



# Transition Engineering

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*The Spectrum of Survival*

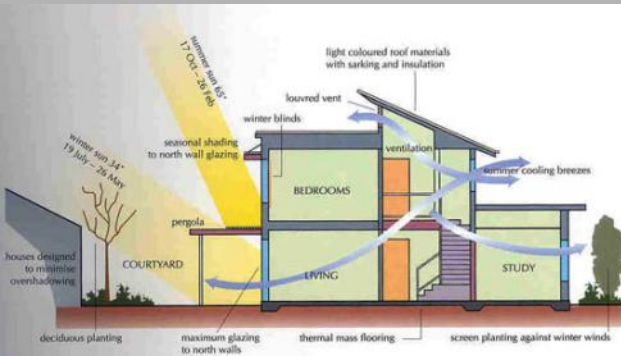
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# Sustainability Engineering?

- Electric Cars
- Solar, Wind Energy
- Energy Efficiency
- Biofuels, Combustion, Pollution
- Fuel Cells and Hydrogen
- CO<sub>2</sub> Capture and Sequestration



# What do we mean by sustainability?

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Do not ask this question ever again



Art by Ruxana



# Un-sustainability is the problem



# The project is survival

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- Society depends on engineered systems for *survival*.
- What if the engineered systems threaten survival?



# Survival: Balance of Benefit & Risk

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## Safety

CO<sub>2</sub>, Nox Emissions

*Risk*

*Individual*  
*Immediate*

## Security

Peak Oil

*Risk*

*Organization*  
*Long Term*

## Sustainability

Global Climate Change

*Risk*

*System Integration*  
*Continuity*



# Survival Spectrum

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## Safety

*Big ears to hear  
predators, speed  
and agility,  
camouflage*

*Individuals*

## Security

*Diet, burrows,  
high fertility*

*Populations*

## Sustainability

*Predator-Prey Cycle  
Natural Selection  
Adaptation Strategies*

*Species*

# Adaptation is the Key to Survival

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**ad•ap•ta•tion** or **ad•ap•tion** *n*

1. the process or state of changing to fit new circumstances or conditions, or the resulting change
2. something that has been modified for a purpose
3. the development of physical and behavioral characteristics that allow organisms to survive and reproduce in their habitats

Encarta® World English Dictionary © 1999 Microsoft Corporation





# Adaptation

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Humans are as adaptable as rabbits

A few physical adaptations, but mostly

**Shared Cultural Values and Engineering**

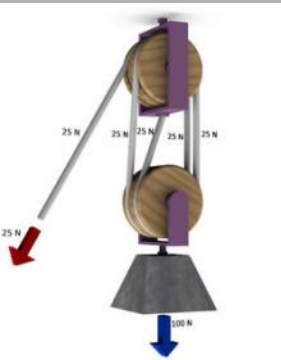


# Human Adaptation Strategy

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- When known solutions don't work
- When discover opportunities
  - *Innovation*
  - *Change*
  - *Transition*

Ideas





# Transition Engineering

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- Reduce Risks of Un-Sustainability
- System Change for Adaptation
- System Engineering for Constraints

*Survival = Balance of Risk & Benefit*



# Can Engineering really do it?

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## Survival Requirements:

- Social Values: Safety, Security, Sustainability
- Change and Adaptation to Constraints
- Save the World from Darkness





# Engineering for Safety

# Safety



# History of Safety Engineering

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- 1911 American Society of Safety Engineers Founded (ASSE) 62 members
- Result of public outrage over Triangle Shirtwaist Factory Fire in New York
  - 146 young girls
  - All deaths were preventable
  - No regulations existed

[www.asse.org](http://www.asse.org)





# History of Health & Safety Engineering

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- 1921 2500 members, Eye protection research
- 1924 1<sup>st</sup> respirators replace handkerchiefs in chemical plants
- 1933 Manager and worker training programs
- 1936 1<sup>st</sup> chemical exposure limit standard
- 1936 1<sup>st</sup> federal government safety standards
- 1958 Fall protection harness developed
- 1964 Safety profession and systems safety



# ASSE Code of Conduct

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- **Protect** people, property and the environment through the application of state-of-the-art knowledge.
- Inform the public, employers, employees, clients and appropriate authorities when professional judgment indicates that there is an unacceptable level of **risk**.
- Issue public statements in a **truthful** manner.
- Serve the public, employees, employers, clients and the Society with fidelity, **honesty and impartiality**.



# Safety, Health, Environment Engineering

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- Occupational Safety and Health Act 1970
- Economics: 2009 OSHA study \$1 invested in safety = \$6 savings to society



# Transition Engineering Method

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- Projects involved in changing current systems, practices, materials, intensities
- Curtailing un-sustainability Risks
- Embedded in all practice

Safety - Security - Sustainability



# Safety Engineering as Model

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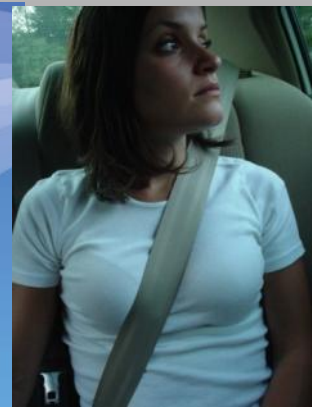
- 100% solution not possible, but always trying anyway
- No Exemptions
- Everyone Responsible
- Expectations from all Sectors





# Safety Engineering as a Model

- Research and Development
- Measurement, Monitoring
- Standards and Best Practice
- Communications and Behaviour
- Responsibility and Enforcement





# Transition Engineering Conclusion

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## Sustainability is Survival

- Public trusts engineers to help them survive
- No Panacea Technology or a Science
- Use lessons of Safety Engineering
- Without Engineering Leadership, Unsustainability is Ensured

