A Presentation to the

**Northwest Construction Consumer Council**

Seattle, WA

April 24, 2002

# Enabling Sustainability in the A/E/C Industry:

## A National Perspective on What Works & Why


**Dr. Jorge Vanegas**

The Fred and Teresa Estrada Professor

College of Engineering

**Georgia Institute of Technology**

Atlanta, Georgia 30332–0595

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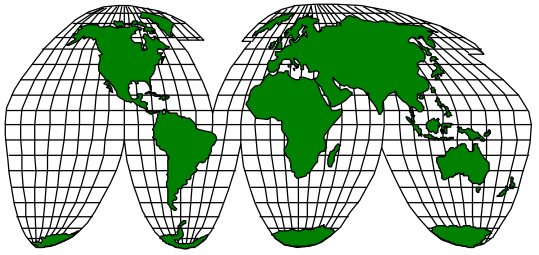

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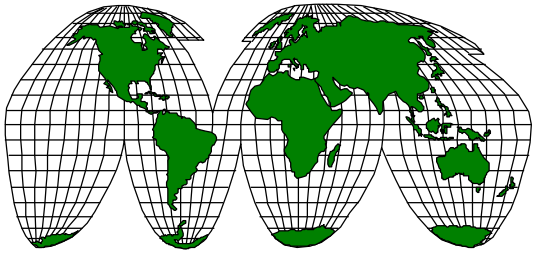


The **Future** arrives every second as today's reality, and it does not have "Pause" nor "Reset" buttons….

... and, whether we like it, accept it, or even care about it, **Sustainability** is an integral part of the Future, if not it's only hope….

So, from an A/E/C Industry point of view, the question is:

*… are we going to contribute to make the Future we want happen…?*

*… are we going to just wait and see what type of Future happens…?*

*… or are we going to ask, when the Future arrives, what happened…?*

**The fundamental question when anyone begins to talk about Sustainability in the A/E/C Industry is:**

***"What do you mean by sustainability…?"***

# There is no single, easy answer to this question…

- In answering this question, some people will try to make you feel:
- **Scared**… (the possible outcomes)
- **Bad**… (the statistics and blame)
- **Guilty**… (the greater good)
- **Confused**… (the intellectual base)
- **Relieved**… (the technological fix)
- But this is not the point**…**

# Sustainability has brought together a diverse set of constituencies…

Engineers

Businesses

Industries

Federal, State, and Local Governments

**And many, many, many more…**

Communities

Universities

Global and Local Alliances

Individuals

Health Professionals

Researchers

Social Scientists

Non-governmental Organizations (NGOs)

Educators

Physical Scientists

Religious Organizations

Financial Institutions

Professional and Industry Associations

Developed Countries

Developing Countries

# Some Selected Examples

- World Bank
- World Business Council for Sustainable Development (WBCSD)
- World Federation of Engineering Organizations (WFEO)
- The Business Roundtable (BRT)
- The U.S Green Building Council (USGBC)
- The U.S. Army Corps of Engineers
- U.S. Federal Government (Departments and Agencies)
- Urban Land Institute (ULI)
- The Construction Industry Institute (CII)
- The National Center for Construction Education and Research (NCCER)
- … and many others

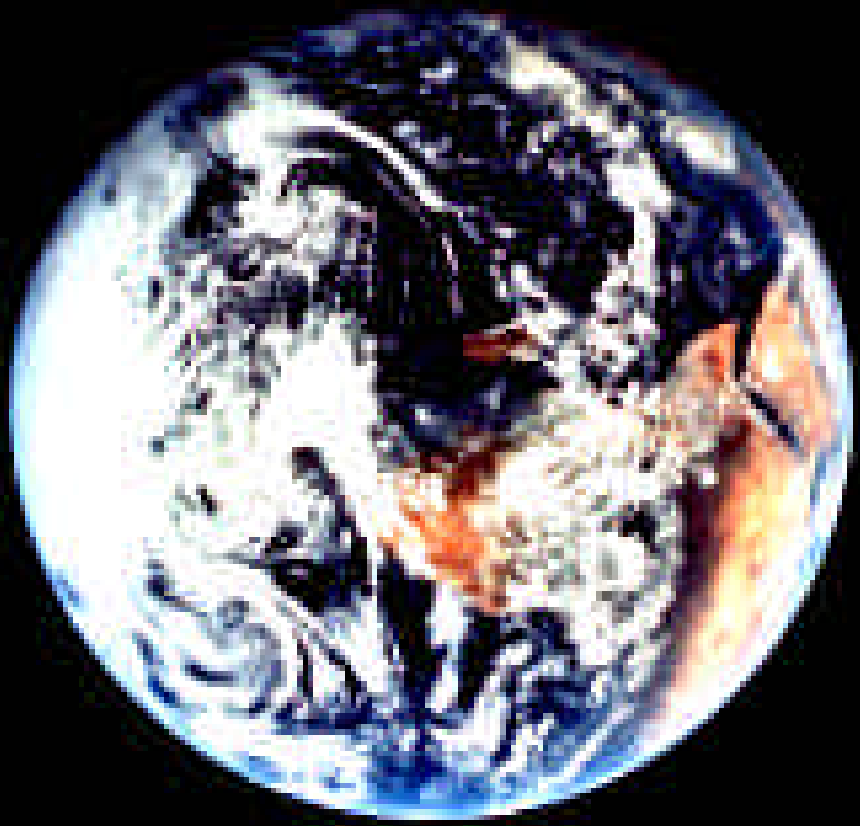
# So, let’s see what works and why…

**The first thing that works is:**

***(1) Do not get hung up on a definition, or on the definition of sustainability…***

***Instead, focus on what it is that we want/need to sustain…***

**Now, the answer is simple:**



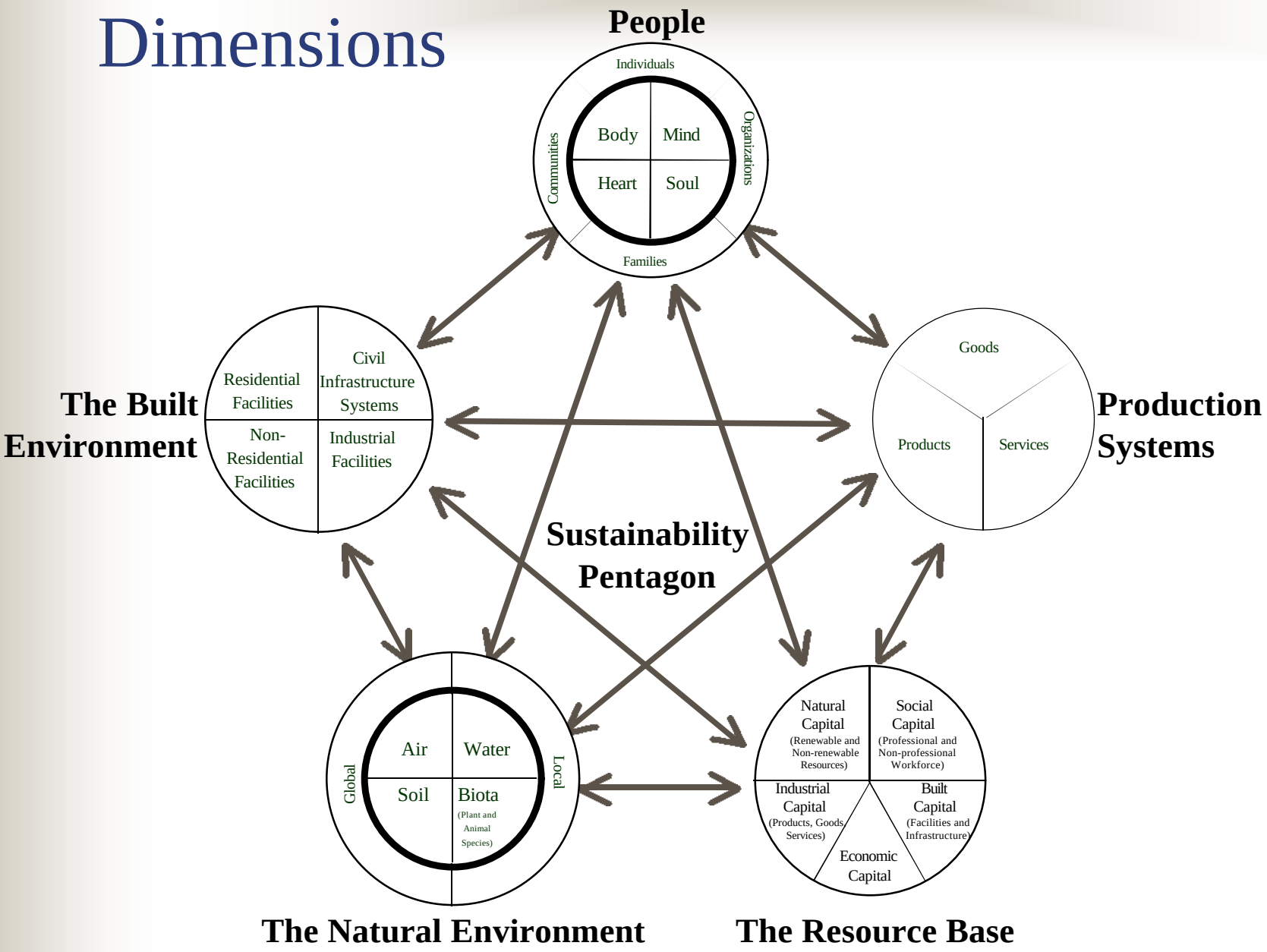
**But unfortunately, sustainability is not sexy enough… and in reality, quite complex…**

**The second thing that works is:**

***(2) Understand the context of sustainability…***

***This means, understand the dimensions and the scales of sustainability, and the influences that can affect it…***

# Dimensions


People
Individuals
Communities
Organizations
Families
Body
Mind
Heart
Soul
The Built Environment
Residential Facilities
Civil Infrastructure Systems
Non-Residential Facilities
Industrial Facilities
Production Systems
Goods
Products
Services
Sustainability Pentagon
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Local
Air
Water
Soil
Biota
(Plant and Animal Species)
The Natural Environment
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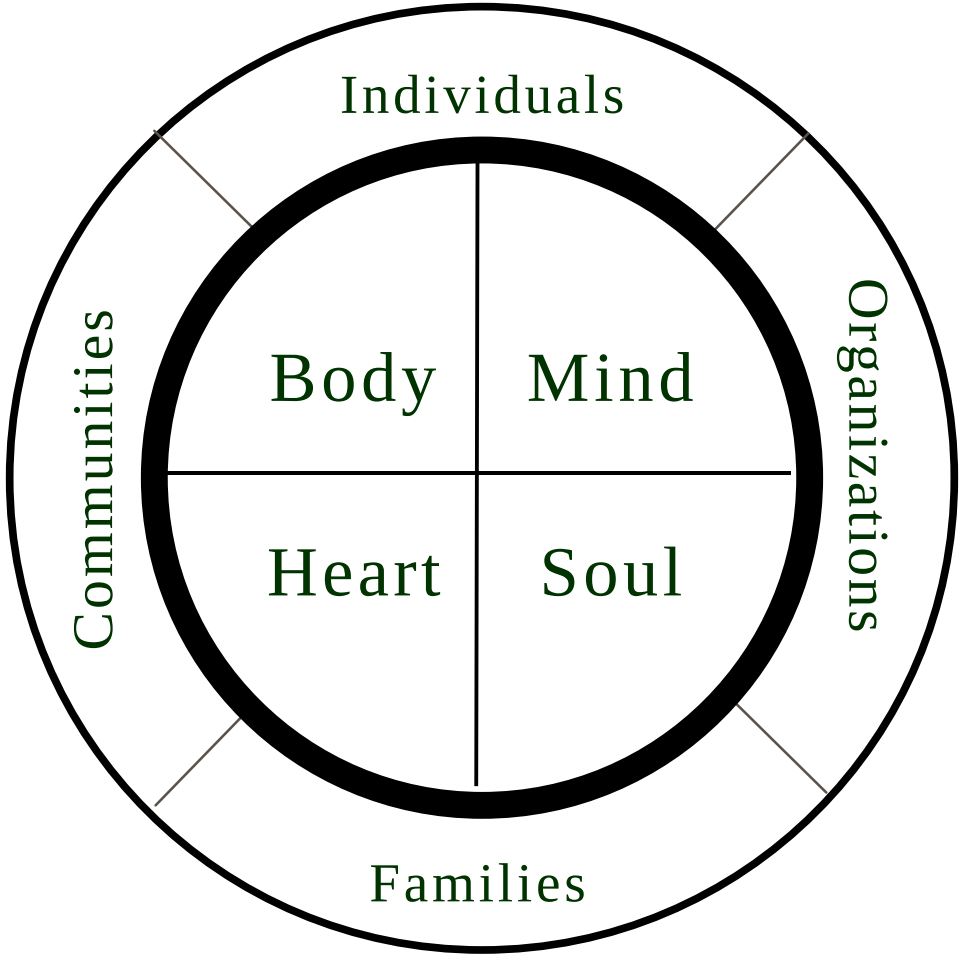
Social Capital
(Professional and Non-professional Workforce)
Industrial Capital
(Products, Goods Services)
Built Capital
(Facilities and Infrastructure)
Economic Capital
The Resource Base

# People


Individuals
Organizations
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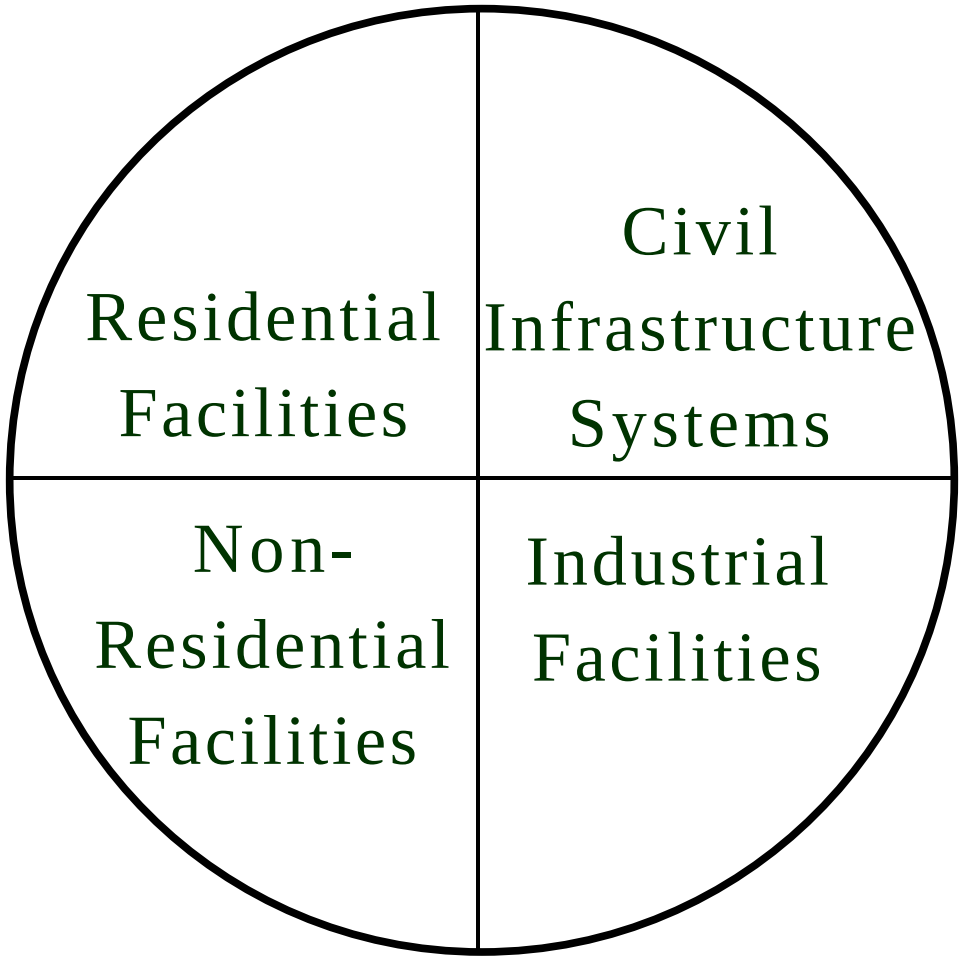
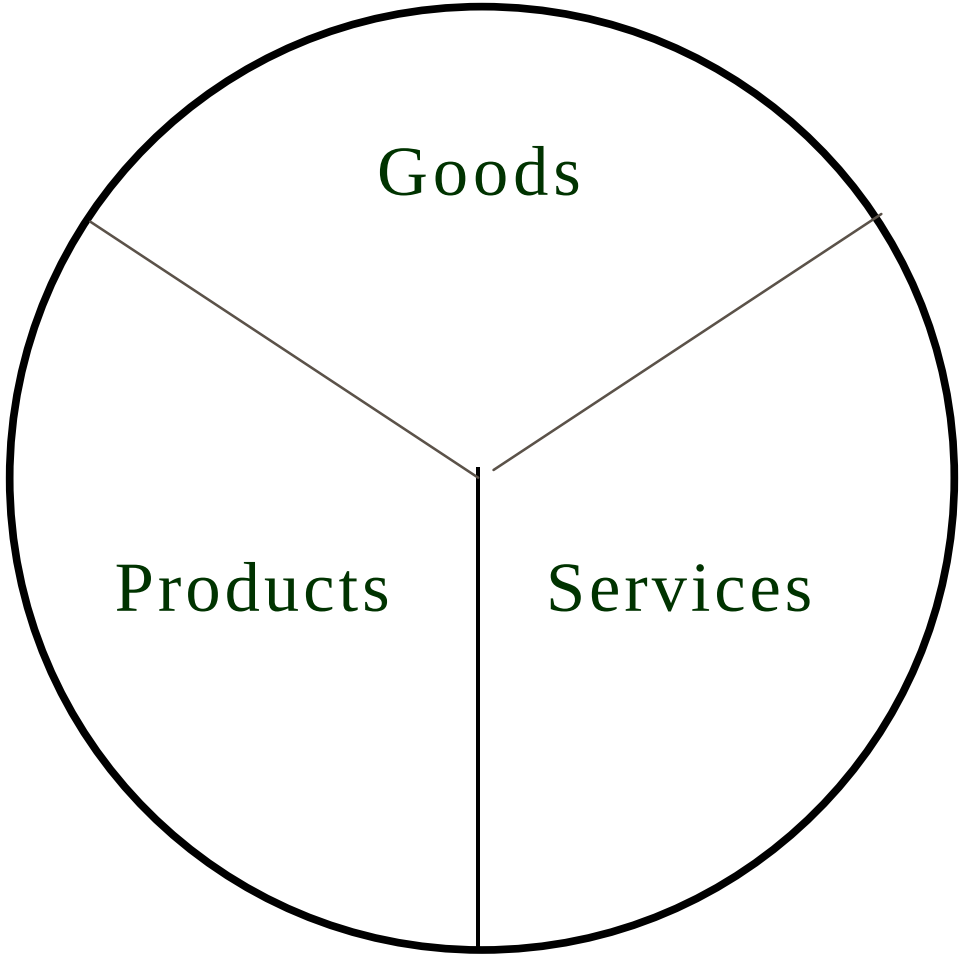
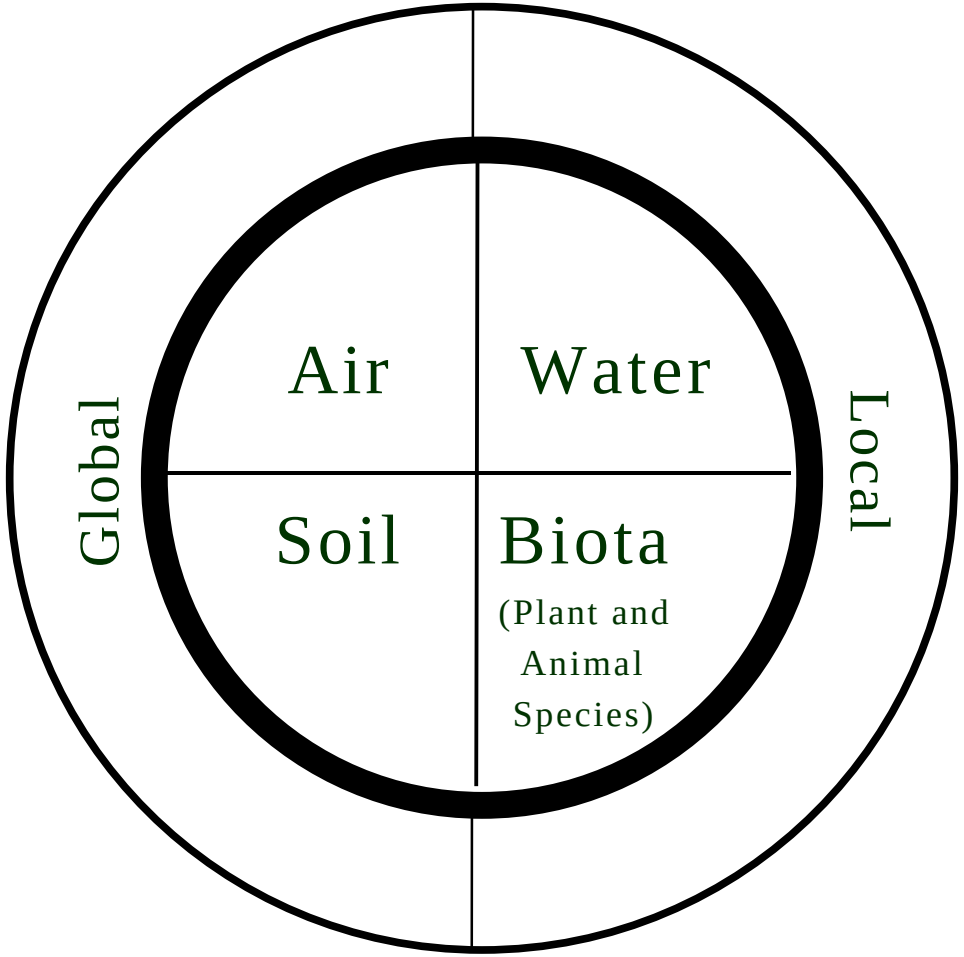
# The Built Environment



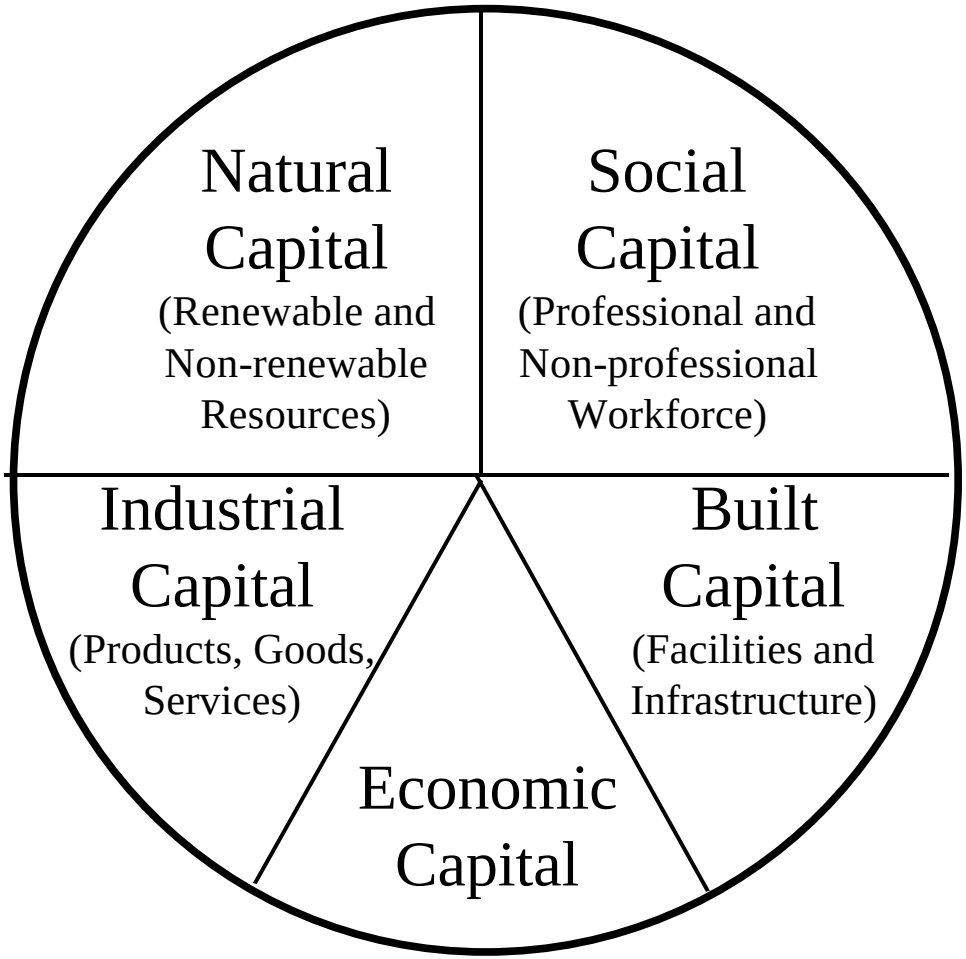
# Production Systems



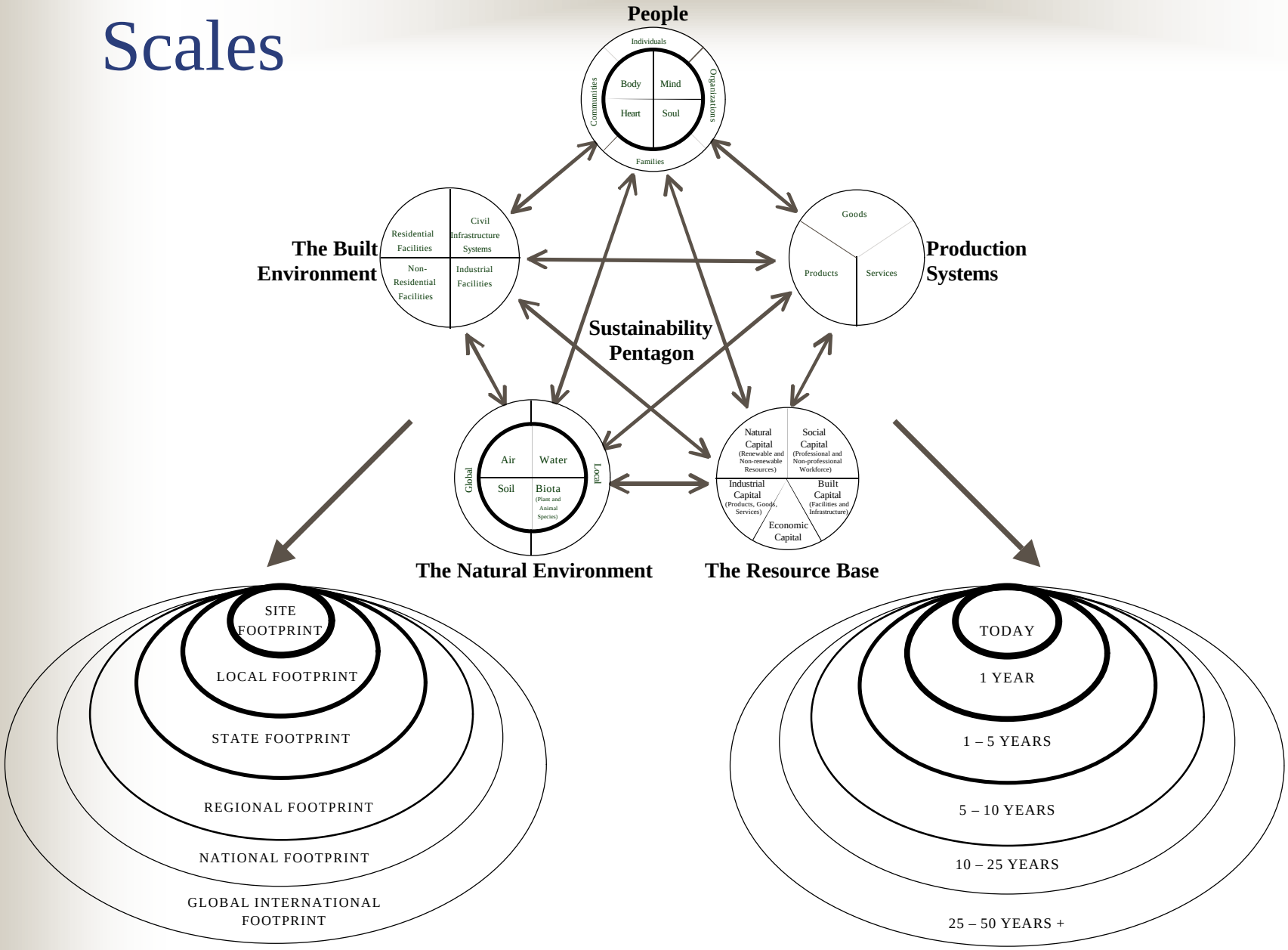
# The Natural Environment



# The Resource Base



# Scales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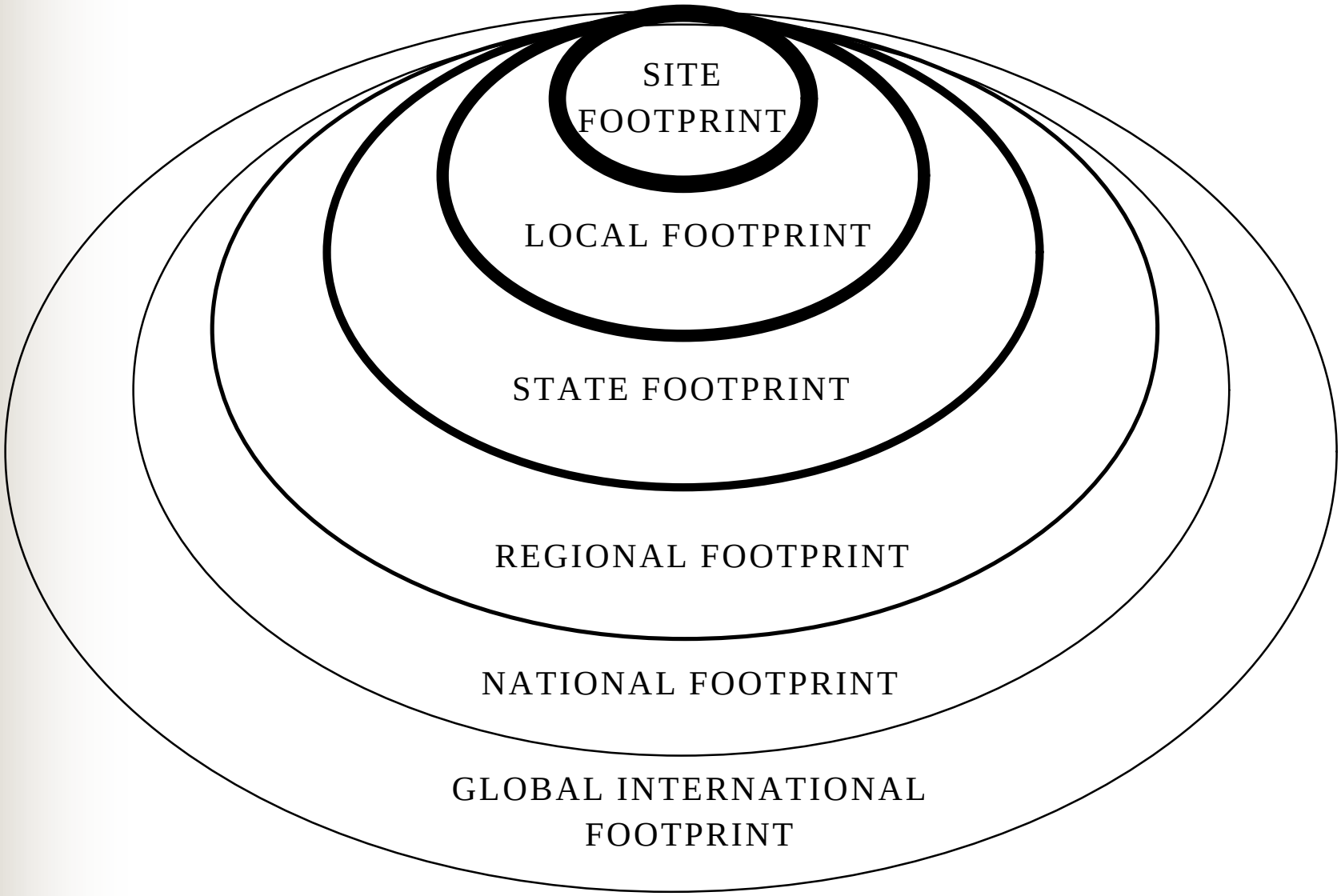
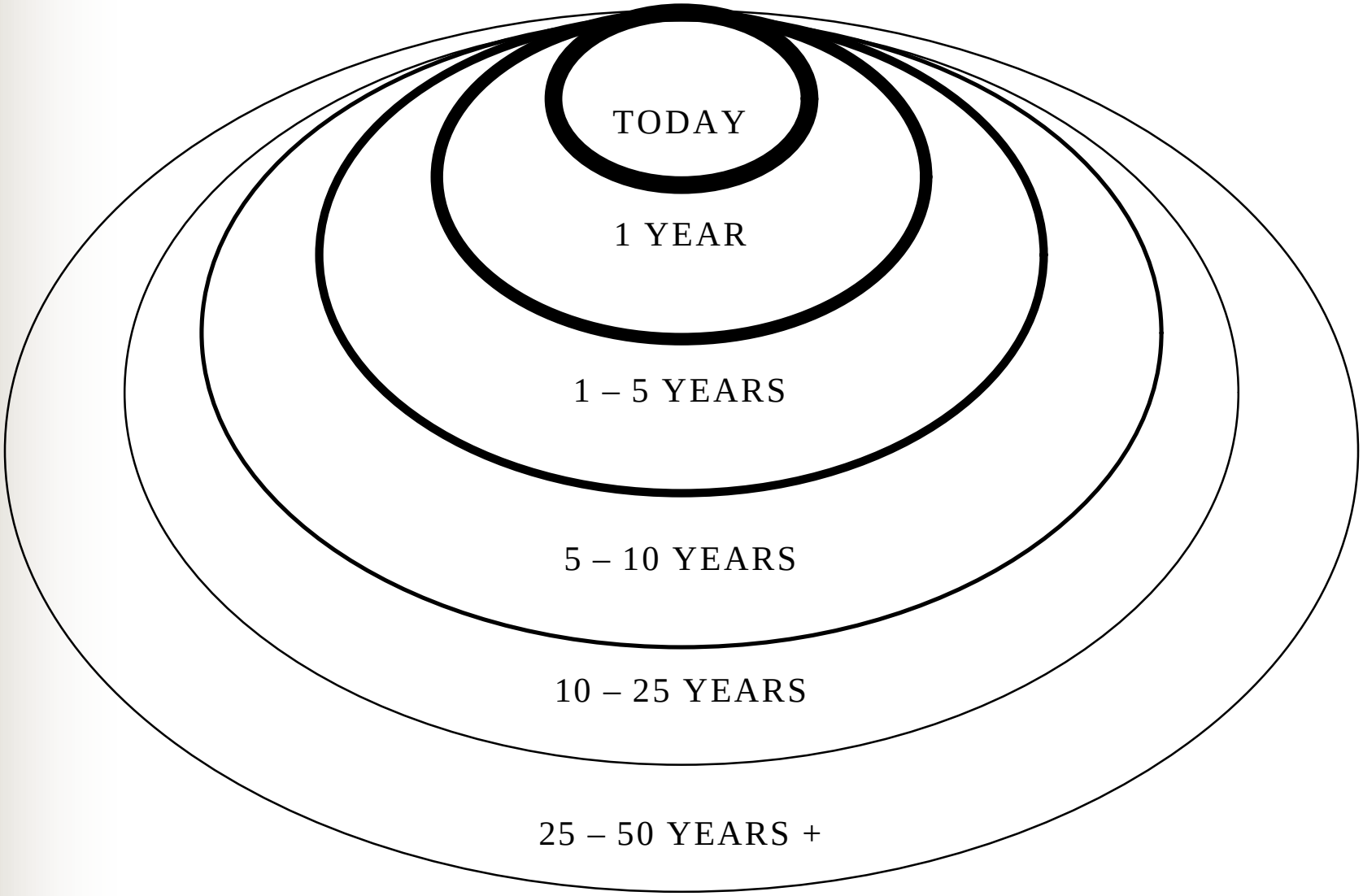
SITE FOOTPRINT
LOCAL FOOTPRINT
STATE FOOTPRINT
REGIONAL FOOTPRINT
NATIONAL FOOTPRINT
GLOBAL INTERNATIONAL FOOTPRINT
TODAY
1 YEAR
1 – 5 YEARS
5 – 10 YEARS
10 – 25 YEARS
25 – 50 YEARS +

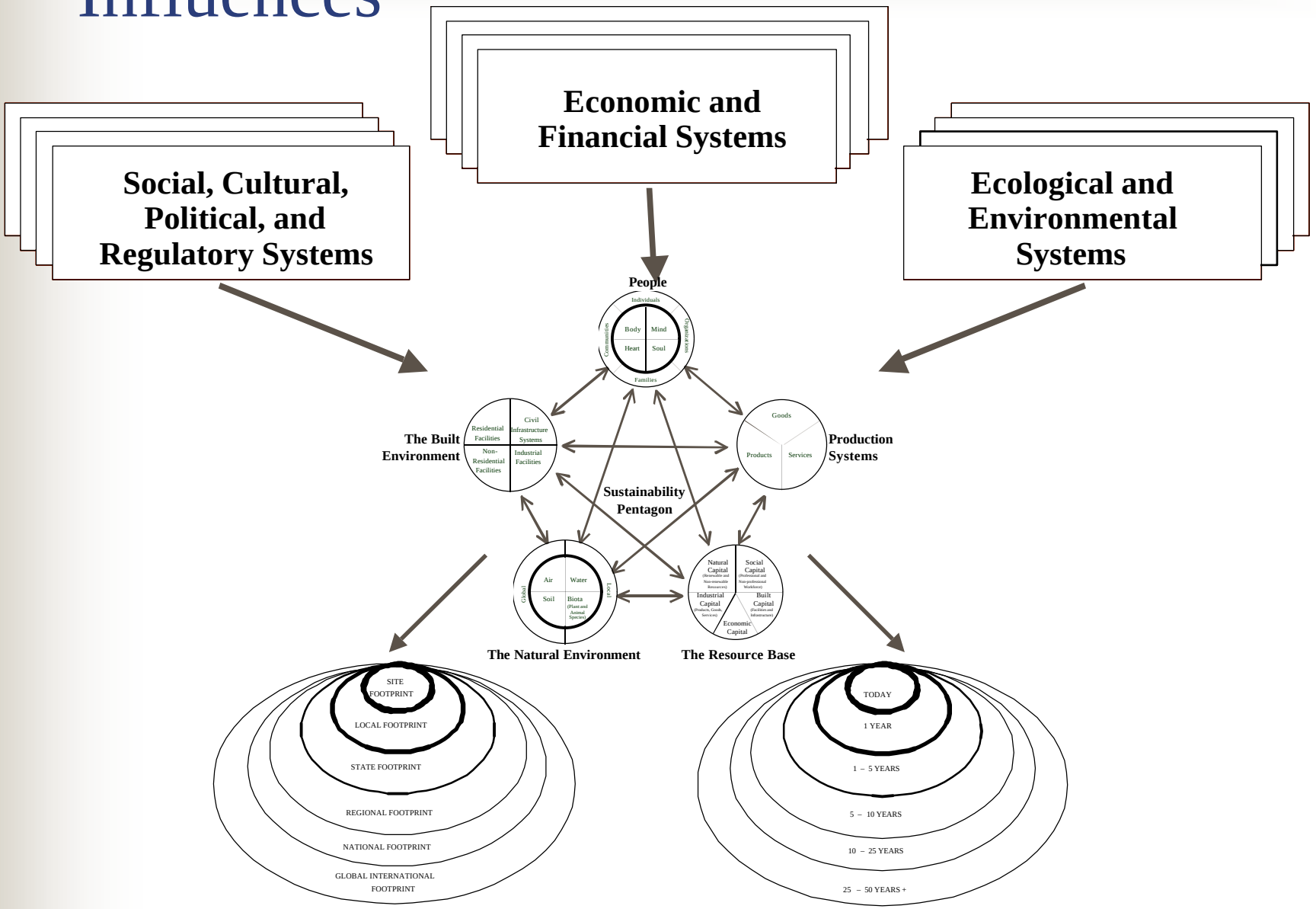
# Spatial Scale



# Temporal Scale



# Influences


Economic and Financial Systems
Social, Cultural, Political, and Regulatory Systems
Ecological and Environmental Systems
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**The third thing that works is:**

***(3) Acknowledge that sustainability inevitably will lead to change in the A/E/C industry, in A/E/C enterprises, and in A/E/C projects…***

***This means, understand the triggers, the drivers, and the implications of change…***

# Triggers of Change

**ATTITUDE TOWARD CHANGE**

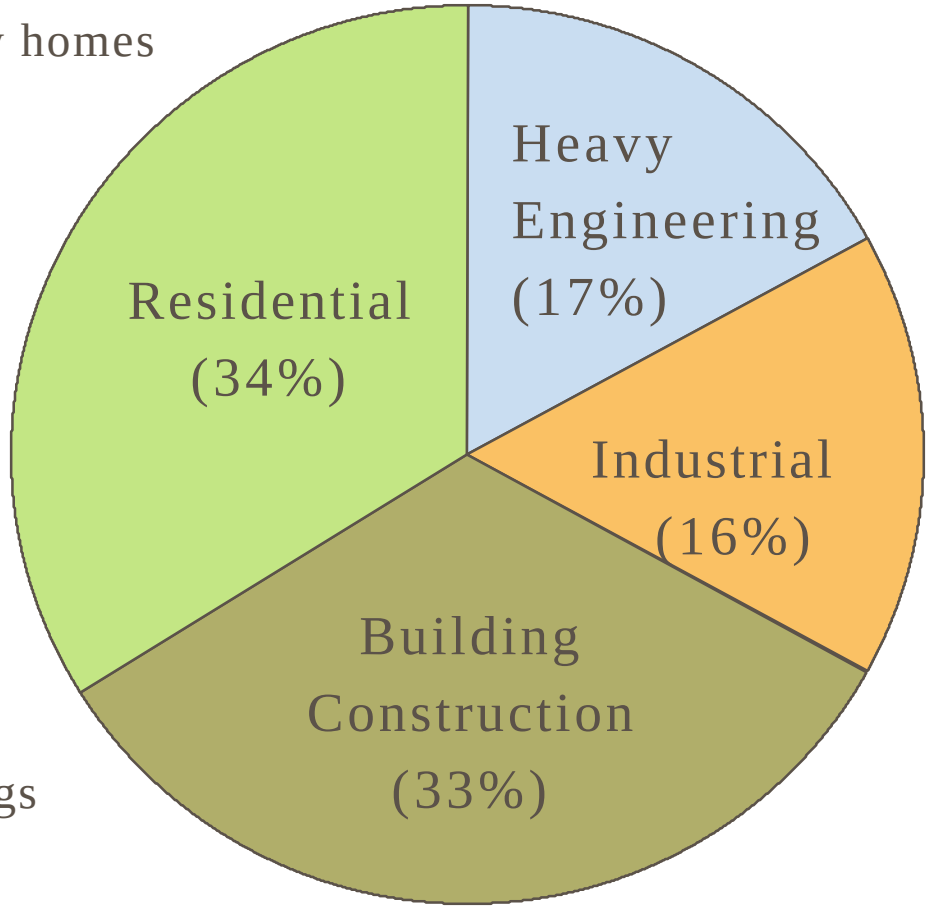
| SOURCE OF CHANGE | Proactive | Reactive |
|---|---|---|
| Internal | **FLASH**<br>Triggers are changes in:<br>• Values<br>• Mission<br>• Perceptions | **CRASH**<br>Triggers are changes of:<br>• Functional Requirements<br>• Physical Integrity /Function |
| External | **SPLASH**<br>Triggers are changes caused by:<br>• Market<br>• Benchmarks<br>• Competition | **CLASH**<br>Triggers are changes in:<br>• Codes<br>• Regulations<br>• Standards |

***Regardless of the trigger, sustainability will inevitably force change, and how organizations respond will make them end…***

either with a Pile of **CASH…** or as a Pile of **ASH…**

# Drivers of Change: The Global Market

- Single-family homes
- Townhouses
- Apartments
- Condos




- Dams
- Highways
- Airports
- Pipelines

- Schools
- Office Buildings
- Warehouses
- Shopping Centers

- Refineries
- Power Plants
- Steel Mills
- Heavy Mfg.

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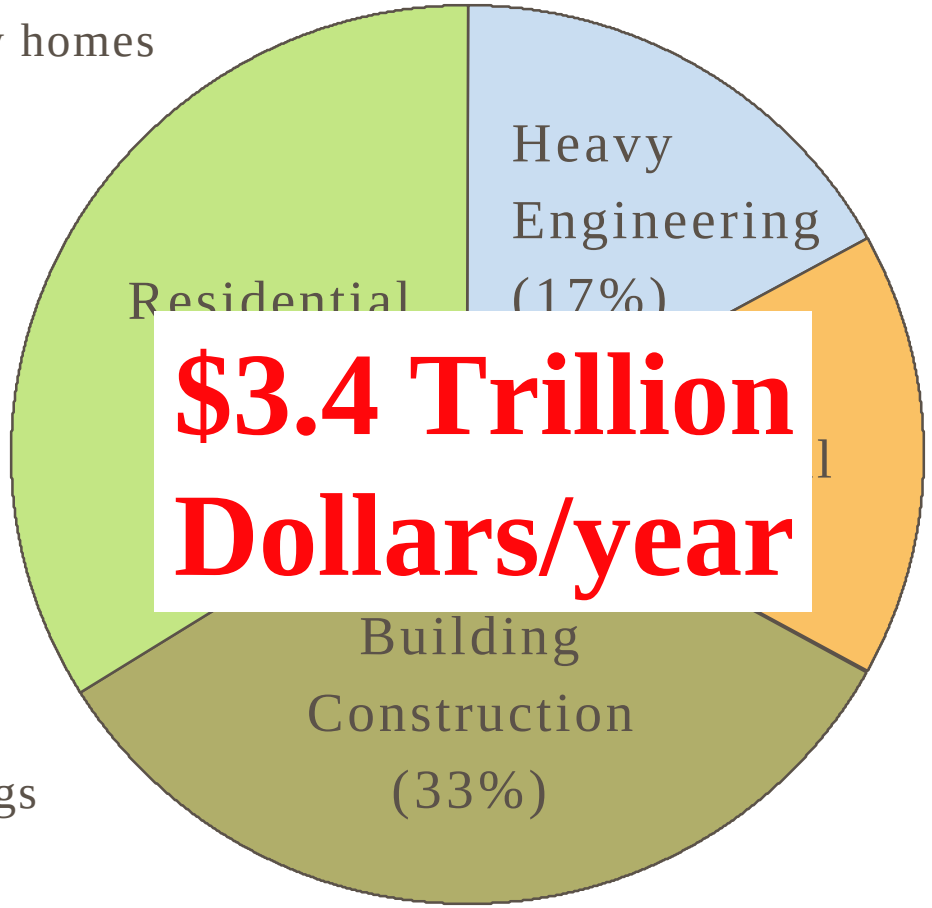


**$3.4 Trillion Dollars/year**

- Dams
- Highways
- Airports
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- Schools
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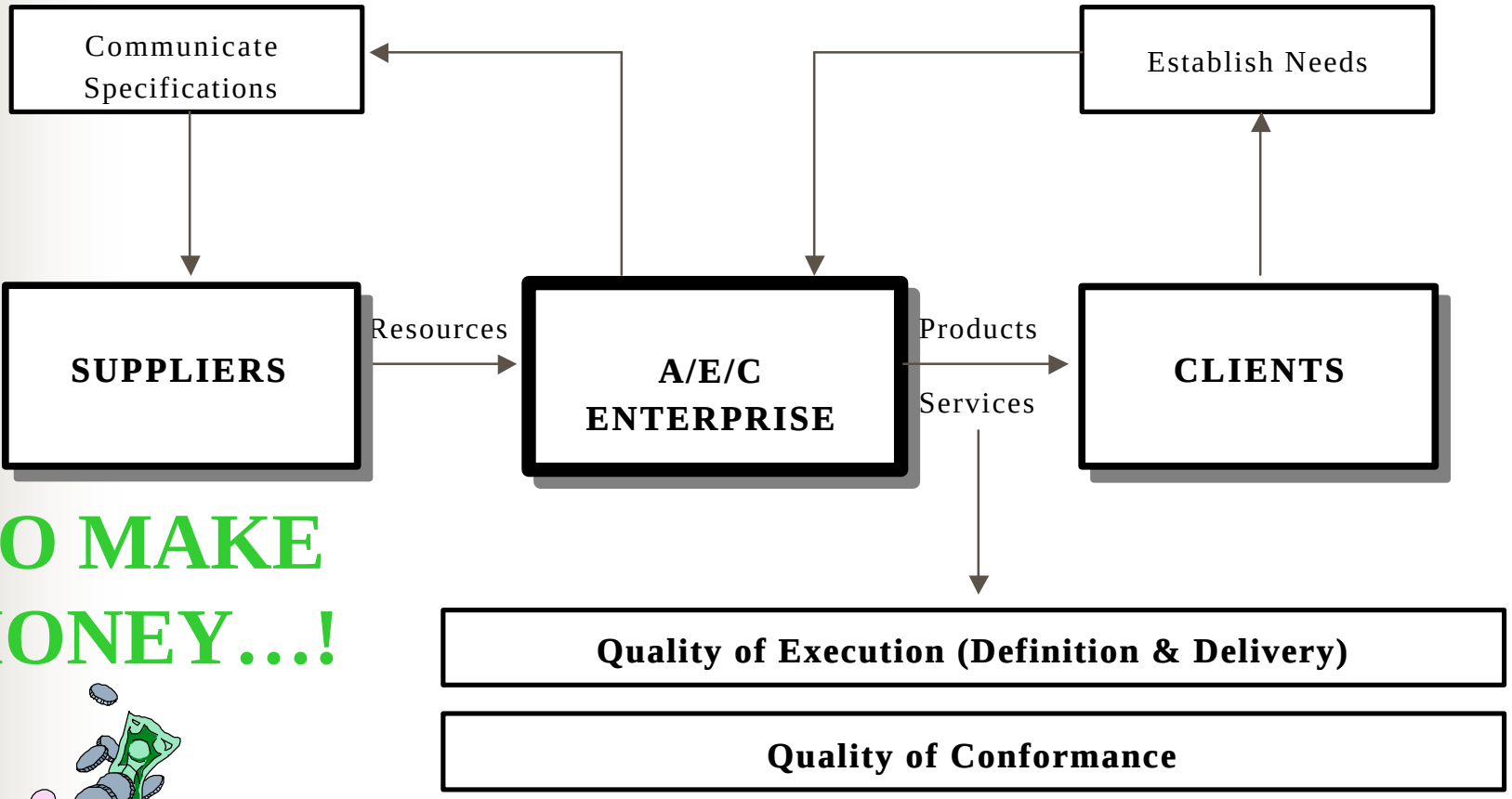
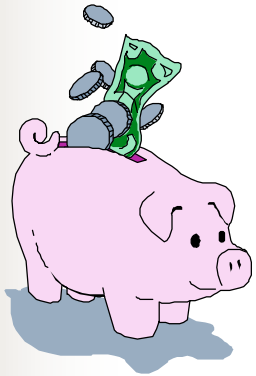
# Drivers of Change: Clients




**TO MAKE MONEY…!**



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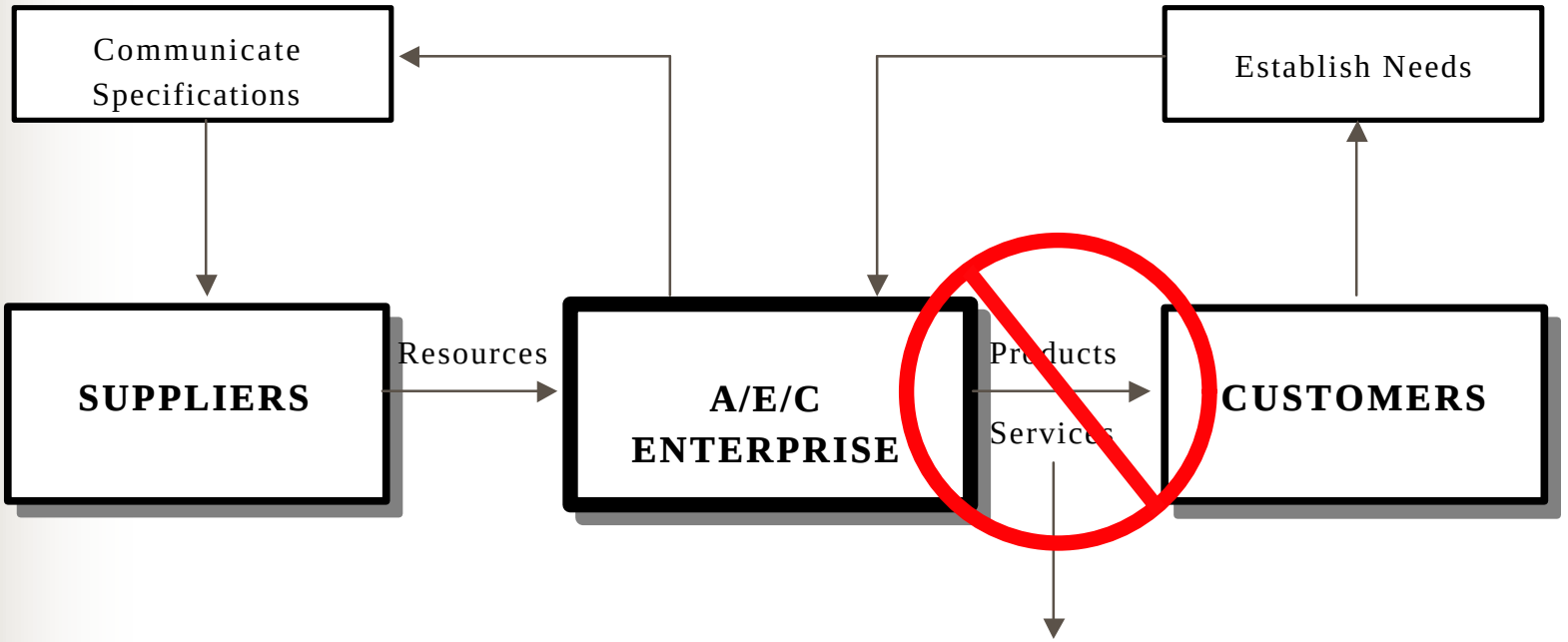



**CLIENTS ARE EXPECTING/REQUIRING BETTER LONG TERM SOLUTIONS, NOT JUST PRODUCTS AND SERVICES…**

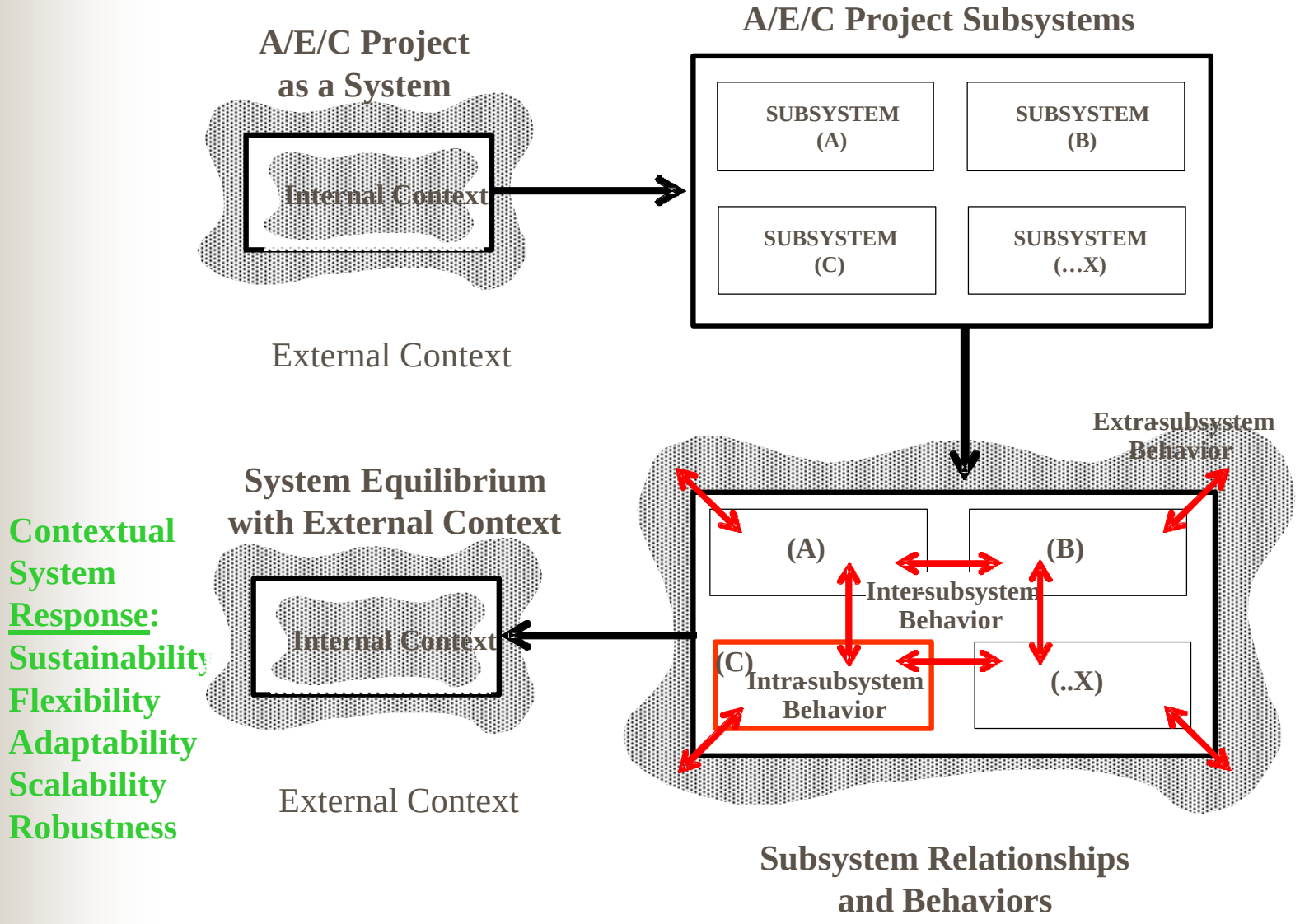
**Quality of Performance**

**Quality of Redesign/Improvement**

# Implications of Change

- **Strategic**
  - Sustainability requires change toward a **system-based approach** to A/E/C projects
- **Tactical**
  - Sustainability requires change in the **attributes and characteristics** of the solutions offered to clients…
  - in the **delivery and use** of these solutions…
  - in the **resources** required in the delivery and use of these solutions…
- **Operational**
  - Sustainability requires change in the **processes, practices, and standard operating procedures** followed in the delivery and use of these solutions particularly the decisions and choices made, and the actions taken,
- Sustainability requires change in **Mental Paradigms**

# Implications of Change: Strategic

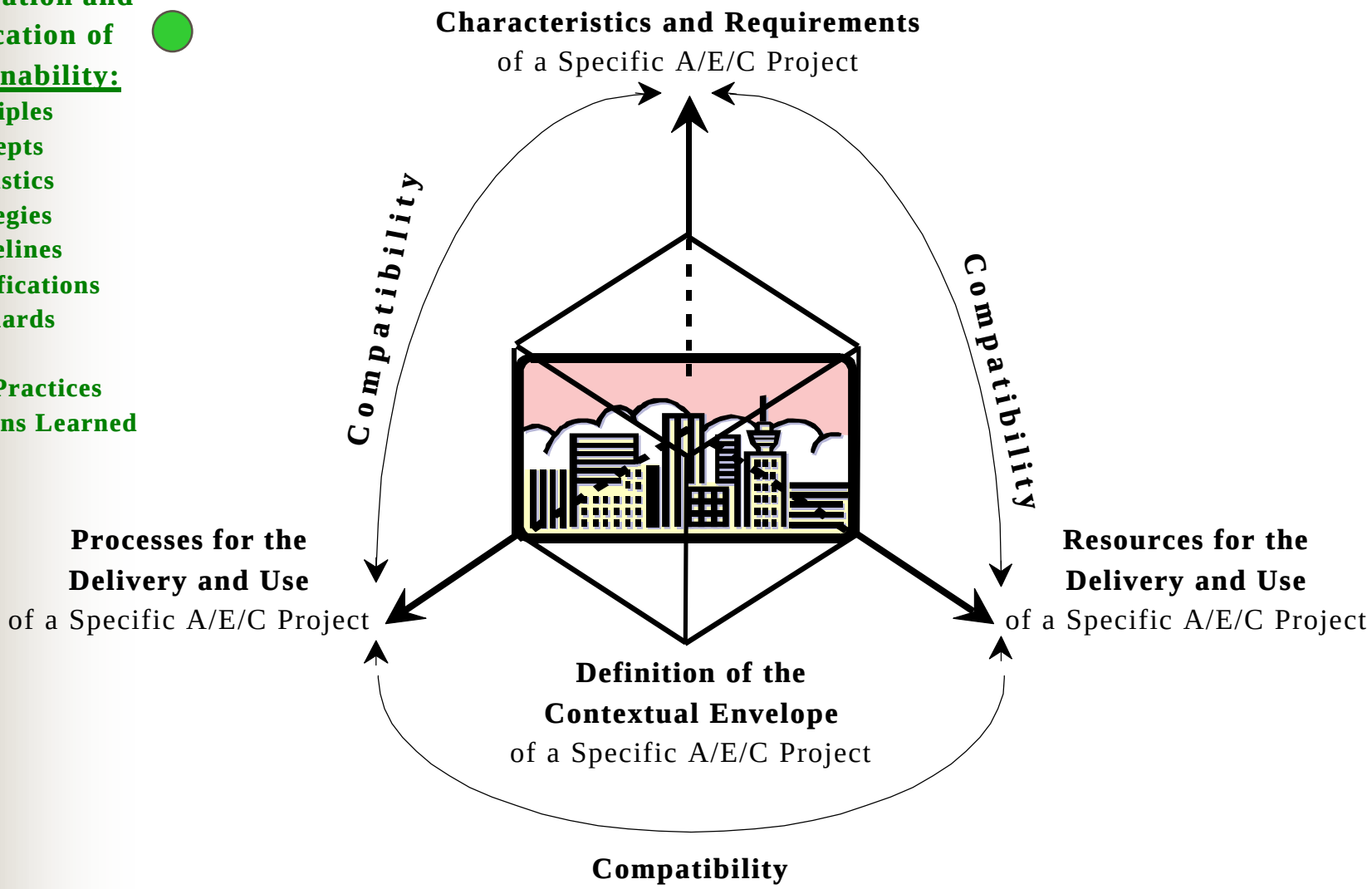



**Contextual System Response:**
**Sustainability**
**Flexibility**
**Adaptability**
**Scalability**
**Robustness**

# Implications of Change: Tactical

**Integration and Application of Sustainability:**

- **Principles**
- **Concepts**
- **Heuristics**
- **Strategies**
- **Guidelines**
- **Specifications**
- **Standards**
- **Tools**
- **Best Practices**
- **Lessons Learned**



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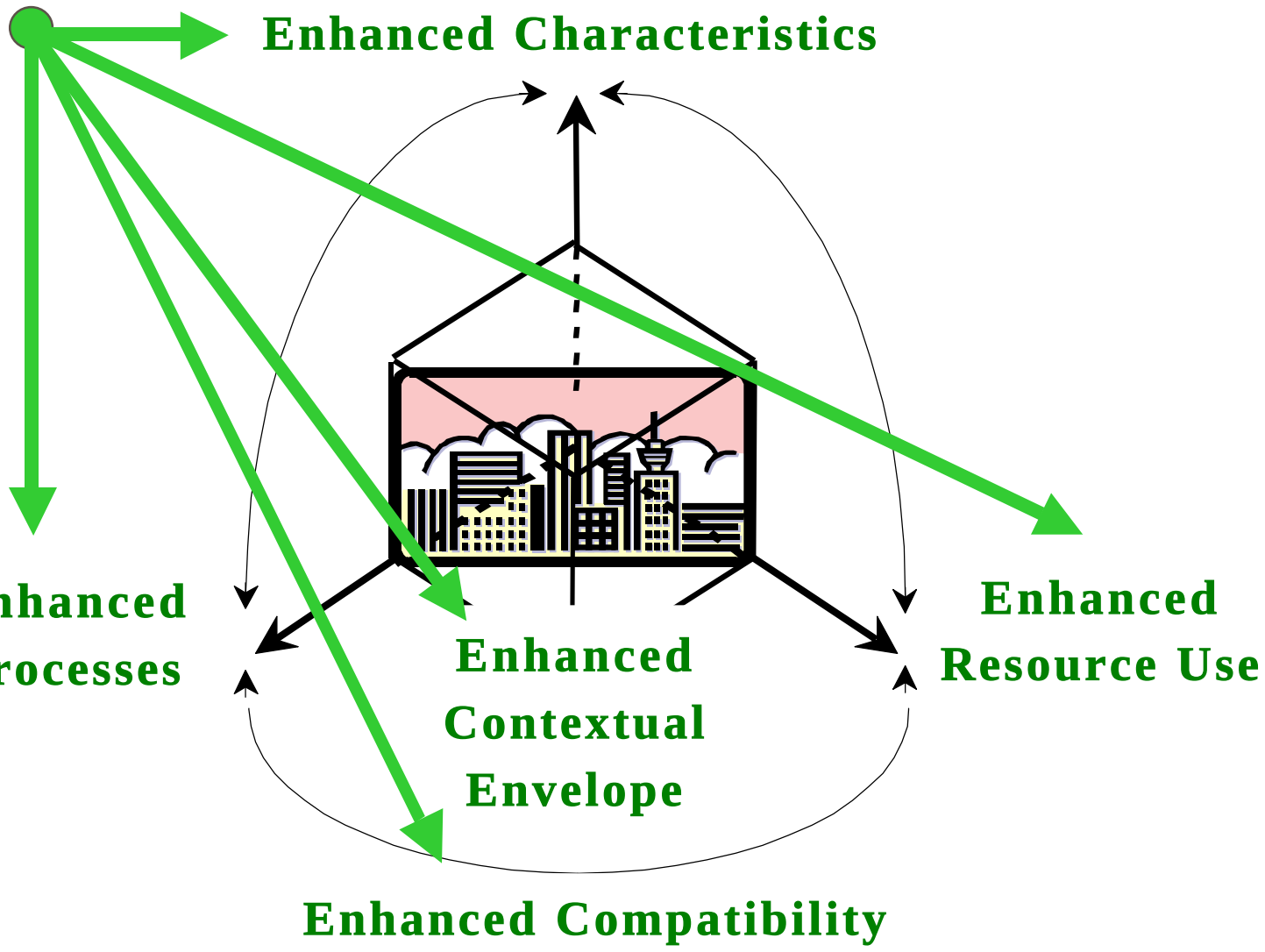

# Implications of Change: Operational

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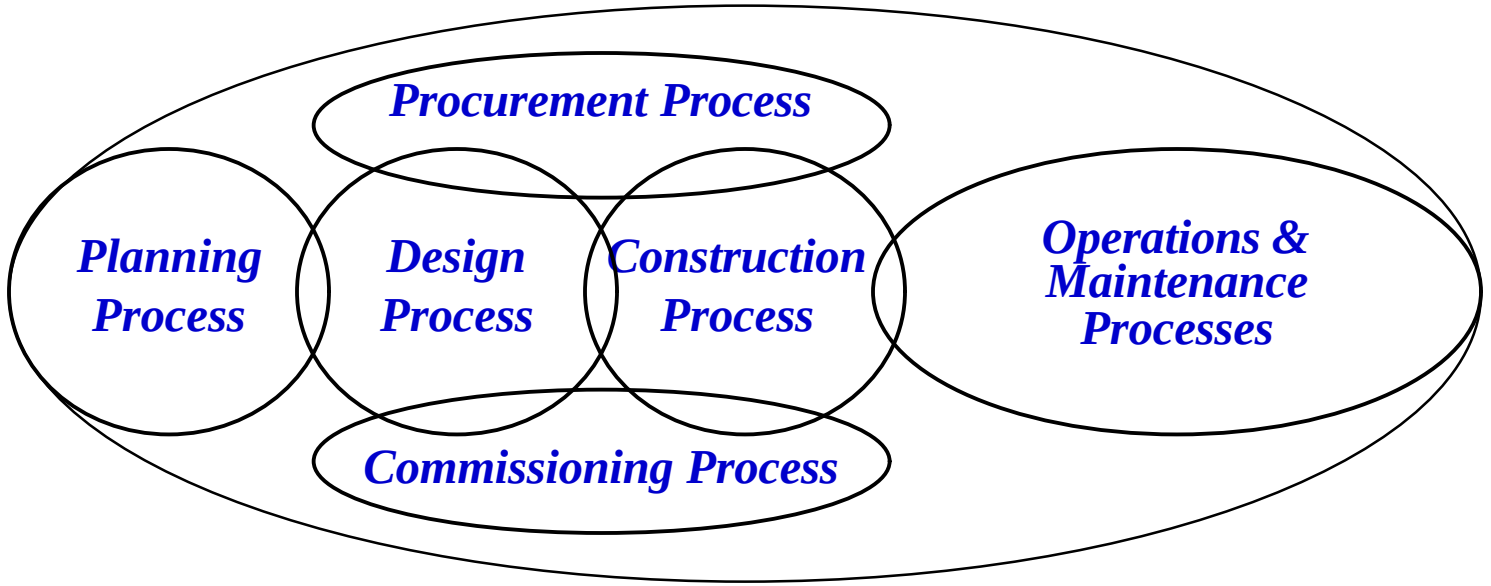

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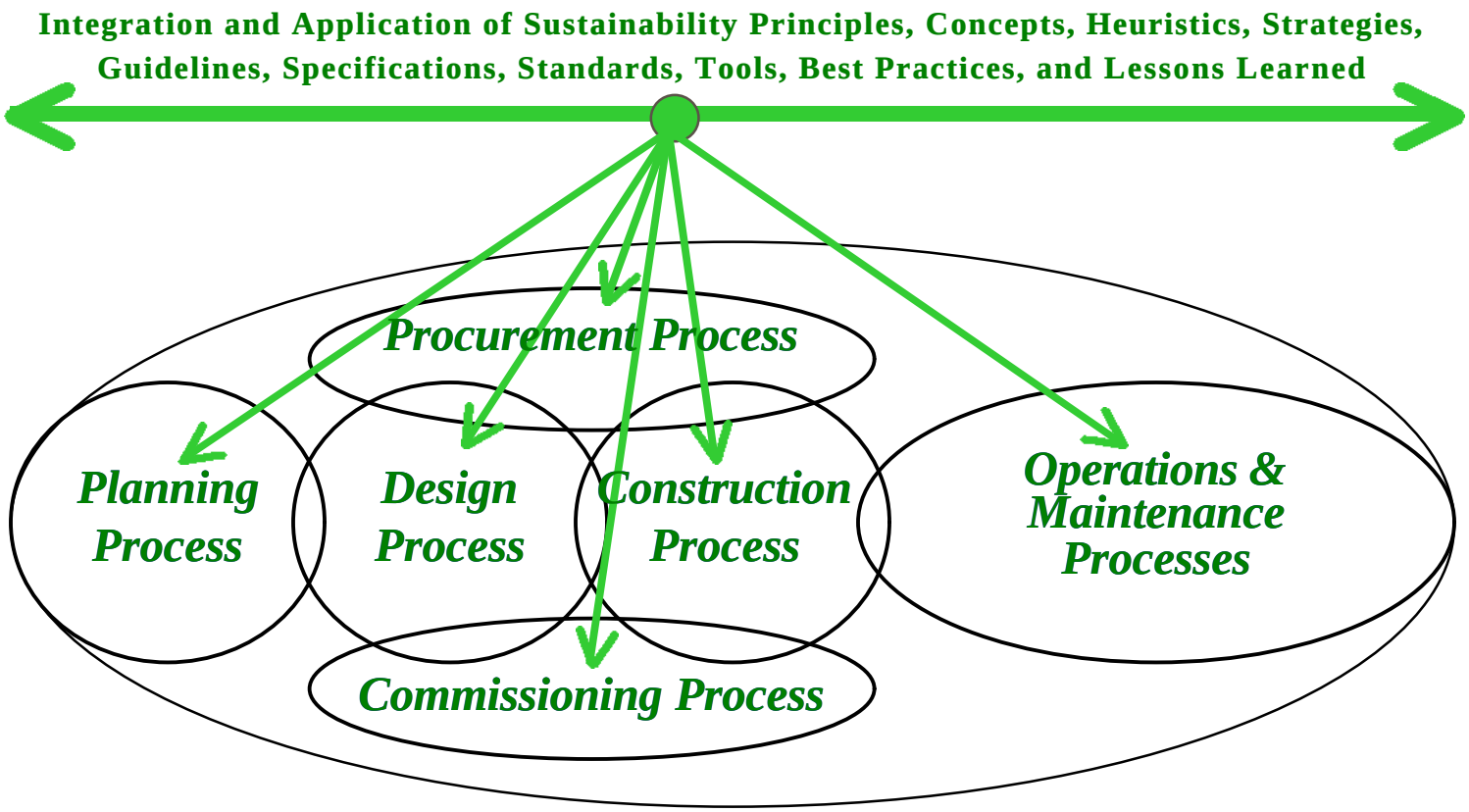

# Implications of Change: Operational

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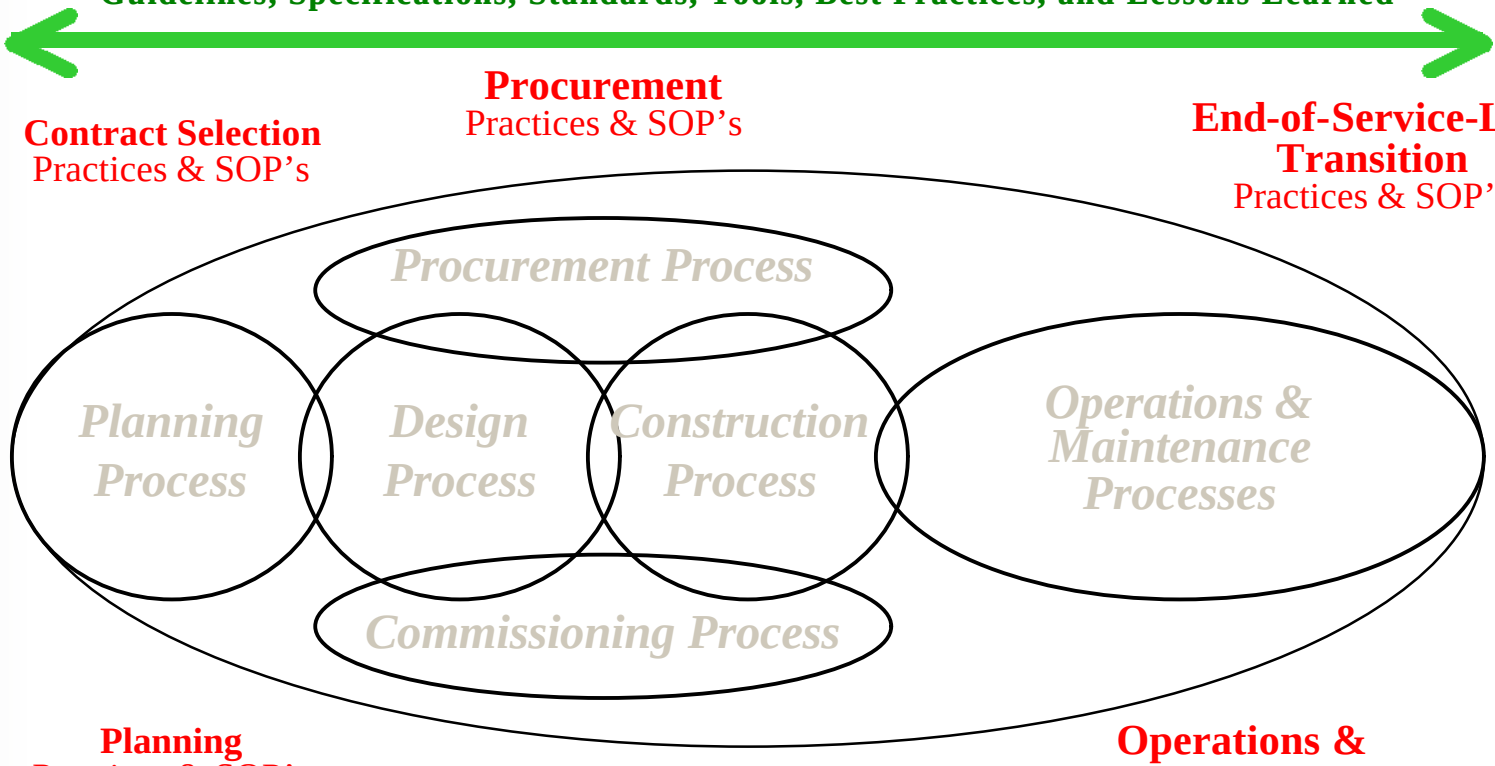



**Procurement**
Practices & SOP's

**Contract Selection**
Practices & SOP's

**End-of-Service-Life Transition**
Practices & SOP's

**Team Definition & Building**
Practices & SOP's

**Project Characterization**
Practices & SOP's

**Project Definition**
Practices & SOP's

**Planning**
Practices & SOP's

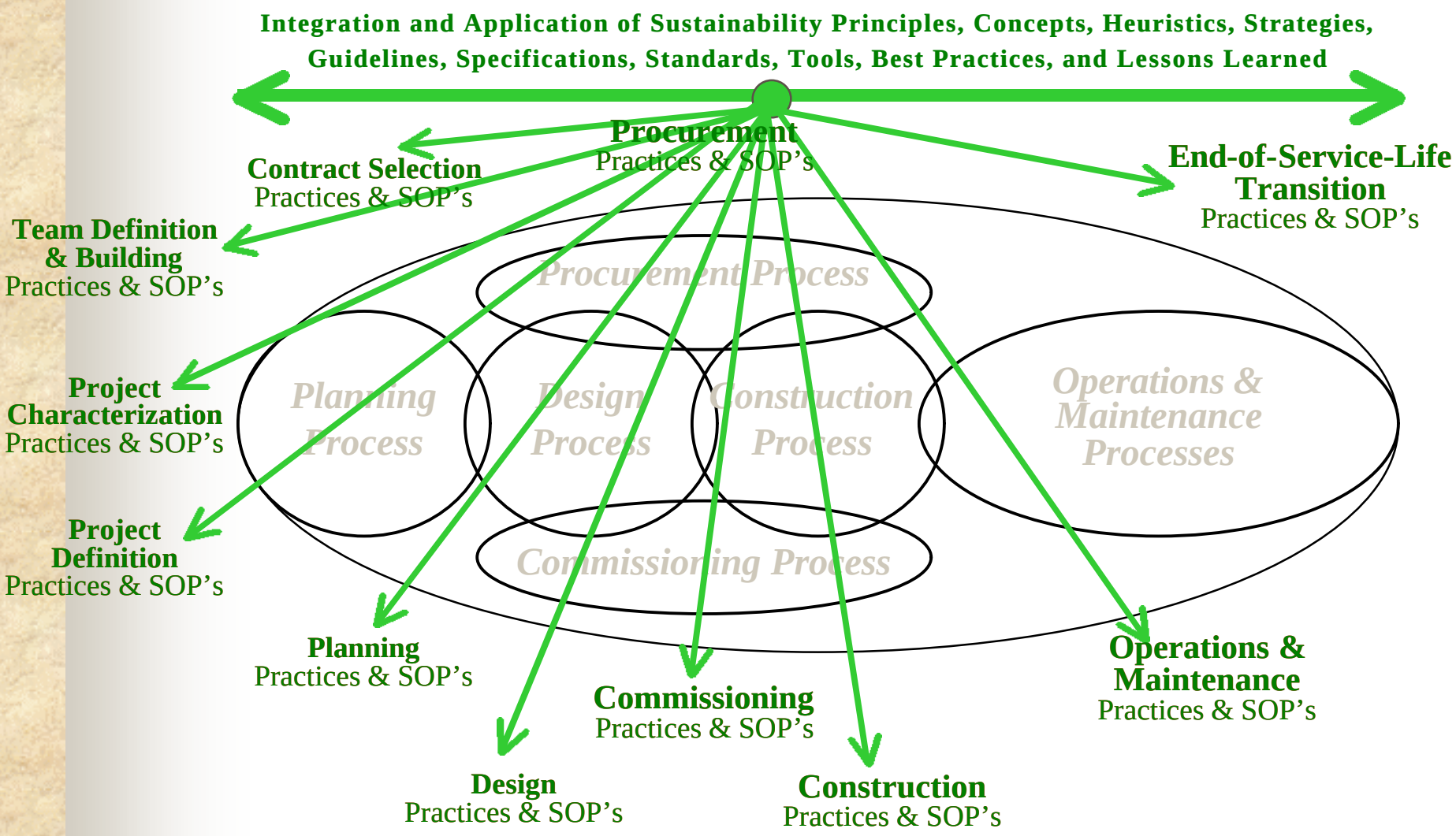
**Commissioning**
Practices & SOP's

**Operations & Maintenance**
Practices & SOP's

**Design**
Practices & SOP's

**Construction**
Practices & SOP's

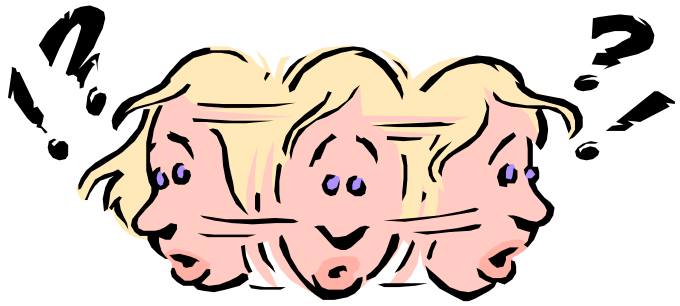
# Implications of Change: Operational



# Implications of Change: Mental Paradigms

- There is no Unified Theory of Sustainability; it can be expressed in multiple forms:
- …Principles
- …Concepts
- …Heuristics
- …Strategies
- …Guidelines
- …Specifications
- …Standards
- …Tools
- …Best Practices
- …Lessons Learned

**So, which of these forms of Sustainability must/should/could we use?**



**The answer is ANY…**

# Implications of Change: Mental Paradigms

**We need to go beyond just discussing the Theoretical Dimensions of sustainability…**

**and start focusing on the Practical Implementation of sustainability…**

# Implications of Change: Mental Paradigms

**We need to stop listening to those that only know how to say**

**Why Not!…**

**and start listening to those that only know how to say**

**Why Not?…**

# Implications of Change: Mental Paradigms

**We need to overthrow the**

**Tyranny of the OR…**

**and embrace the Genius of the AND…**

**It is not GREEN ($) or GREEN,**
**it is GREEN ($$$) and GREEN**

**The fourth thing that works is:**

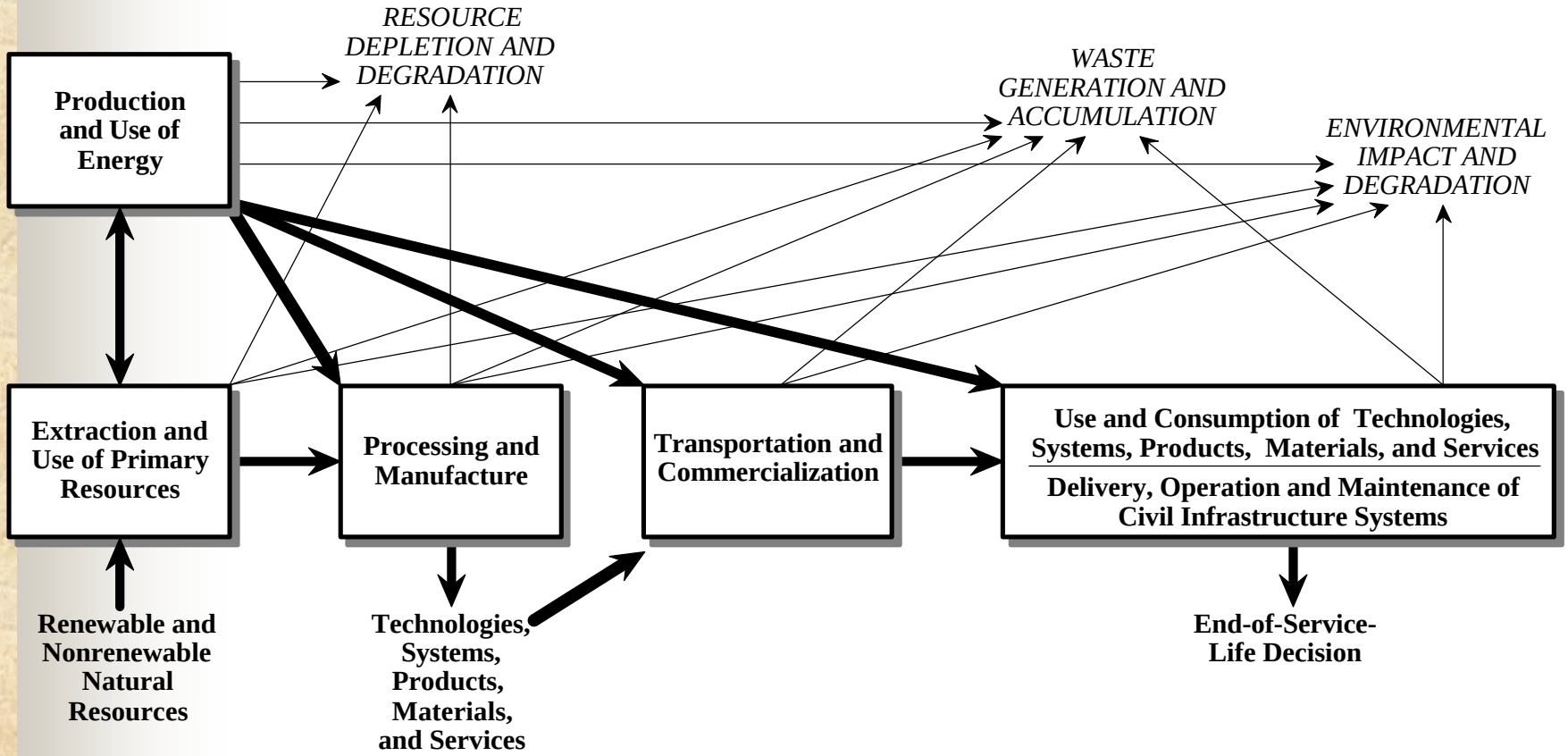
***(4) Overcome the inhibitors of sustainability, and embrace the enablers of sustainability…***

***This means, accept that there are multiple paths to sustainability…***

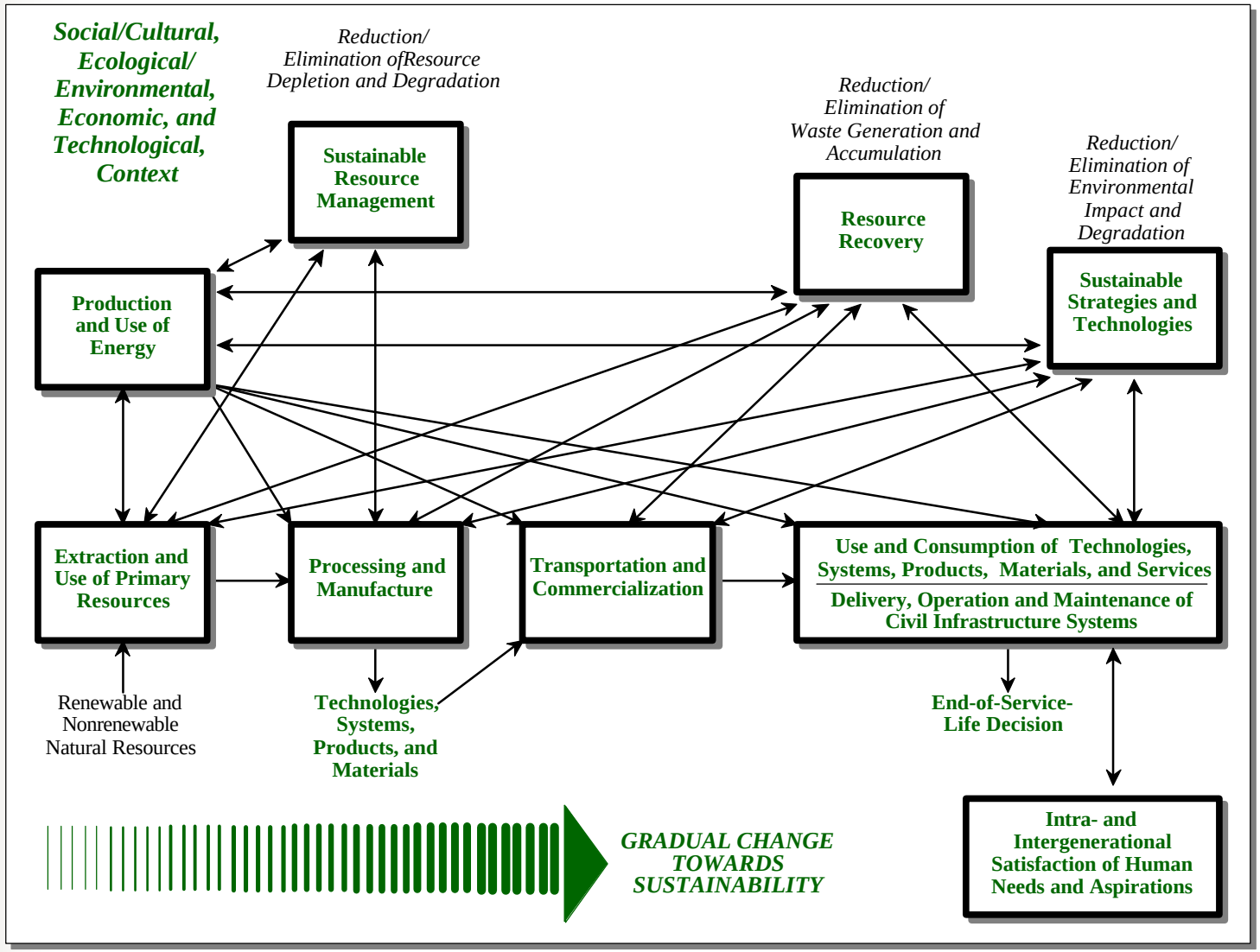
# The Multiple Paths Toward Sustainability

- Sustainable System Approach to Industry…
- A/E/C Industry Collaboration…
- Streamlined A/E/C Enterprises…
- Expanded A/E/C Project Scope…
- Integrated A/E/C Project Life Cycle…
- Integrated and Aligned Project Team…
- Expanded Project Performance Paradigm …
- Minimum Waste Levels…
- Learning Organization Environment…

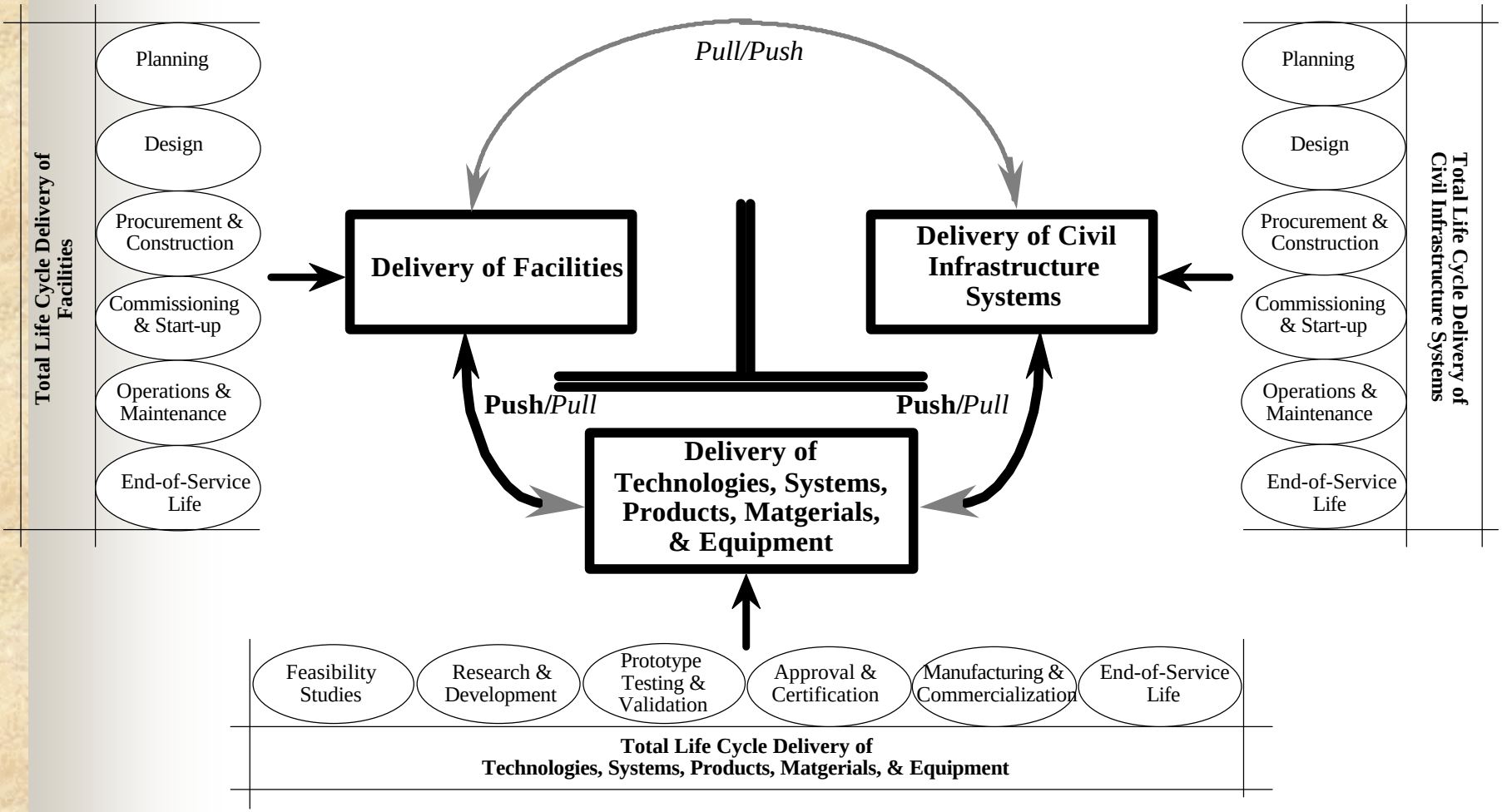
# From an unsustainable linear approach to development…



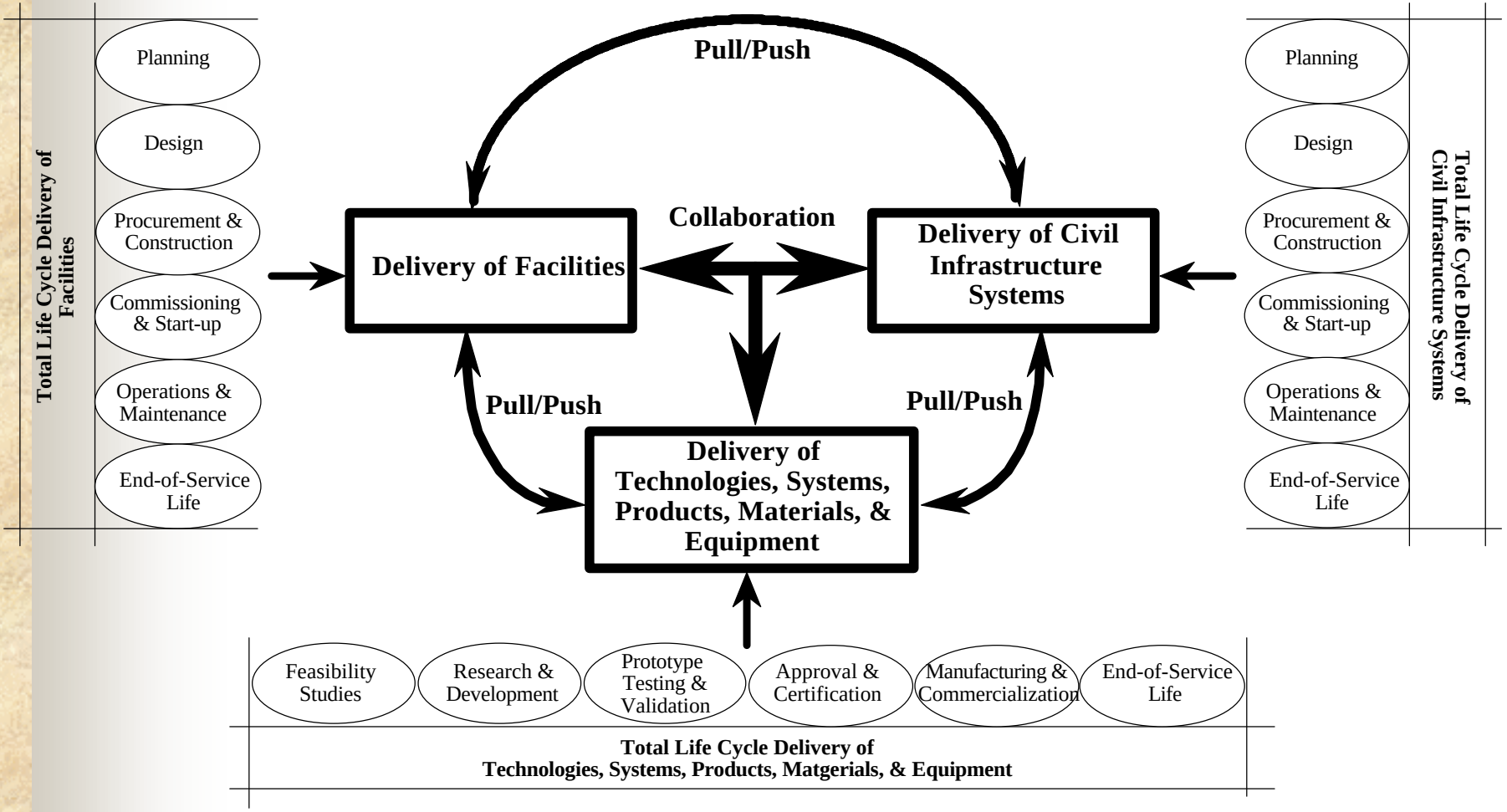
# …to a Sustainable Systems Approach



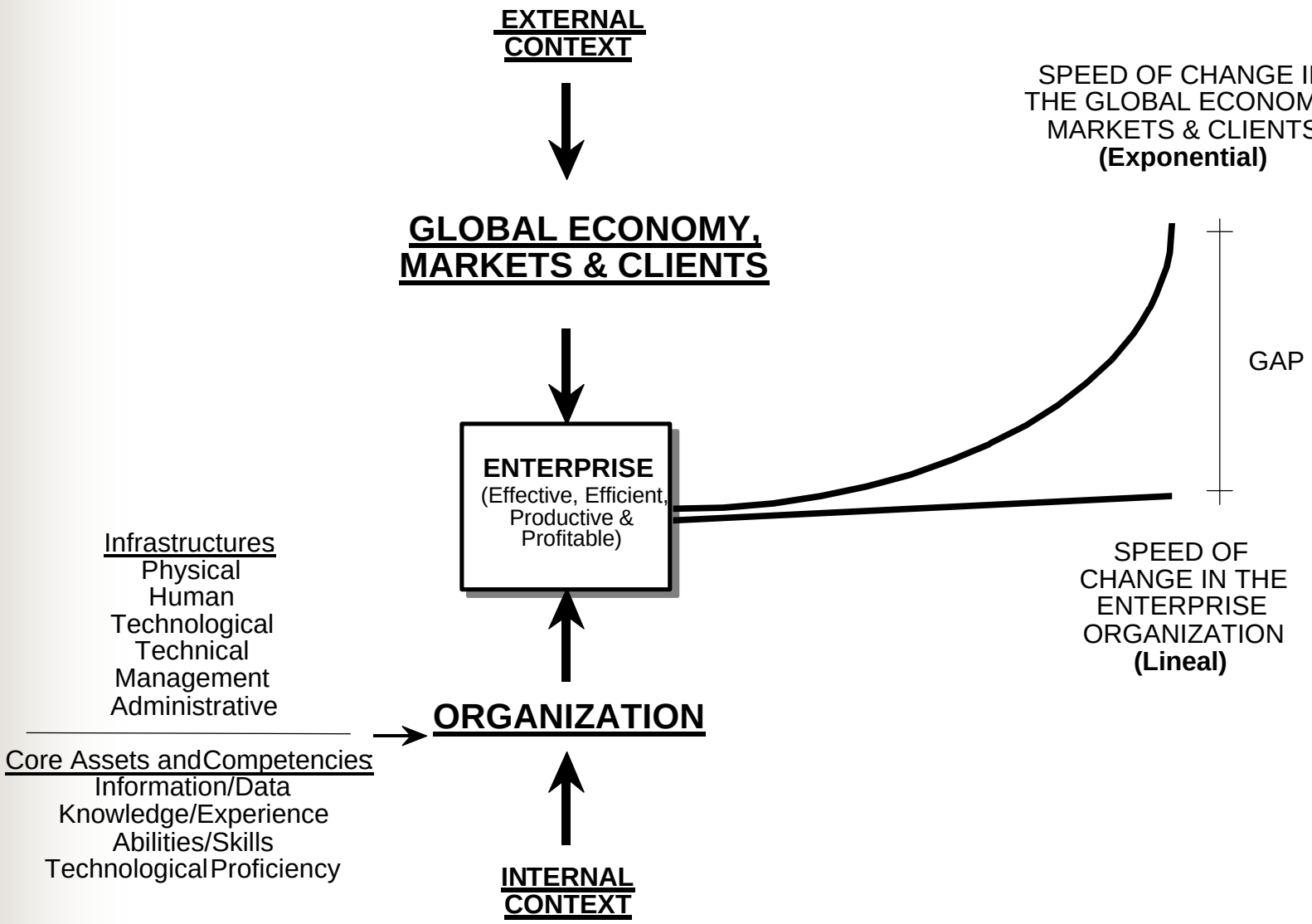
# From A/E/C Industry fragmentation…



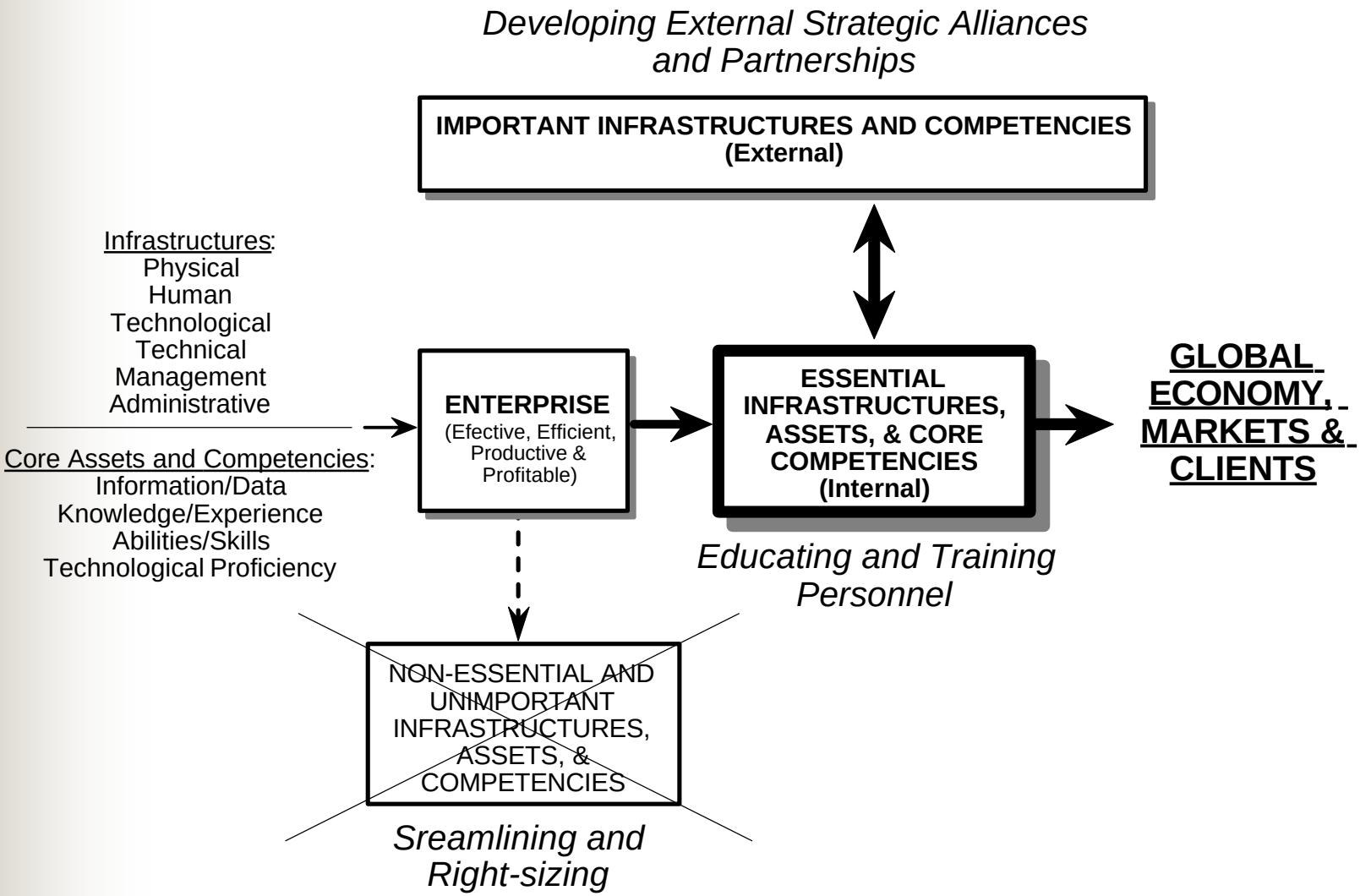
# …to A/E/C Industry Collaboration



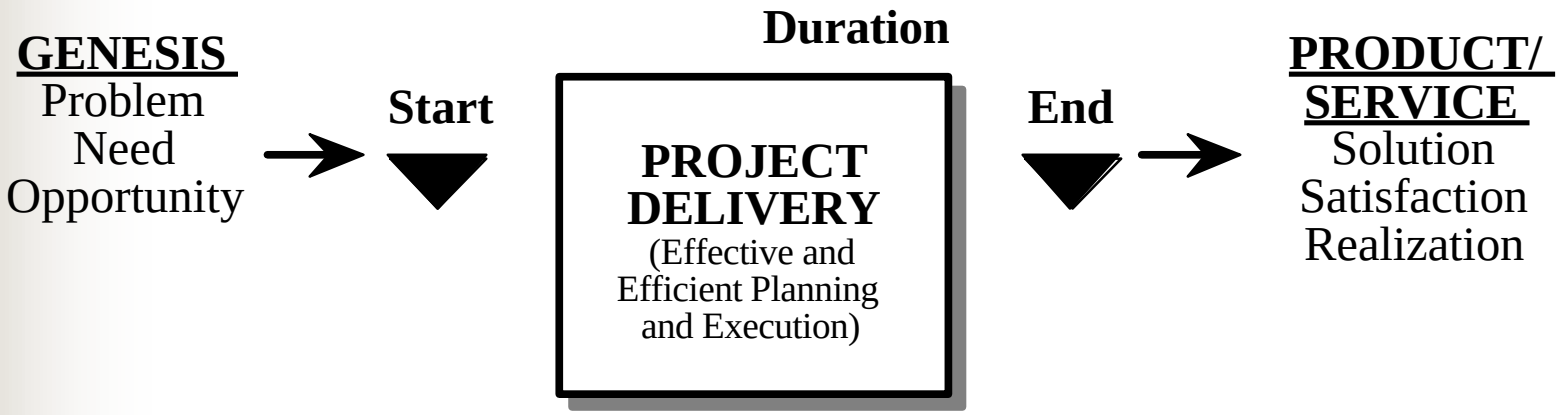
# From conventional A/E/C Enterprises…



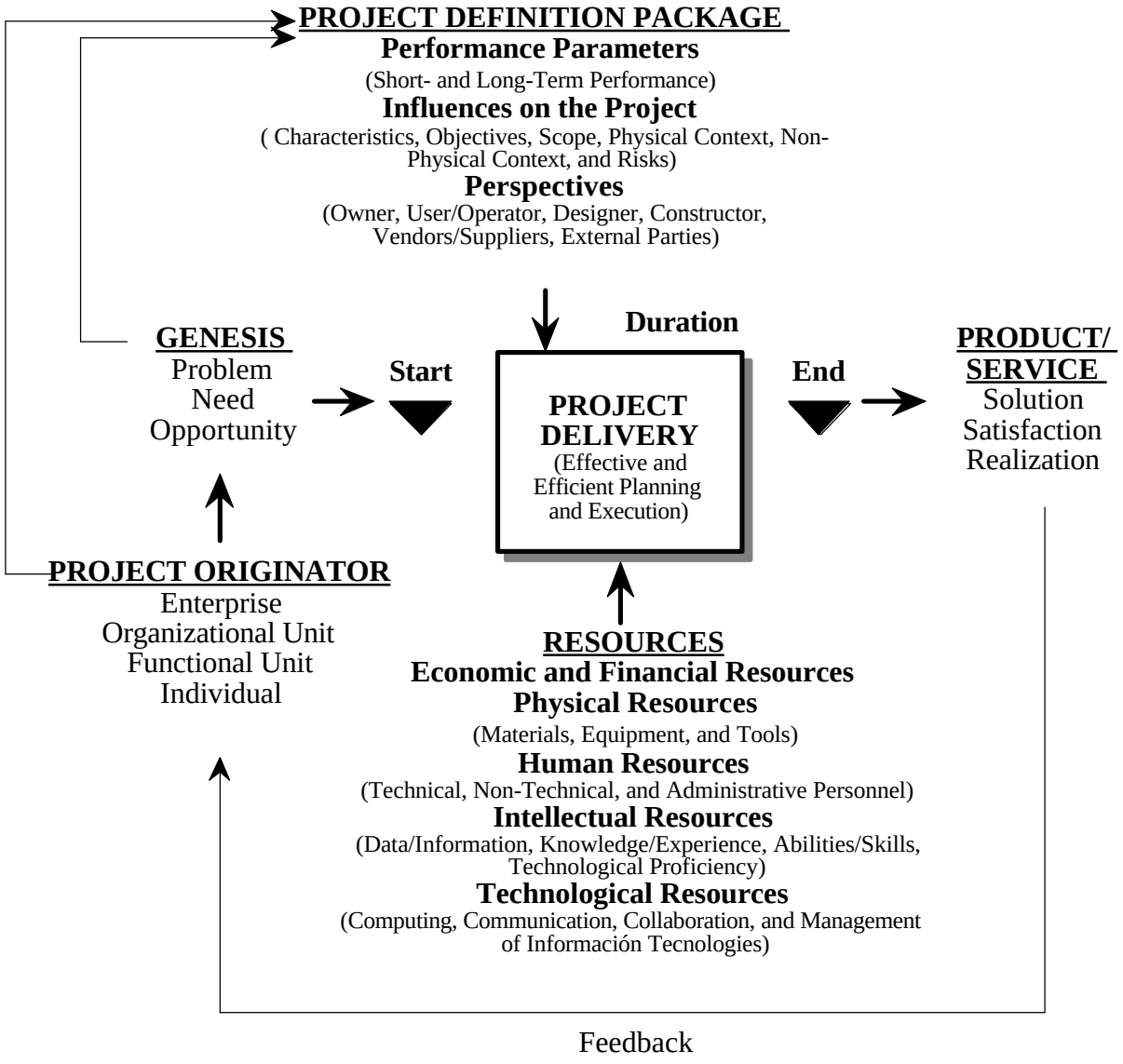
# ... to Streamlined A/E/C Enterprises



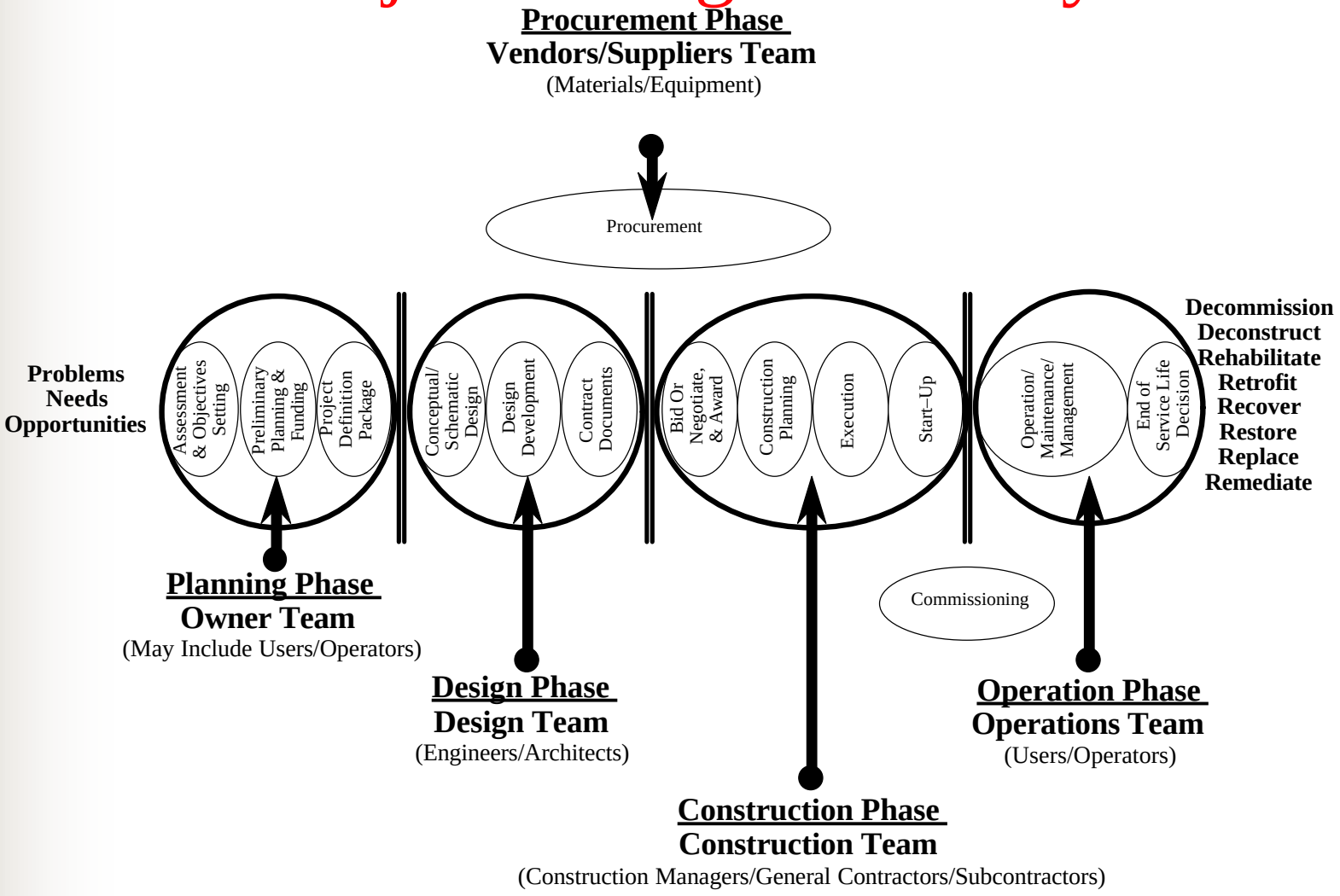
# From a limited and narrow view of A/E/C Project Scope…



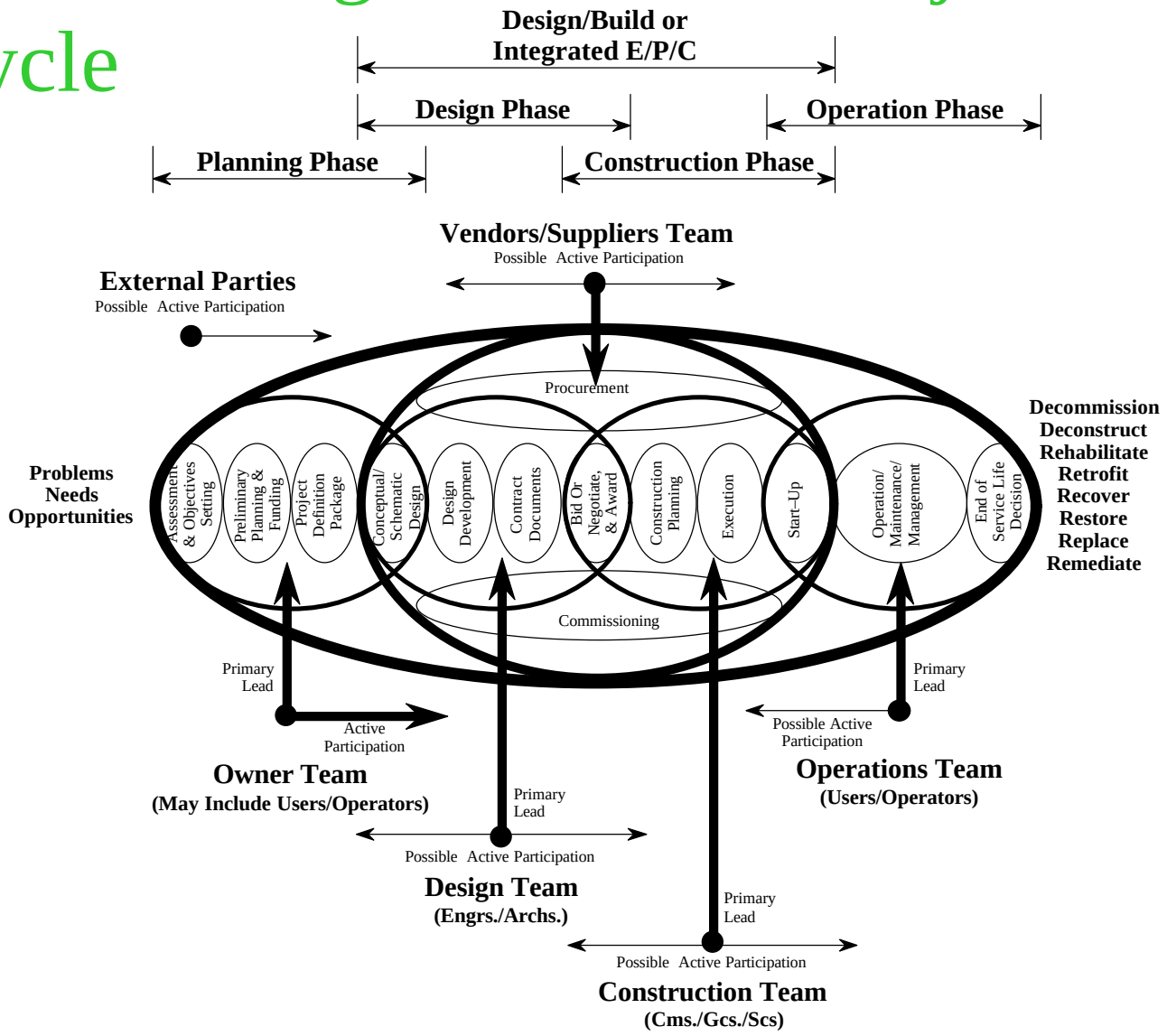
# …to an Expanded A/E/C Project Scope



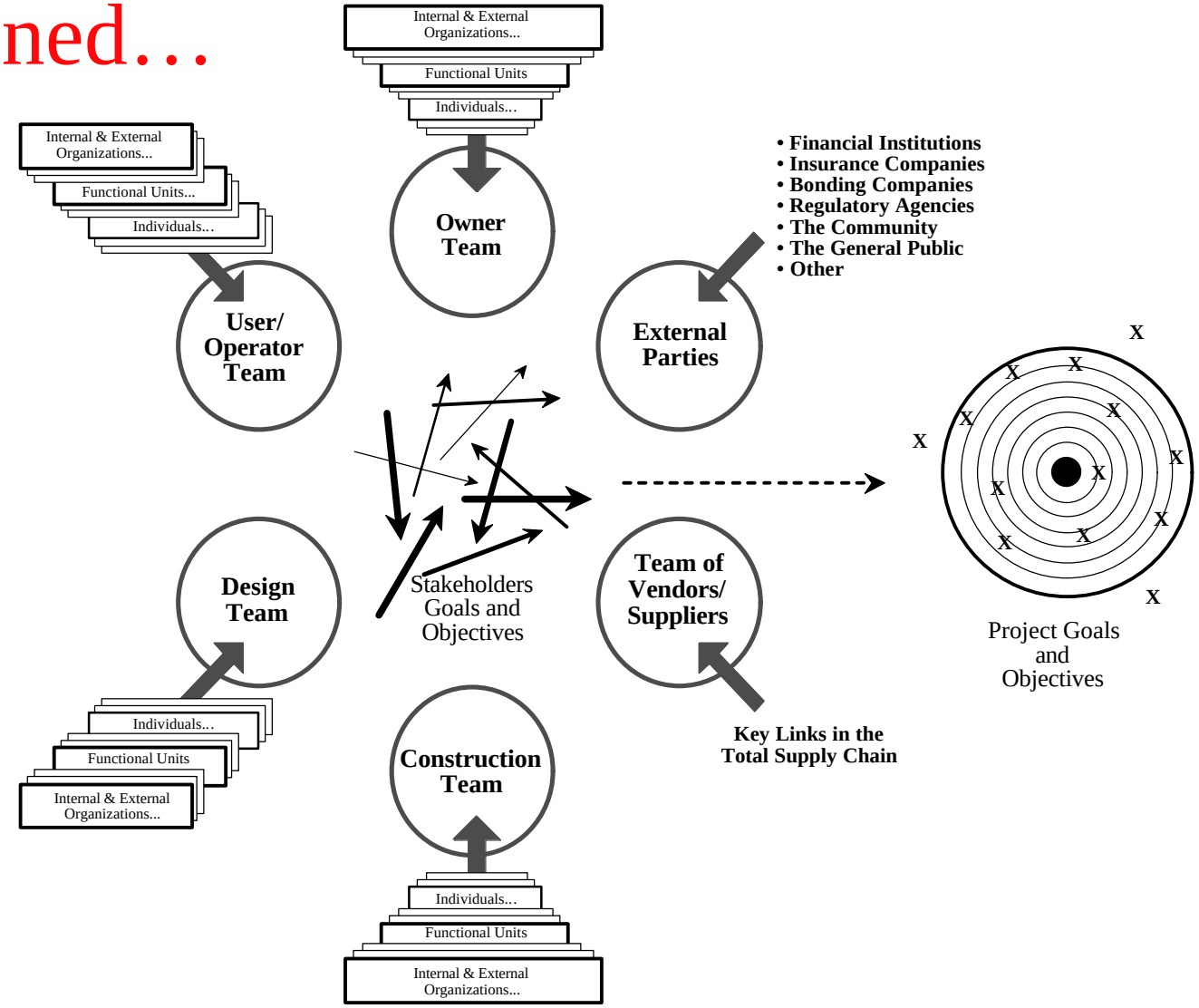
# From a very fragmented execution of an A/E/C Project through its life cycle…



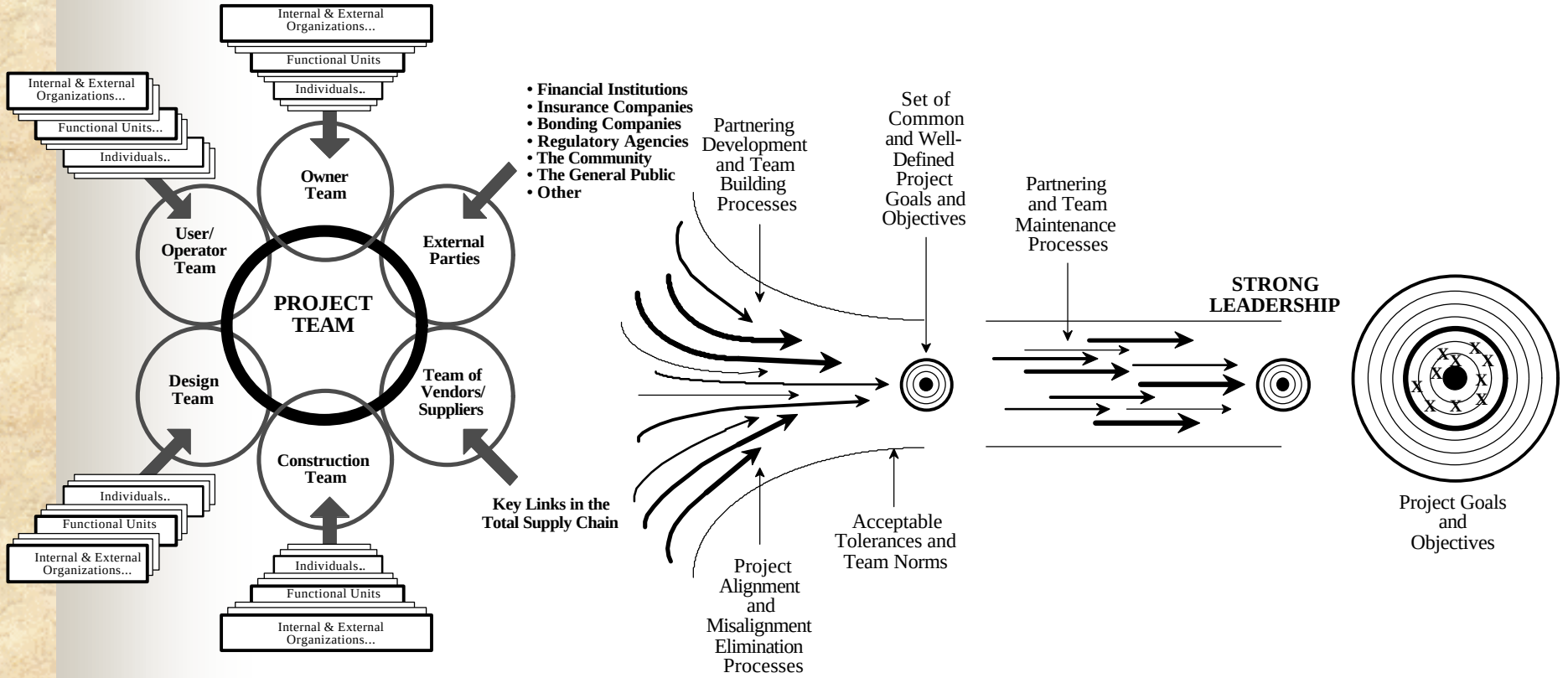
# …to an Integrated A/E/C Project Life Cycle



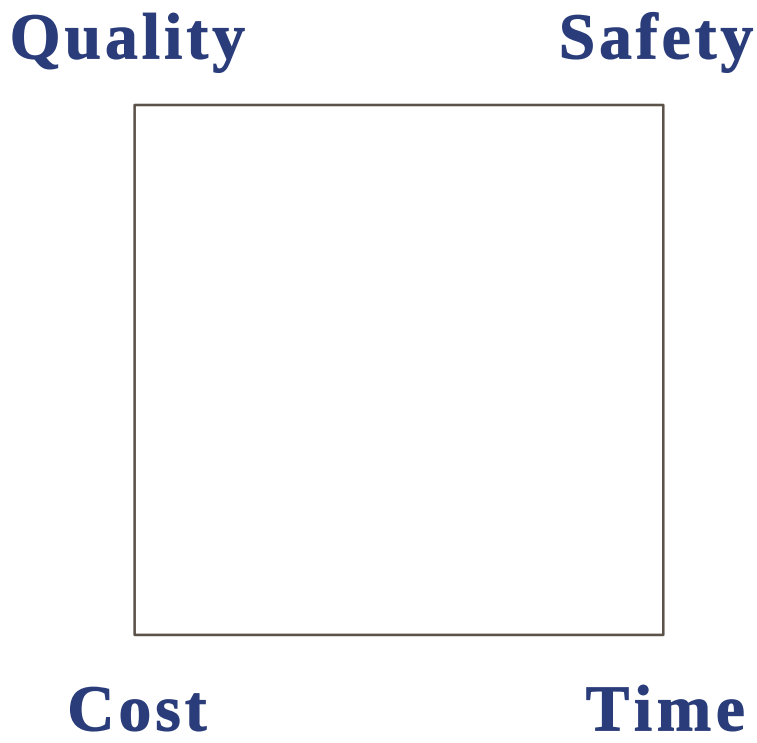
# From multiple stakeholders who are not aligned…



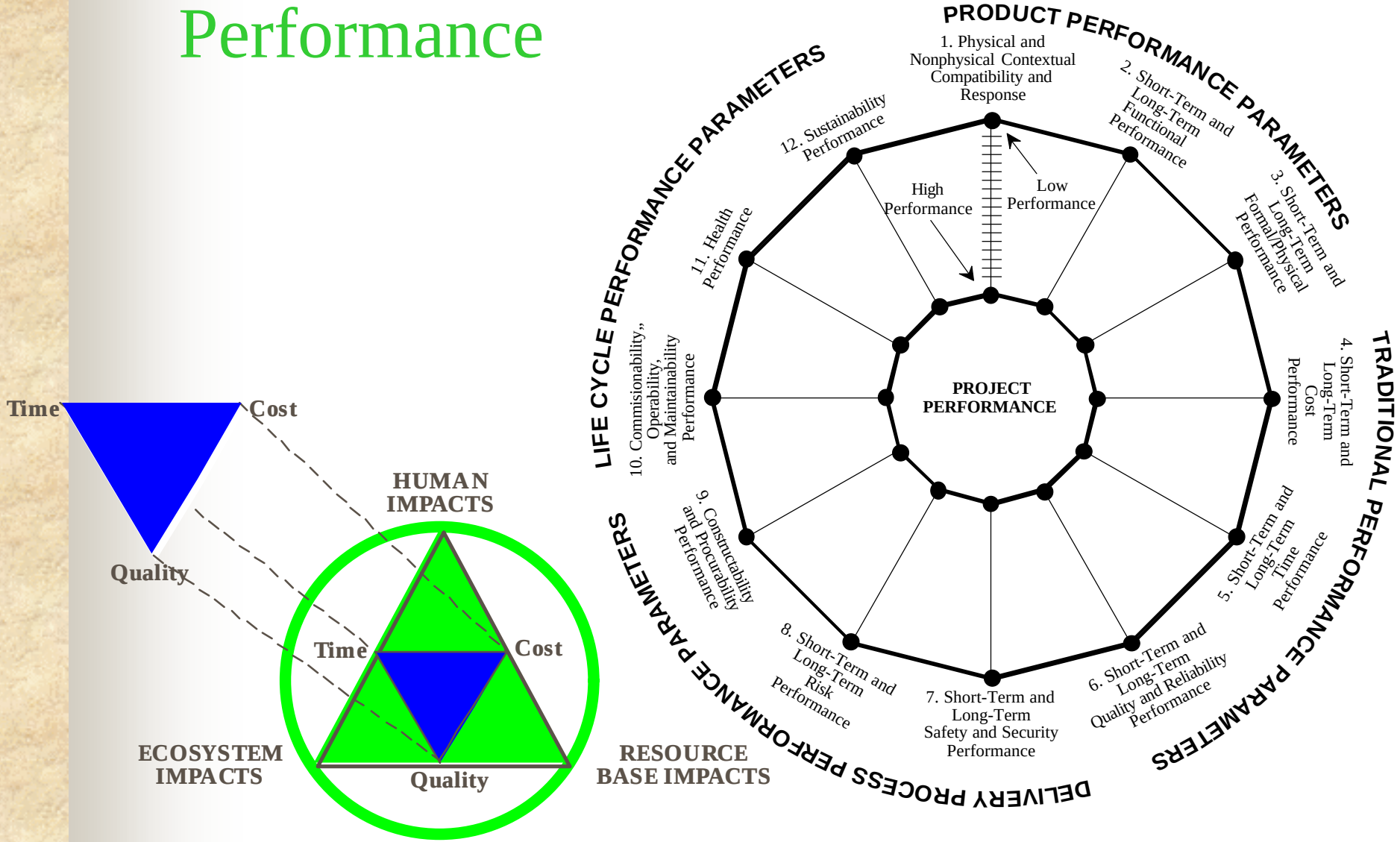
# …to an Integrated and Aligned Project Team



# From an entrenched paradigm of project performance…

# … to an expanded paradigm of Project Performance



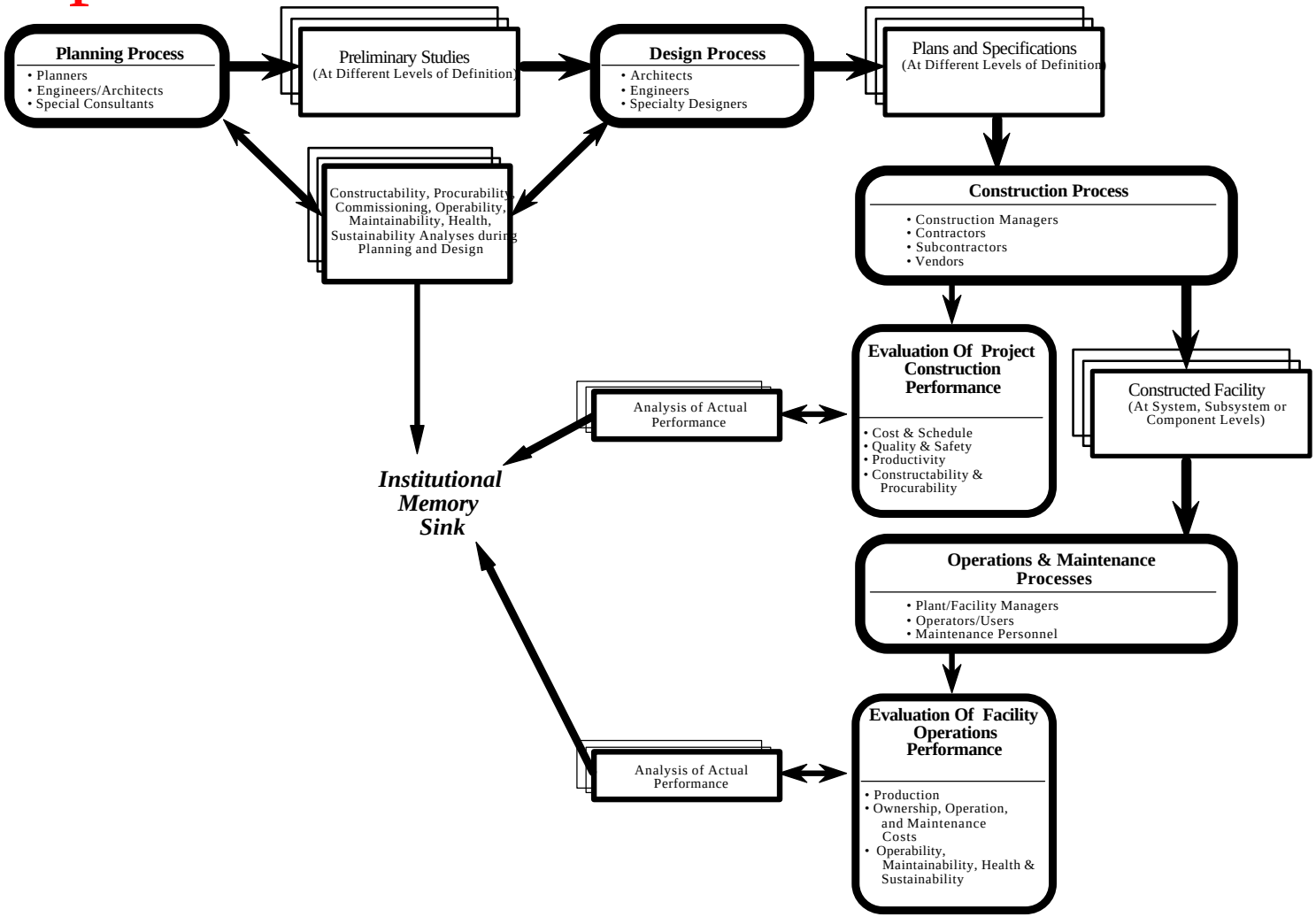
# From high levels of waste…

- "Waste" any human activity which absorbs resources but creates no value
- Mistakes which require rectification
- Production of items that are not wanted (inventories and stockpiles)
- Processing steps that are not needed
- Movement of people or transport of goods from one place to another without any purpose
- People waiting in a "downstream activity" because an "upstream activity" has not delivered
- Products and services that do not meet the needs of the customer

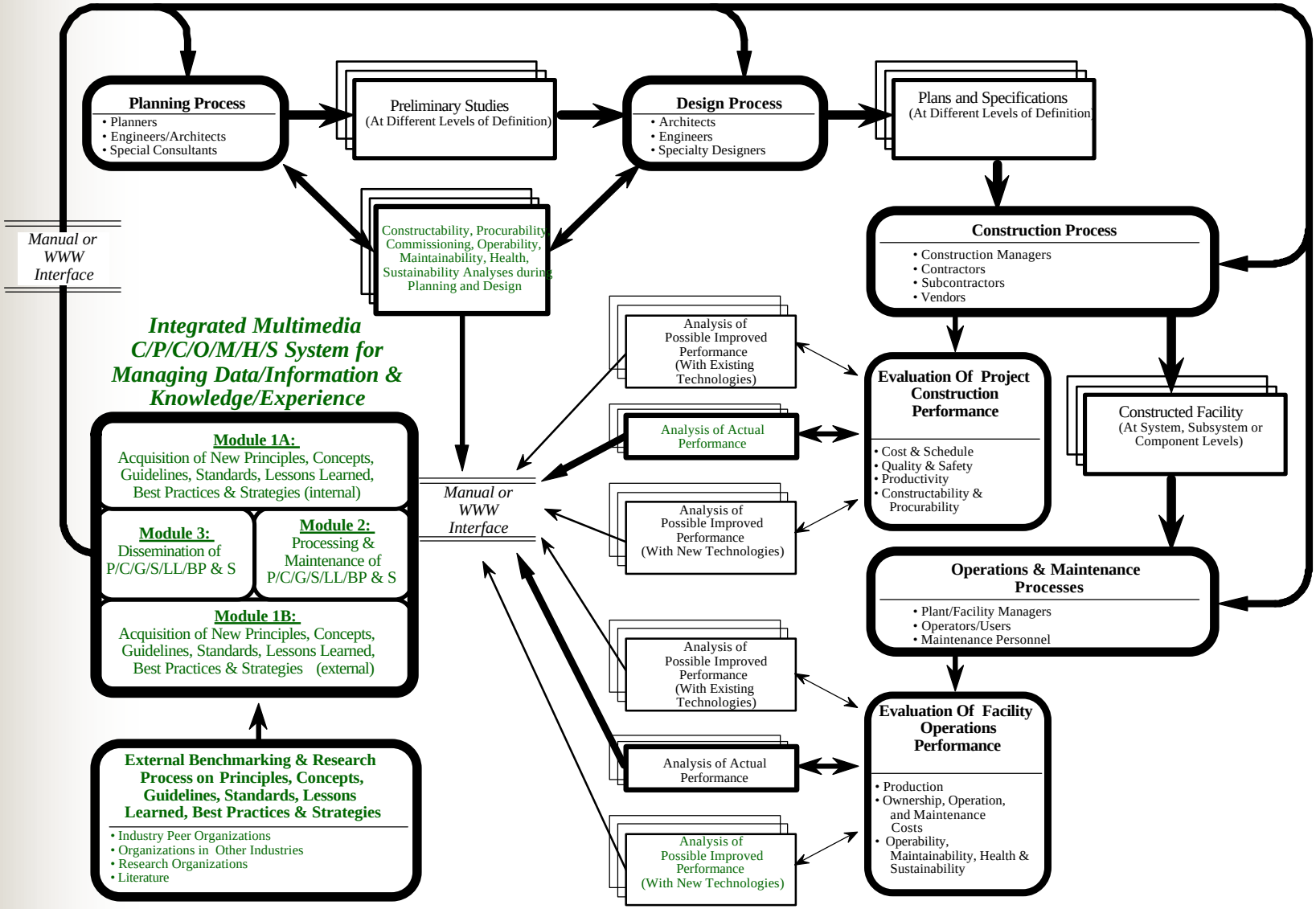
# …to Minimum Waste Levels

- Increased labor productivity
- Reduced production throughput times
- Reduced inventories in the system
- Reduced time-to-market of new products
- Reduced errors reaching the customers
- Reduced scrap in the production process
- Reduced job-related injuries
- Wider variety of products at a very modest additional cost
- And all of this, with modest capital investments…

# From no institutional memory within our enterprises...



# …to a Learning Organization environment



**Is all this hard to imagine…?**

**Impossible to achieve…?**

**Not really, but it will require some level of change in:**

**In our *Decisions…***

**In our *Choices…***

**In our *Actions…***

**In our *Paradigms…***

**The fifth thing that works is:**

***(5) Just do it…***

***This means, start educating and training all stakeholders, start using existing tools, start sharing best practices, lessons learned, and case studies…***

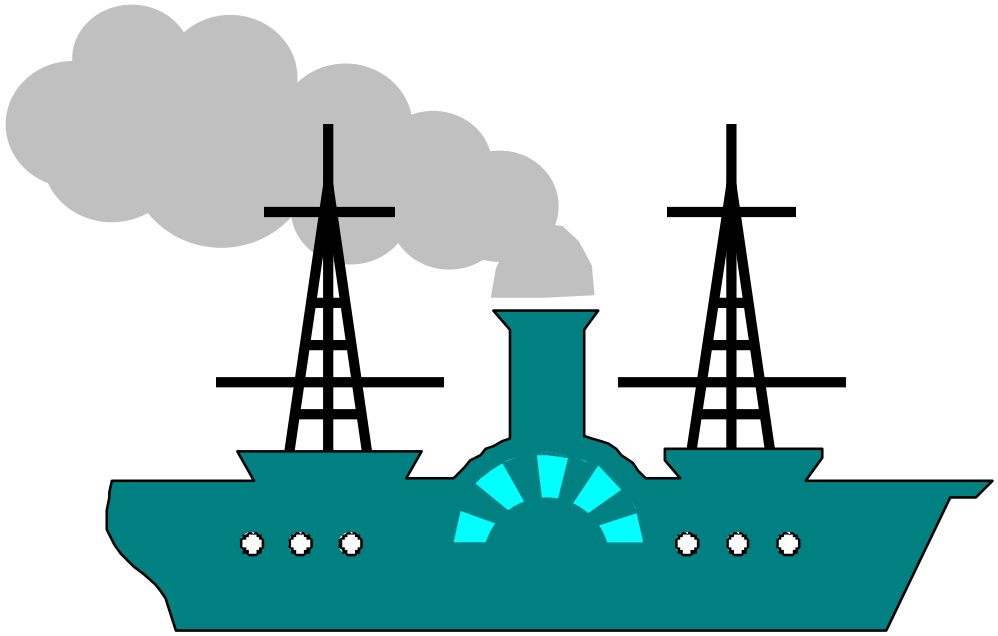
**This last point can be the focus of many more hours of discussion…**

**So, let me leave you with these thoughts…**

# Reflections

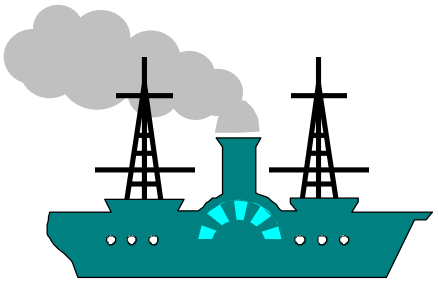
- Timely opportunity for the A/E/C industry to take a proactive lead in implementing Sustainability
- Anchor implementation efforts in an understanding of the context, the inhibitors, and the enablers in both education and research
- Remember, Sustainability can be implemented:
  - one decision at a time
  - one choice at a time
  - one action at a time
  - one paradigm at a time
  - one product or process at a time
  - phase by phase in a product's or a project's life cycle
  - one project at a time
  - one enterprise at a time
  - in a gradual shift to a sustainable future……

Let me conclude with a short story of an impressive naval fleet that encounters a small light approaching them directly in a dark, stormy night...

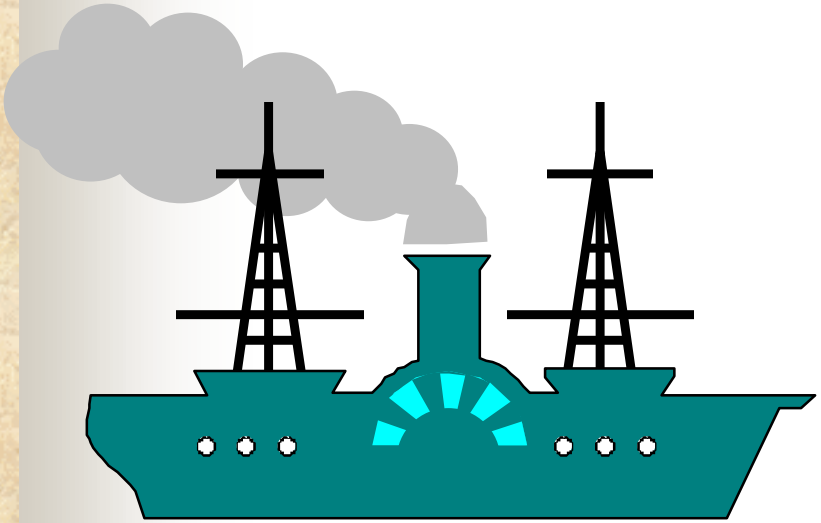


# The Exchange...

- " I am Admiral Jones from the U.S. Navy. Identify yourself, and move 5 degrees south."
- " I am Bob Smith, and no, I won't move… I suggest you move 5 degrees north."
- "You do not understand Son, I am Admiral Jones from the U.S. Navy, and I have enough ships and firepower to blow you out of the water. I suggest you move immediately 5 degrees south..."
- "You do not understand Sir. I am not moving anywhere. I suggest you move 5 degrees north…."



“You see Sir, I am just the lighthouse operator…”



“Your call…”

So, to anyone in the A/E/C Industry who believes that they will avoid having anything to do with sustainability...

... all I can say is...

…your call...

Thank you...

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***Any Questions…?***