

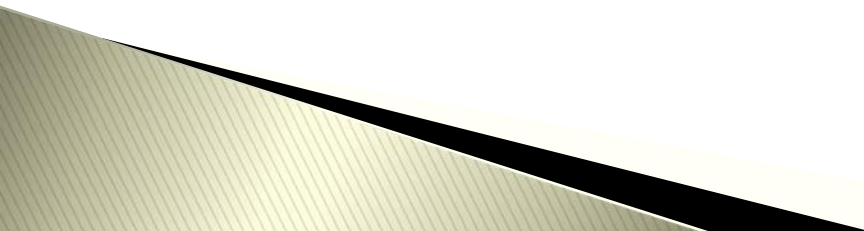
Sustainability within Engineering

David Champion

Sustainability

- ▶ What does sustainability mean to an engineering?

Sustainability within Engineering

- ▶ Sustainability within engineering, To use a resources reasonably.
 - ▶ Natural resources
 - ▶ Contribute to building a sustainable society
 - ▶ Take a lead role
 - ▶ Do more than just apply codes and legislation
 - ▶ Use resources efficiently and effectively
 - ▶ Manage risk
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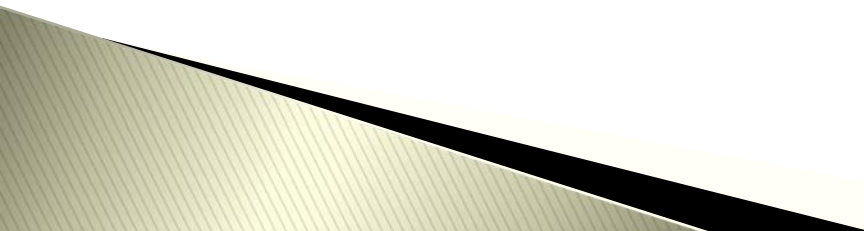
Sustainable development

Sustainable development involves,

- Environmental
- Economic
- Social aspect

Does the process or component cause a irreversible effect to the environment

Ledwood example

- ▶ Ledwood engineering example. Pressure testing oil and gas pipe.
 - ▶ What do they use to test the pipe?
 - ▶ What do they do with the waste?
 - ▶ What are the problems with this?
- 

Sustainability

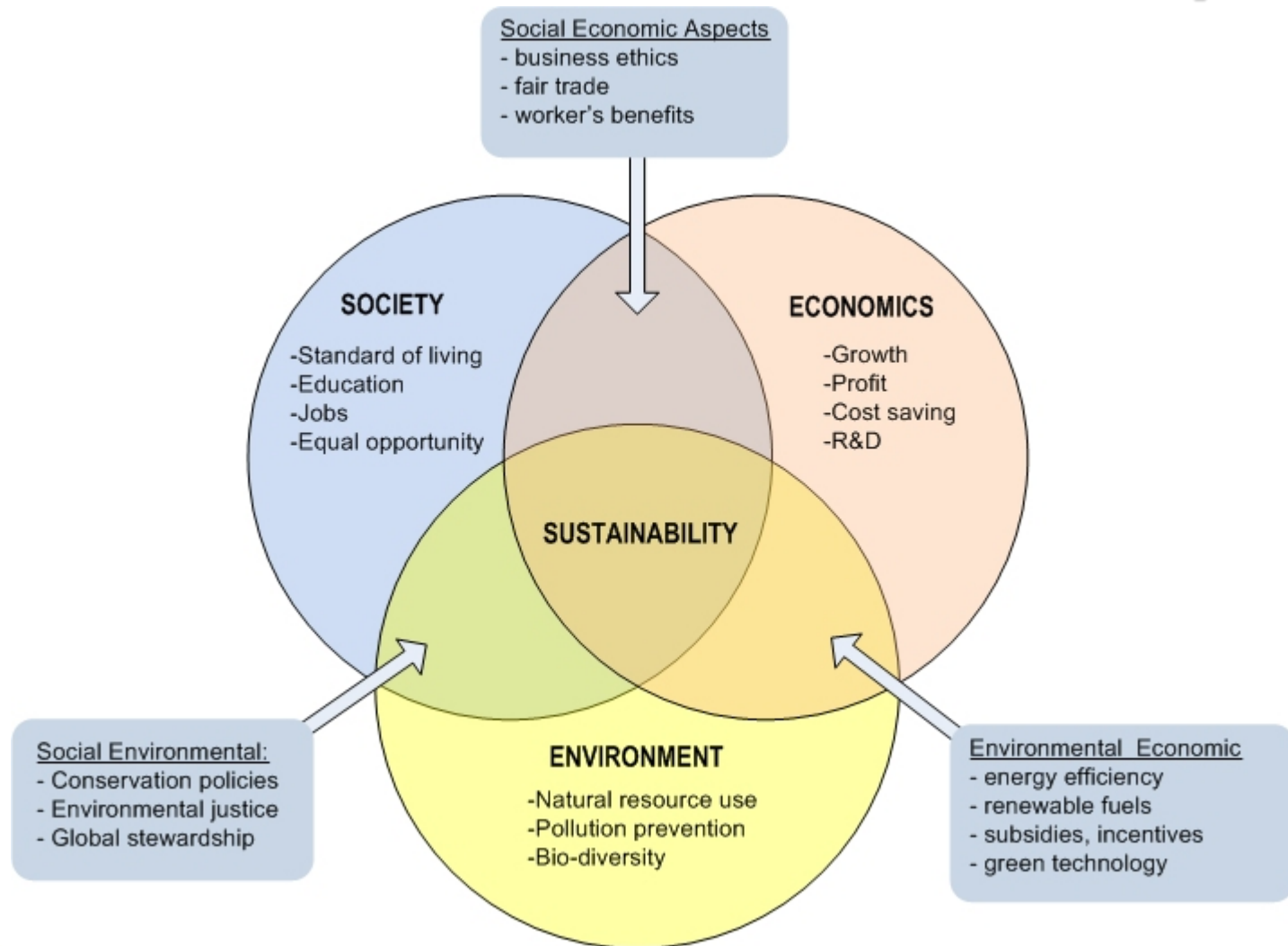
Sustainability is represented as a synergy between,

- ▶ Society
- ▶ Economics
- ▶ Environment.

What do each of these mean?

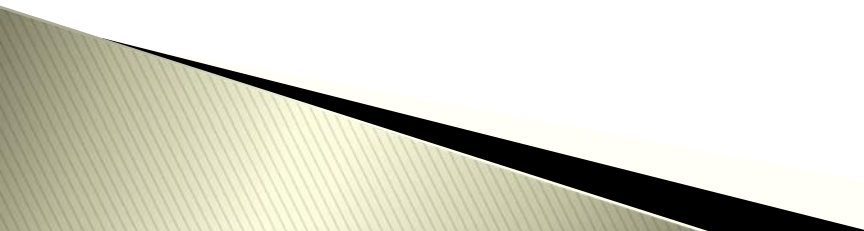
These three can be called the pillars of sustainability

Three Pillars of Sustainability



Three Pillars of Sustainability

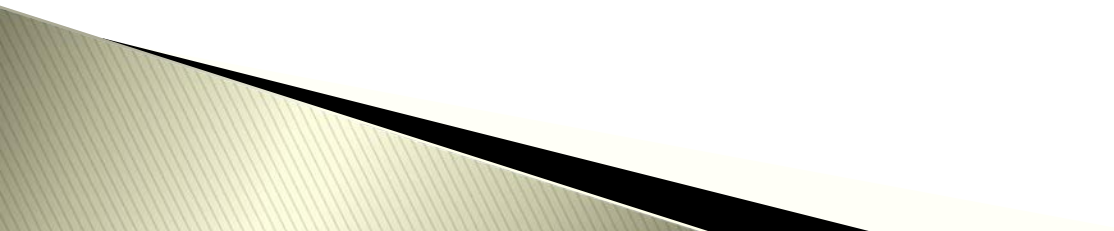
The Three pillars are never isolated. Other aspects should be taken in to account. How the pillars intersect.

- ▶ Social Economic
 - ▶ Environmental Economic
 - ▶ Social Environmental
- 

Principle of design

The term design is normally referred to the,

“Way of doing things or making things”



Principles of design

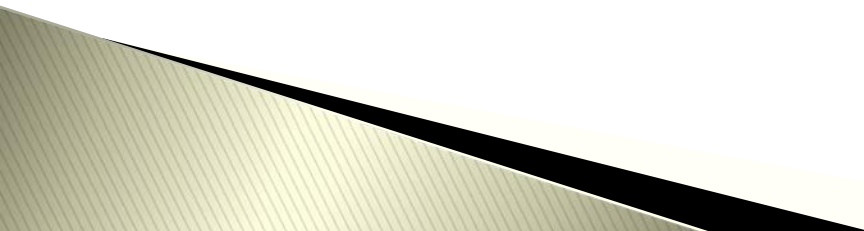
- ▶ Design within your groups, what are your main goals.
- ▶ How sustainable are your designs?

Principle of design

Objectives can be drastically polar and to reach them, certain designs may require a change of thinking and high level creativity. Especially to ensure a sustainable design.

So what is sustainable design?

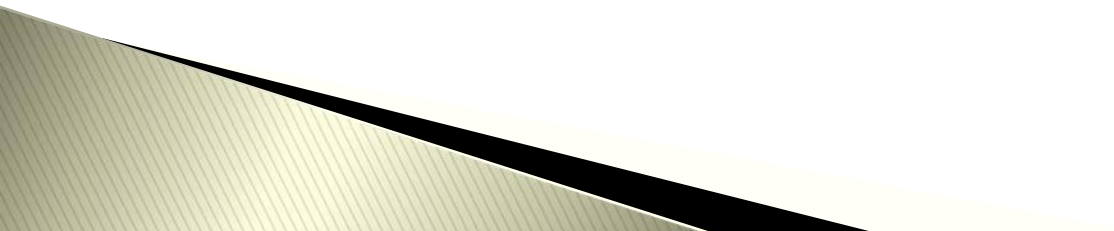
▶ <https://www.youtube.com/watch?v=VO-oO7uULcc>



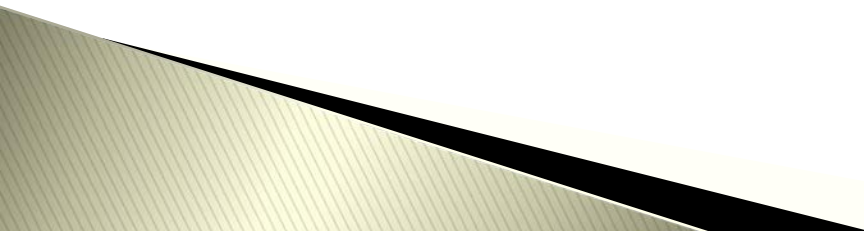
Principles of design

McDonough crafted sustainable design ideas.

These ideas are called the Hanover principles,



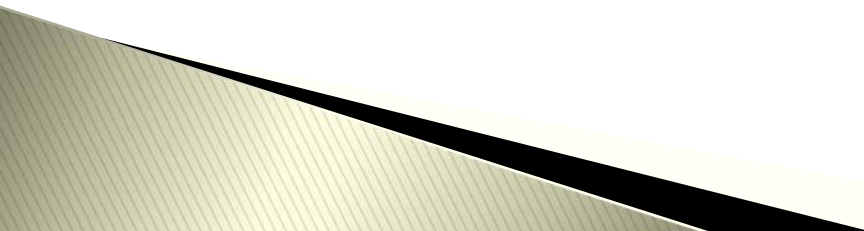
Hanover Principles

- ▶ Insist on rights of humanity and nature to coexist
 - ▶ Recognize interdependence.
 - ▶ Respect relationships between spirit and matter.
 - ▶ Accept responsibility for the consequences of design
 - ▶ Create safe objects of long-term value.
 - ▶ Eliminate the concept of waste.
 - ▶ Rely on natural energy flows.
 - ▶ Understand the limitations of design.
 - ▶ Seek constant improvement by the sharing of knowledge.
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Hanover Principles

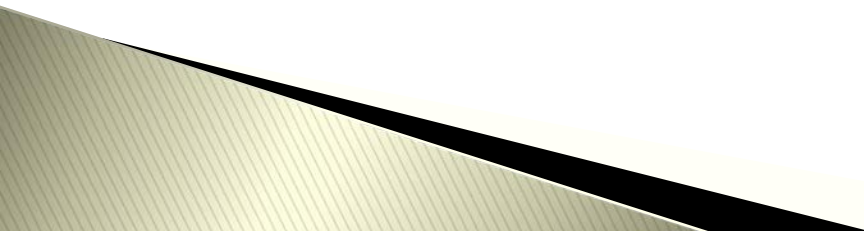
- ▶ Number 6 has to be taken in to a major consideration, the concept of waste elimination.
- ▶ Waste prevention is a major issue within design and manufacturing circles. Here are a few points that companies can do to reduce waste.

Waste Prevention

1. Low-impact materials
 2. Energy efficiency
 3. Emotionally Durable Design
 4. Design for reuse and recycling
 5. Biomimicry
 6. Service substitution
 7. Renewability
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- A decorative graphic element in the bottom-left corner of the slide. It consists of several overlapping geometric shapes, including a large triangle and a parallelogram, in shades of olive green and yellow, creating a textured, layered effect.

Sustainable Engineering

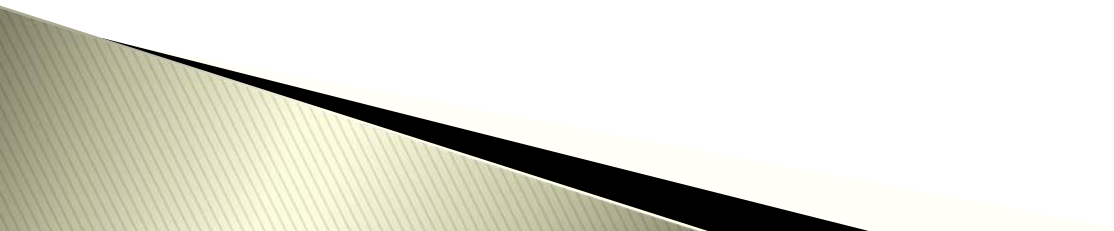
Sustainable engineering principles,

- Start at the beginning.
 - Continue sustainable thinking throughout.
 - Plan :
 1. Material resourcing
 2. Transportation
 3. Material processing
 4. Recyclability
 5. etc
- 

Sustainable Engineering

Sustainable engineering falls back on to the three pillars and Hanover principles.

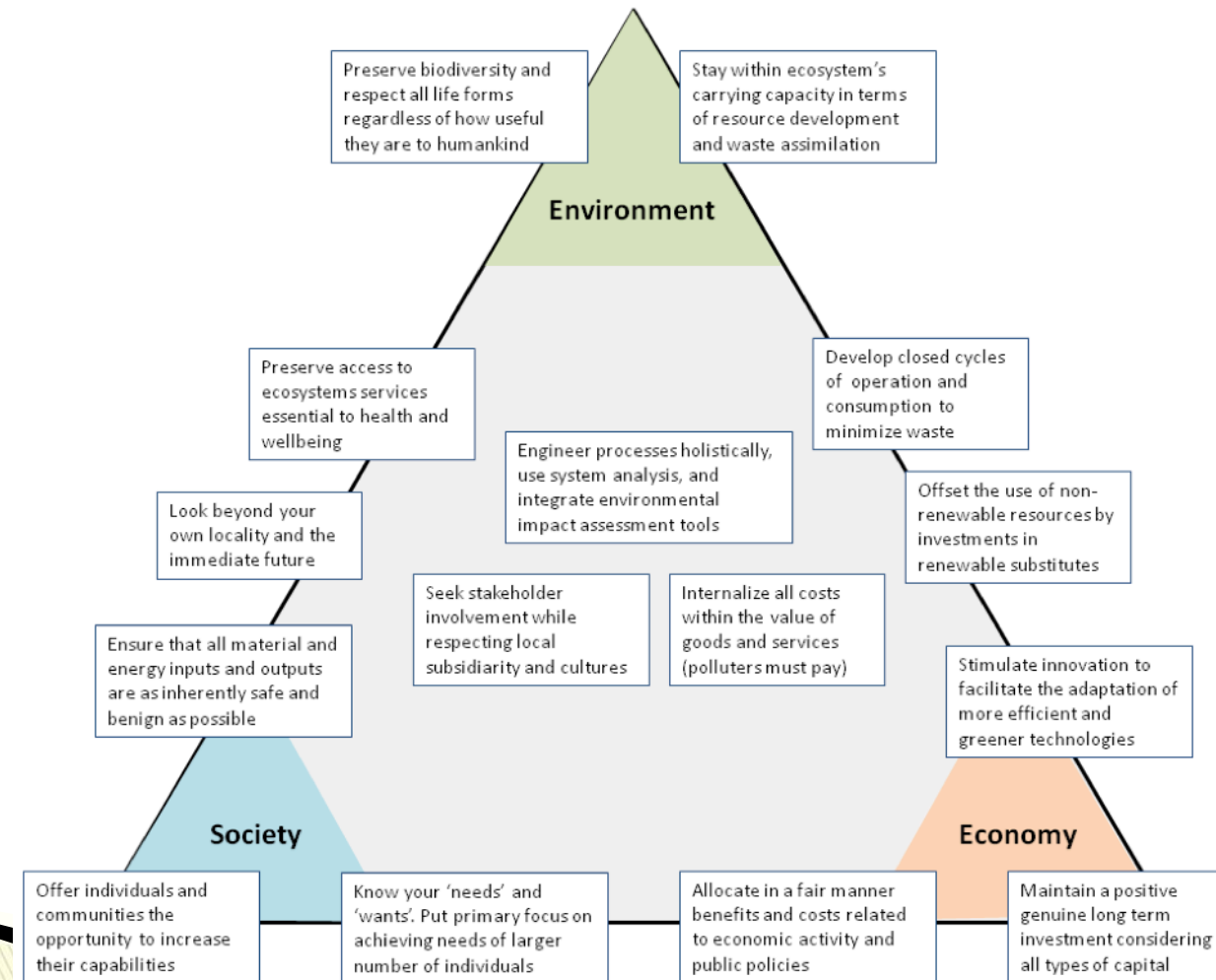
Engineers must be careful not to concentrate on one of these pillars



Sustainable Engineering

Sustainability Approaches in Engineering	
Considers the object or process	Considers the whole system in which the object or process will be used
Focuses on technical issues	Considers both technical and non-technical issues synergistically
Solves the immediate problem	Strives to solve the problem for infinite future (forever?)
Considers the local context	Considers the global context
Assumes others will deal with political, ethical, and societal issues	Acknowledges the need to interact the experts in other disciplines related to the problem

Sustainable Engineering



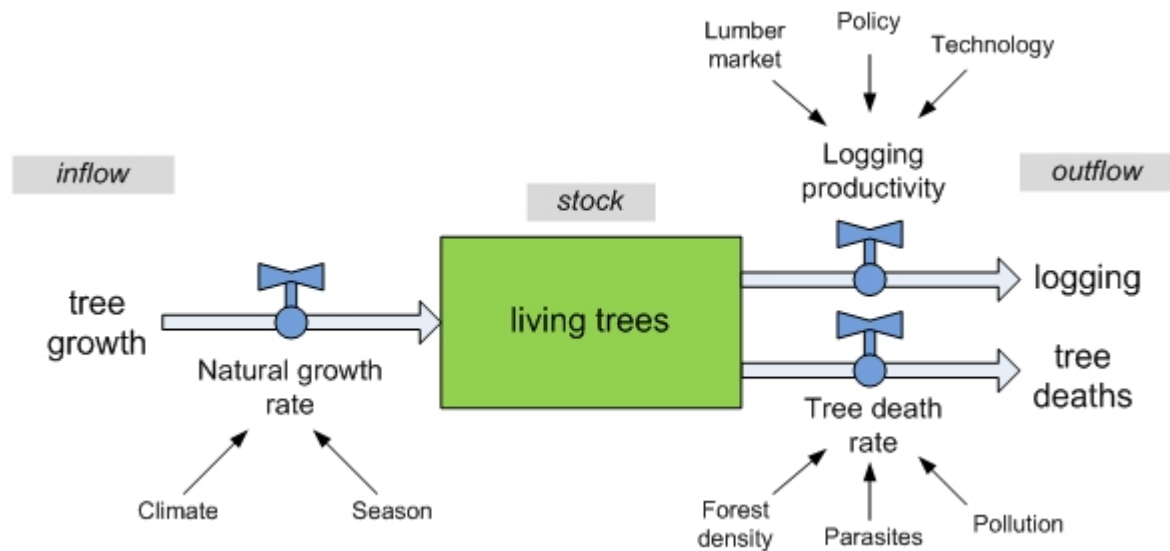
Systems approach to sustainability principles

A **system** is an interconnected set of elements that is organized in a way that achieves a purpose. Three distinct entities of any system are: **elements**, **interconnections**, and **purpose** (or function).

Example of sustainable approach

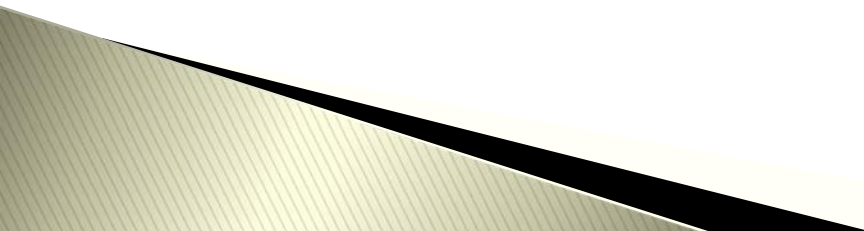


Example of sustainable approach



Sustainable approach

In the technical world, systematic functions can be even more obvious since many engineering systems are designed by people for a specific purpose. Thus a power plant system has a purpose to produce electric power and distribute it to a community or facility. It consists of equipment, workers, transportation means, fuel stocks, etc., all of which are interconnected in power production cycle.



Life cycle of engineering

Chassis

What is a chassis made from?

Steel, Aluminium

Sources of these materials?

Mining for ore, recycled materials

What are the next stages?

Transportation, energy use, Resources, processing, Forming, Life time cost, legislation, recyclability, waste and environmental impact.

This is part of the engineering concepts that every design must think of when making a sustainable component

