

UNIT-I

DIFFERENT METHODOLOGIES OF E.I.A

Any Environmental impact Analysis methodology should effectively deal with

- a. impact identification, impact measurement, impact interpretation
- b. impact communication to information users

E.I.A, methodologies have not yet been standardized and are not yet well documented. From the available literature, it can be understood that six methods are referred frequently. Based upon the way impacts are identified, the six methods are named as

- i. Ad Hoc method
- ii. Overlays methods
- iii. Checklist method
- iv. Network method
- v. Method of Matrix
- vi. Combination –computer aided method

The names of the methods are self explanatory and description of each one of the six methods is made below.

- i. **Ad Hoc Method:** Broad areas of possible impacts like impacts upon flora and fauna, impacts on lakes and forests etc.; are identified in this method. This method does not define specific parameters to be investigated, and so may not provided sufficient guidance for impact assessment. A team of specialists will identify the nature of the impacts such as no effect, short or long term, reversible or irreversible etc. Ad hoc methods are for rough assessment of total impact giving the board areas of possible impacts and general nature of these possible impacts.

This method was use initially in 1971 as a planning tool for sating power generation and power transmission facilities. the approach consider a range of pollution , and cological, economic and

ii. **Overlays Method :**

A set of transparent maps giving physical, social, ecological, aesthetic characteristics of the project area are overlaid to produce a composite characterization of the regional environment. By overlaying maps, area of preferred variable and area of adverse impacts and their geographical locations are identified. Overlays method has been used popularly in highway route selection and selection of transmission line corridors. This method is useful as a first-out method of identifying and shifting out alternative projects sites prior to preparing a detailed impact analysis. However, this method is unable to quantify and identify possible impacts. High degree of skill and training are required to prepare the map overlays. The best utility of the overlays method is to perform an initial screening process to identify feasible alternatives which would then be subjected to a more detailed analysis available through other means.

iii. **Checklist Method:**

A comprehensive listing of environmental parameters which are related to a particular type of action, is done in checklist method. This is a very popular method in EIA. Studies. Check list method helps order thought, aids in data gathering and presentation and acts against the omission of possible impacts. Four broad categories of check lists are in vogue, viz.

- i. Simple check lists
- ii. Descriptive checklists
- iii. Scaling checklists
- iv. Scaling weighting checklists

Simple checklists are a simple list of environmental parameters without any reference to as to how environmental parameter data are to be measured and interpreted. Descriptive checklists identify environmental parameters and give guidelines on how parameters data are to be measured. But no numerical ranking is use in evaluating the level of impact. Adkins and Broke

(4) used scaling checklists, involving the scaling of impacts on a relative basis from minus five to plus five. Scaling –weighting checklists represent scaling checklists with information provides as to subjective evaluation of each parameter with respect to every other parameter. Scaling weighting checklists employ both magnitude and importance factor.

Magnitude is considered to be a measure of the degree or severity of an impact and is assessed after the analysis of the impact . Importance is defined as the baseline level significance of an impact and is used to weight the impact appropriately as determined through the subjective judgment of a scientific team, determine prior to impact analysis. Table given below gives an examples of scaling –weighting checklists . the lists has to be very comprehensive to include all environmental parameters which will be effected by a project.

TABLE

An example checklist for a proposed industry in a study area

| Sl.No | Environmental parameter in the descending order of important | Rating or weight | Possible score on Environmental impact |
|-------|--|------------------|--|
| 1 | Air pollution | High | 10 |
| | | Medium | 5 |
| | | Low | 0 |
| 2 | Water pollution | High | 10 |
| | | Medium | 5 |
| | | Low | 0 |
| 3 | Rehabilitation | High | 10 |
| | | Medium | 5 |
| | | Low | 0 |

The major feature of the checklist system is that environmental impact is expressed in commensurate units. The steps involved in the development of commensurate units include transformation of parameter estimates into an environmental quality scale, assignment of importance weights to the individual parameter, and multiplication of scales value any importance value to obtain environmental impact units. One of the important environmental quality to assess the status of river is the concentration of dissolved oxygen, which may vary from 0 to 9 mg/l. Environmental quality scale can be identified for concentration of settleable dust in ambient air, leaching of pollutants into ground water etc. For any given project a panel of engineers can prepare a detailed list of environmental parameters which may be allocated by the project in the project are m, assign environmental quality indices and prepare values function graphs with environmental parameters like dissolved oxygen In river water, ambient dust fall concentration, concentration of dissolved solids in ground water, level of noise pollution, quality of solids waters etc. on the abscissa and environmental quality scale on the ordinate.

iv. Networks Method:

A project is related to its potential impact through a cause –condition-effect network. Through this method is not necessarily a full methodology, it will useful in identifying the impacts. Projects activities are related to first order condition charges, which in turn cause second and third order condition charges, leading finally to effects. In network diagrams , the impact of one environmental factor on other environmental or socio-economic factors and other similar interactions are identified.

Subsequently, network diagrams will acts as a guide for impact identification and presentation of results Odom (5) who wrote a book on Ecology used network diagram to depict the concept of energy flow between different components of oceans, rivers, forests, grasslands etc. Net work methodology was first used to identify potential commercial, residential and transportation use of sea coasts.

V. Method of Matrices:

Matrix method aims at relating projects activities to their environmental impacts. After the identification of project activities and their environmental impacts, their interdisciplinary team of specialists should assess the magnitude an importance. The matrix method is a convent method of visual display of both total project activities and their impacts. The Matrix method comprising of a series of rows depicting project activities and a series of columns depicting environmental impacts, has the ability for factor expansion , depending upon the project analysis.

The methods of assigning weights to the interactions can take various forms including the assignment of three levels of impact viz :major , minor, intermediate, or assignment of negative as well as positive scores to indicate the adverse or beneficial nature of the impact. Scales have also been used to describes the possibilities of impact occurrence as well as the extent of potential impact reversibility.

The most effective way to use the matrix is to check each action which is likely to be involved significantly in the proposed development project. Each of the action thus checked is evaluated in terms of magnitude of effects on environmental characteristics on the vertical axis, and a slash is placed diagonally from upper to lower left across each block represents significant interaction. After all the boxes which represent possible impact have been marked , the most important ones are evaluated individually. Within each is representing a significant interaction place a number 1 to 10 on the upper , left-hand corner to indicate the relative magnitude of impact (1 is the least impact, 10 is the greatest) in the lower right had corner of the box, place a number 1 to 10 to indicate the relative importance of the impacts (again 1 is the least impact, 10 is the greatest). Magnitude is defined as the degree or the extensiveness of scale of the impact, while importance is a weighting of the degree of significance of the impact. The former can be based on fact, while the later is based on judgment.

VI. Combination Computer –Aided:

To identify activities associated with implementing major governmental parameters to identify potential environmental impacts at different user levels, to provide guidance for abatement and mitigation techniques, and to provide analytical models to establish cause –effects relationships to quantitatively determine potential environmental impacts, a combination of matrices, networks, analytical models and a computer aided systematic approach if allowed. Given the appropriate input information for a particular program, the computer-aided system developed will provide relevant environmental information to allow the user to respond to the requirements of environmental quality guidelines. Analytical models, like Economic impact Forecast System(EIFS), , are being developed to quantitatively assess the environmental impacts. Three levels of attributes viz; detailed level, review levels, and controversial attributes, are identified. Ramification remarks regarding potential impacts are presented along with mitigation procedures for minimizing adverse impacts. Instead of a numerical system, potential impacts are identified on a need –to-consider scale, using A,B and C as indicators.

Criteria for choosing an EIA methodology:

A number of people like Adkins, Burke, Dee, Jain, Leopold, Moore, Smith, Warner etc; have used one form or the other of EIA. Methodologies like adhoc, overlay, checklist, matrix, network of combination computer-aided etc. Important criteria to be considered. In choosing and evaluating an impact assessment methodologies are: comprehensive nature, flexibility of detecting project-generated impacts, and objectivity. the methodology chooses should ensure input expertise, utilize the state of the art , employ explicitly defined criteria , provided for assessment of impact magnitude, provide for overall assessment of total impacts and detect environmentally sensitive areas.

In view of the large number of models and methodologies being practiced in EIA .studies, one must choose between two extremes: complete uniformity or complete uniqueness. So far as uniformity, reproducibility and comparability are concerned, it would be profitable if one uniform method could be prescribed for any EIA. On the other hand, each environment is so unique that a standard methodology would most probably neglect the unique factors. This is why many specialists on EIA made their own methodologies for watch one of the projects.

Finally, any EIA methodology is expected to de three main things, viz; i. Identification , ii. Prediction and iii. Evaluation.

In the process of **identification**, the existing system has to be clearly described, the components of the project have to be clearly identified, and modifications in the project area as also in all the projects components have to be defined effectively. In the process of **prediction**, Identification of environmental modifications that may be significant is expected,. It is necessary to forecast the quantity and special dimensions of change in the environment of the project area. I is along with some time frame. In the process of **evaluation** , it become necessary to determine the incidence of costs and benefits to user group and populations affected by the project. It become necessary to prepare specifications and comparisons of the trade off (costs or effects being balanced) between various alternatives

Follow up of E.I.A:

Environmental Impact Assessment should be followed by analytical studies of the special impacts on the environment which appears most adverse. This is achieved by techniques such as materials balance, dispersion modeling, market simulation, marginal cost analysis and trade-off analysis.

The first and most basic analysis is to prepare a materials balance model of projects operational showing all materials inputs and outputs. Inputs will depend on the type of project and residuals released to the environment will be related to the processes involved and the controls incorporated in the project.

It is them, necessary to study the dispersion of residuals released to the ecosystem. In this way we arrive at concentration and movements of pollutants which will allow us

to assess potential damage and other damage costs associated with subsequent uses of the environmental media.

The next step is to construct a market simulation of the ecosystem which involves attaching shadow prices to unpriced values. Easily obtained market prices will be for project development costs, materials, power, labour and other operating costs and product prices. Unpriced components will be related to the ecosystem and are the values attached to water quality, air quality, wilderness quality, scenic views, biological health, species balance and hazards to species. Some of these unpriced components, can be valued as the cost of rectification or avoidance; damage costs of poor air, air and water quality can be determined by estimating the costs of removal of pollutants to a desirable or safe level.

The optimum level of environmental quality may not immediately appear because the marginal cost for each degree of quality is not constant.