

# Environmental Impact of Materials



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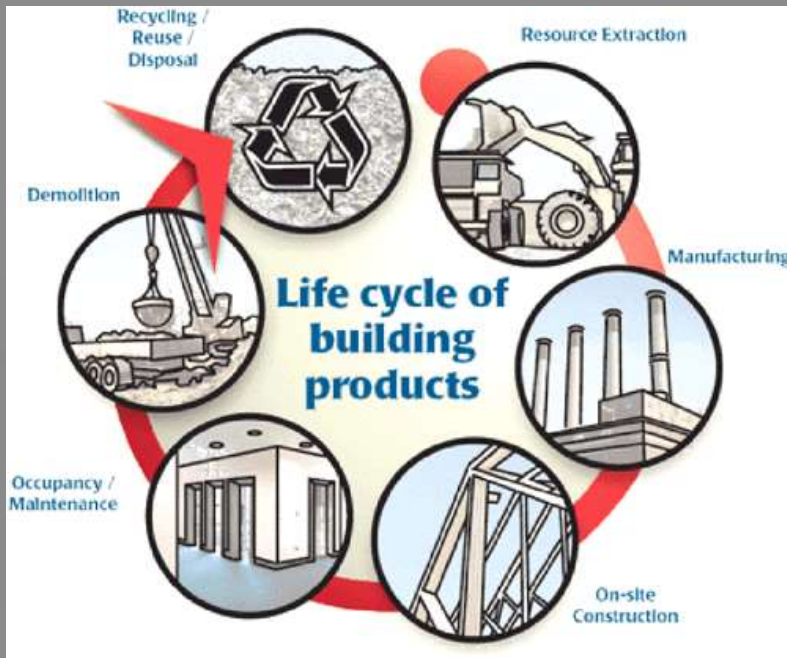
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# Introduction

- Annually three billion metric tons of raw materials are consumed to manufacture building materials and products.
- The building industry is the second largest consumer of raw materials , after the food industry.





## Research Aim

To diagnose the environmental impact role of building materials through life cycle, in order to reduce the environmental problems related with building materials during selection process.

# What are Building Materials

- Building material is any material used for construction purposes. Many naturally occurring substances , such as clay, rocks, sand, wood, and even leaves have been used to construct buildings.
- Apart from naturally occurring materials, many man made materials are in use eg. Concrete and brick .



# Guidelines for assessing and choosing materials

- Environmental factors
- Local materials and transport needs
- need for appropriate building design for marketing
- Aesthetic appeal
- Sustainability and Performance







# Impact of Building materials on Ecological Aspects



# Global warming Potential (GWP)


The GWP is also refers to carbon footprint since global warming is heigh through the accumulation of gases in the atmosphere such as CO<sub>2</sub> and CH<sub>4</sub>, the GWP calculates how much heat a certain amount of gas can retain in the atmosphere, compared to the same number of CO<sub>2</sub>. The higher the value of the GWP, the greater the impact on global warming.





# Ozone depletion potential(ODP)

Certain gases released from materials during their production can degrade the ozone layer, which in turn decreases protection against radiation in the atmosphere affecting flora and fauna. Materials that require low processing, such as stones and copper sheets, contribute less to this category and materials like cement contribute more.



# Photochemical Ozone Creation Potential (POCP)

The POCP quantifies the relative skills of volatile organic compounds (VOS) to produce ozone at soil level. In high concentrations, ozone can affect the health of human and nature. The POCP is measured using ethylene equivalent ( $C_2H_4EQ$ ) as an indicator unit. While wood based materials remain at the lowest level, EPS insulators and structural steel are the largest emitters.

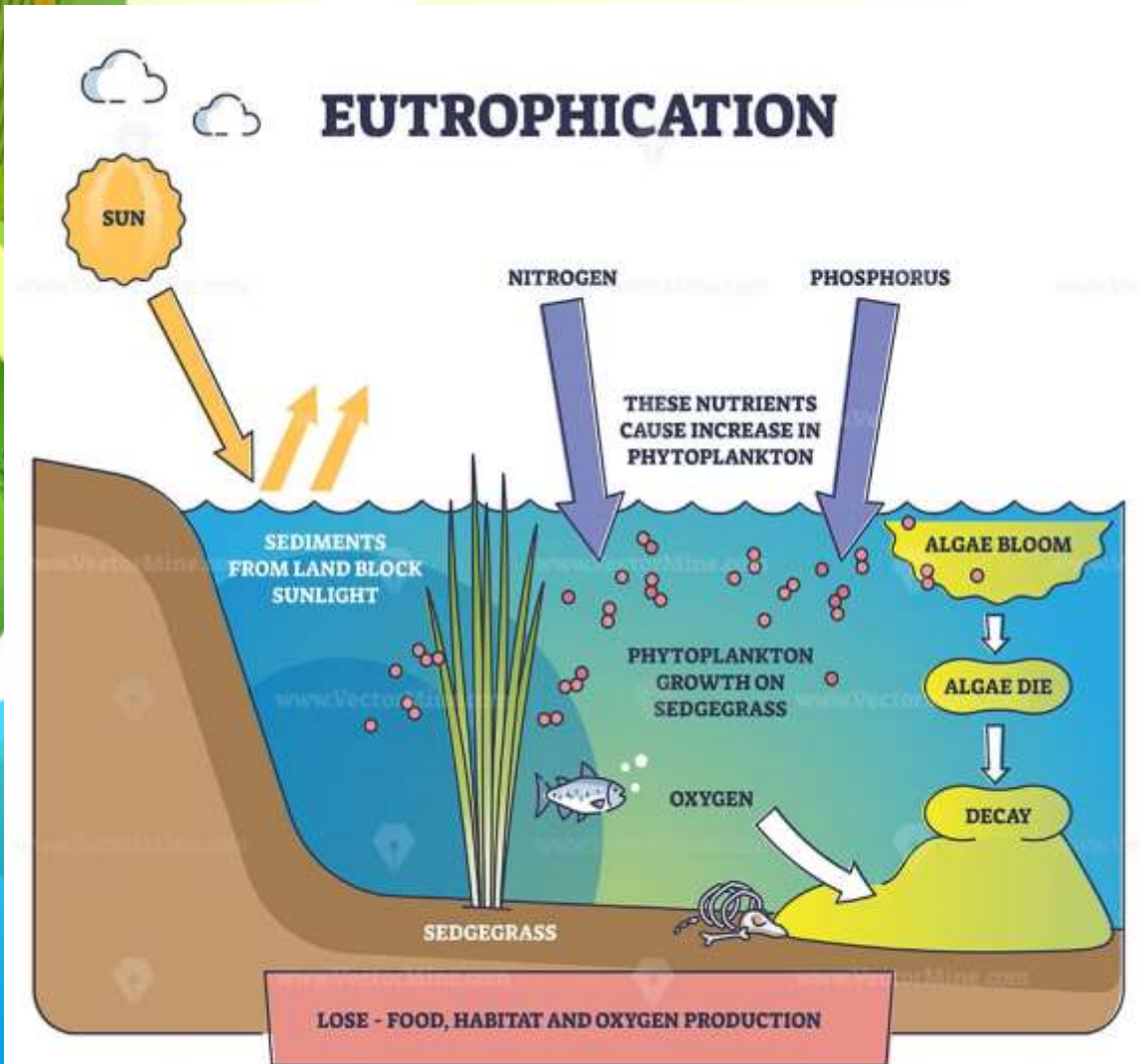


# Eutrophication Potential(EP)

In this case, phosphate is the reference substance, calculate in its equivalents. Eutrophication is the increase in nutrient concentration in ecosystems, which can cause imbalance such as desertification or super fertilization. Steel production, for example emits large amounts of nitrogen oxides. While this chemical element is vital to soils, too much concentration can affect soil biodiversity and aquatic environments.



# Eutrophication process





# Habitat Alteration

It is the primary impact resulting from mining and harvesting of material for the manufacturing of building materials. Habitat alteration also can occur as a result of air, water, and land releases from industrial processes that change environmental conditions.



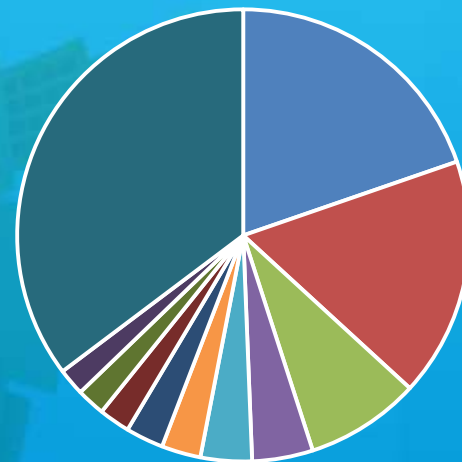
Building materials impact on energy  
consumptions



# Energy consumption during the production of building materials

The primary energy consumption is the energy needed to manufacture the building product.

Primary energy consumption



USA

China

Russia

Japan

India

Canada

Germany

France

Korea

Brazil

Other countries



## Energy consumption during building, use, and demolition

- Building consumption for the transport of manufactured products.
- Energy consumption on the building site.
- Energy consumption during maintenance .
- Energy consumption of dismantling or removal of materials during demolition.

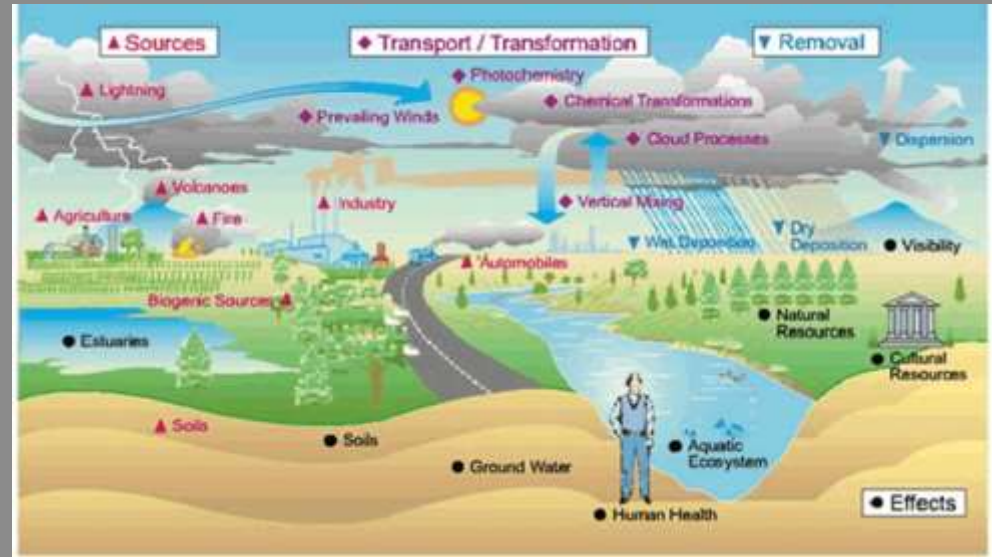
# Impact of building materials on human health





# Air pollution

Air pollutants are airborne solid and liquid particles and gases that can pose risks to the environment and human health.



# Smog

Smog is a type of air pollution, resulting when industrial and fuel emissions become trapped at ground level and are transformed after reacting with sunlight.





# Preventions







# Reducing fuel consumptions

- Using alternative fuel sources
- Using hybrid equipment
- Upgrading equipment
- Reducing haul distances
- Minimizing vehicle idling time



## Smog eating building

Consists of thermoformed shells coated in photo catalytic titanium dioxide.





# Minimizing discharge of contaminants

- Waste water from concrete washout
- Fuels
- Oils
- Soaps
- Solvents
- Detergents
- Toxic or hazardous substance





## Investing in sustainable materials and technique

Sustainable construction materials are materials that have a low ecological impact in their manufacture . They also have minimal impact on the environment once construction is complete.



## **Sustainable materials**

- Renewable wood
- Bamboo
- Rammed earth
- Recycled brick, concrete
- Straw bales
- Timber Crete
- Ferrock

## **Sustainable techniques**

- Installing integrated automated building system
- Providing alternative energy
- Promoting green roofs
- Installing greywater plumbing
- Switching to synthetic roofing materials
- Experimenting with bio concrete



# Conclusion

In order to reduce the environmental impact the selected building material should :

- Provide resource savings
- Reduce wastes (be reusable and easily recyclable. )
- Not be harmful for human health
- Provide energy savings
- Provide comfortable and suitable conditions for human health within the covered areas.





# Thank you

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