



Green Engineering in Investment & Consultancy Sector

Challenges For Investors & Consultants

- ▶ Public awareness on green engineering
- ▶ Laws & Regulations
- ▶ Life Cycle Cost
- ▶ Involvement of Financing Firms

Application of Green Engineering is a Joint Effort Between :

- ▶ Owners
- ▶ Financing Firms
- ▶ Consultants
- ▶ Government Authorities
- ▶ Contractors
- ▶ Facilities Management Firms

Green Engineering Case Study

► Commercial Bank of Kuwait -(1985)

- Glass Blocks
- Passive Solar Control
- Air GAP
- Daylight
- Reduction of Heat Gain
- Sound Isolation
- Light Control System
- BMS



Green Engineering Case Study (Contd)

► Somabay Robinson Club (300 Bedroom) , 1995

- Centralized solar domestic hot water solar system
- 33 % of total hot water demand
- 1000 m² Solar collectors
- 4000 m² Solar field
- Centralized hot water storage tanks
- Circulated insulated pipe network



Green Engineering Case Study (Contd)

► Marina Mix 12A&12B Towers 2015

- GSAS 3 Star Building
- Passive Solar Control
- Twisted Fins Shadows
- Connectivity
- Shadows on neighbor building
- Gray water treatment and recycle
- BMS.



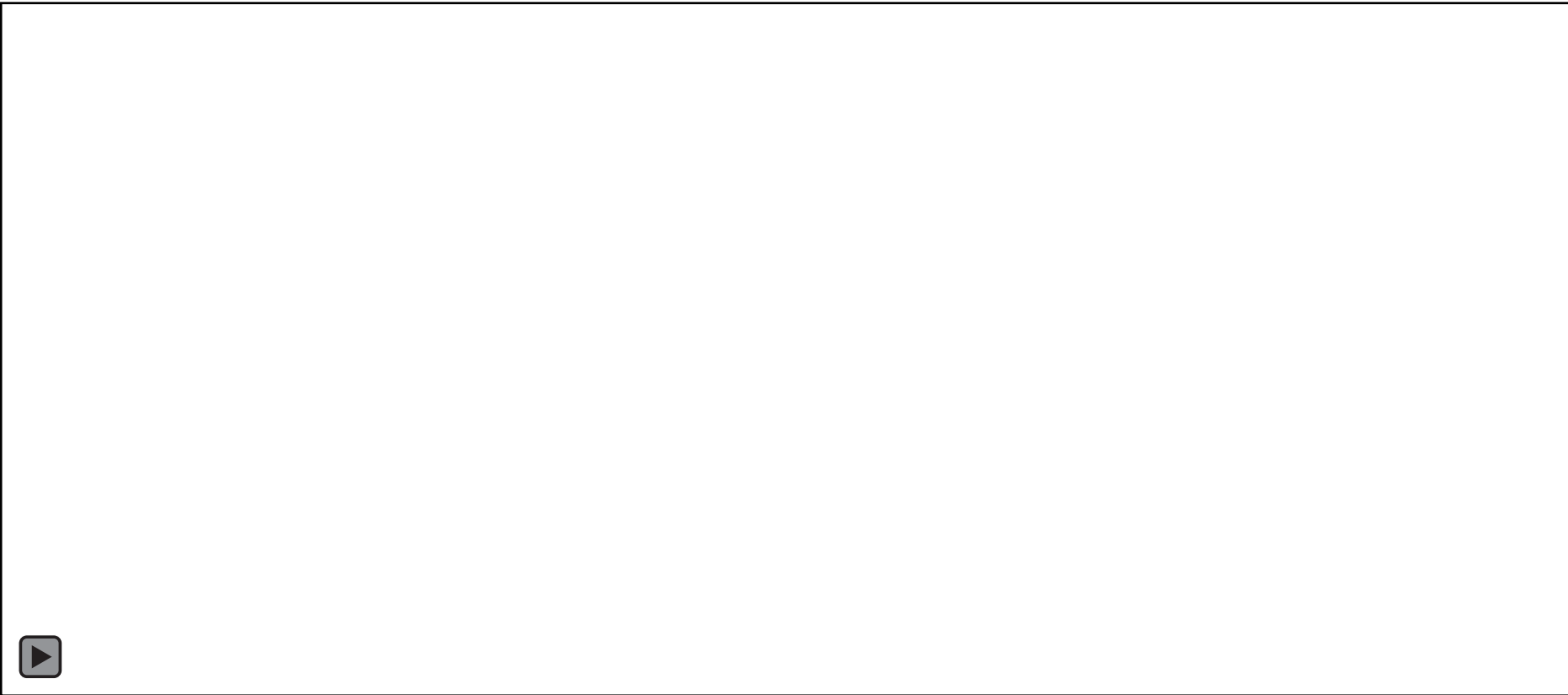
Green Engineering Case Study (Contd)

► Marina Mix 12A&12B Towers



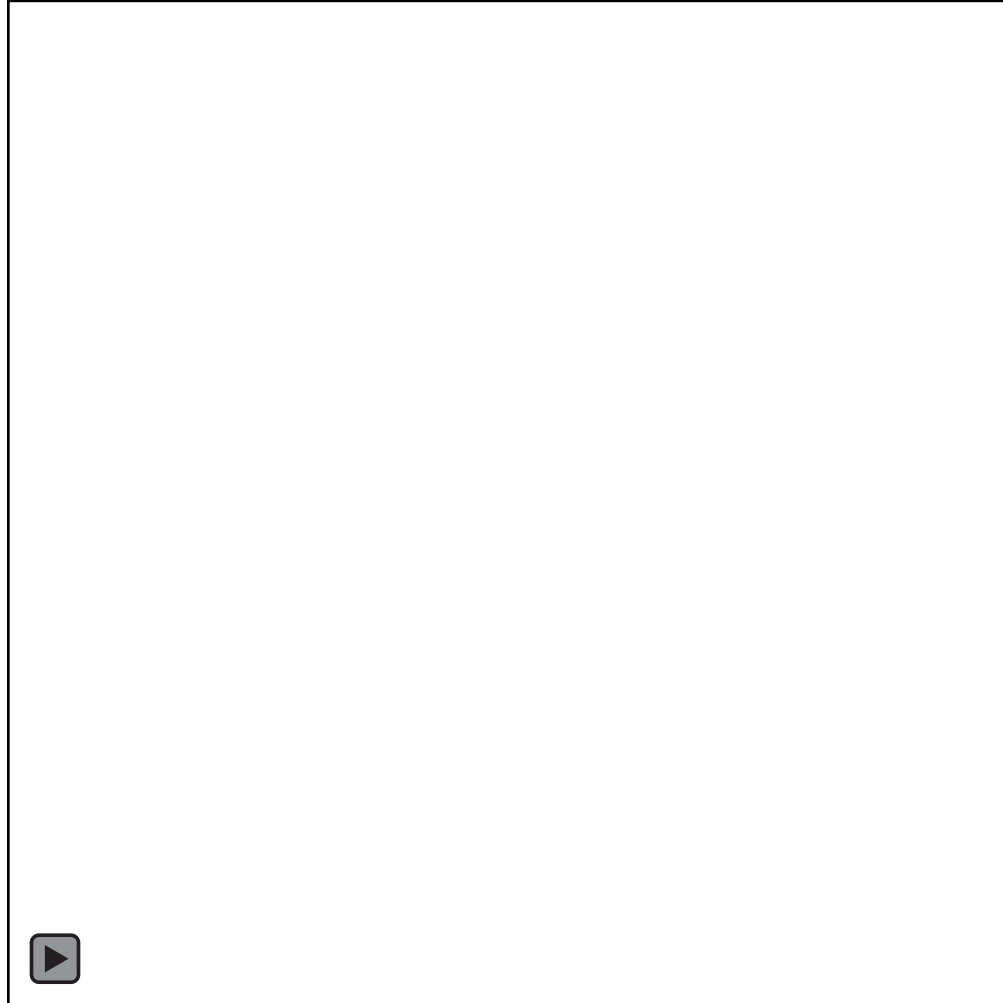
Green Engineering Case Study (Contd)

► Marina Mix 12A&12B Towers



Green Engineering Case Study (Contd)

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Green Engineering Case Study (Contd)

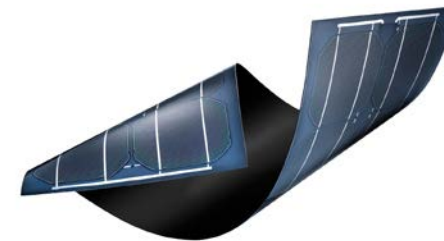
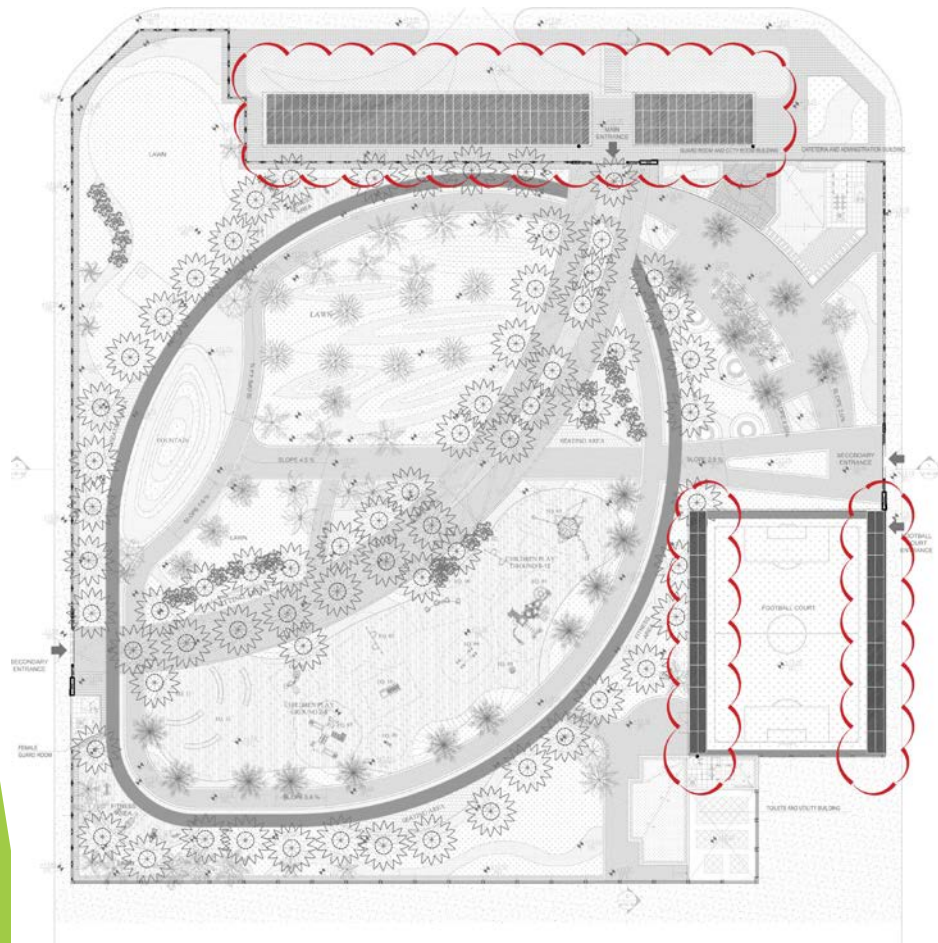
► MMUP Public Parks-Palm Park, 2016

- GSAS 2 star
- Solar panels
- Wind Barriers
- Lighting Control
- Connectivity



Green Engineering Case Study (Contd)

► MMUP Public Parks-Palm Park, 2016



Historical Development :

► Stockholm 1972 :

- Governments first actively addressed the issues of global environmental needs to take part in the UN Conference on Human Environment and Earth's Environment problems

► Rio de Janeiro 1992 :

- 20 years after Stockholm The next UN Conference on Environment and Development the participating countries focused development the national and international levels, the Rio Convention leads to the preparation of the Kyoto Protocol.

Historical Development (Contd) :

► Japan 1997 :

- After meeting for 2 (Conference of the Parties, COP) in Berlin and Geneva, eventually on the third COP held in Kyoto, the member countries prepared the Kyoto Protocol.

► USA 2001 :

- The United States withdraws from Kyoto protocol.

► February 2005 :

- The Kyoto Protocol finally came into effect 7 years after it was first negotiated with the signature of Russia ratifying the document.

Qatar Green Building Council (QGBC)

► 2009 :

- Established by a decree signed by H.H. Sheikha Moza Bint Nasser Encouraging collaboration in conducting environmentally sustainable practices for green building design and development
- Support the overall health and sustainability of the environment, the people, and economic security in Qatar for generations to come.
- Helping Qatar on its journey to establish a post-hydrocarbon, knowledge economy and progressive society.

Sustainability & Green Engineering

► Sustainability :

- Sustainability involves taking action **now** to enable a future where the environment and living conditions are protected and enhanced.

► Green Engineering :

- Green engineering is the design of materials, processes, systems, and devices with the objective of minimizing overall environmental impact over the entire **life cycle** while also meeting required performance, economic, and social constraints.

Green Engineering

- ▶ Sustainability and sustainable design have **historically** occurred as a portion of the project
- ▶ Sustainability of the entire project from design through to construction and operation is **now** considered a minimum requirement with focus being applied to how this is consistently achieved
- ▶ The 12 principals of green engineering have been developed to enable engineers to incorporate elements of sustainability throughout all areas of project in a **systematic** and **comprehensive** approach

The Twelve Principles of Green Engineering

► Principle 1 : Inherently Non-Hazardous

- Designers need to strive to ensure that all materials and energy inputs and outputs are as inherently nonhazardous as possible

► Principle 2 : Prevention As Opposed To Treatment

- It is better to prevent waste than to treat or clean up waste after it is formed

► Principle 3 : Design For Separation

- Separation and purification operations should be designed to minimize energy consumption and materials use

► Principle 4 : Maximize Efficiency

- Products, processes, and systems should be designed to maximize mass, energy, space, and time efficiency

The Twelve Principles of Green Engineering

► Principle 5 : Le Chatelier's Principle

- Products, processes, and systems should be "output pulled" rather than "input pushed" through the use of energy and materials

► Principle 6 : Conserving Complexity

- Embedded entropy and complexity must be viewed as an investment when making design choices on recycle, reuse, or beneficial disposition

► Principle 7 : Durability Over Immortality

- Targeted durability, not immortality, should be a design goal

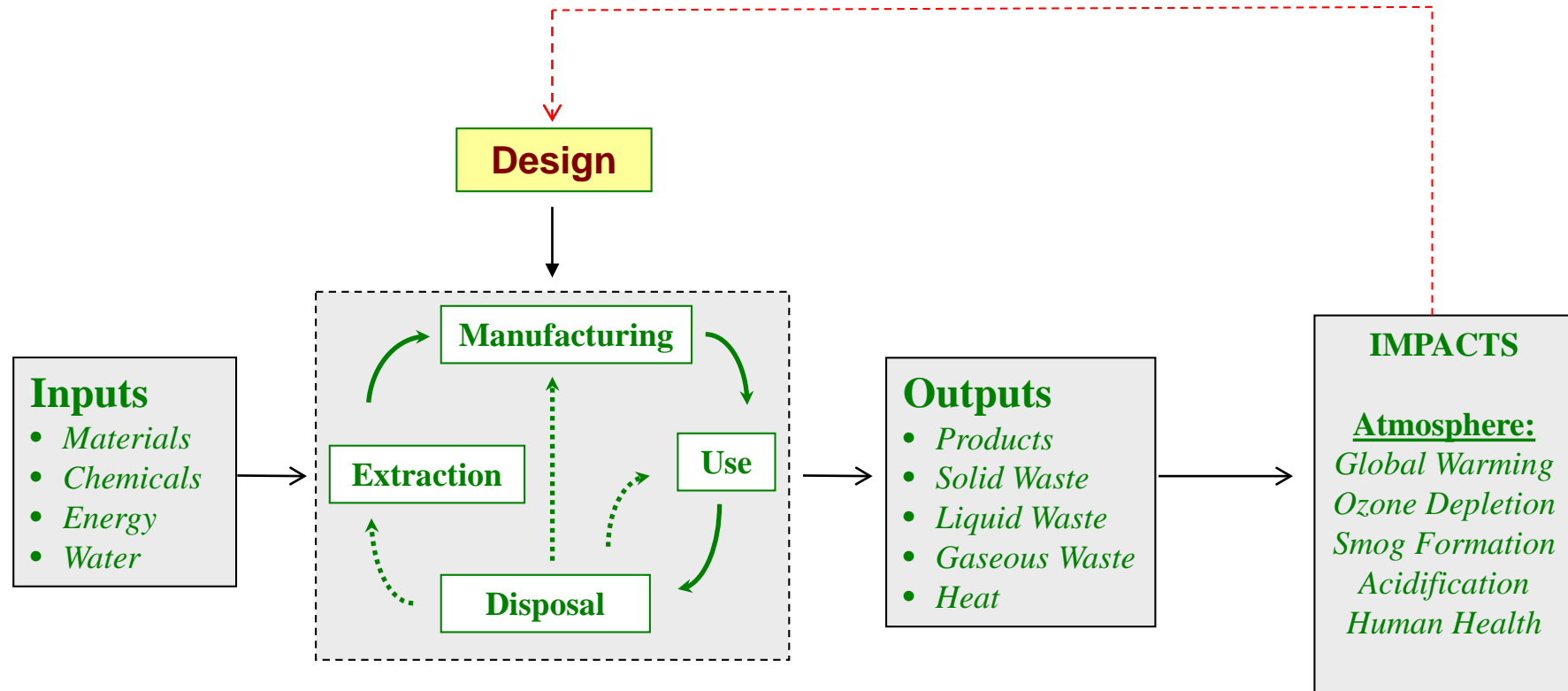
► Principle 8 : Meet Needs But Minimize Excess

- Design for unnecessary capacity or capability (e.g., "one size fits all") solutions should be considered a design deficiency

The Twelve Principles of Green Engineering

- ▶ **Principle 9 : Minimize Material Diversity**
 - Material diversity in multicomponent products should be minimized to promote disassembly and value retention
- ▶ **Principle 10 : Integrate Material And Energy Flows**
 - Design of products, processes, and systems must include integration and interconnectivity with available energy and materials flows
- ▶ **Principle 11 : Commercial Afterlife**
 - Products, processes, and systems should be designed for performance in a commercial "afterlife"
- ▶ **Principle 12 : Renewables Rather Than Depleting**
 - Material and energy inputs should be renewable rather than depleting

Design Changes Provide Most Significant Changes in Environmental Impact



Green Engineering is better design.

Is Green Engineering Costly?

How Much?

► Initial Investments Cost benefit model alternative

- Optimum Alternative (Maximum savings) 4-12%
- Economical alternative (minimizing's initial investments) 0.2-1.5%

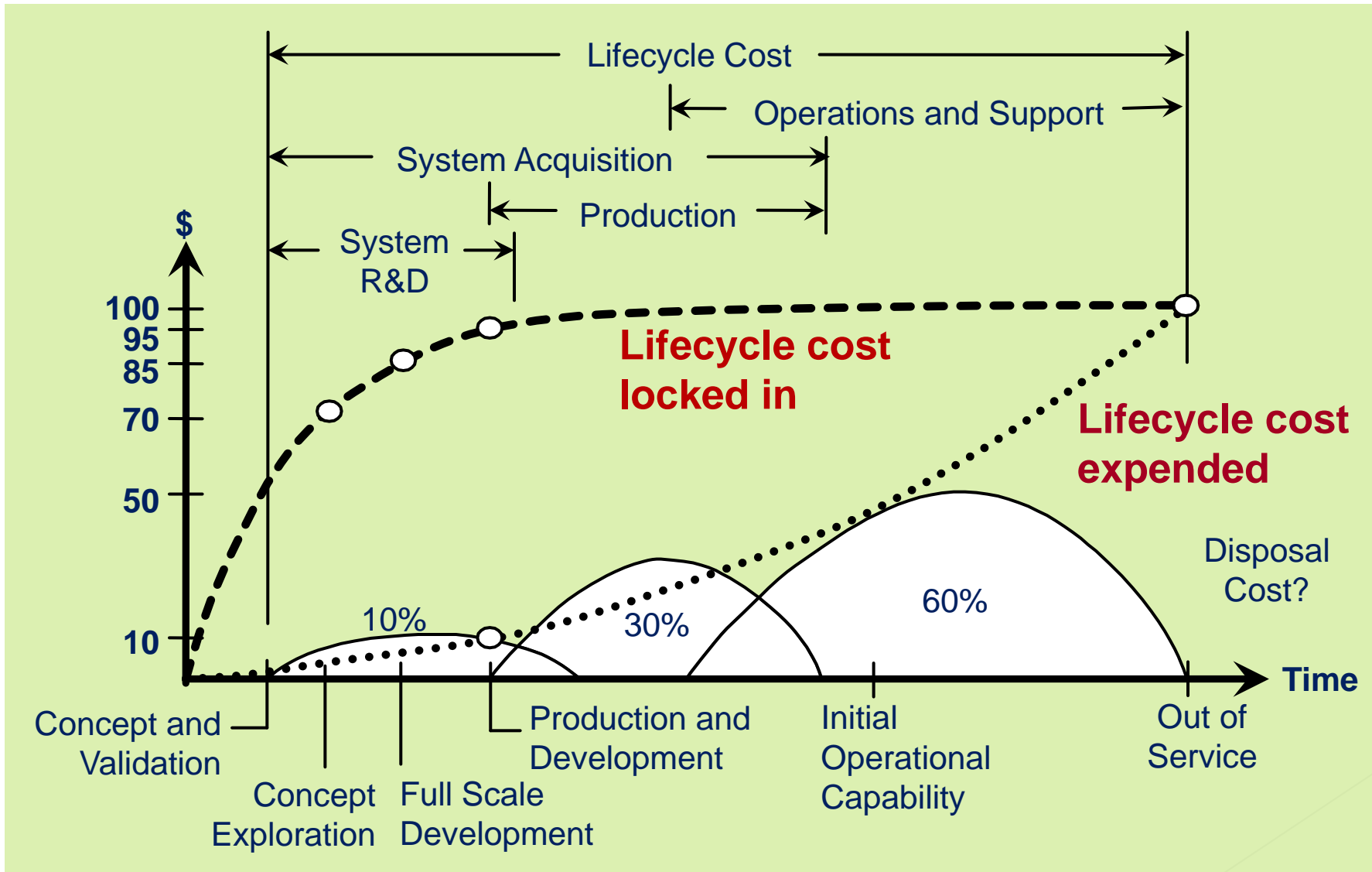
► In General

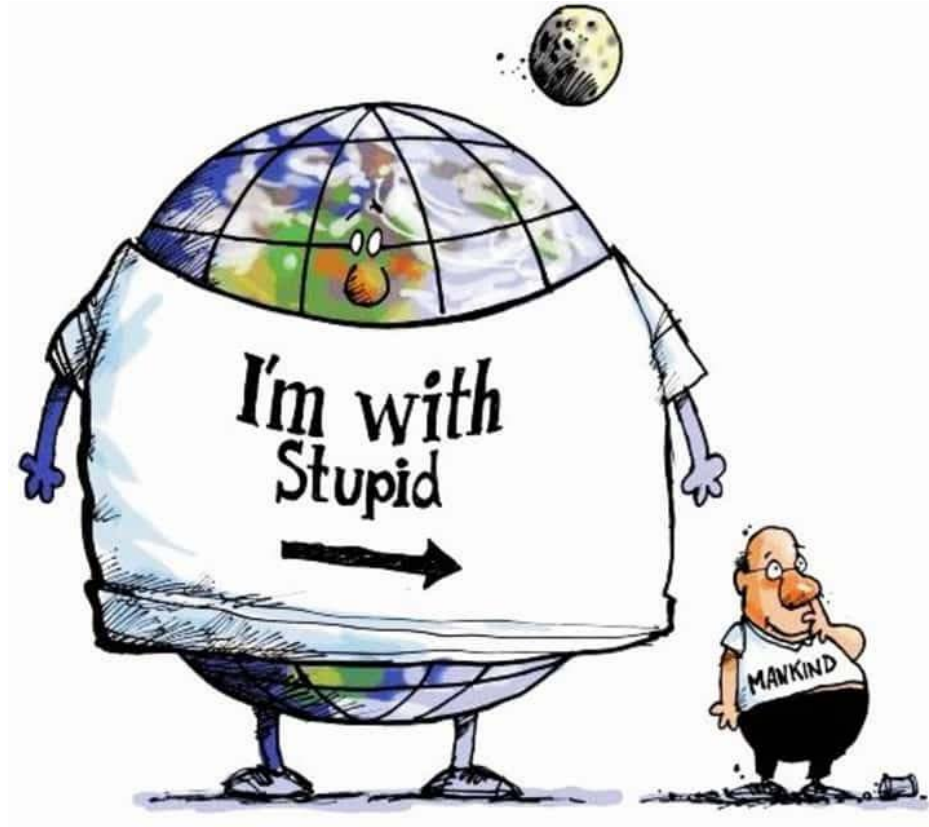
- Added initial Cost of Green Engineering is between 0.2-10%

► Life Cycle Cost

- There is a perception that sustainability cost more than historical ways as the products and processes do not reflect their full life cycle cost
 - Cost of environmental and social impacts
 - Cost of clean up and disposal materials
- In fact sustainable product or progress provide a cost saving over the entire life cycle of the product or process when considering cost operation & capital cost

Highest Leverage is Early in Design





THANK YOU