Life Cycle Assessment

Life Cycle Assessment (LCA)

- **Definition:** LCA is a sophisticated way of examining the total environmental impact of a product through every step of its life
  - From obtaining raw materials all the way through making it in a factory, selling it in a store, using it in the home, and disposing of it.
  - Disposal options include incineration, burial in a landfill, or recycling.

Overview of LCA

- History:
  - U.S. Department of Energy 60s-70s
  - Further develop by Coca-cola in 1969
- Still need further refinement & consistency. However, already been proven to be a useful decision making tool.
- Methodology described in an international standard ISO 14040

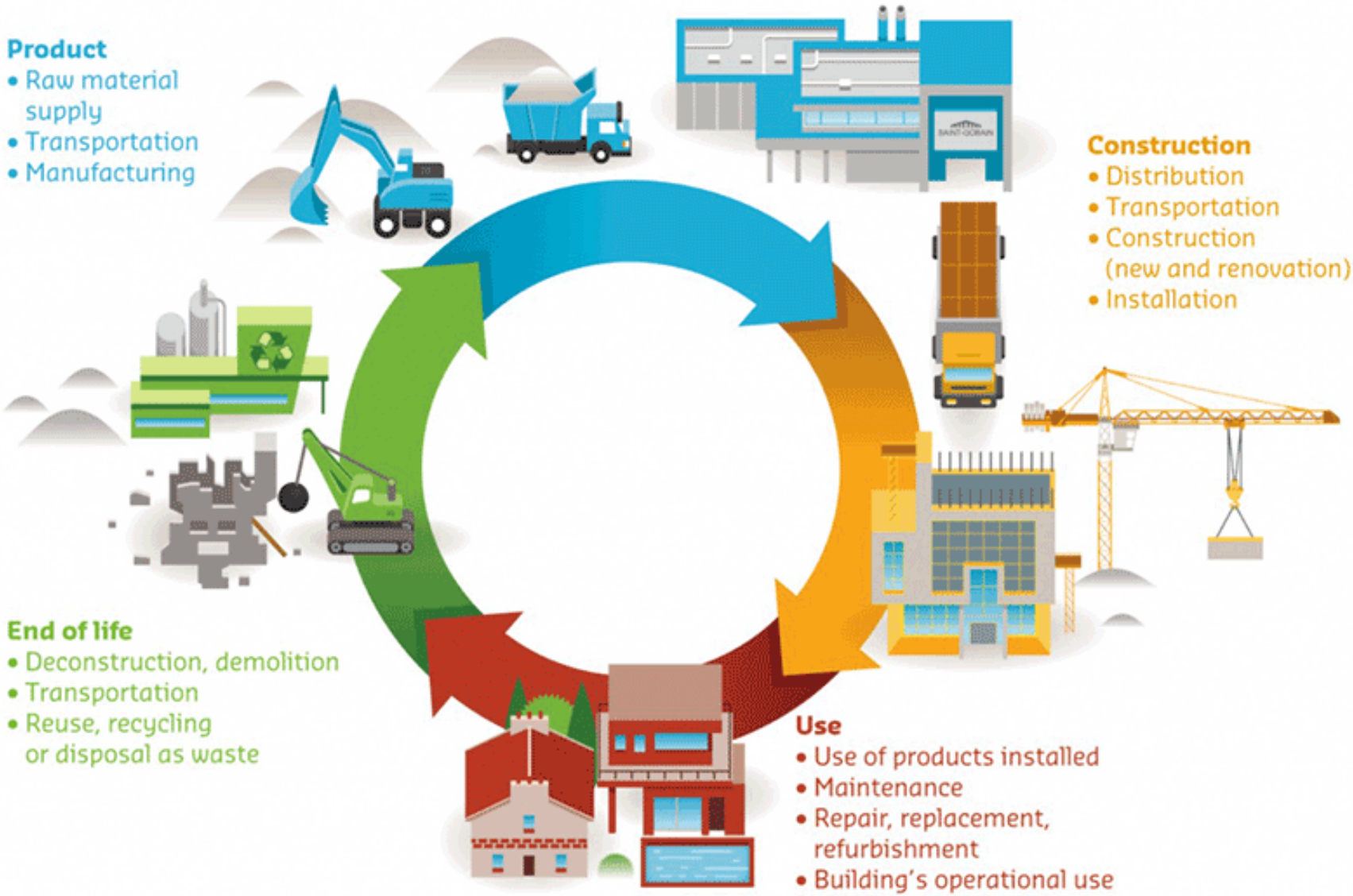
What is LCA?

https://www.iso.org/standard/37456.html
https://www.iso.org/standard/38498.html

(ISO 14040:2006) (ISO 14044:2006)

- **LCA** is a technique for assessing the potential environmental aspects associated with a product (or service), by:
- compiling an **inventory** of relevant inputs and outputs,
- **evaluating** the potential environmental impacts associated with those inputs and outputs,
- **interpreting** the results of the inventory and impact phases in relation to the objectives of the study.

THE LCA OF A CONSTRUCTION PRODUCT



Product
- Raw material supply
- Transportation
- Manufacturing

Construction
- Distribution
- Transportation
- Construction (new and renovation)
- Installation

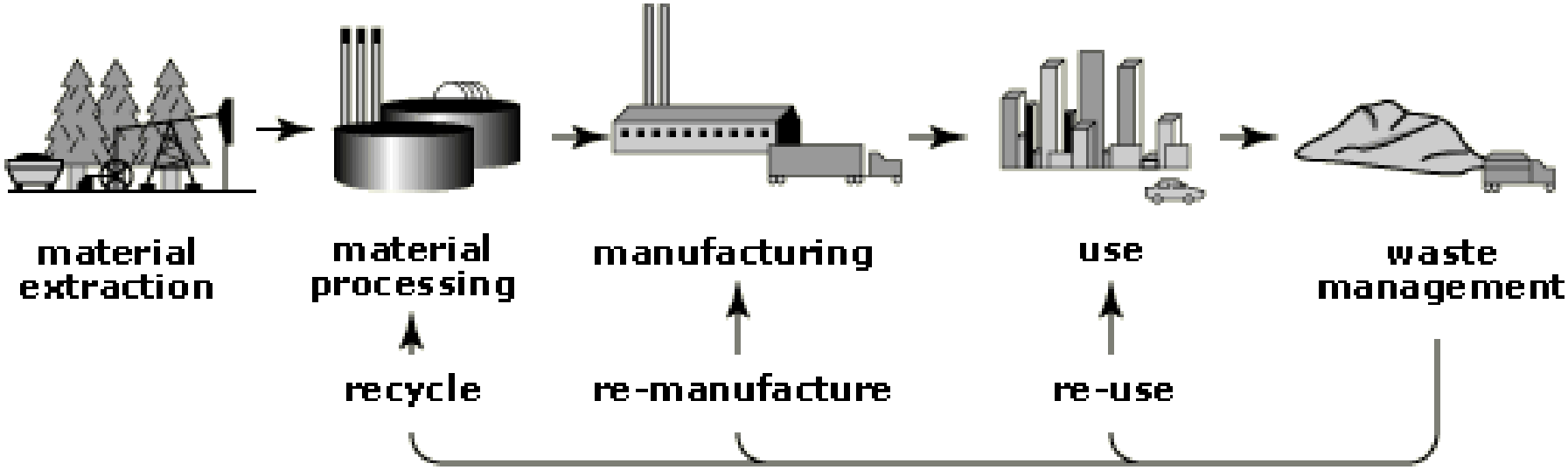
Use
- Use of products installed
- Maintenance
- Repair, replacement, refurbishment
- Building's operational use

End of life
- Deconstruction, demolition
- Transportation
- Reuse, recycling or disposal as waste

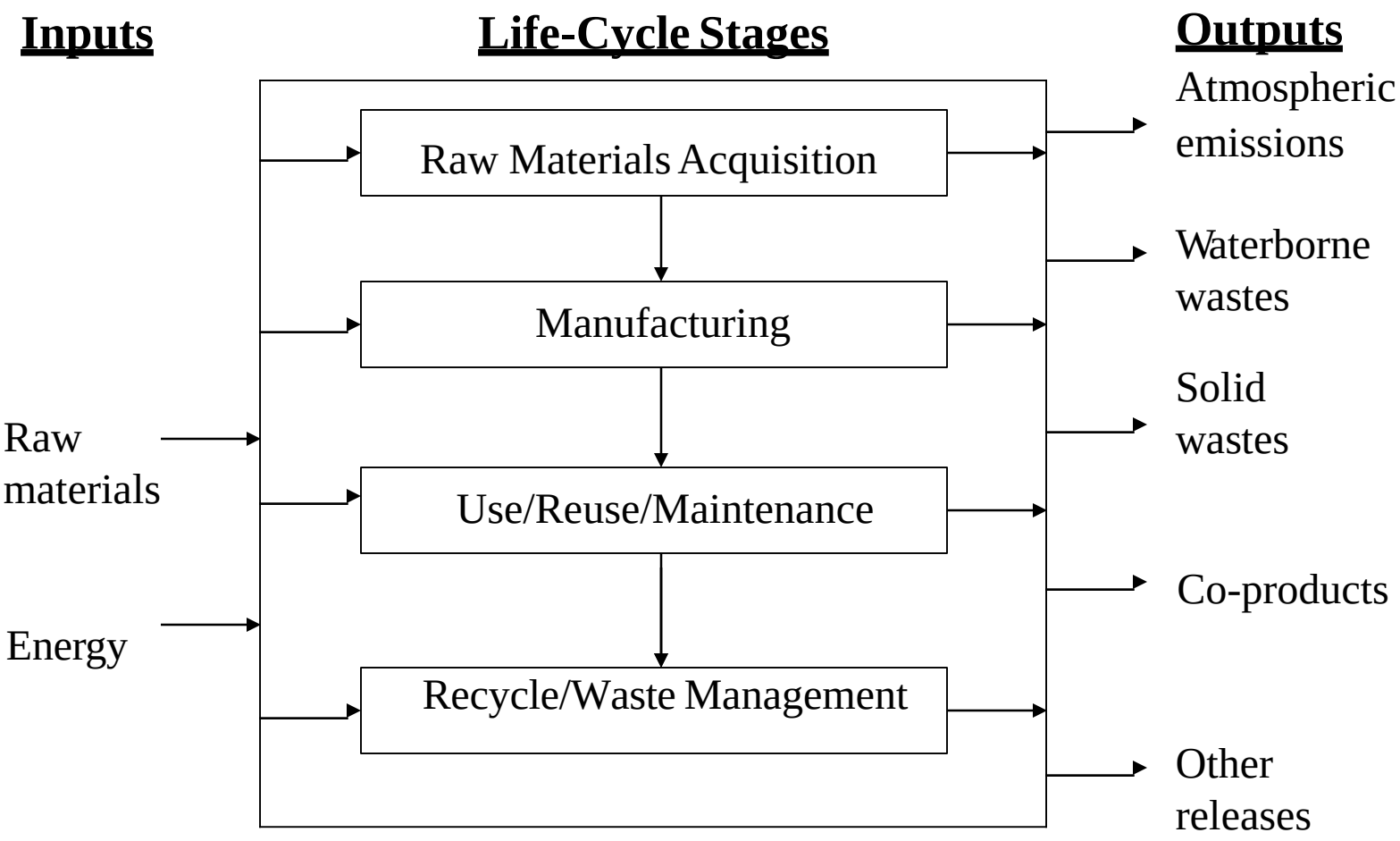
LCA can assist in:

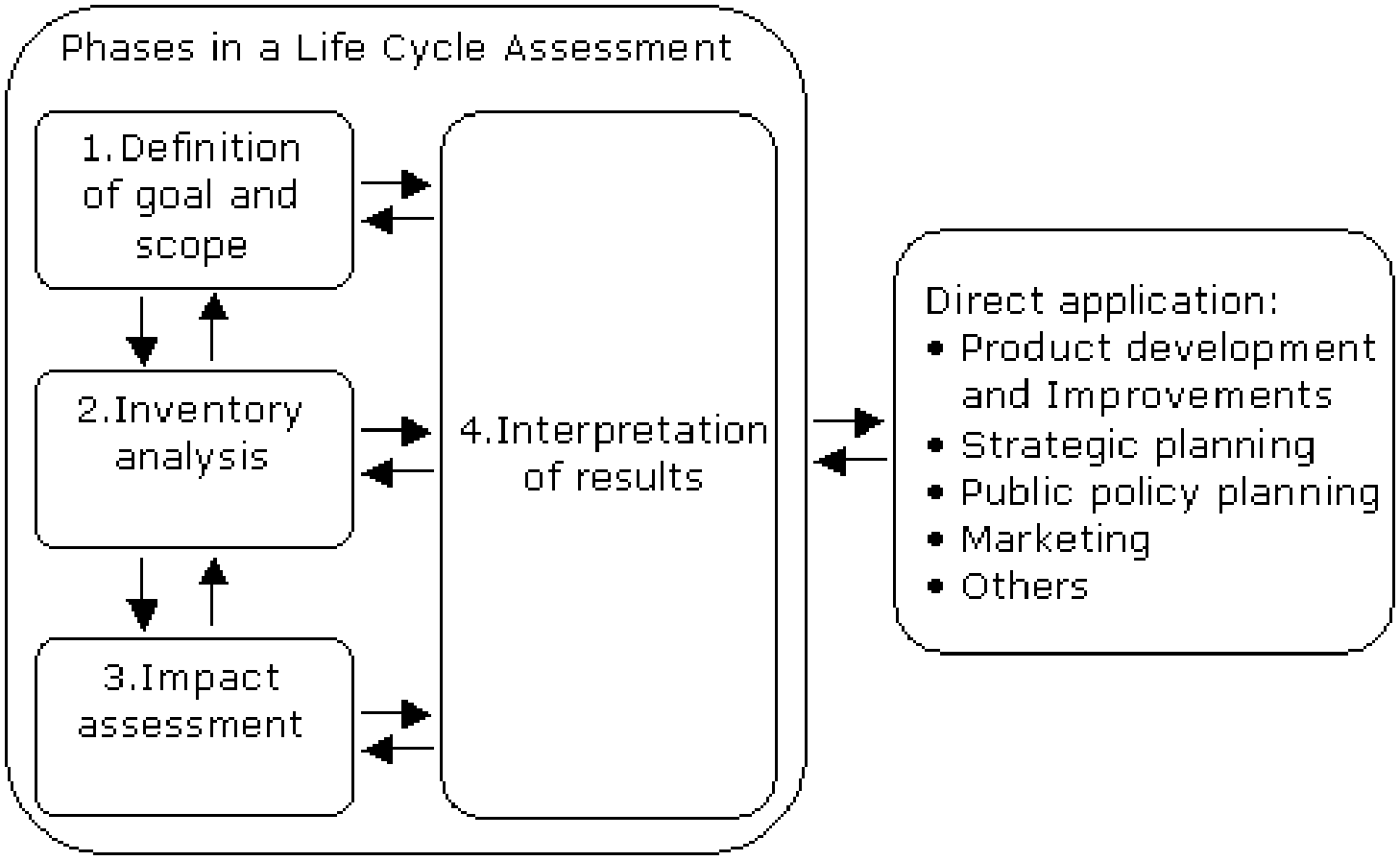
- Identifying opportunities to improve the environmental aspects of products and services at varying stages in their life cycle
- Decision making
  - Strategic planning,
  - Product or process design
- Selecting relevant indicators of environmental performance
- Marketing and labelling

The life cycle of a product



LCA Stages


Inputs
Life-Cycle Stages
Outputs
Raw Materials Acquisition
Manufacturing
Use/Reuse/Maintenance
Recycle/Waste Management
Raw materials
Energy
Atmospheric emissions
Waterborne wastes
Solid wastes
Co-products
Other releases



Phases of LCA (ISO 14040)

Benefits Of LCA

- Can be used to reduce production costs
- Companies can claim one product is better than another on the basis of LCA
- LCA inventory process helps to narrow in on the area where the biggest reductions in environmental emissions can be made
- Many other benefits

Drawbacks of LCA

- Using LCA to compare products is like comparing an apple to an orange.
  - For example, which is worse: a product that pollutes the air by consuming energy from coal-fired power plants or one that disrupts ecosystems by consuming energy from massive hydroelectric dam projects? Both types of pollution should be minimized if possible.
  - Heavy energy demand & heavy water use: which imposes greater environmental burden?
- LCA is subjective
- Is a complicated & expensive process

Who Does LCA?

- Conducted by an industry sector to enable it to identify areas where improvements can be made, in environmental terms.
- LCA may be intended to provide environmental data for the public or for government.
- Companies use LCA for marketing and advertising, to support claims that their products are *'environmentally friendly'* or even *'environmentally superior'* to those of their rivals.
- Multinational companies: 3M, Unilever, Procter Gamble, General Motors, ExxonMobil, etc

Environmental Impact Assessment

Environmental Impact Assessment (EIA)

- A study to predict the effect of a proposed activity/project on the environment.
- Compares alternatives for a project and seeks to identify the one which represents the best combination of economic and environmental costs and benefits.

Environmental Impact Assessment (EIA)

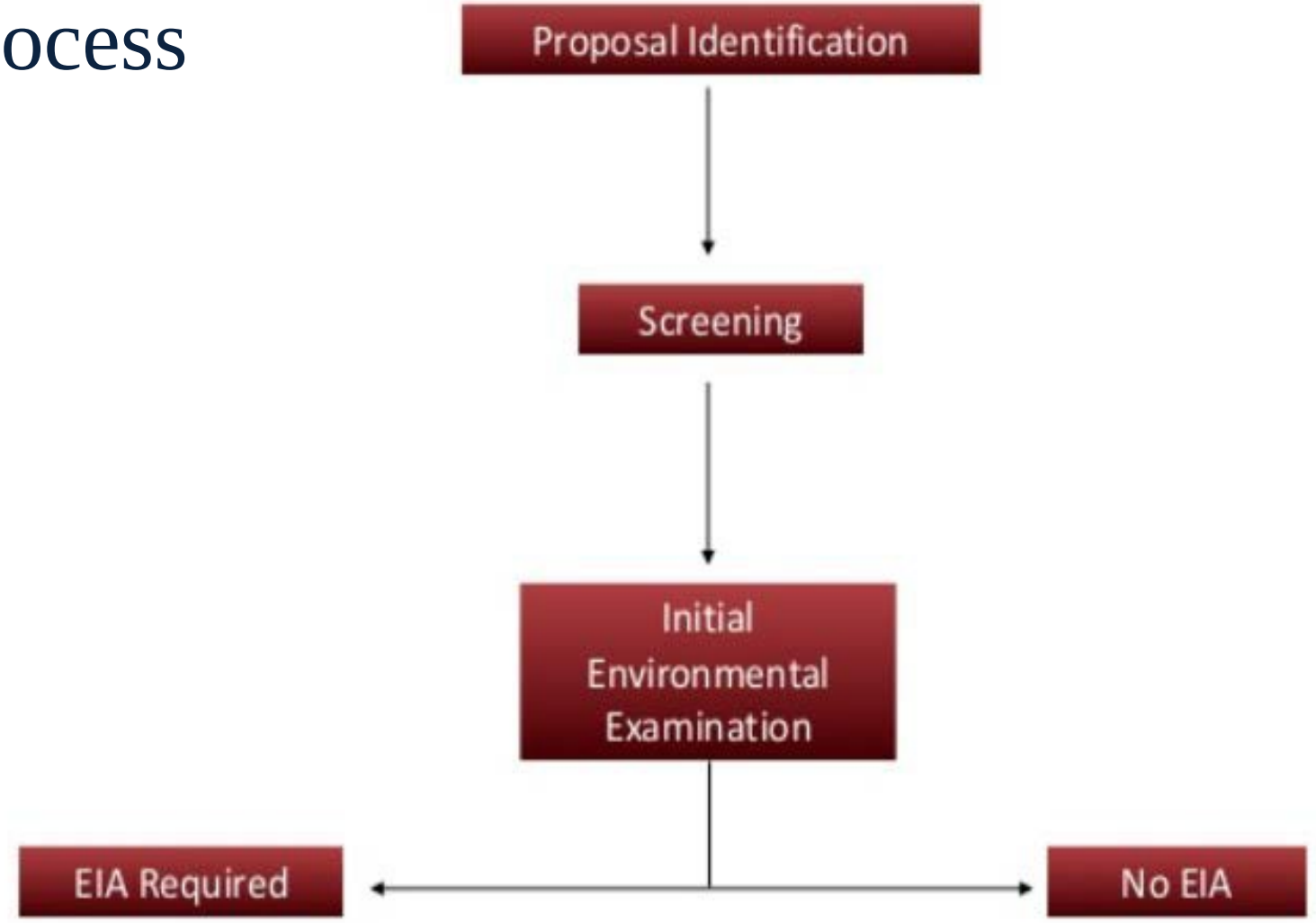
- Considers environmental concerns at the initialstages of a project.
- Allows integration of environmental concerns and mitigation measures in project development.
- Prevents future liabilities or expensive alterations in project design.

Benefits of EIA

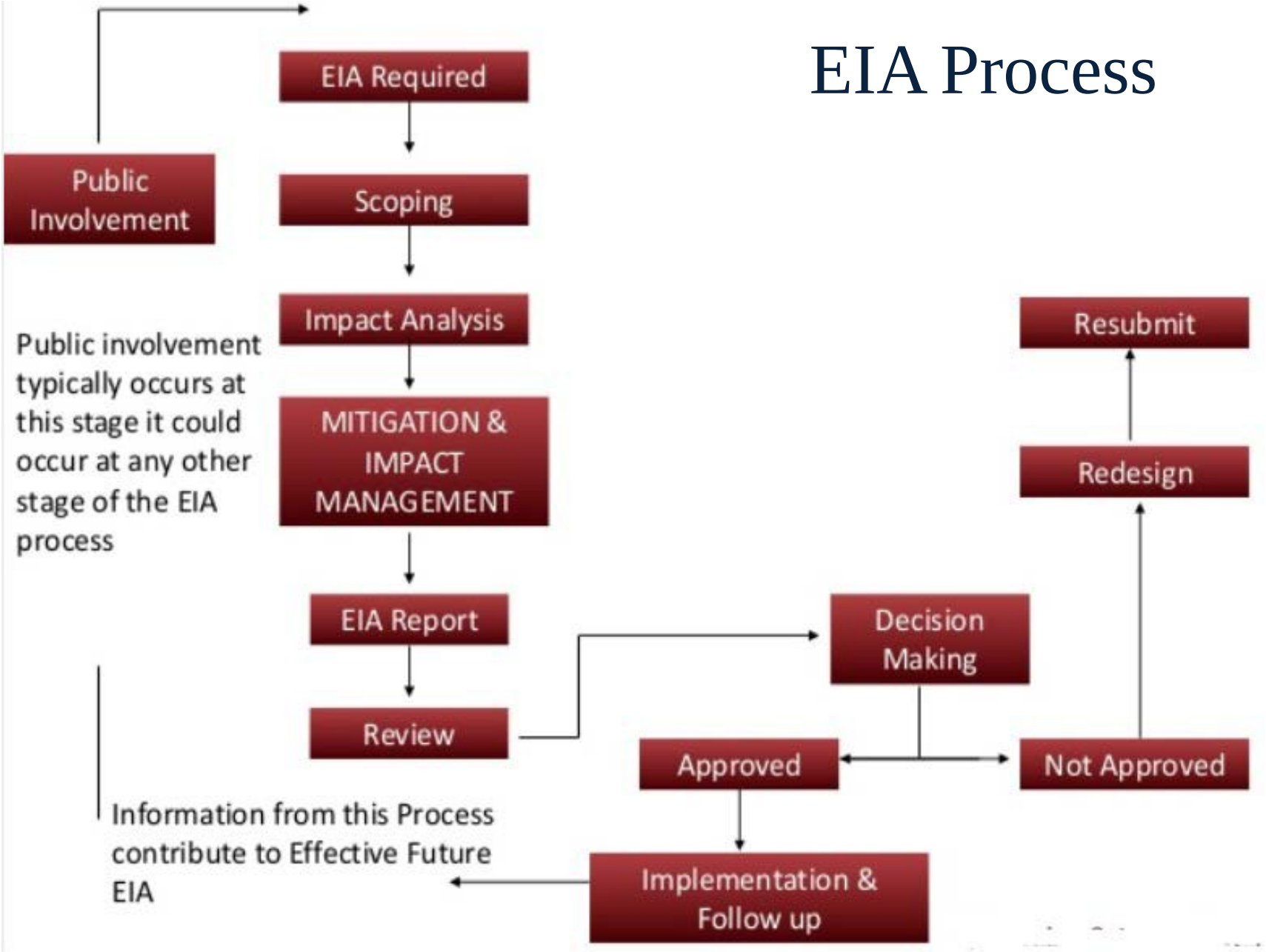
- Protection of the environment
- Optimum utilisation of resources
- Promotes community participation
- Informs decision makers
- Lays base for environmentally sound projects
- Can reduce project cost and time

Components of EIA

EIA Process


Proposal Identification
Screening
Initial Environmental Examination
EIA Required
No EIA

EIA Process


EIA Required
Public Involvement
Scoping
Impact Analysis
Public involvement typically occurs at this stage it could occur at any other stage of the EIA process
MITIGATION & IMPACT MANAGEMENT
EIA Report
Review
Decision Making
Resubmit
Redesign
Approved
Not Approved
Information from this Process contribute to Effective Future EIA
Implementation & Follow up

EIA

Advantages

- Provides systematic method of impact assessment
- Estimates the cost/benefit trade-off and alternative actions
- Facilitates public participation
- Provides an effective mechanism for
  - Coordination
  - Environmental integration
  - Negotiations
  - Feedback
- Achieves a balance between the impact of development and environmental concern

Disadvantages

- Time consuming
- Costly
- Little public participation in actual implementation
- Unavailability of reliable data (mostly in developing countries)
- Ensuring compliance monitoring after EIA

Some links

https://www.ead.ae/Documents/Business%20and%20Industry/Technical%20Guidance%20Document%20for%20Environmental%20Impact%20Assessment%20(EIA).pdf

http://ec.europa.eu/environment/eia/eia-support.htm

Multi-criteria Assessment (MCA)

Uses set of criteria and weights to establish score.

http://futureoxford.ca/general/sustainabilityplan/pdf/MCA_Tool_20161125.pdf