ENVIRONMENT IMPACT ASSESMENT

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EIS (ENVIRONMENT IMPACT STATEMENT)

An Environmental Impact Statement (EIS) is a document prepared to describe the effects for proposed activities on the environment. Here, "Environment,", is defined as the natural and physical environment and the relationship of people with that environment. This means that the "environment" considered in an EIS includes land, water, air, structures, living organisms, environmental values at the site, and the social, cultural, and economic aspects. An "impact" is a change in consequence that results from an activity. Impacts can be positive or negative or both. An EIS describes impacts, as well as ways to "mitigate" impacts. To "mitigate" means to lessen or remove negative impacts. Public Consultation is an important in EIS. It will be discussed in detail in unit 3.

EMP (ENVIRONMENTAL MANAGEMENT PLAN)

Environmental Management is the process of allocating natural and artificial resources so as to make optimum use of the environment in satisfying basic human needs at the minimum, and more if possible, on a sustainable basis.

It can also be defined as a generic description of a process undertaken by systems-oriented professionals with a natural science, social science, or less commonly an engineering, law, or design background, tackling problems of the human altered environment on a interdisciplinary basis from an quantitively and or futuristic viewpoint.

A well formed and documented action plan which describes above activities is called as environmental management plan.

PROJECTS WHICH NEED EIA

ACCORDING TO EIA NOTIFICATION 2006, GOVERNMENT OF INDIA

1. Mining
2. River valley project (Construction of Dam, Hydroelectric Power Project)
3. Off shore and On Shore Oil Exploration
4. Thermal Power Plants
5. Nuclear Power Plants
6. Coal Washeries
7. Cement Plant
8. Chemical Refinery / Chemical Manufacturing Factory
9. Industries of Leather/Skin/Synthetic Materials, Chemical and Dye, Paper & Pulp, Hazardous Materials etc. having any effect on environment.

CHARACTERISTICS OF EMP

It is often used as a generic term.

It supports sustainable development.

It deals with a world affected by human beings.

It demands a multidisciplinary or interdisciplinary approach.

It has to integrate different development viewpoints.

It seeks to integrate science, social science, policy-making and planning.

It recognizes the desirability of meeting, and if possible exceeding basic human needs.

The time-scale involved extends beyond the short-term and concerns range from local to global.

It should show opportunities as well as address threats and problems.

It stresses stewardship, rather than exploitation.

TYPES OF ENVIRONMENTAL IMPACTS [1]

1. Beneficial or detrimental
2. Naturally reversible or irreversible
3. Repairable via management practices or irreparable
4. Short term or long term
5. Temporary or continuous
6. Occurring during construction phase or operational phase
7. Local, regional, national, or global
8. Accidental or planned (recognized before hand)
9. Direct (primary) or indirect (secondary)
10. Cumulative or single

STEPS IN EIA [1]

1. **Project screening:** Not all development projects require EIA. Project screening will help to identify the ones that actually do. This section describes the various screening criteria. This is done by CPCB
2. **Scoping**: The process of scoping helps determine the coverage or "scope" of the EIA. The methods of scoping are elaborated in this section.
3. **Baseline data collection**: A brief explanation on the concept of baseline data collection, its purposes, source of collection of baseline data, and derivation of primary data are given in this part of EIA process.
4. **Identification of environmental impacts**: Described here are the various types of environmental impacts of development projects both beneficial and adverse.

STEPS IN EIA (CONTD..)

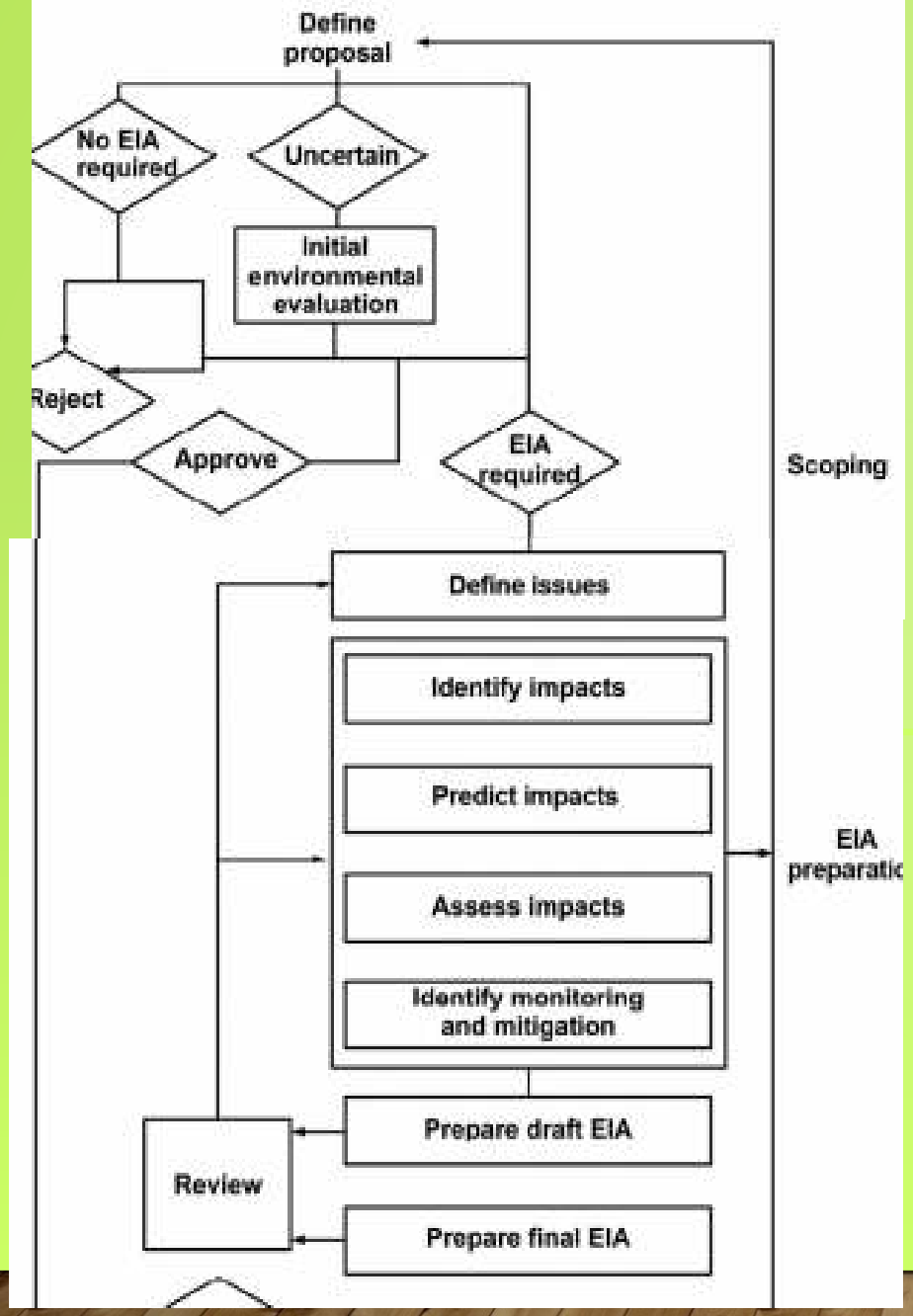
5. **Impact prediction comparison of alternatives and determination of significance**: This section covers the considerations for impact prediction, uncertainties in impact prediction, and comparison of alternatives for impact prediction.
6. **Mitigation measures**: Described briefly under this section are the concept and objectives, types, and interesting points of mitigation measures.
7. **Public consultation and participation:** Public participation is a necessary component of the EIA. “Who are the public?”, “How to involve them?”, and “What are the benefits/ disbenefits?” The answers can be found under this section. This mainly constitutes the report on the socioeconomic environment.

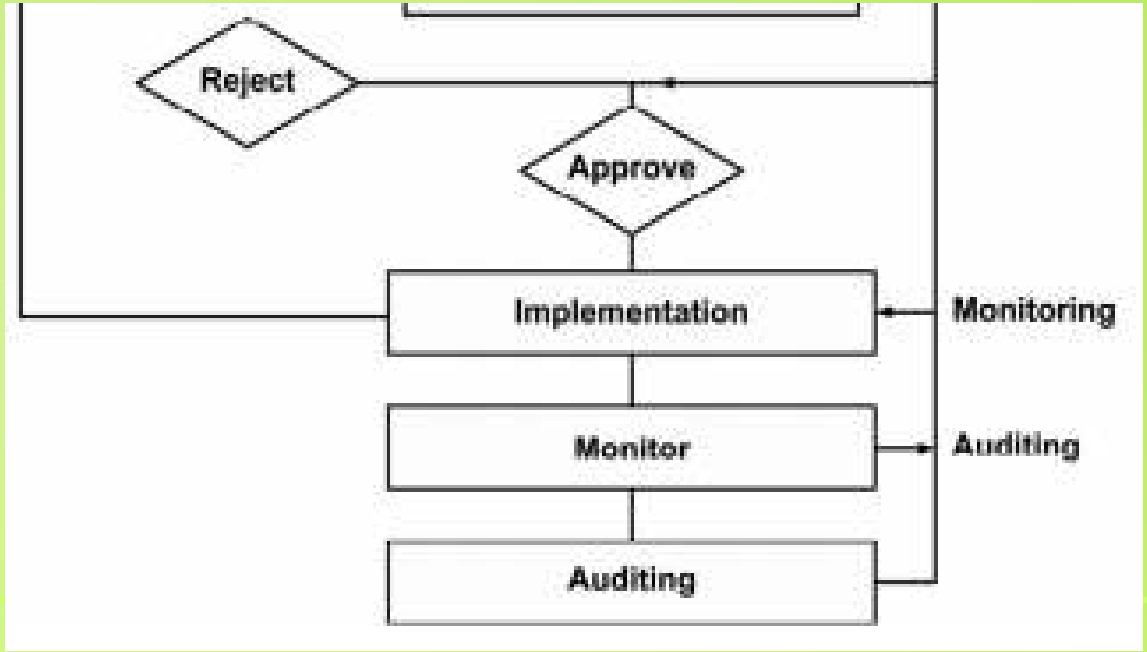
STEPS IN EIA (CONTD..)

8. **Environmental monitoring**: As one of the most important aspects of EIA, “environmental monitoring” is defined here along with explanations on monitoring principles, types, and institutional aspects.
9. **Environmental auditing**: You will find under this section the various types of environmental auditing and when it should be carried out during the EIA

EIA BENEFITS AND FLAWS

Benefits	Flaws
Provides systematic methods of impact assessment	Time-consuming
Estimates the cost/benefit trade-off of alternative actions	Costly
Facilitates the public participation	Little public participation in actual implementation
Provides an effective mechanism for • coordination, • environmental integration, • negotiations, • feedback.	Unavailability for reliable data (mostly in developing countries)
Top-level decision-making	Too focused on scientific analysis (sometimes)
Triggers an institutional building	Poor presentation of EIA report (bulky volumes, scientific explanation, difficult to understand)
Achieve a balance between the impact of developmental and environmental concern	Compliance monitoring after EIA is seldom carried out


Define proposal
No EIA required
Uncertain
Initial environmental evaluation
Reject
Approve
EIA required
Scoping
Define issues
Identify impacts
Predict impacts
Assess impacts
Identify monitoring and mitigation
EIA preparatic
Prepare draft EIA
Review
Prepare final EIA


Reject
Approve
Implementation
Monitoring
Monitor
Auditing
Auditing

SCREENING

There are Four Broad Steps in EIA

1. Screening
2. Scoping
3. Public Consultation
4. Appraisal

METHODS OF EIA

There are seven general methods of EIA

1. Ad hoc
2. Checklists
3. Matrices
4. Networks
5. Overlays
6. Cost/benefit analysis
7. Modeling

CHECKLISTS METHOD

1. **Environmental factors are listed in a structured format and weightage is given to each factor based on the impacts it has on environment.**
2. **This method is done to assess the nature of impacts i.e. adverse or beneficial. The adverse/beneficial impacts are further sub categorized into short term-long term, no impact-significant impact or reversible – irreversible impact etc.**
3. **It is extensive and complete. All possible impacts are listed in the checklist.**
4. **Scaling matrix is generally used in final evaluation of a project and in comparing the different alternatives.**

CHECKLISTS METHOD

It should identify the impacts on

1. **SOIL**
2. **WATER**
3. **ATMOSPHERE**
4. **FLORA**
5. **FAUNA**
6. **Resources**
7. **Recreation**
8. **Cultural**

CHECKLISTS ARE MAINLY OF 4 TYPES

1. **Simple: No information 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. **Scaling & Rating:- Against each impact, a scale of 1-3 is used to quantitatively estimate the impact**

SIMPLE CHECKLISTS METHOD

Items	Nature of Likely Impacts									
	Adverse						Beneficial			
	ST	LT	R	IR	L	W	ST	LT	SI	N
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							x			x
Socioeconomic								x		x
Aesthetic		x			x					

Legend

x	indicates potential for type of impact	ST	denotes Short Term	LT	denotes Long Term
R	denotes Reversible	IR	denotes Irreversible	L	denotes Local
W	denotes Wide	SI	denotes Significant	N	denotes Normal

DESCRIPTIVE CHECKLISTS METHOD

No.	Questions to be considered in Scoping	Yes/No/?	Which Characteristics of the Project Environment could be affected and how?	Is the effect likely to be significant? Why?
1. Will construction, operation or decommissioning of the Project involve actions which will cause physical changes in the locality (topography, land use, changes in waterbodies, etc)?				
1.1	Permanent or temporary change in land use, landcover or topography including increases in intensity of land use?			
1.2	Clearance of existing land, vegetation and buildings?			
1.3	Creation of new land uses?			
1.4	Pre-construction investigations eg boreholes, soil testing?			
1.5	Construction works?			
1.6	Demolition works?			
1.7	Temporary sites used for construction works or housing of construction workers?			
1.8	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations?			
1.9	Underground works including mining or tunnelling?			
1.10	Reclamation works?			

EXAMPLE OF DESCRIPTIVE CHECKLIST METHOD (SOURCE FROM INTERNET)

3.4	Are there especially vulnerable groups of people who could be affected by the project eg hospital patients, the elderly?	Yes	Project location is adjacent to regional hospital and long term care centre. Potential for significant noise and other disturbance during construction	Yes - Hospital environment may become much noisier over one year construction period.
4. Will the project produce solid wastes during construction or operation or decommissioning?				
4.2	Municipal waste (household and or commercial wastes)?	Yes	New population will generate household and other wastes	No- there is ample local waste management capacity
5. Will the project release pollutants or any hazardous, toxic or noxious substances to air?				
5.5	Dust or odours from handling of materials including construction materials, sewage and waste?	yes	Earth moving during construction could be dusty in dry climate and affect neighbouring habitats and residents	Yes - Habitat is internationally protected and vulnerable to dust deposition. Condition of hospital patients could be worsened by exposure to dust
6. Will the project cause noise and vibration or release of light, heat energy or electromagnetic radiation?				
6.5	From construction or operational traffic?	yes	Heavy traffic flows for import of material during construction affecting residents and hospital	Yes – noise levels already elevated by traffic and industry
7. Will the project lead to risks of contamination of land or water from releases of pollutants onto the ground or into sewers, surface waters, groundwater, coastal wasters or the sea?				
7.2	From discharge of sewage or other effluents (whether treated or untreated) to water or the land?	Yes	Increase in municipal sewage flows from new residents	Possibly – depends on requirement for new treatment facilities

SCALING AND WEIGHING CHECKLIST

Two alternative examples to illustrate weighting and scaling techniques.

Factors	Weights	Alternative One			Alternative Two		
		Raw Data	Scaled	Weighted	Raw Data	Scaled	Weighted
Wildlife Habitat Preserved (ha.)		5000			10000		
Employment Increase (jobs)		5000			3000		
Wildlife Habitat Index	1		0.5			1	
Employment Increase Index	1		1			0.6	
Wildlife Habitat Weighted Index	0.2			0.1			0.2
Employment Increase Weighted Index	0.8			0.8			0.48
Grand Index		n/a	1.5	0.9	n/a	1.6	0.68

MATRIX METHOD

1. **Matrix is a presentation of information in grid form.**
2. **In this method project activities (e.g. construction, demolition, querrying etc.) are mentioned on one axis while environmental factors (e.g. air, water, land, flora, fauna, forests, aquatic life, rivers, farming etc.) are mentioned on other axis. If impact due to any activity on environmental factor exists it is mentioned in corresponding cell.**
3. **If more information is required about a project, then symbols, color coding or ranking (1,2,3..) can be used to mention the intensity and importance of the impact.**
4. **Earliest example of a matrix method is Leopold Interaction Matrix. It is an comprehensive matrix having 88 environmental factors/characteristics and 100 project activities. Generally in all project we need to take only those activities and environmental factors which are actually affected.**

MATRIX METHOD

THIS EXAMPLE IS OF EIA OF MAA WASTE WATER TREATMENT PLANT AT NACHARAM AND MALLAPUR INDUSTRIAL AREA DEVELOPED JOINTLY BY INDWA GROUP, GOVERNMET OF INDIA AND GOVERNMENT OF ANDHRA PRADESH

MATRIX METHOD

and Government of Andhra Pradesh. The following definitions are used for the codes (Canter, 1991).

SB = Significant beneficial impact: represents a highly desirable outcome in terms of either improving the existing quality of the environmental factor or enhancing that factor from an environmental perspective.

SA = Significant adverse impact: represents a highly undesirable outcome in terms of either degrading the existing quality of the environmental factor or disrupting that factor from an environmental perspective.

B = Beneficial impact: represents a positive outcome in terms of either improving the existing quality of the environmental factor or enhancing that factor from an environmental perspective.

A = Adverse impact: represents a negative outcome in terms of their degrading the existing quality of the environmental factor or disrupting that factor from an environmental perspective.

b = Small beneficial impact: represents a minor improvement in the existing quality of the environmental factor or a minor enhancement in that factor from an environmental perspective.

a = Small adverse impact: represents a minor degradation in the existing quality of the environmental factor or a minor disruption in that factor from an environmental perspective.

O = No measurable impact is expected to occur as a result of considering that project action relative to the environmental factor.

M = Some type of mitigation measure can be used to reduce or avoid a minor adverse, adverse, or significant adverse impact.

NA = The environmental factor is not applicable or not relevant to the proposed project.

Simple interaction matrices have been used for analyzing the impacts include flood-control and/or hydropower, highway, transmission-line, offshore projects, coal mine, power plant, industrial plant, industrial park, construction and building projects and area development projects.

MATRIX METHOD

Table 5.3 Interaction Matrix a typical example (CETP)

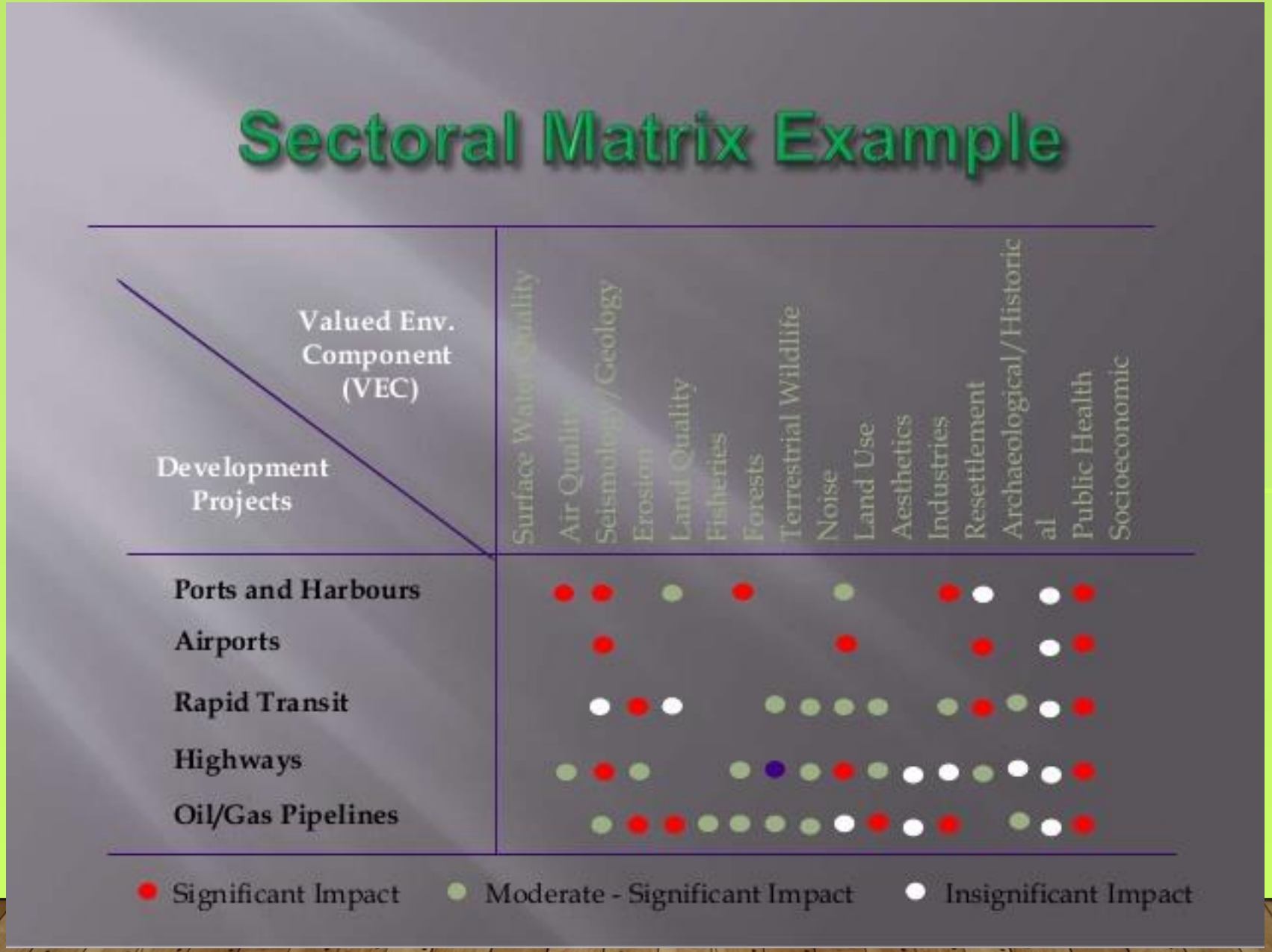
Environ-mental attributes	Baseline quality	Construction phase				Operation phase			
		Collection system	Treatment plant	Outfall line	Resultant quality	Collection system	Treatment plant	Outfall line	Resultant quality
Air quality	In compliance with air quality standards	A/M	A/M	a	Dusts, CO	a (odor at lift station sites)	A/m	O	Localized odor
Noise	Typical of urban residential areas	A/M	A/M	a	Increase in local noise	a (pumps)	a	a (pumps)	Small increase in noise
Ground water	satisfactory for area	O	O	O	Same as existing	b	b	b	Better quality due to less sheet water discharge
Beach erosion, coral reef, coastal water quality	Erosion of 0.1 to 0.3 m/yr. deteriorating coral reef and coastal water quality	NA	NA	a (Water quality)	Turbidity increase	b	SB	NA	Improve quality
Traffic	No problem as it is inside the industry	SA/M	a	a	Increase in congestion	a	a	a	Continued problem due to movement of vehicles

A = adverse impact, M = mitigation measure planned for adverse impact, a = small adverse impact, O = no anticipated impact, NA = environmental factor not applicable, SA = significant adverse impact, b = small beneficial impact, B = beneficial impact, SB = significant beneficial impact.

MATRIX METHOD

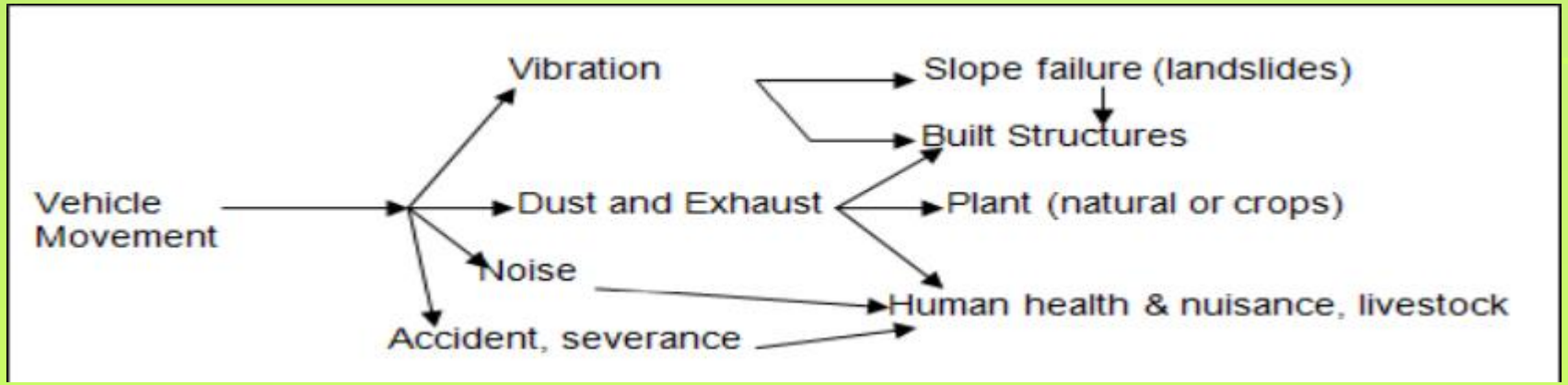
		PROJECT ACTIONS HAVING THE POTENTIAL TO CAUSE AN IMPACT																	
		A1 Modification of industrial site	A2 Modification of industrial buildings	A3 Modification of property limits	A4 Demolition of buildings	A5 Construction of new buildings	A6 Landfills and earth movements	A7 Siting and drainage	A8 Recycling of wastes	A9 Transport of materials	A10 Handling of hazardous radioactive or toxic materials	A11 Emission of liquid and gaseous effluents	A12 Use of rubble tips or solid inert waste tips	A13 Storage of solid radioactive wastes	A14 Fires	A15 Releases or leakage of contaminating liquids or gases	A16 Operating failures	A17 Personnel accidents	A18 Structural failures due to external events	A19 Monitoring and control operations
ENVIRONMENTAL FACTORS																			
PHYSICAL MEDIUM	E1 AIR				X	X	X			X		X			X	X			X	
	E2 LAND AND SOIL	X	X	X	X	X	X	X	X			X	X	X		X			X	
	E3 WATER							X				X	X	X		X			X	
	E4 FLORA											X	X	X		X			X	
	E5 FAUNA											X	X	X		X			X	
	E6 LANDSCAPE		X		X	X	X						X	X	X					
	E7 NOISE AND VIBRATION	X	X		X	X	X			X			X						X	
SOCIO-ECONOMIC MEDIUM	E8 LAND USE	X		X	X	X							X	X		X			X	
	E9 CULTURAL FACTORS	X																		
	E10 INFRASTRUCTURE									X										
	E11 HUMAN FACTORS				X	X	X			X	X	X	X	X	X	X	X	X	X	X
	E12 POPULATION AND ECONOMY	X							X										X	

MATRIX METHOD

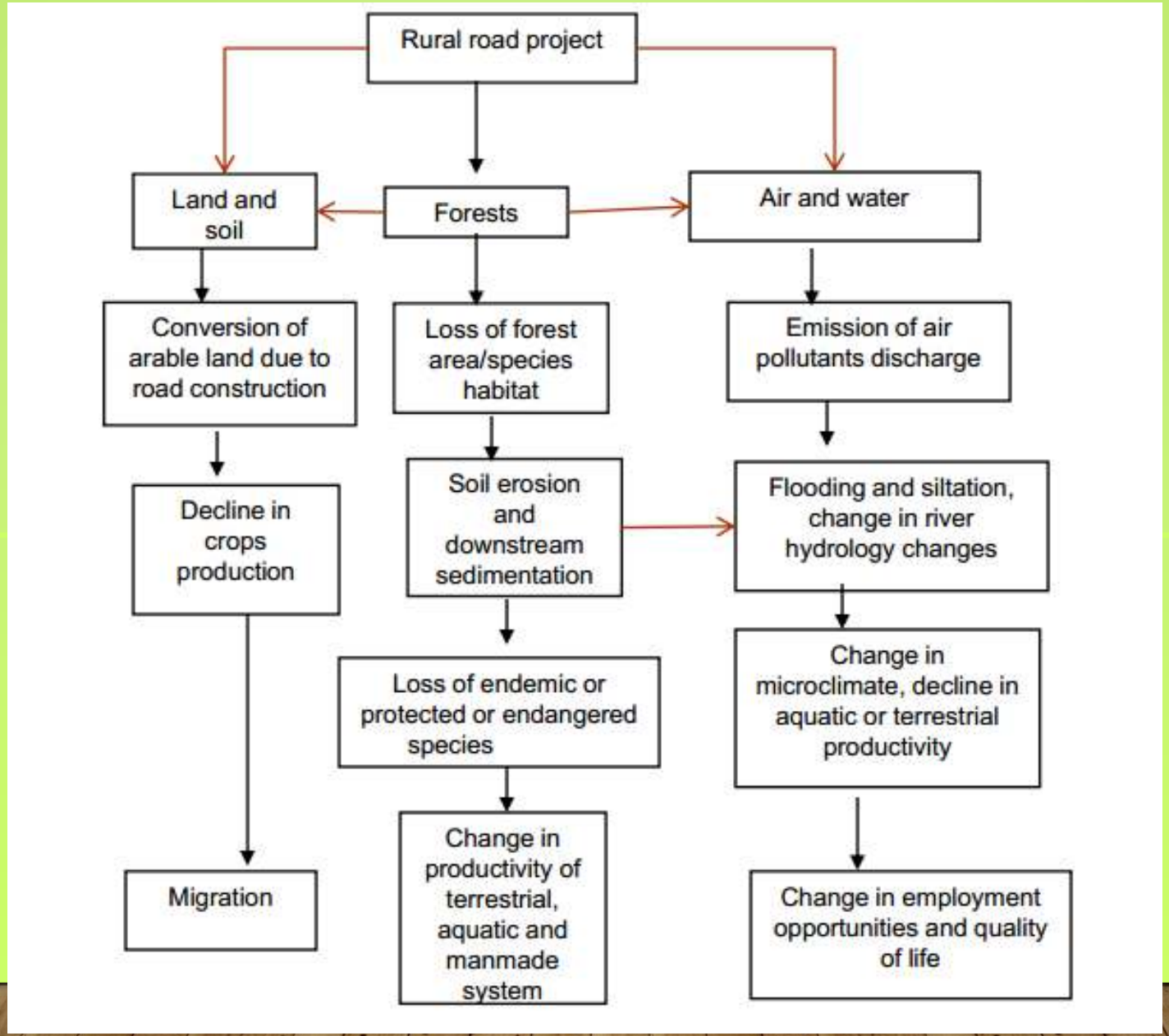


NETWORK METHOD

1. **In this method the relationship between the project activities and their effects are shown.**
2. **Secondary effects can also be seen easily.**
3. **It does not provide any information about the magnitude and importance of impact.**
4. **It is generally shown as flow diagram.**



NETWORK METHOD EXAMPLE



NETWORK METHOD EXAMPLE

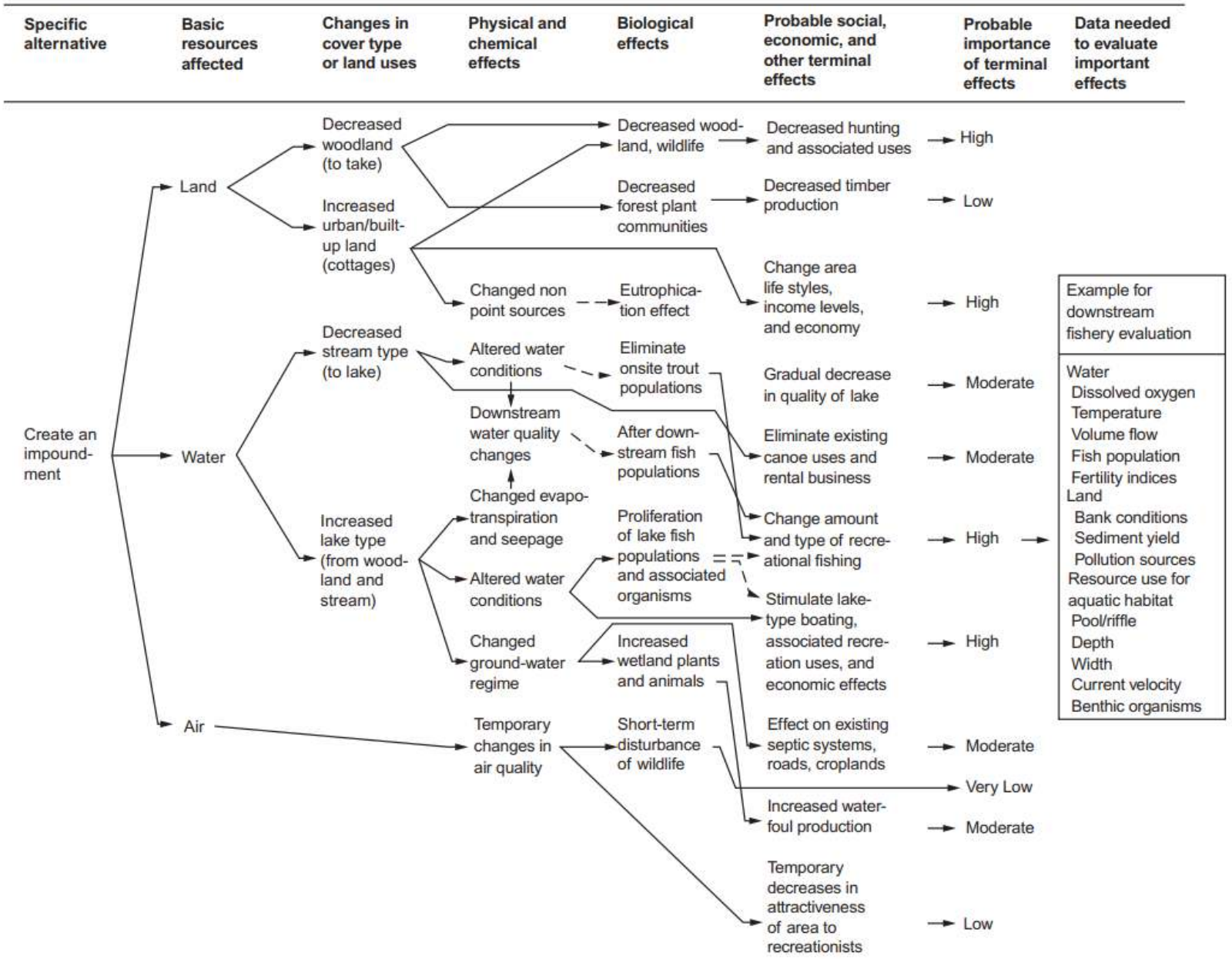


Fig. 4.3 An example of a network diagram for analyzing probable environmental impacts.

NETWORK METHOD EXAMPLE