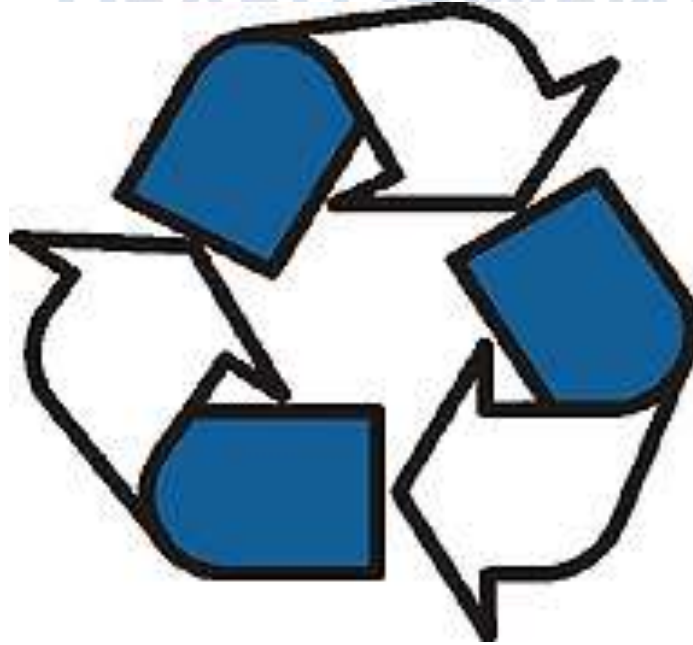


SUSTAINABLE ARCHITECTURAL DEVELOPMENTS



3. WHOLE LIFE CYCLE OF BUILDINGS



ENVIRONMENTAL MANAGEMENT

ENVIRONMENTAL IMPACT ASSESSMENT

ECOLABELS

CRADDLE TO GRAVE

LIFE CYCLE ASSESSMENT

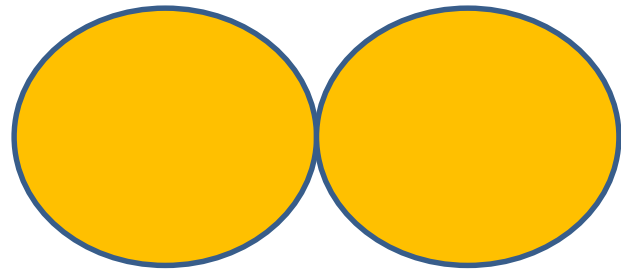
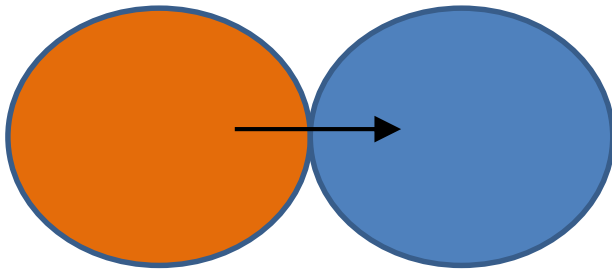


THERMODYNAMICS

ZERO LAW

When two bodies with different temperature get in contact, they tend to balance.

The body with the highest temperature gives to the other one until balance





THERMODYNAMICS

FIRST LAW

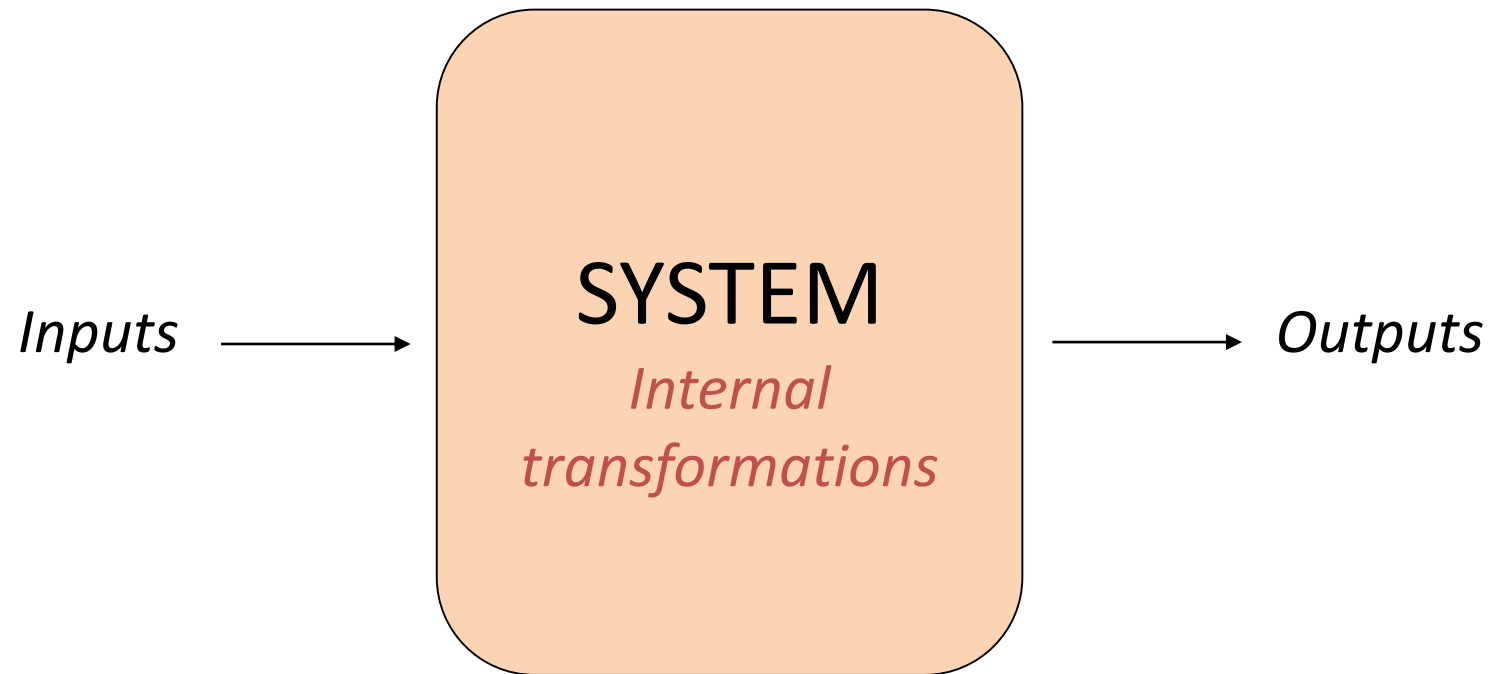
If work is produced or heat interchange is produced over a system , the system will change.

Principle of Energy Conservation

$$E_{in} - E_{out} = \Delta E_{system}$$



DEFINITION OF A SYSTEM



Not self-sufficient systems

Internal transformations always tend to organise

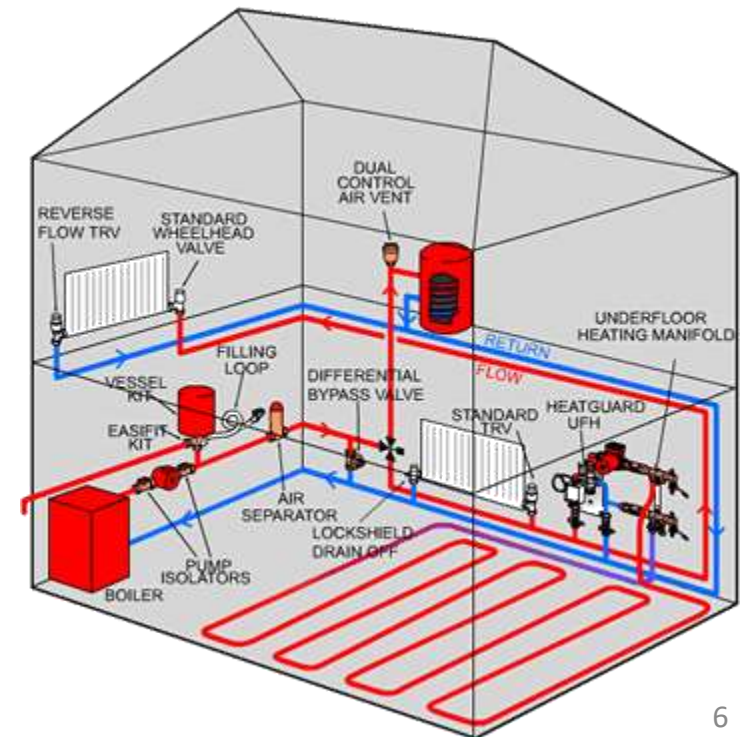
Always happen with an external support



Entropy (Second Law of Thermodynamics)

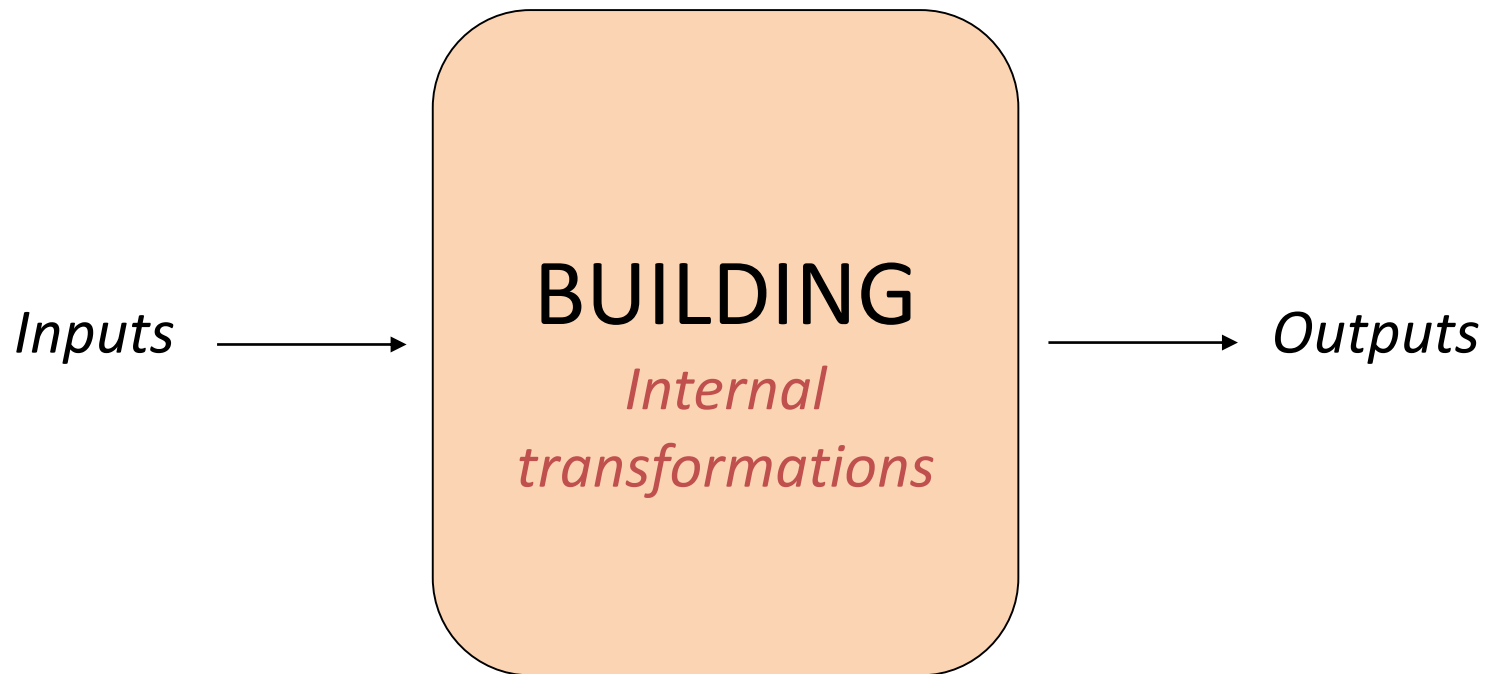
Efficiency of a system

An efficient system tends towards zero, but never gets it





EXAMPLE: BUILDINGS AND OTHER CONSTRUCTIONS

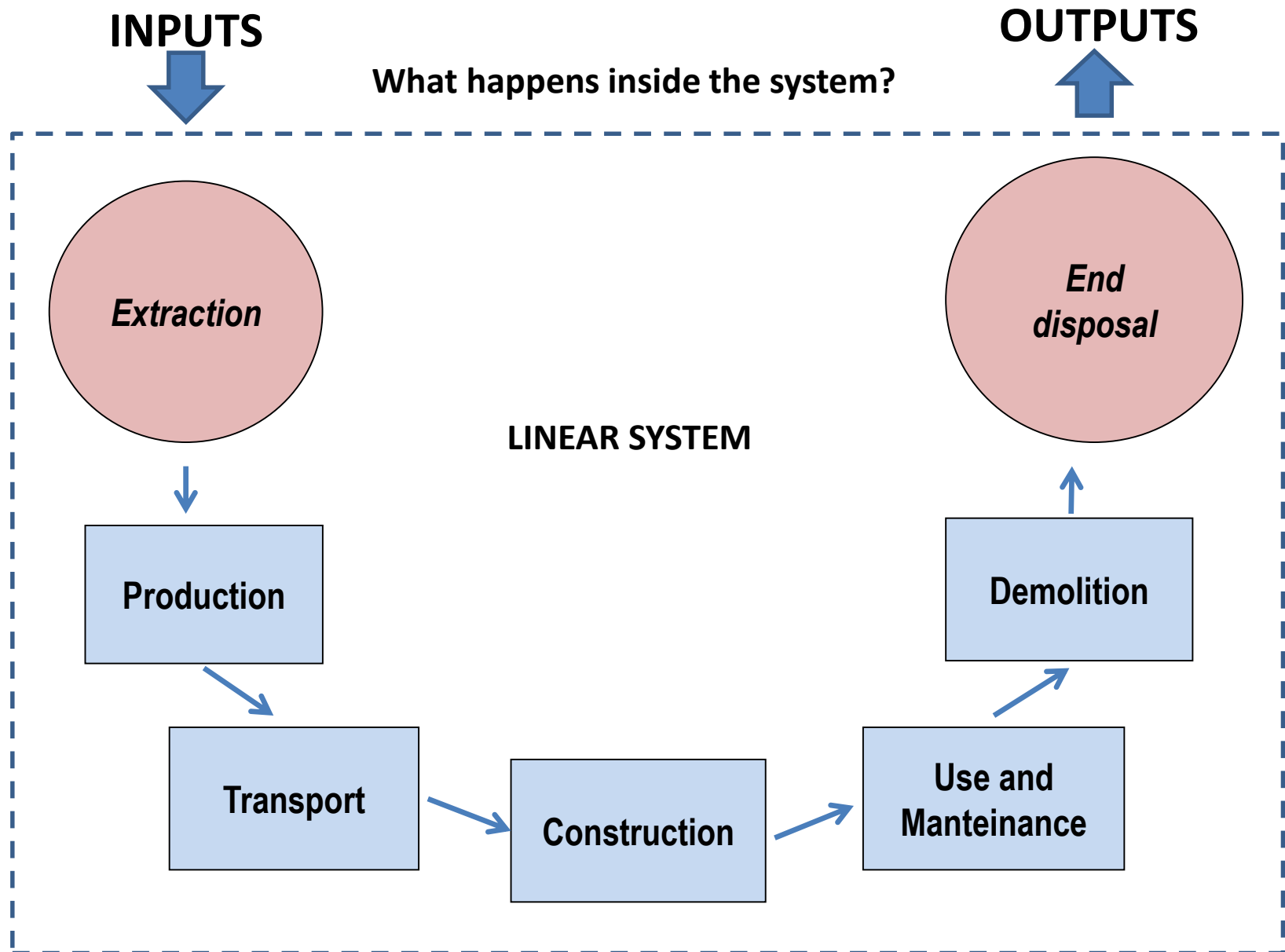


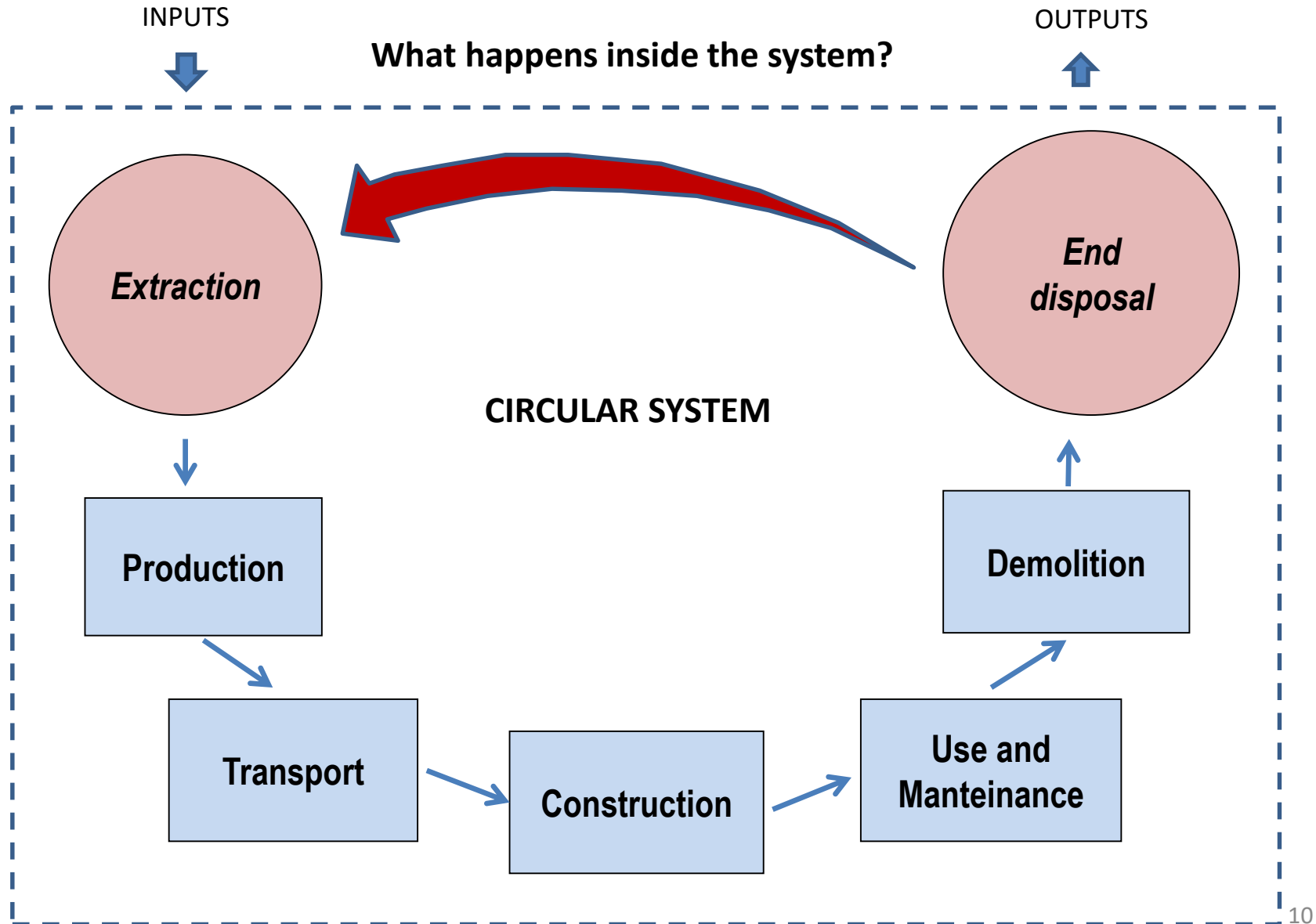


EXAMPLE: BUILDINGS AND OTHER CONSTRUCTIONS

This means:

- Our constructions are never going to be self-sufficient
- They will always need external support, and there will always be losses
- We can improve efficiency, but never get to zero
- We can use kinder energies, materials, processes... but we are always producing environmental impact







INPUTS AND OUTPUTS

INPUTS

- Natural resources
- Energy
- Water
- Land



OUTPUTS

- Solid waste
- Polluted water
- Gas emissions



LIFE CYCLE ASSESSMENT

ISO 14040

“Compilation and evaluation of the inputs, outputs and potential environmental impacts of a product system throughout its life cycle”

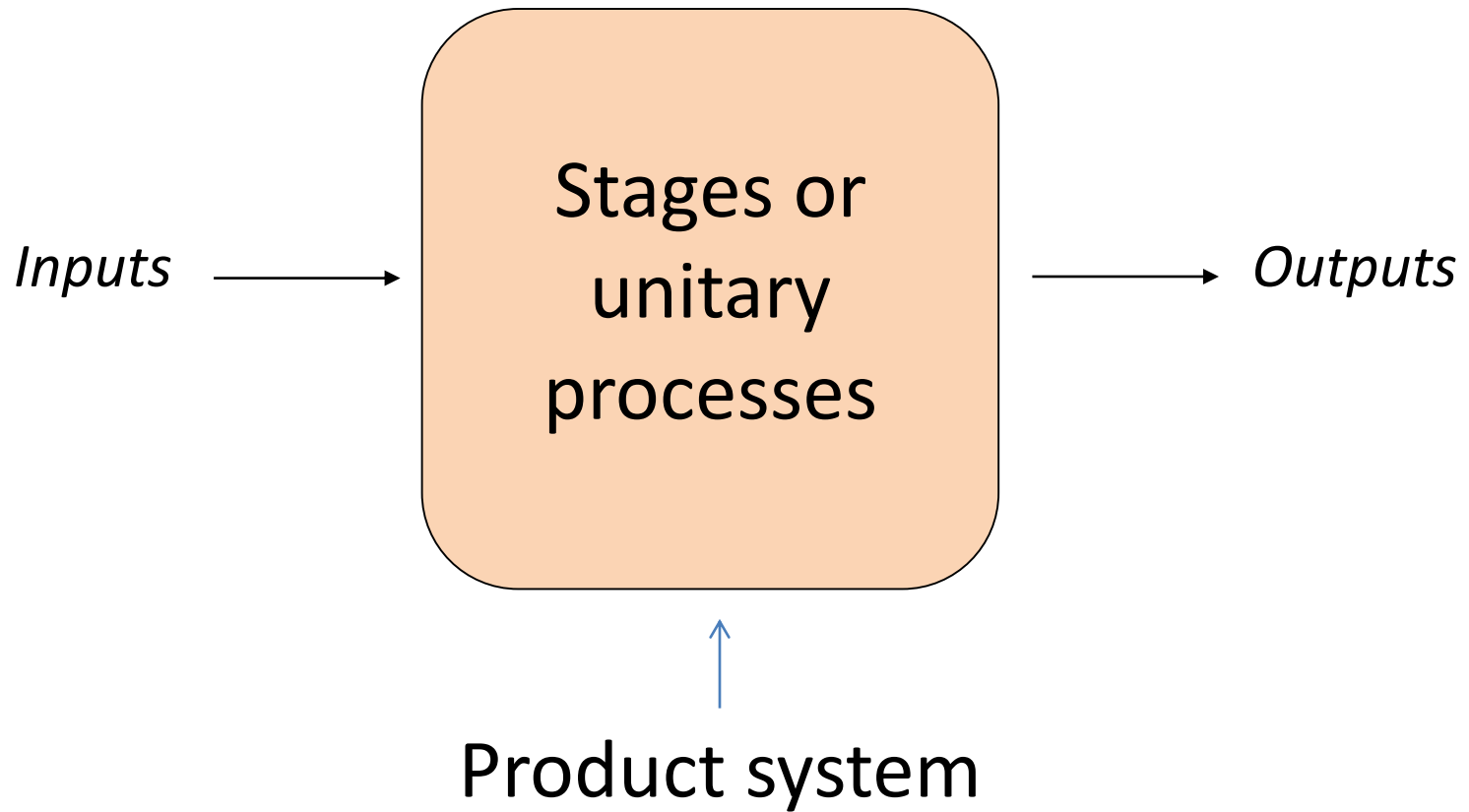
From cradle to grave

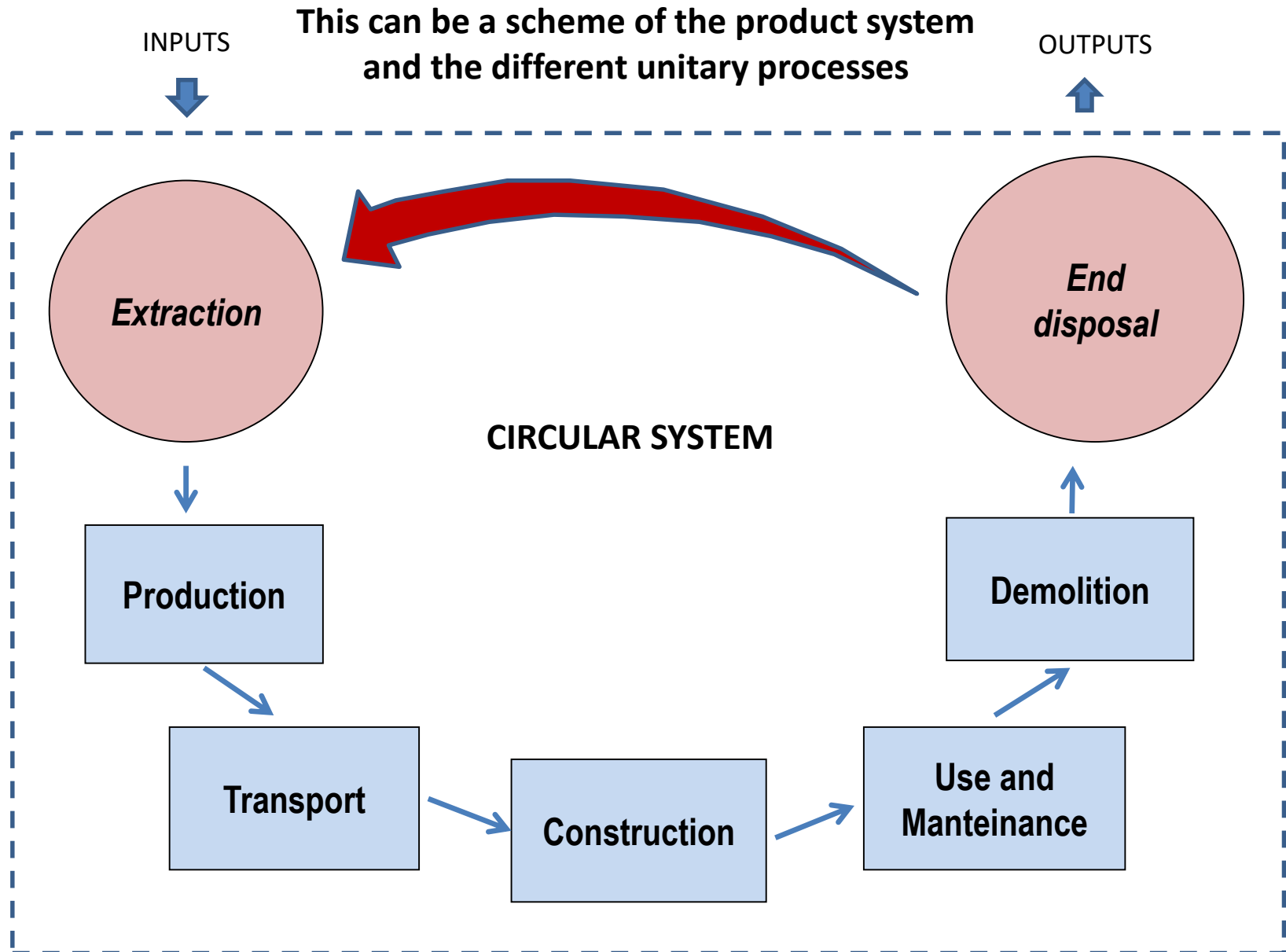
- Services
- Software
- Hardware
- Processed materials



LIFE CYCLE ASSESSMENT

ISO 14040







LIFE CYCLE ASSESSMENT

ISO 14040

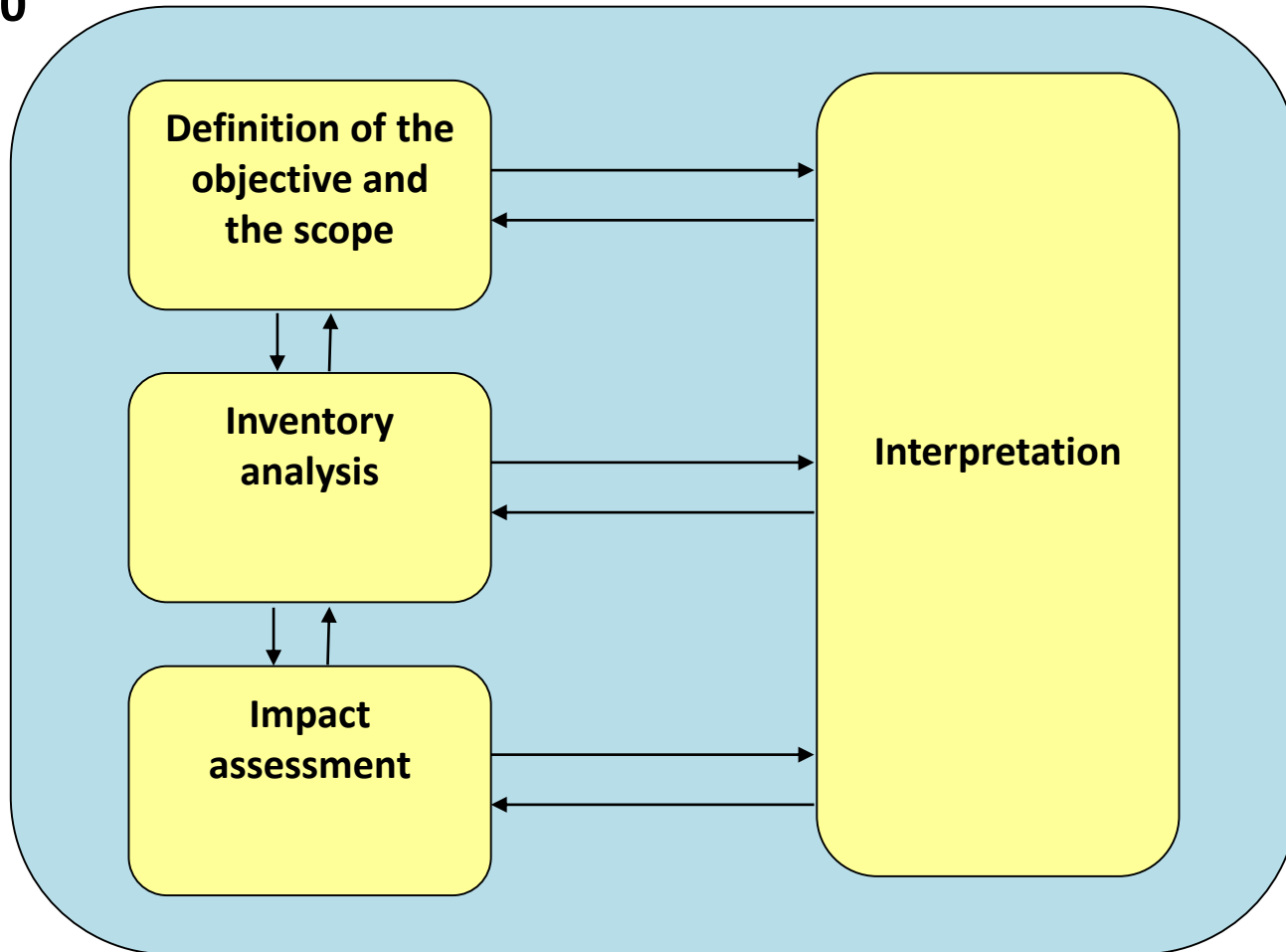
Applications

- Identification of the processes that most contributes to environmental impact
- Comparison between different options
- Be a guide for strategical planning in the long term
- Assessment on the effects over natural resources
- Introduction to product designers in material production and environmental comparison



LIFE CYCLE ASSESSMENT

ISO 14040



Study of Life Cycle Inventory does not include the “Impact assessment”



CEN/TC 350. SUSTAINABILITY OF CONSTRUCTION WORKS

European standardisation system

Sustainability assessment: environmental, social and
economical

Functional equivalent: defined by owner and/or regulations

This is the comparison basis to develop different situations

Conceptual level	Owners and regulations requirements				
	Integrated behaviour of building				
	Environmental	Social	Economical	Technical	Functional
Framework level	EN 15643-1 Sustainability assessment of buildings – General framework			Technical characteristics	Functionality
	EN 15643-2 Framework for the assessm. of environmental performance	EN 15643-3 Framework for the assessment of social performance	EN 15643-4 Framework for the assessment of economic performance		
Building level	EN 15978 Assessment of environmental performance	EN 16309 Assessment of social performance	WI 017 Assessment of economical performance		
Product level	EN 15804 Environmental Product declarations (EPD)	At present, the technical information related to some aspects of social and environmental performance are included in EN 15804 to form part of EPDs.			
	EN 15942 Communication format business-to-business				
	CEN/TR 15941 Methodology for selection and use of generic data				



CEN/TC 350. SUSTAINABILITY OF CONSTRUCTION WORKS

Framework level

BS EN 15643-1:2010
BS EN 15643-2:2011
BS EN 15643-3:2012
BS EN 15643-4:2012

Building level

BS EN 15978:2011
BS EN 16309:2014+A1:2014

Product level

BS EN 15804:2012+A1:2013
BS EN 15942:2011
PD CEN/TR 15941:2010



Sustainability of construction works. CEN/TC 350

BS EN 15643

Information of the building life cycle									Additional information beyond the life cycle
A1-A3 Product stage	A4-A5 Construction stage		B1-B7 Use stage				C1-C4 End of life stage		D Benefits and loads beyond the system limit
A1 Supply of raw materials A2 Transport A3 Production	A4 Transport	A5 Construction/installation process	B1 Use	B2 Maintenance	B3 Reparation	B4 Substitution	B5 Restoration	C1 Demolition/deconstruction C2 Transport C3 Waste treatment C4 Dumping	Potential to reuse , recuperateand recycle
			B6 Use of energy in-service						
			B7 Use of water in-service						



BS EN 15643

Information of the building life cycle										Additional information beyond the life cycle			
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				B6 Use of energy in-service									
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CEN/TC 350. SUSTAINABILITY OF CONSTRUCTION WORKS

Possibilities of assessment

- New buildings
- Existing buildings
- Construction materials
- Construction systems
- Instalations



EXERCISE

Two different options to develop:

- Define how to calculate the energy consumed in a building during the whole life cycle.
- Define how to calculate the water consumed during the life cycle of a tap.

In both cases, you have to explain what consumptions you have, what energy sources, the procedure and sources of information to get it.

How can you develop the impact assessment of each one? How do you think it can be useful?