GREEN BUILDING CONCEPT

Green building (also known as **green construction** or **sustainable building**) refers to both a structure and the using of processes that are environmentally responsible and resource-efficient throughout a building's life-cycle: from siting to design, construction, operation, maintenance, renovation, and demolition. In other words, green building design involves finding the balance between homebuilding and the sustainable environment. This requires close cooperation of the design team, the architects, the engineers, and the client at all project stages. The Green Building practice expands and complements the classical building design concerns of economy, utility, durability, and comfort.

Although new technologies are constantly being developed to complement current practices in creating greener structures, the common objective of green buildings is to reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and environmental degradation

Benefits of Green Building

With new technologies constantly being developed to complement current practices in creating greener structures, the benefits of green building can range from environmental to economic to social. By adopting greener practices, we can take maximum advantage of environmental and economic performance. Green construction methods when integrated while design and construction provide most significant benefits. Benefits of green building include:

Environmental Benefits:

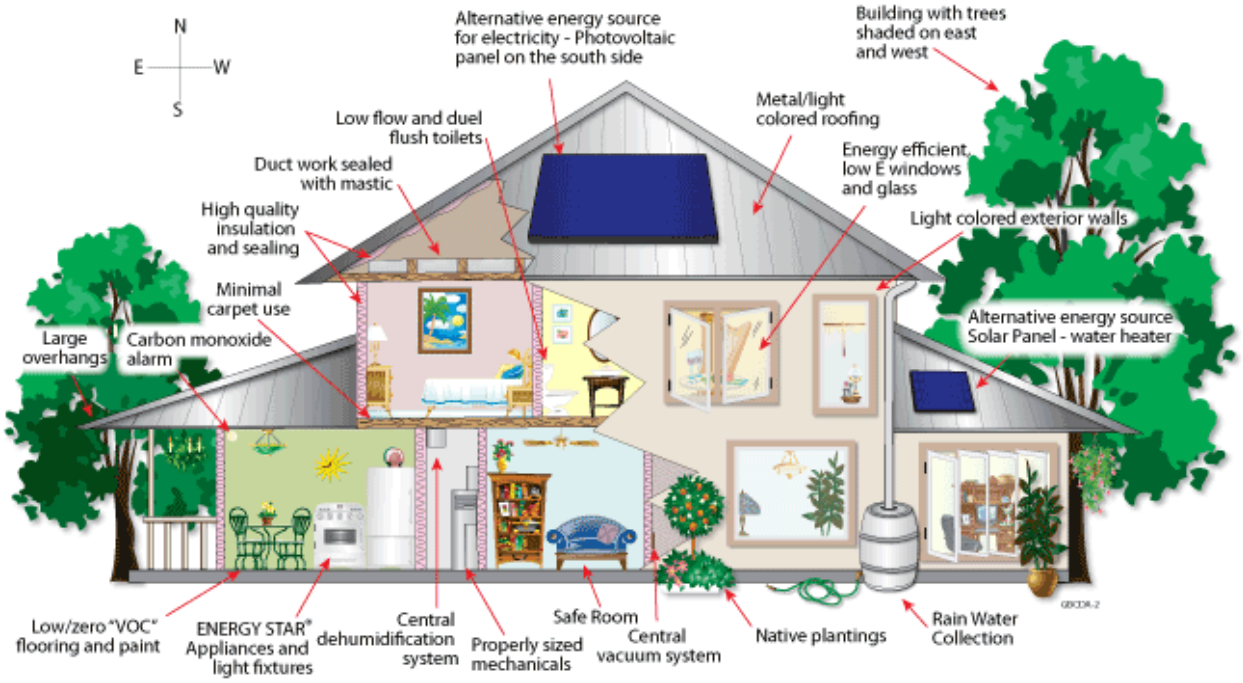
- Reduce wastage of water
- Conserve natural resources
- Improve air and water quality
- Protect biodiversity and ecosystems

Economic Benefits:

- Reduce operating costs
- Improve occupant productivity
- Create market for green product and services

Social Benefits:

- Improve quality of life
- Minimize strain on local infrastructure
- Improve occupant health and comfort



Environmental Impact Assessment (EIA)

EIA goals

Environmental Impact Assessment is a tool designed to identify and predict the impact of a project on the bio-geophysical environment and on man's health and well-being, to interpret and communicate information about the impact, to analyze site and process alternatives and provide solutions to sift out, or abate/mitigate the negative consequences on man and the environment.

EIA is always necessary for a pulp and paper project (whether it is a new mill or the expansion of an existing facility), as for any industrial project of importance. The EIA is a means of avoiding environmental disturbances that are always much more expensive to correct after their occurrence than before. It is also important to underline that very few projects have been deemed not viable merely because of the cost of pollution control and that modern environmental control, in a new plant, is less than 3% of the initial investment.

Aware of this necessity, numerous countries have implemented EIA regulations. International agencies generally also lend their assistance to any industrial project of importance implementing an EIA, including pulp and paper industries.

Contents of an EIA

1. **Executive summary :**

   In a few pages it allows anyone (specialist or not) to understand the different repercussions of the project (on the environment, human well-being and safety) and to be informed of the alternatives chosen and the mitigating measures that have to be implemented.

2. **Project description, and legal and administrative framework :**

   A brief description of the project is necessary with all off-site extensions and their interaction with natural and social components. All the regulations implemented within the EIA must be detailed here.

3. **Scoping and screening :**

   It is important that people in charge of the protection of the environment (ministries, borrowers, donors, NGOs, associations, inhabitants…) can outline to the investor the limits of the EIA, in time, space and the type of impact to be addressed (as well as the way of evaluating them), and identify the alternatives.

4. **Description of the existing environment :**

   Precise data relevant to the site is required, describing: intended uses, quality, physical, biological, social, and economic conditions. This description must include other existing or proposed developments. The use of maps, graphs, drawings… is very important for a better understanding of the situation. Key data gaps and uncertainties must be identified here.

5. **Analysis of alternatives and basis for the selection of the alternative proposed:**

   The project description (see paragraph 2 above) is completed by a precise description of the different choices concerning processes, site and all alternatives that the investor has

examined for a better protection of the environment and populations concerned. A comparison of these different alternatives, in term of their potential impact and cost/benefit analysis, is required. The basis on which each alternative is chosen must be stated.

6. **Environmental issues of the project:**

Once the project is defined and all alternatives thoroughly studied, this section presents the environmental issues around the final project. Each area of positive or negative impact must be defined in terms of its magnitude, reversibility, period of occurrence and nature (primary, secondary…). At this stage it is important to outline in detail the different phases of the project and to address all the environmental repercussions linked with each phase. All the drastically negative repercussions that cannot be eliminated must be identified and mitigating measures must be proposed in the next chapter.

7. **Mitigating measures:**

For all remaining negative repercussions, mitigating measures have to be proposed (and must be undertaken as soon as the project starts). These measures must be realistic both technically and economically. The efficiency of each measure in reducing significant negative effects to an acceptable level must be assessed. An estimation of the required investment is necessary at this stage to verify the feasibility of the proposed measures.

8. **Environmental management and training and environmental monitoring plan:**

In order to try and prevent environmental accidents, it is necessary to prepare a document to define the role of each person or group in the environmental management team of the future company and the monitoring and training procedures undertaken to enhance the capabilities of the staff and workers. These documents will naturally be updated once the plant is built.

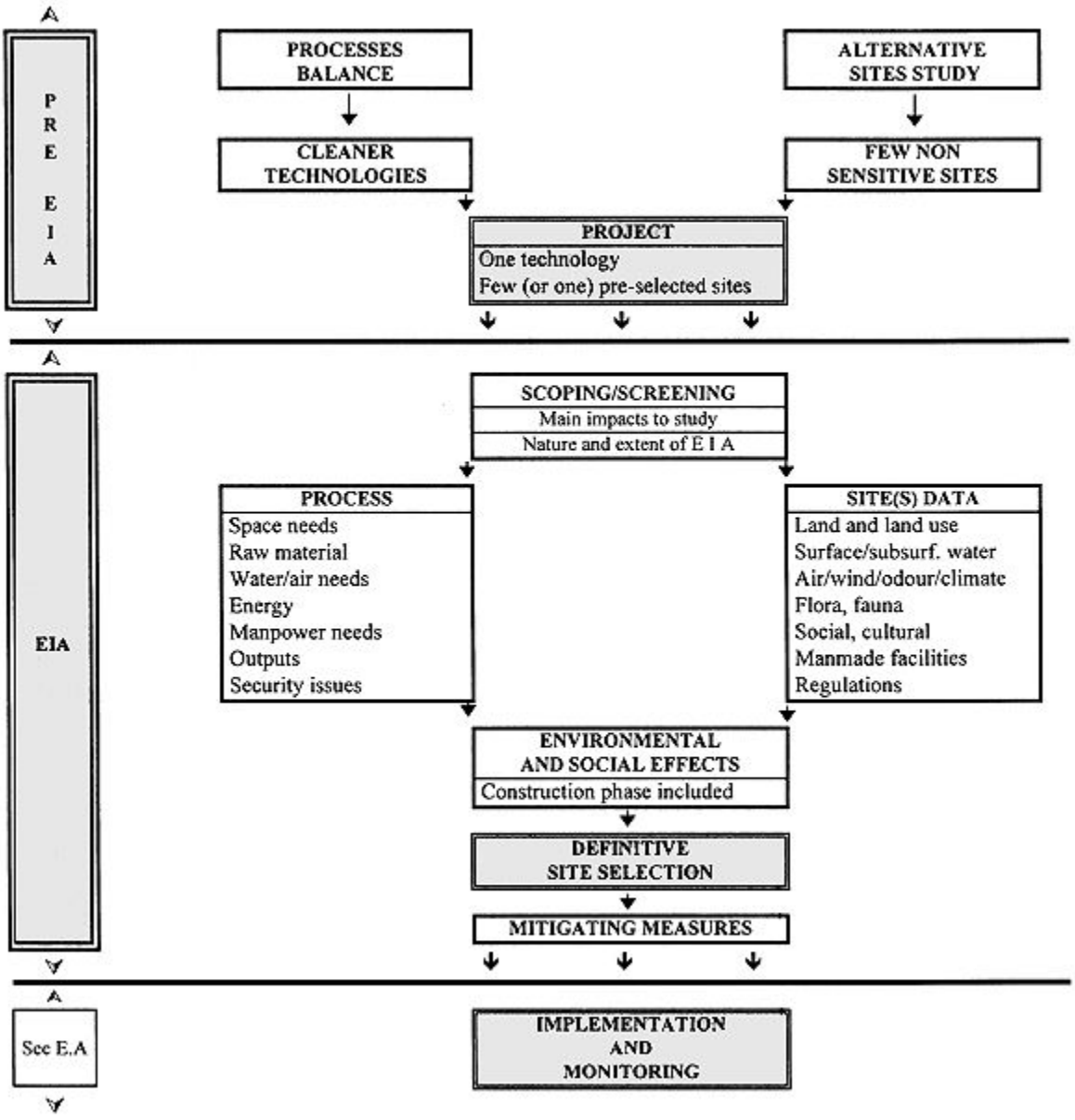
9. **Appendices:**

All documents needed for understanding the chosen methodology, the references, the meetings with ministries, scientists, managers, affected groups, the names and qualifications of the authors of the study, need to appear under this heading.

The EIA Cycle

The EIA follows the project but it has its own requirements. Figure 3 shows the EIA cycle and its conception. Chapter 3 proposes a precise description of each phase of an EIA for a pulp and paper project.

Figure 3 : Environmental Impact Assessment cycle



Methodologies for Predicting Impact in an EIA

various methods available to guide the EIA author. Three are being detailed here:

- The check-list method or the EIA type
- The matrix method,

Check-lists or EIA type methods

Various check-lists, or EIA type methods, are available world-wide. Generally check-lists are more widely used in developing countries while EIA type methods are often used in developed countries by authorities to guide the EIA authors in their thinking.

The principle of these two methods is to give a framework to EIA authors so that they do not forget any important point. Check-lists, or EIA type methods, are good tools but they cannot take into consideration all particular cases that can be met during an EIA. However, they are generally sufficient for small scale projects. These methods can be combined with the use of environmental guidelines, widely proposed by authorities or donors agencies.

While EIA type methods are available for different activities, check-lists are provided both for various sectors of activity (industries, forestry, agriculture…) and for the different types of areas affected (wetlands, tropical forests, coastal zones…).

Some examples of check-lists are provided both in the appendices and in the next chapter dedicated to EIA in the pulp and paper industry.

Matrix method

The Leopold matrix is the best known matrix methodology available for predicting the impact of a project on the environment.

It is a two dimensional matrix cross-referencing:

- the activities linked to the project that are supposed to have an impact on man and the environment.
- the existing environmental and social conditions that could possibly be affected by the project.

The activities linked to the project are listed on one axis: raw material production, building construction, water supply, energy supply, raw material preparation, pulp and paper mills

processing, gaseous emissions, liquid effluents, cooling water discharges, noise, solid wastes treatment and disposal, transportation.

The environmental and social conditions are listed on the other axis, and divided in three major groups:

- physical conditions: soil, water, air…,
- biological conditions: fauna, flora, ecosystems…,
- social and cultural conditions: land use, historical and cultural issues, populations, economy…

The Leopold matrix proposes a three-step process to estimate the impact:

First step :

for all the interactions considered significant by the authors, the first step is to mark the corresponding boxes in the matrix with a diagonal line.

Second step :

once the boxes with supposed significant interactions are slashed, the author evaluates each box by applying a number from 1 to 10 (1 is the minimum and 10 the maximum) to register the magnitude of the interaction. This number is transferred to the upper left hand corner. It represents the scale of the action and its theoretical extent.

Third step :

the final step for this method is to mark (from 1 to 10), in the lower right hand corner, the real importance of the phenomenon for the given project. It then gives an evaluation of the extent of the environmental impact according to the assessor's judgement.

Once the matrix is established the EIA gives a precise description of each important impact in the matrix (with the larger numerical values for magnitude and importance). The discussion must also address columns and rows with large numbers of interactions. They show activities, or elements, in connection with the environment which are particularly significant or sensitive.

The Leopold matrix proposes a framework for all developers but, on one hand, it is too detailed for pulp and paper projects, and on the other not precise enough for such projects. It is generally more efficient to accommodate it as needed and to develop a customized matrix for the project.