

# Sustainability

From Awareness to Application

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# Sustainability

Awareness



# Sustainability

Awareness



# Sustainability

Perceptions





# Sustainability

Six Degrees of Recognition



**No Limits:** Natural resources and ecological systems are essentially limitless.

**Limits:** Natural resources and ecological systems are finite.

**Stewardship:** Finite natural resources and ecological systems must be effectively managed, maintained and enhanced.

**Predicament:** Society is using up resources and ecological carrying capacity faster than they can be replaced, replenished or restored.

**Consequences:** Reaching or exceeding resource or carrying capacity limits has serious consequences.

**Urgency:** Society must act soon before the consequences become inevitable, devastating and irreversible.

Source: ASCE Fundamentals of Sustainable Engineering Course



# Sustainability

Six Degrees of Recognition

## Attitude



No Limits

I can use whatever I need.

Limits

I know there are limits but there are plenty of resources left.

Stewardship

I have a moral, economic and often a regulatory obligation to manage well.

Predicament

I need to understand these limitations and their possible consequences.

Consequences

I understand the consequences and they could be severe.

Urgency

I need to take action now to deal with urgent and serious problems.

# Sustainability

Awareness



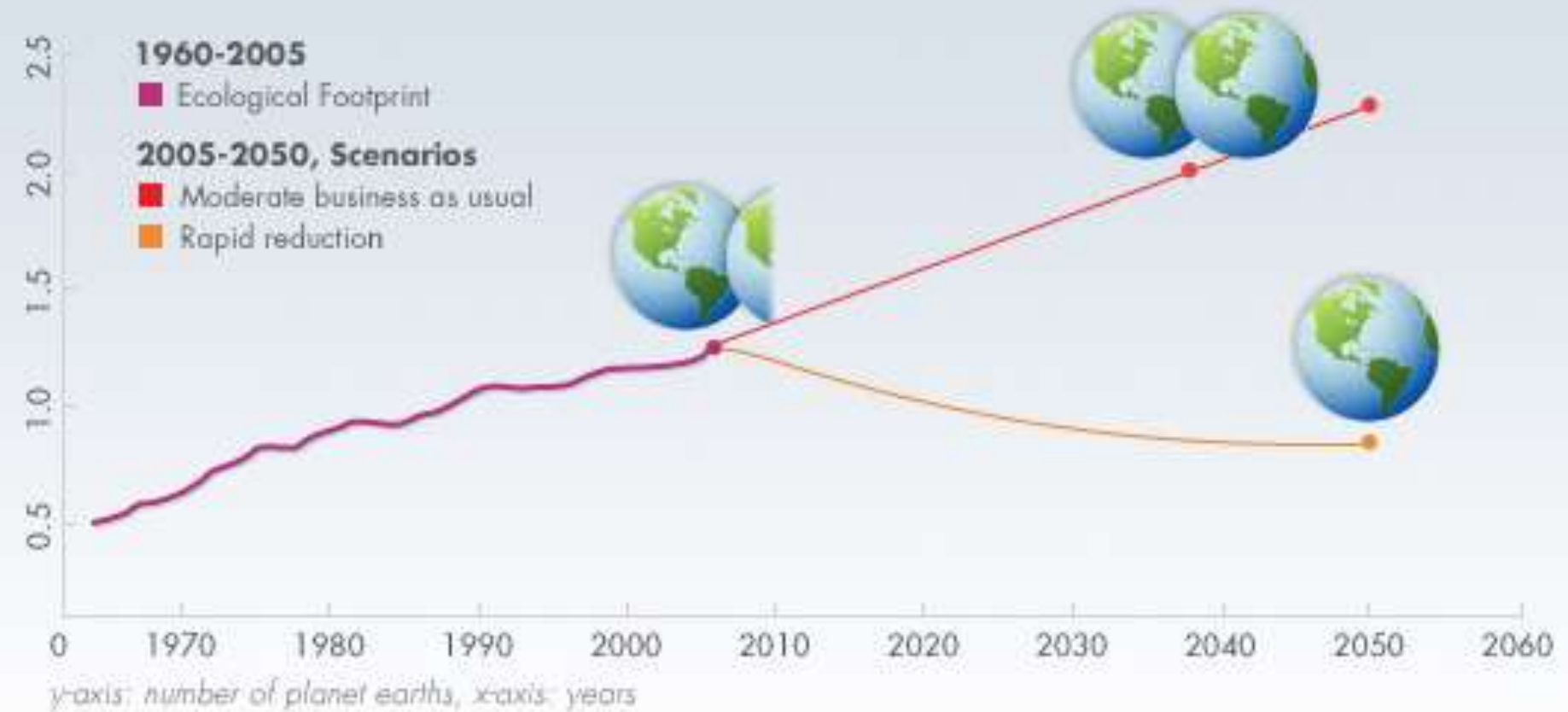
Global hectares per person



©BFF 2015

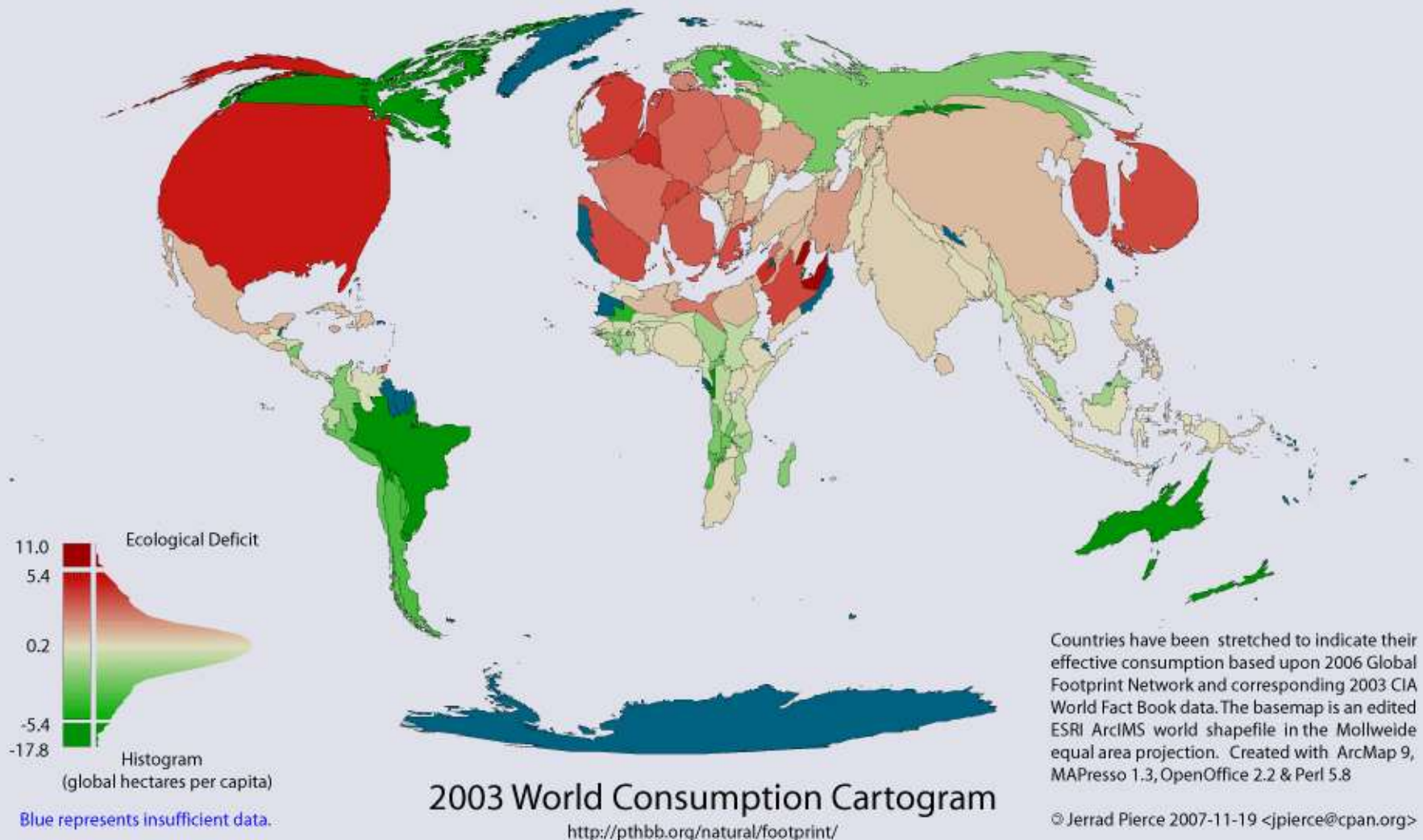
# Sustainability

Awareness



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Awareness

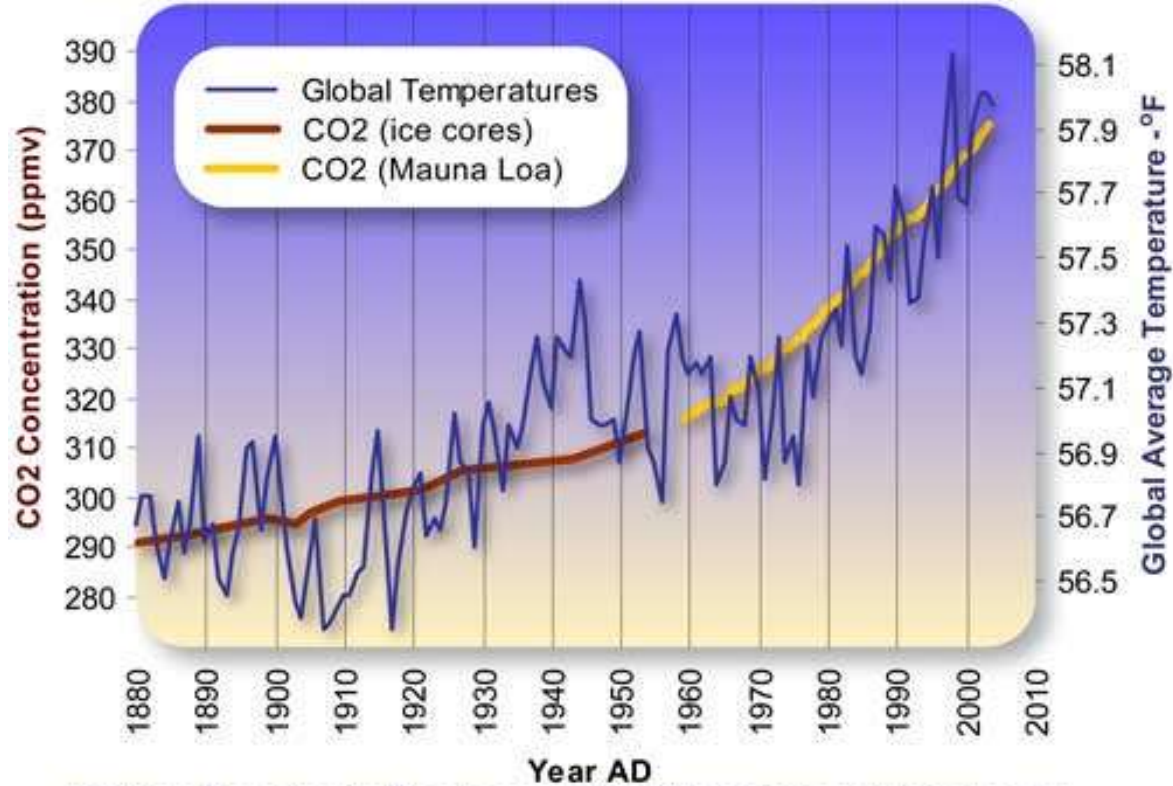


# Sustainability

Awareness



### Global Average Temperature and Carbon Dioxide Concentrations, 1880 - 2004



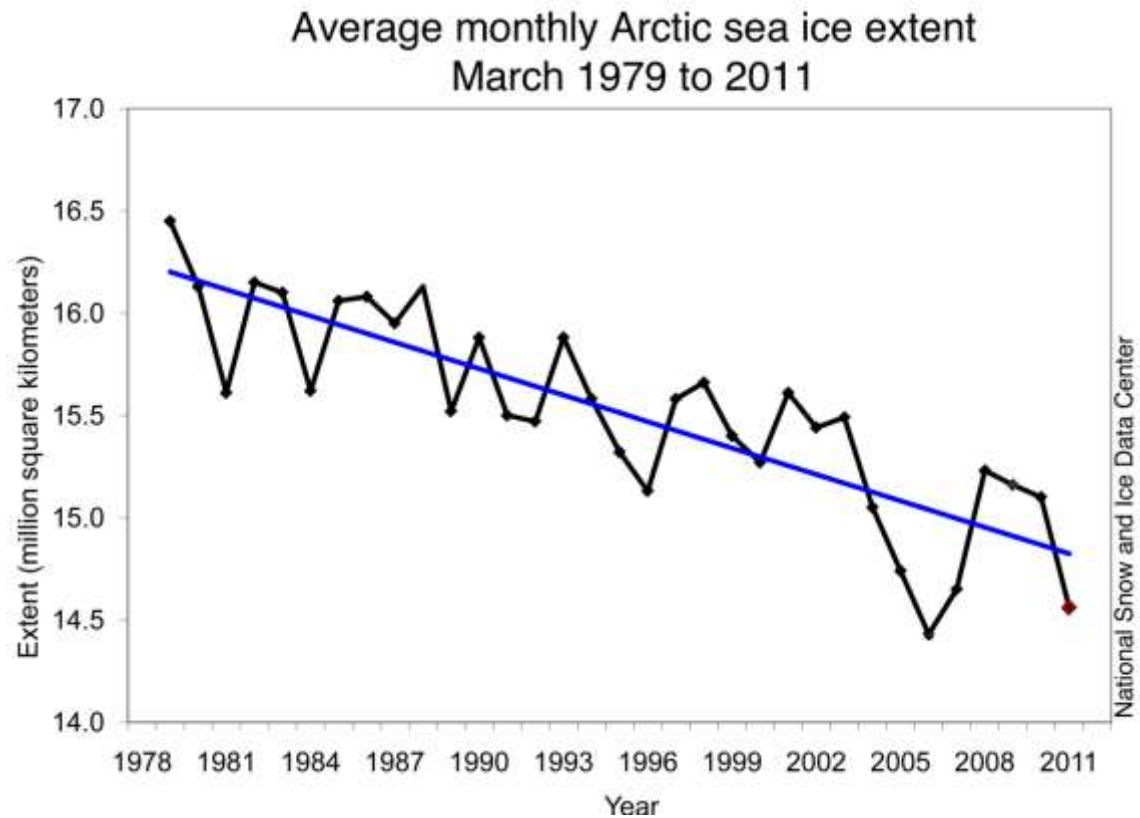
Data Source Temperature: [ftp://ftp.ncdc.noaa.gov/pub/data/anomalies/annual\\_land\\_and\\_ocean.ts](ftp://ftp.ncdc.noaa.gov/pub/data/anomalies/annual_land_and_ocean.ts)  
Data Source CO2 (Siple Ice Cores): <http://cdiac.esd.ornl.gov/ftp/trends/co2/siple2.013>  
Data Source CO2 (Mauna Loa): <http://cdiac.esd.ornl.gov/ftp/trends/co2/maunaloa.co2>

Graphic Design: Michael Ernst, The Woods Hole Research Center



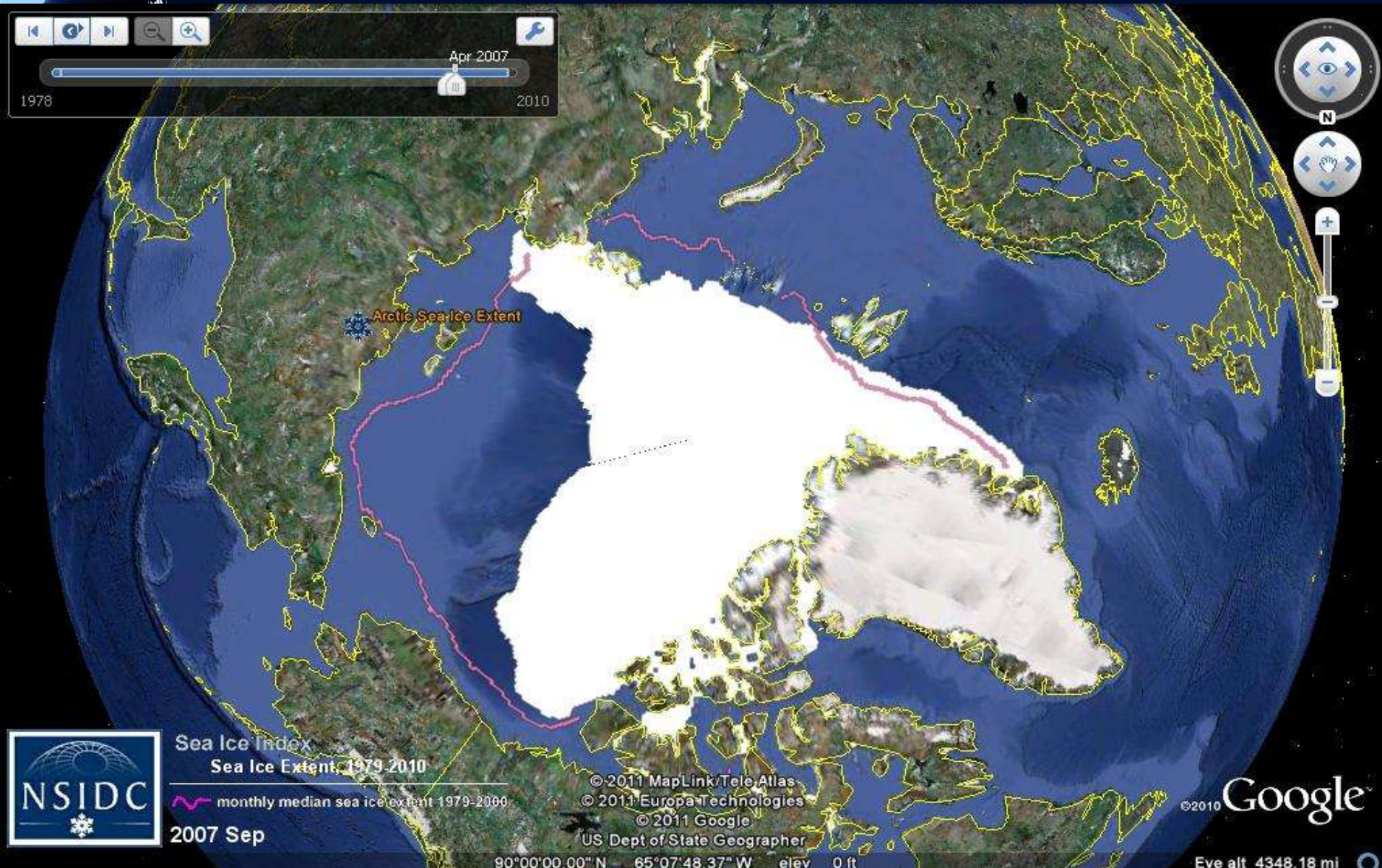
# Sustainability

Awareness



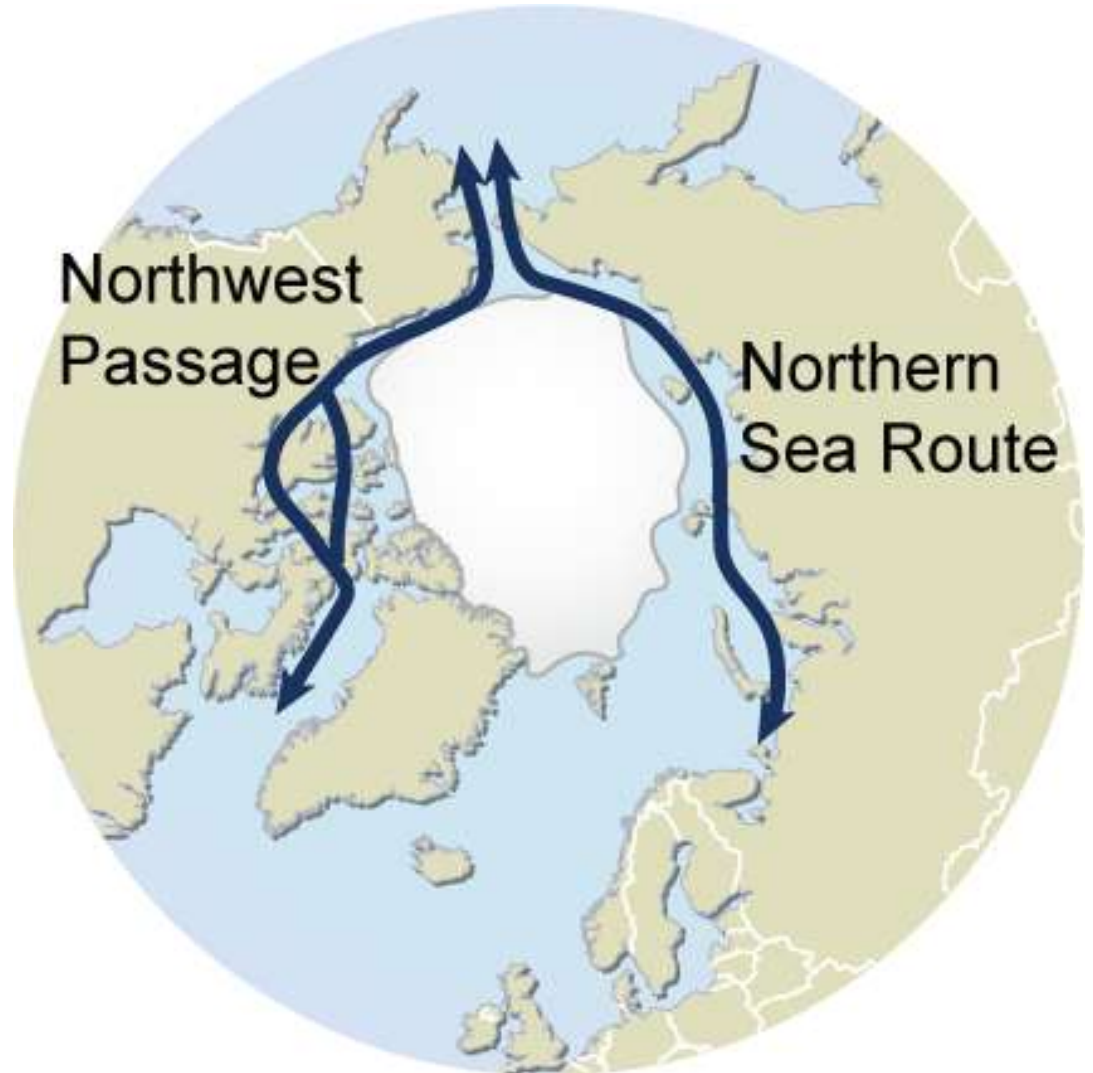
# Sustainability

Awareness



# Sustainability

Awareness



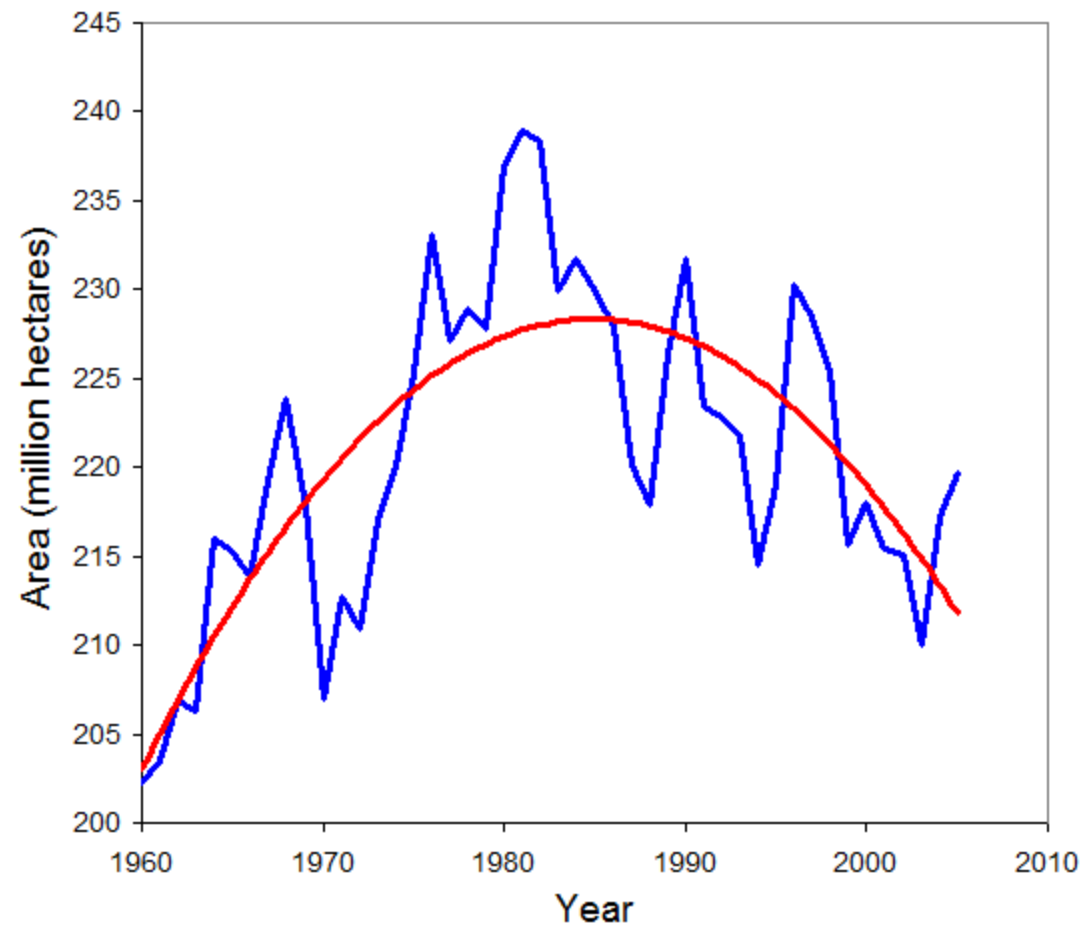
# Sustainability

Awareness



## Global Wheat Area Harvested

Source: [www.ers.usda.gov](http://www.ers.usda.gov)



# Sustainability

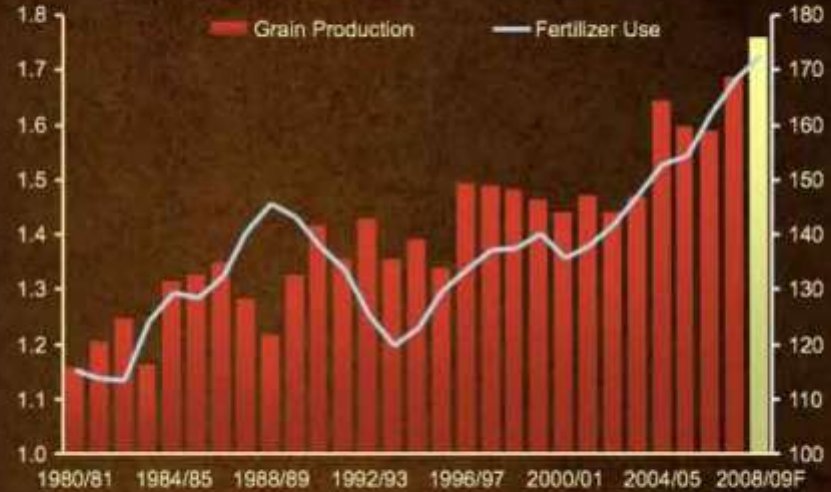
Awareness



## World Grain\* Production and Fertilizer Use

Billion Tonnes Grain

Million Tonnes Fertilizer



\* Includes wheat and coarse grains

Source: USDA, Fertecon

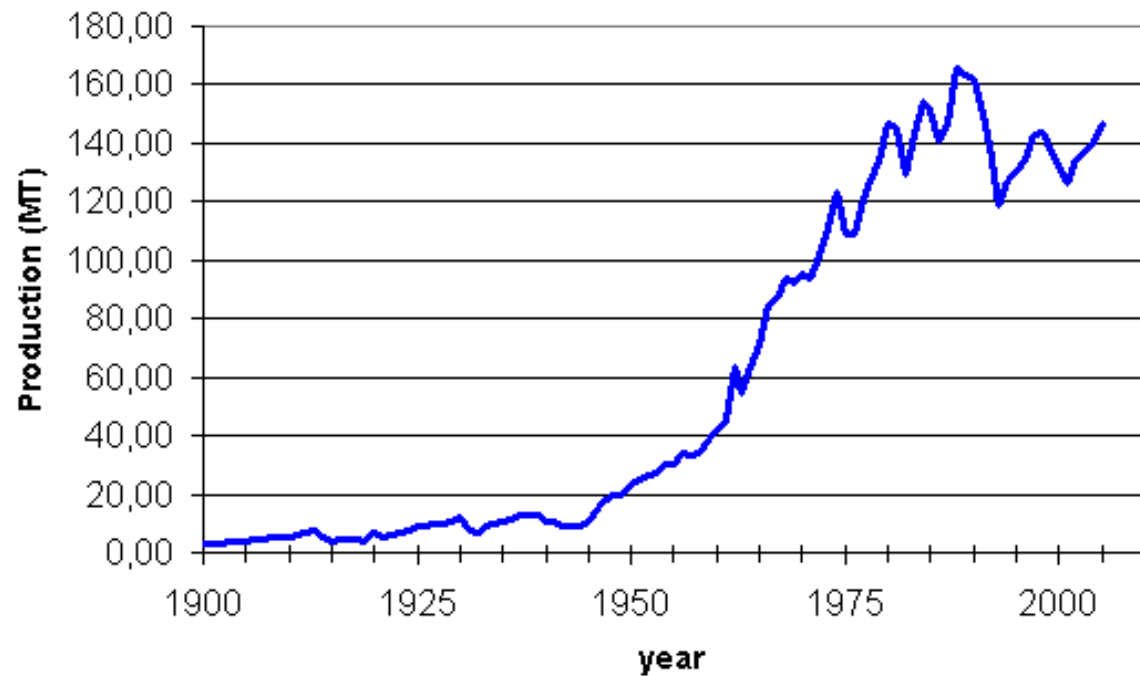
 **PotashCorp**  
Helping Nature Provide

# Sustainability

Awareness

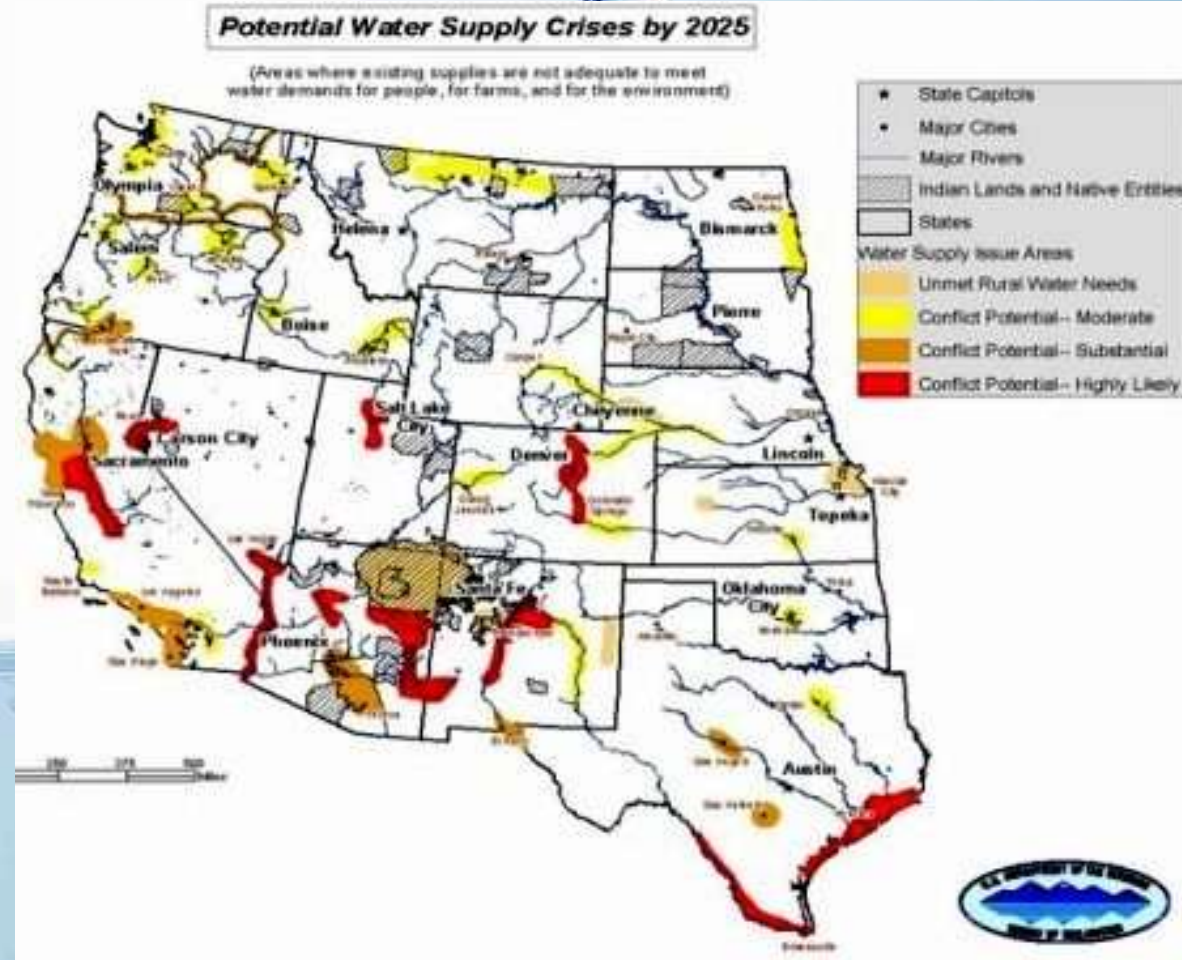


World rock phosphate production



# Sustainability

Awareness



# Sustainability

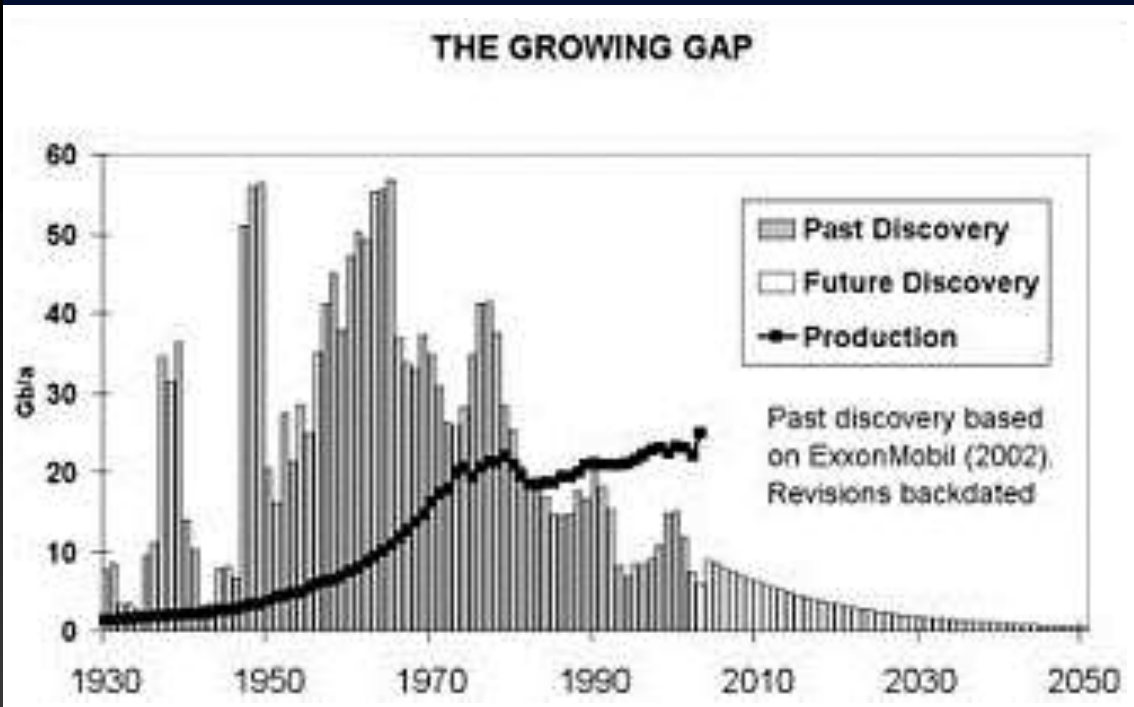
Awareness



**MY  
CARBON  
FOOTPRINT  
IS BIGGER  
THAN  
YOURS**

# Sustainability

Awareness



Oil exploration and investment:

\$350B needed annually through 2030

\$390B actual world expenditure 2000-2007 combined

# Sustainability

From Awareness to Application

**Reducing  
carbon  
emissions  
isn't just for  
environmentalists  
anymore.**



# Sustainability

From Awareness to Application

## Sustainability Rating Systems



5 - Great



Rate

## Infrastructure Sustainability Rating Systems

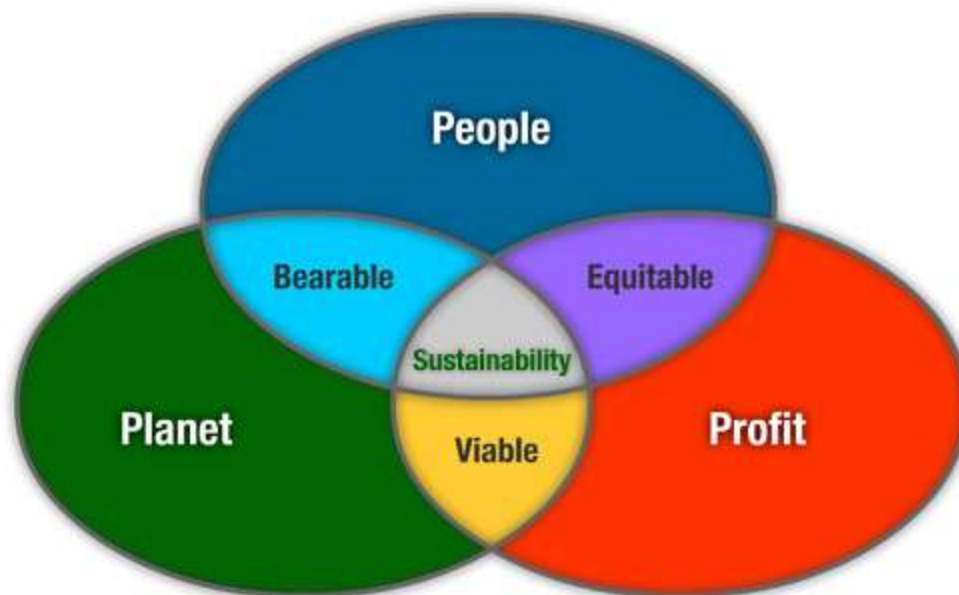
- CEEQUAL (UK, 2004)
- Envision (USA, under development)  
Institute for Sustainable Infrastructure

# Sustainability

Application

## Principles Incorporated into Envision

- Triple Bottom Line (Economic, Environmental, Social)
- Pathway
- Systems
- Enlarging

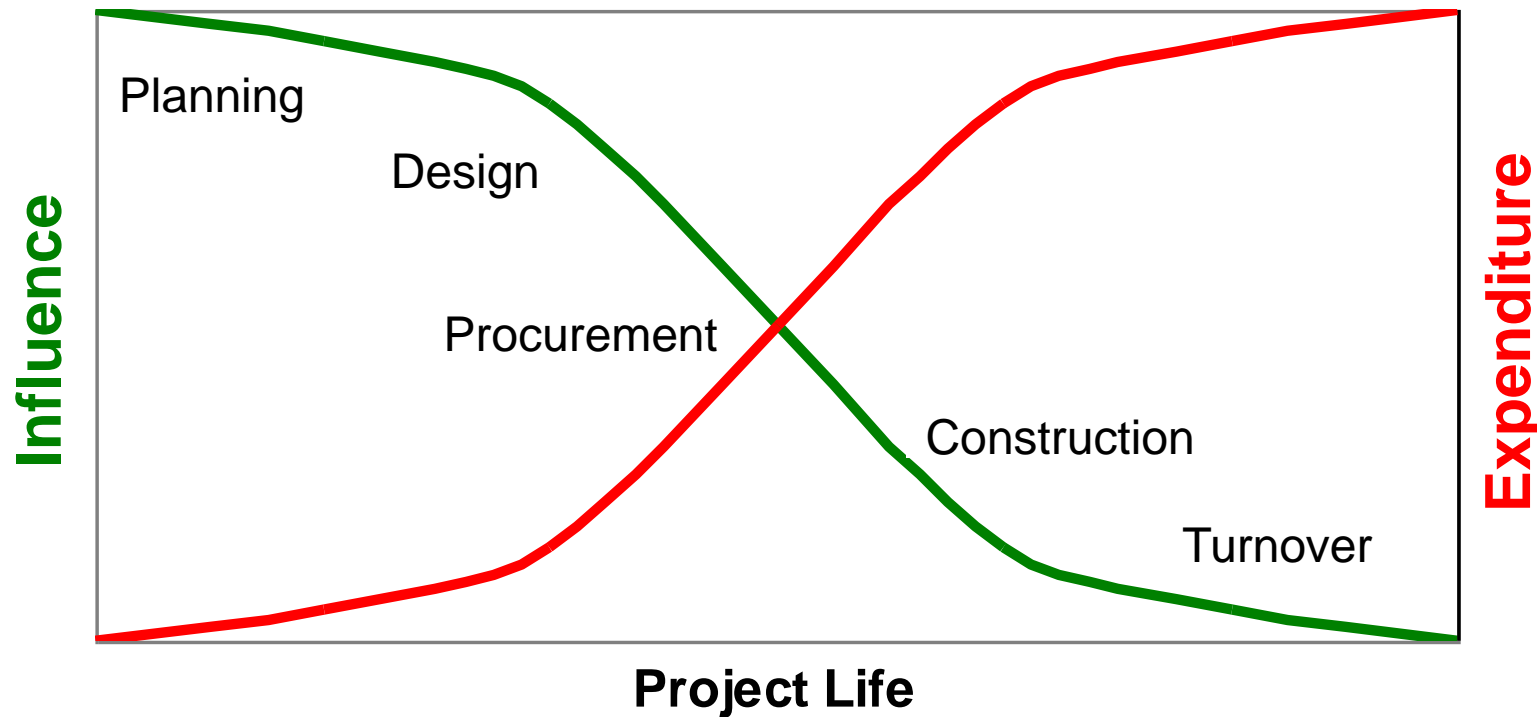


## Enlarging Opportunities:

### Sustainability at All Project Phases

- Planning
- Design
- Construction
- Operations & Maintenance
- Decommissioning

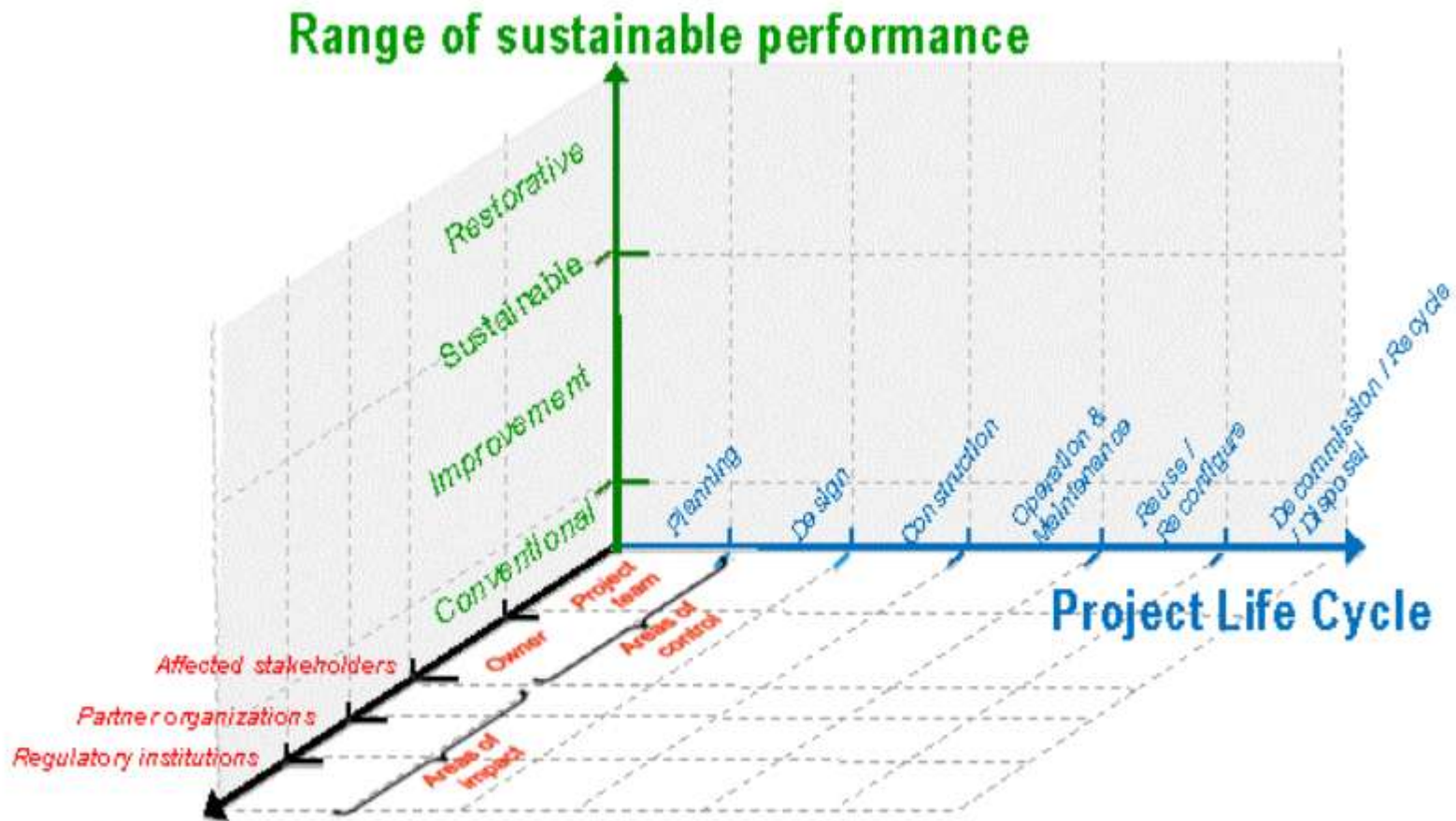
## Timing-Influence Curve



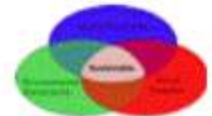
Adapted from CII Constructability Primer.

# Sustainability

Application

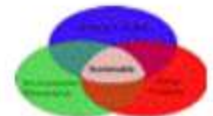
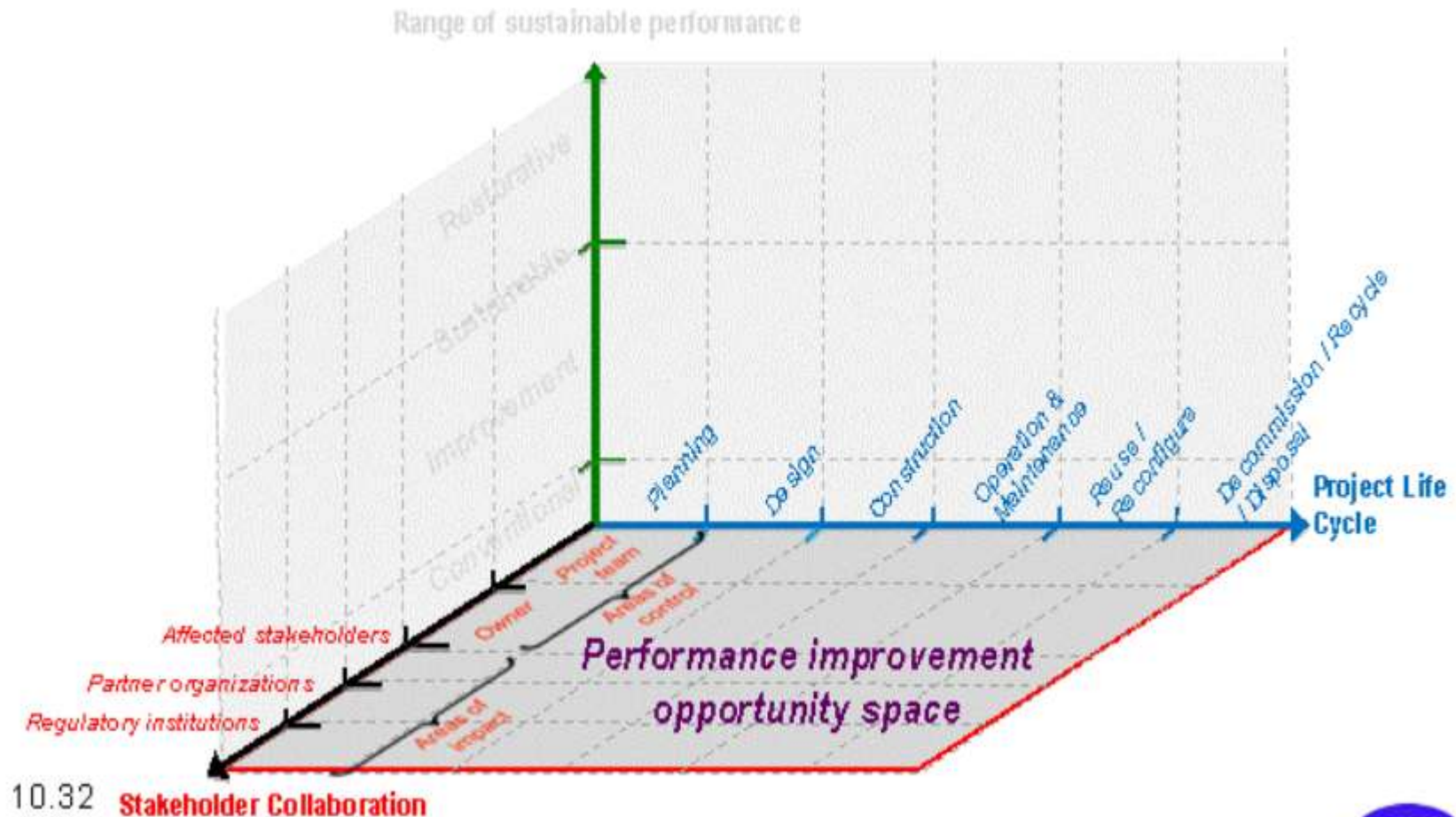


## 10.10 Stakeholder Collaboration



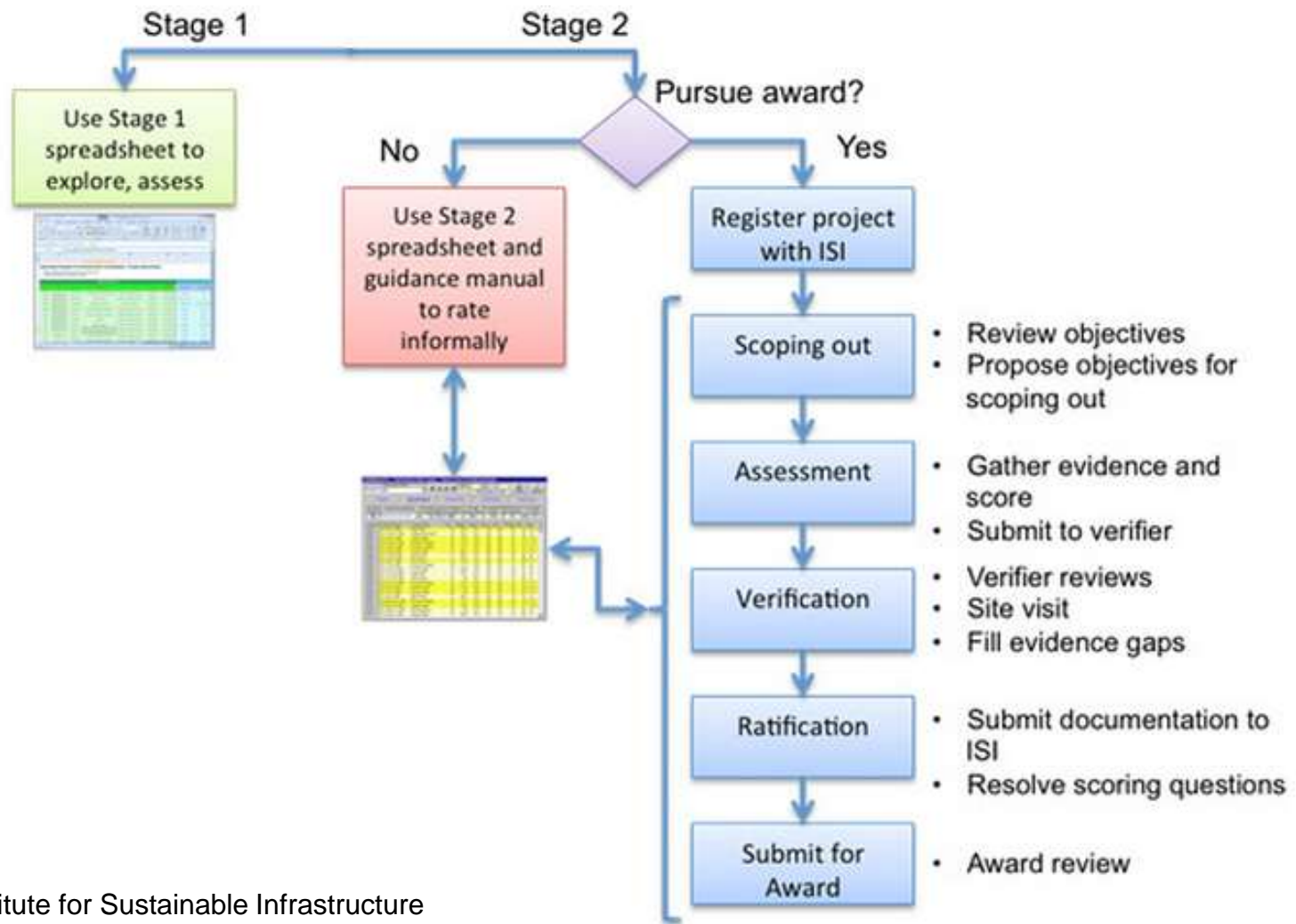
# Sustainability

Application



# Sustainability

## The Envision Rating System



# Sustainability

The Envision Rating System

## Project Rating System

**1. Project Pathway  
Contribution**

**2. Project  
Strategy and  
Management**

# Sustainability

The Envision Rating System

**Project Rating System**

**3. Communities**

**10. Access and  
Mobility**

# Sustainability

The Envision Rating System

## Project Rating System

**4. Land Use  
and Restoration**

**5. Landscapes**

**6. Ecology &  
Biodiversity**

**7. Water  
Resources &  
Environment**

**8. Energy and  
Carbon**

**9. Resource  
Management**



# Sustainability

The Envision Rating System

## Example Objectives

- Project Pathway Contribution: Avoid traps and vulnerabilities that create unacceptably high, long-term costs or risks.
- Land Use and Restoration: Prevent soil loss and pollution infiltration from stormwater runoff during construction.

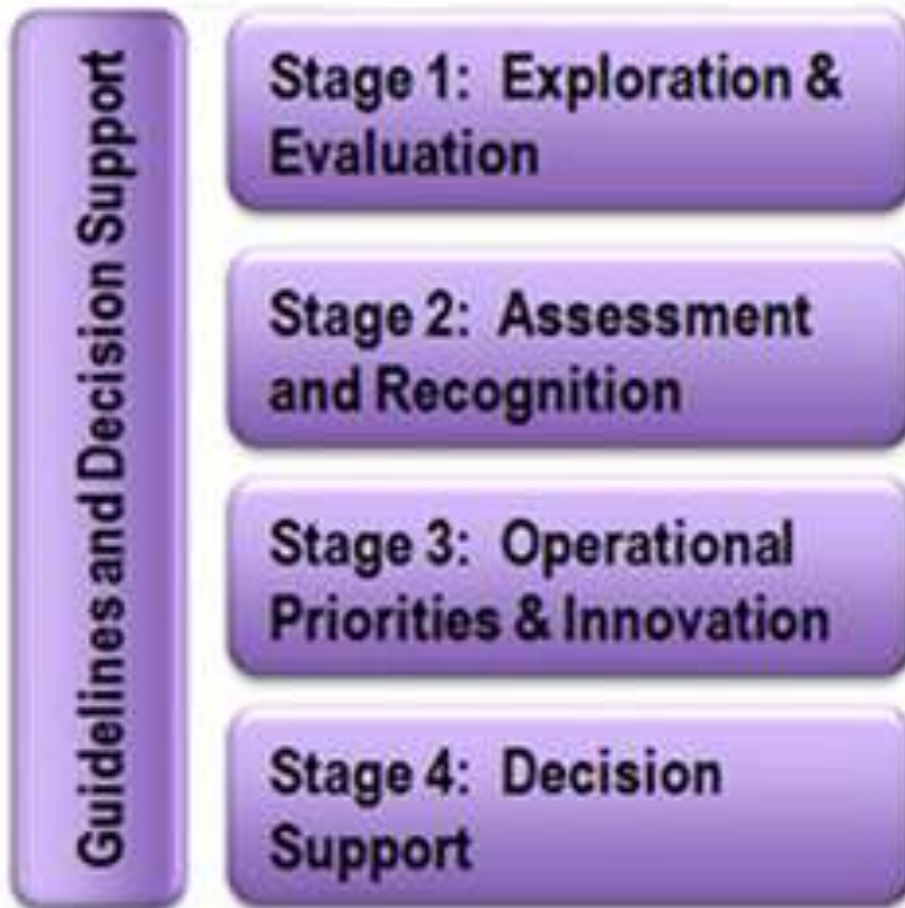
## Example Objectives under Project Strategy and Management

- Pursue by-product synergy applications.
- Pursue opportunities for sustainability improvement throughout the useful life of the project.
- Work with public agencies to identify and resolve conflicting regulations, standards and policies.



# Sustainability

The Envision Rating System

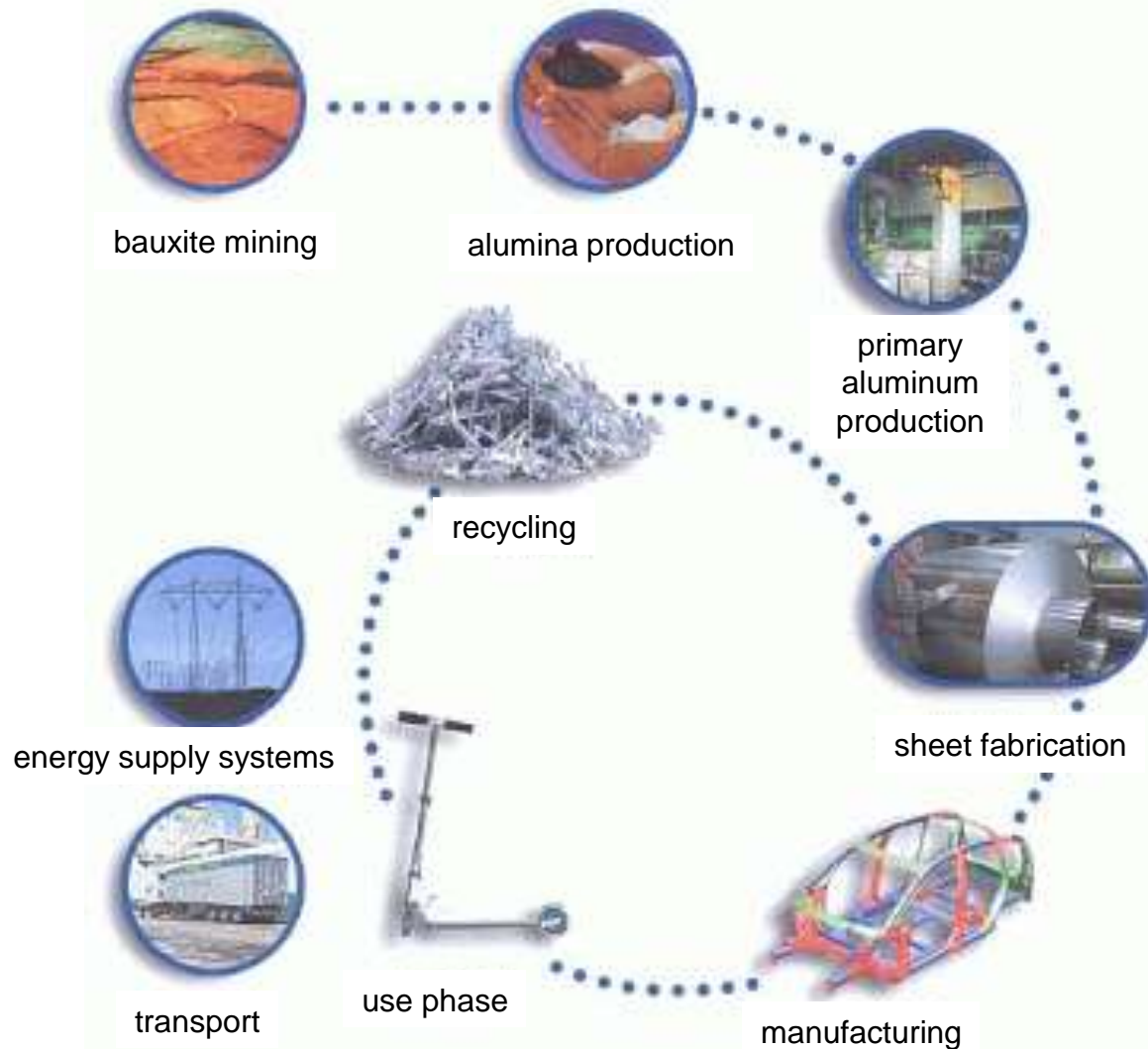


Source: Institute for Sustainable Infrastructure

# Sustainability

The Envision Rating System

## Stage 4 Tools: Life Cycle Assessment



## Potential Influence of the Envision System

- A measure of good government
- A factor in loan rates and bond ratings
- A factor in “Infrastructure Bank” financing decisions

# Sustainability

The Envision Rating System

## Evaluation of the Envision System

- Weighting scheme difficulties
- Greenwashing vs.

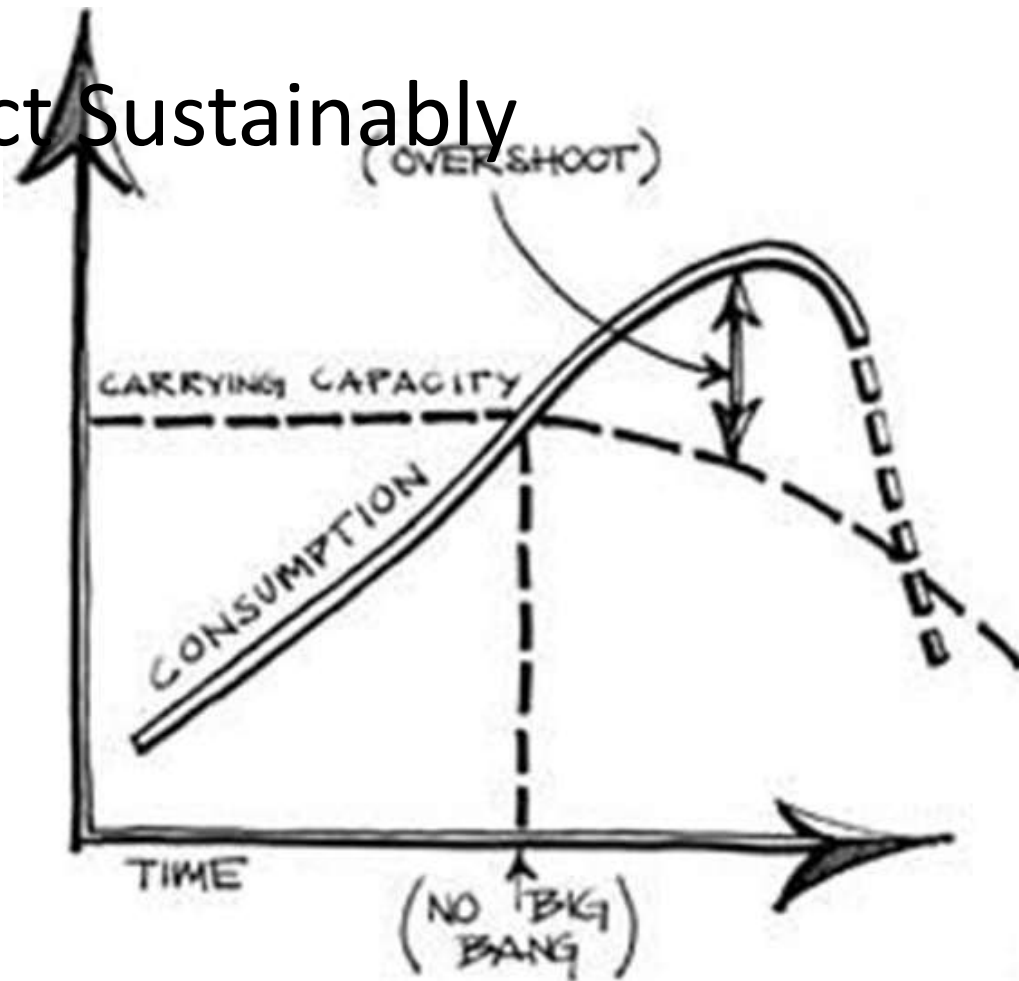
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# Sustainability

Think and Act Sustainably

Overshoot



Source: *Our Ecological Footprint*, Wackernagel and Rees

# Sustainability

## Limits to Growth



# Sustainability





Thank you

