alternative Compariso	n P
Communication	21. Communicability	P
	22. Summary Format	N 13

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## Check list

- 1. Simple : no information needed on magnitude or importance of impacts
- 2. Descriptive: require information on magnitude or importance of impacts as well as indication on prediction methods and indicators.
- 3. Questionnaires: three types of answer: "yes", "no", "may be"

## **Checklist and Matrices**

- All checklists and matrices have boxes or cells that must be filled with information about the nature of the impact.
- Depending on the method, this information can be descriptive or evaluative.
- The simplest methods merely determine the possibility or potential existence of an impact, while others, like weighting-scaling checklists, make judgments about the magnitude and importance of the impact.

### **Check list**

- Bring structure to:
  - gathering and classifying information
  - -identifying potential environmental impacts
  - thinking about possible mitigation actions
  - -useful for making "threshold"
    - determinations

## Type of Check list Methods

There are four general types of checklists:

- 1. Simple Checklist: a list of environmental parameters with no guidelines on how they are to *be* measured and interpreted. Table illustrates a simple checklist that identifies the potential impacts of the Huasai Thale Noi Road Project in Thailand.
- 2. *Descriptive Checklist:* includes an identification of environmental parameters and guidelines on how to measure data on particular parameters.
- 3. Scaling Checklist: similar to a descriptive checklist, but with additional information on subjective scaling of the parameters.
- 4. Scaling Weig hting Checklist: similar to a scaling checklist, with additional information for the subjective evaluation of each parameter with respect to all the other parameters.

#### Example of a Simple checklist

#### **Proposed Activities**

clearing	Χ
cut/fill	Х
dredging	Х
blasting	-
Environmental components:	
Physical	
air quality	X
water quality	Χ
water flow	Χ
Biological	
spawning habitat	
X	
rearing habitat	X
Socio-economic	
fishing	Х

(After Sadar, 1994)

#### Simple Check list Developed for Road Project

		Nature of Likely Impacts								
		Adverse				Beneficial				
Items	ST	LT	R	IR	L	W	S	T LT	SI	
Aquatic Ecosystems		x		x	x					
Fisheries		x		x	x					
Forests		X		X	X					
Terrestrial Wildlife		x		x		x				
Rare & Endangered Species		X		X		X				
Surface Water Hydrology		x		x		x				
Surface Water Quality		x								
Groundwater	*	*	*	*	*	*	*	*	*	
Soils										
Air Quality	x				X					
Navigation		x			X					
Land Transportation			_					x	x	
Agriculture							х			)
Socioeconomic								X		;
Aesthetic		x			x					

Legend

R

w

MIL.

- x indicates potential for type of impact
  - denotes Reversible
- denotes Wide

- ST denotes Short Term
- IR denotes Irreversible
- SI denotes Significant

- LT denotes Long Term
- L denotes Local
- N denotes Normal
- 19

### Major reasons for using checklists

- They are useful in summarizing information to make it accessible to specialists from other fields, or to decision makers who may have a limited amount of technical knowledge;
- scaling checklists provide a preliminary level of analysis; and
- weighting is a mechanism for incorporating information about ecosystem functions

## Checklist

- Structured list of environmental factors potentially affected."
- Extensive and complete. Main function: identify ALL possible consequences of the proposal"
- Should enable identification of impacts on:
  - ➢ Soil
  - ➢ Water
  - Atmosphere
  - ➢ Flora
  - Fauna
  - Resources
  - Recreation
  - Cultural

#### **Evaluation of Simple Checklist**

Key Area of the		L denotes Criteria Completely Satisfied P denotes Criteria Partially Satisfied
Assessment Process	ChiteNa	N denotes Cateria Not Satisfied
	1. Expertise Requirements	L
	2. Data Requirements	L
	3. Time Regularments	L
Cost / Time	4. Rexibility	L
Effectiveness Criteria	5. Personnel Level of Effort	L
	6. Comprehensiveness	L
	7. Indicator-based	N
	8. Discriminative	N
Impact Identification	9. Time Dimension	N
	10. Spatial Dimension	N
	11. Commencurate	N
	12. Quantitative	N
Impact Measurement	<ol> <li>Measures Changes</li> </ol>	N
	14. Objective	N
	15. Credbilly	P
	15. Replicability	N
	17. Significance-based	P
	18. Aggregation	N
Impact Assessment	19. Uncertainty	N
	20. Alternative Comparison	P
Communication	21. Communicability	L
	22. Summary Format	L

## Scales and Weights

- Descriptive checklists are excellent for describing comprehensive lists of impacts, however, they are not able to rank alternatives.
- Various methods have been developed for the evaluation of alternatives.
- Before discussing the simplest of these methods (that is, checklists), it is necessary to define the basic steps of methods for evaluating alternatives

## **Basic Steps**

- 1. determine an appropriate set of environmental factors to be considered (for example, wildlife habitat);
- 2. determine the environmental impact index for each factor;
  - 2.1 define the units of measurement for each environmental factor (e.g., hectares preserved),
  - 2.2 collect the data on the environmental factor (e.g., 10000 hectares preserved),
  - 2.3 decide on a common interval scale for each environmental factor index (e.g., 0 to 1),
  - 2.4 convert the data for the environmental factor to environmental factor index (this is usually done by normalizing all values over a maximum or minimum value);
- 3. determine a weight for each environmental factor; and
- 4. decide on the method of aggregation across all factors (usually additive).

### Factors

- The two factors are wildlife habitat (measured in hectares preserved) and employment increase (measured in jobs).
- In the hypothetical example for two alternatives, data has been provided. In the example, the environmental factor data has been scaled to an index (0 is worst and 1 is best).
- Scaling was done by dividing the factor data by the maximum values for both alternatives. The example shows two methods of aggregation:
  - 1. Simple addition of factor indices, which assumes all factors are equally weighted. In this case alternative two is preferred.
  - 2. Weights of .20 on wildlife habitat and .80 on employment, respectively. In this case, alternative one is preferred to alternative two.

### Evaluation of Weighting Scaling checklist

		L denotes Criteria Completely Satisfied
Key Ares of the		Pidenotes Chteria Pardaty Satisfied
Assessment Process	Chiena	N denotes Cateria Not Satisfied
	1. Expertise	N
1	Neyworkers	
	<ol><li>Deta Requiremento</li></ol>	P
	<ol><li>Time Requirements</li></ol>	P
Cost / Time	<ol> <li>Flexibility</li> </ol>	L
Effectiveness Oriteria	5. Personnel Level of Effort	P
	<ol><li>Comprehensiveness</li></ol>	P
	7. Indicator-based	N
	8. Discriminative	N
Impact Identification	9. Time Dimension	N
	10. Spatial Dimension	N
	11. Commensurate	P
	12. Quantitative	N
Impact Measurement	13. Neasures Changes	N
	14. Objective	N
	15. Credbilty	P
	16. Replicability	N
	17. Significance-based	N
	18. Aggregation	P
Impact Assessment	19. Uncertainty	N
	20. Alternative Comparison	L
Communication	21. Communicability	P
	22. Summary Format	L

#### Checklists + & -

- Advantages
  - can structure initial stages of assessment
  - help to ensure that vital factors are not neglected
  - are easy to apply, particularly by non-experts
- Disadvantages
  - pose danger of "tunnel vision"

#### Matrices

Double entrance tables, permit establishment of relationships: "
1. Project actions or activities (causes) "
2. And the environmental factors (effects)

Functions:

- Preliminary identification of impacts (scoping)"
- Comparative analysis of alternatives"
- Impact assessment"
- -Presentation of evaluation results"
## Matrices - Basic rules

- 1. Objectives and assumptions clear.
- 2. Matrices can be used creatively to identify indirect impacts, cumulative impacts or contributions to mitigation measures.
- 3. Its better to use colour codes and graphical symbols in matrices.
- 4. The development of a matrix does not imply that it needs to be used in the report, it may simply be an element of work.
- 5. Each impact analysis needs to be contextualized.

## **Interaction Matrices**

- Allow for the identification of cause-effect relationships
- Qualitative or quantitative estimates can be used
- Can address impact severity and significance

## **Example of an Interaction Matrix**

	Spawning habitat (substrate)	Fishing	Water quality	Water Flow
Dredging				
Clearing				
Access				

## **RISK ASSESSMENT MATRIX**

- Quick method to visualize risk
- Helps Prioritize risk reduction measures
- Consider incident probability
- Consider severity that could results

## **Example of Risk Matrix Analysis**

Likelihood of Occurrence or Exposure	Catastrophic	Critical	Marginal	Negligible
Frequent	High	High	Serious	Medium
Probable	High	High	Serious	Medium
Occasional	High	Serious	Medium	Low Risk Acceptable Remedial
Remote	Serious	Medium	Medium	Low Risk Acceptable Remedial
Improbable	Medium	Low Risk Acceptable	Low Risk Acceptable Remedial	Low Risk Acceptable Remedial

## Use Risk Matrix with caution

- Discuss and review with supervisors and employees – is risk understood? Does everyone agree on assessment?
- Review and research loss history
- Do a reality check Could the severity be greater? Could the exposure be more frequent?
- Matrix <u>only</u> gives a relative way to set priorities and rank order risk

### Actions and Environmental Items in the Leopold Matrix

Actions			Environmental tems				
Category		Description	100	Category		Description	
A Modification of	a) Excit	tic fauna introduction	A.	Physical & chemical			
regime	<ul> <li>b) Dick</li> </ul>	ogical controls		charter Sectorization			
	<ul> <li>C) Micci</li> </ul>	fication of hebitat					
	d) Alter	ration of ground cover		1. Darth			
	a) Albe	ration of groundwater hydrology			- 1960	Mineral resources	
	(1) Aller	ration of drainage			100	Construction material	
	gi Filme	in control & flow modification			-	Scale	
	hi Can	militation.			100	Landform	
	0 imig	milion			-	Force fields & background radiation	
	D West	ether modification			12	Unique physical features	
	K) Durn	ning		2. Water			
	6 Surf.	beca or paying			100	Surface	
	mi Note	e E vibration			100	Operation	
					- 63	Underground	
B. Land	at Lits	an inelion			100	Quality	
Internetion matters the	b) Indu	striel sites & buildings			-	Temperature	
pometrustion.	ci Airo	erte				Recharge	
	di Hist	Instance & Deticiones			100	Show the & permatured	
	ed Door	eta & Invalia		3. Alternatives	and the second		
	5 Paul	in sets			int.	Quality (cases, carticulated)	
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	bit. Trust	enterios lines pineines & contiders			-	Tattración en	
	D. Deer	tions inclusions beaution		A. December 1	100		
	D. Obs	and displaying a straight pairs			in the	Devote	
	M. Ches	the second s			100	Examination	
	D. Car				100	Carportion Institution contribution)	
	ent Deet	and the second sec			100	Solution	
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	of Other	forma allo articipan				Consectors & setting	
	rat Direct				24	California and a second	
	and filling				1000	Contracting the contraction of the	
	Car Longer	the grant of the second s			100	Contrast of the land of the second	
	rg Cours	A. 10			20	An incompany	
	ag rue	nex s underground structures	- D.	teorogical conditions			
G. Resource	a) Disc	ding and drilling		1. Flore			
enditerations	b) Surf	tace excavation					
	CI Sub	surface accevation & retorting			- 160	Treese	
	d) Med	I dredging & fluid			50	Shrube	
	<ul> <li>Dres</li> </ul>	dging			-63	Grass	
	Class	er cutting & other lumbering			100	Crope	
	gi Con	mercial fishing & hunting				Micro flora	
					10	Aquatic plants	
D. Processing	at Far	ning .			100	Endangered species	
	b) Ren	ching & gristing			The later	Darriers	
	EL Free	d liate		2. Fautos	10	Corridors	
	d Dat	vine			100		
	ed Dree	ray persention			100	Bada	
	the latters	mail proceessing			100	Land animals including rectiles	
	of Marin	silungiosi industry			-	Fish & shellfish	
	the City	mical inclusion			100	Berthic organizme	
	D T-	The inclusion			20	Inter 10	
	and a second	and the R sales and			100	Mendia ma	
	MI CORE	will show			100	Enderstand starting	2
	D Deser				ALC: NOT	Carriers.	3.
	and the second				1000		
	and the second						

## Assessment Matrix

Assessment Criteria	Alternative 1<	Alternative 2	Alternative 3	Alternative 4
Source: RMIT University				
TRANSPORT ECONOMIC EVALUATION				
Project Total Estimated Cost (\$ Million)	103	104	105	115
Benefit Cost Ratio (BCR)	0.75	1.11	0.86	0.78
Net Present Value (NPV) (\$ Million)	-18.9	8.2	-10.4	-17.7
IMPACTS				
Land Required (ha)	299	265	305	290
No. of Houses Acquired (within right-of- way)	2	6	3	6
Road Safety (reduction in accidents in fir year of operation)	st 2.7	3.4	3.0	2.9
Business and Tourism	+	0	0	0
Agriculture	-	+	0	0
Social	+	0	0	0
Traffic Noise	+	0	0	0
Land Use Planning	+	0	+	0
Flora and Fauna	0	0	0	+
Exotic Vegetation	0	+	+	-
Landscape	+	0	0	0
Archaeology and Heritage	+	0	0	o <sup>36</sup>

## **Network Analyses**

- Used to identify cause-effect linkages
- Visual description of linkages
- Extension of information found in matrices

## **Network Analysis**

- The proposed project proceeded with the following major steps:
- 1. Review of the project description, which consists of the activities that will occur inside and outside the mill in the manufacture of pulp and paper, and review of the development and operation of the eucalyptus plantations that will supply the mill with wood.
- 2. Review of information on the environmental and socioeconomic setting of the project area, which included review of the current issues surrounding the project.
- 3. A visit to the proposed mill and plantation sites to gather information on the project and proposed site from local residents and the proponent.
- Information synthesis and screening of the potential environmental and socioeconomic effects of project. Development of the TOR for an EIA of the project.

## **Example of a Network Analysis**



## Network Analyses + & -

- Advantages
  - Provides visual summaries that are easily understood and communicated to decision-makers and the public
  - Useful for identifying important indirect impacts
- Disadvantages
  - May oversimplify relationships; can be hard to show adequate level of detail
  - As with above methods analysis is static
  - Doesn't show relative significance of impacts

## FLOW CHARTS

 Flowcharts and impacts trees, including network diagrams, enable the analysis of the interrelationship between causes and effects and enables the analysis of indirect and cumulative impacts.

## Flowcharts / Networks

## Advantages:

- integrated assessment, instead of discipline by discipline
- inter-relations between causes and effects, including indirect impacts
- cumulative impact assessment
- communication (when simple).

## Disadvantages:

- complexity (especially visually complex)
- difficult to distinguish and quantify magnitudes (and importance) of different impacts

# **Spatially Based Methods**

- Map Overlays
- Geographical Information systems

# Map Overlays

- Separate mapping of critical environmental features at the same scale as project's site plan
  - e.g. wetlands, steep slopes, soils, floodplains, bedrock outcrops, wildlife habitats, vegetative communities, and cultural resources...
- Older Technique: environmental features are mapped on transparent plastic in different colors
- Newer Technique: Geographic Information Systems (GIS)

## Map Overlays (Overlay Maps)

#### ENVIRONMENTAL IMPACT ASSESSMENT TOOLS AND TECHNIQUES



• An effective visual aid, Useful as documentation of environmental conditions existing before project implementation May describe both biophysical and social aspects area under of study.

## Map Overlays + & -

- Advantages
  - maps are commonly available
  - Excellent for showing spatial dimension and location of impacts
  - Most useful for assessing alternative routes for linear developments, e.g. pipelines, roads, transmission lines
- Disadvantages
  - Less successful with timing, reversibility, and probability of impacts
  - Sharp boundary definitions can be misleading



## Geographic information systems(GIS)

 GIS is computer-based system incorporating collection, storage, recovery, transformation and display of spatial data

# The Systematic Sequential Approach

- This section focuses on constructing the causal chain: activity changes impact mitigation. The four basic steps are:
- 1. For each reasonable project alternative (that is, technology, size, site, etc.), identify and describe the major project activities during construction, operation, and other phases.

#### **ACTIVITIES LEAD TO CHANGES**

- Predict significant changes in the natural environment, and when uncertain, their likelihood of occurrence, and magnitude or severity (Risk Assessment).
   CHANGES LEAD TO IMPACTS
- 3. Changes, *per se, are not impacts. Ask the question, "Who cares, and why?" about each* change in the environment. The answers are impacts on human health, welfare, and ecosystems.

#### IMPACTS LEAD TO MITIGATION

4. Where it seems likely that the impact is adverse and unacceptable, devise mitigative measures and project changes to prevent and/or ameliorate the impacts; and plan monitoring to assure the implementation of the measures and to determine whether other unforeseen impacts occur.

## Simulation Modeling Workshops

System ecologists have developed an approach to EIA and management commonly referred to as Adaptive Environmental Assessment and Management (AEAM). AEAM uses interdisciplinary workshops composed of scientists and environmental managers to construct simulation models to predict impacts (Holling, 1978). Simulation models are usually expensive, time consuming to construct, and used only when there is sufficient funding and expertise available.



Source Wathern (1988)

# **Sectoral Guidelines**

These guidelines normally contain a comprehensive listing of:

- 1. project types covered by the guidelines;
- 2. activities that fall within each project type;
- environmental components that may possibly be affected by the project activities;
- 4. significant issues that must be addressed in project planning;
- 5. suggested mitigation measures that might be incorporated into the project; and
- 6. recommended monitoring requirements.

## **Sectoral Guidelines**

In practice sectoral guidelines :

- 1. are most useful in the early stages of an environmental assessment when TOR for the EIA are unavailable or are being prepared;
- 2. help with impact identification and in the development of detailed TOR for conducting an EIA;
- 3. provide guidance on how to present information in the proper format to aid in review; and
- 4. provide useful information against which to evaluate the actual results of the EIA.

# THANK YOU