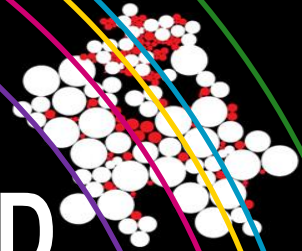
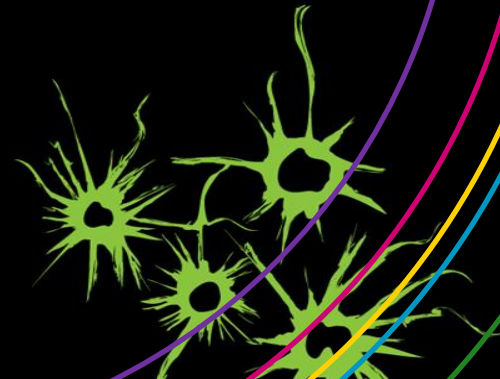


UNIVERSITY OF TWENTE.

SUSTAINABILITY AND CIRCULAR VALUE IN BUSINESS CASES

WCM SUMMER SCHOOL 2014

MAURITS KORSE



MAURITS KORSE

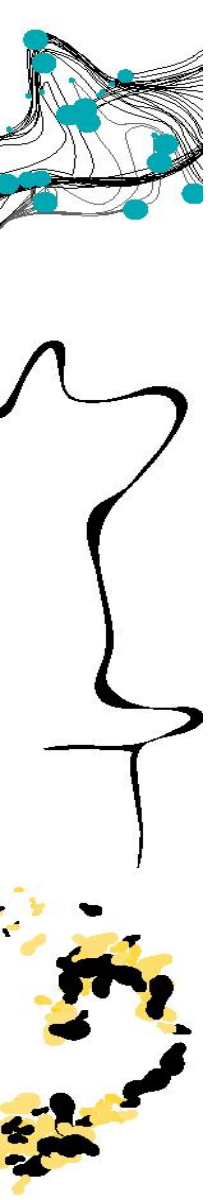
- Interests: Sustainability in Emerging Technologies, Sailing, Wed design, Art & Design
- Graduating master student Sustainable Development for Product Design, University of Twente
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CONTENTS

- Sustainability
- Circular Economy
 - Fundamental Principle
 - Measuring Circularity
 - Managing Ownership
 - Complexity versus Usability
- Business Case
 - Business models
 - Investment decisions

WHAT IS SUSTAINABILITY?

Durability

Recycling

Global Warming

No Pollution

Energy Efficiency

Green

Reduce Footprint

Environmental Friendly

People,
Planet,
Profit

Resource Efficiency

CLIMATE CHANGE

Long Lasting

Sustain

WHAT IS SUSTAINABILITY?

- "Sustainable development is development that **meets the needs of the present without compromising** the ability of **future** generations to meet their own **needs**." – *Brundtland commission, 1987*
- Triple Bottom Line: People, Planet and Profit
- Lander: Sustainable performance based on green house gasses (carbon emissions)
 - CO₂ performance ladder
 - New: Circular Economy?





WHAT IS CIRCULARITY?



RESERVES OF NATURAL RESOURCES

CURRENT RESERVES AND DEPLETION

▪ Oil	1668 thousand million barrels	52.9 years	[BP 2012]
▪ Coal	860 million tonnes	109 years	[BP 2012]
▪ Natural Gas	187 trillion m ³	55.7 years	[BP 2012]
▪ Copper	680 million tonnes	40 years	[Copper Alliance 2010]
▪ Aluminium	25 billion tonnes	81-202 years	[OECD 2008]
▪ Iron	74 trillion tonnes	65-132 years	[OECD 2008]

Estimates based on current demand growth

POTENTIAL CIRCULAR ECONOMY

WHY, WHAT'S IN IT FOR ME?

Resource efficiency

- Securing future resources

Business models

- Dutch Business Benefits
 - TNO: Saving €7.3 billion and 54.000 jobs
- European business benefits:
 - Ellen MacArthur Foundation: \$380 billion up to \$630 billion
 - European Commission: €245 billion to €604 billion



SUSTAINABILITY AND CIRCULAR INDICATORS

HOW CAN WE INCORPORATE CIRCULARITY INTO OUR BUSINESS

- Avoid virgin material usage
- Apply the 3R method (reduce, reuse, recycle)
- Resilience through diversity
- Rely on renewable energy
- Think in systems
- Waste equals food
- Biological and Technological separated
- Increase resource effectiveness
- Increase lifespan
- Biobased approach
- Product Service System
- Use of freshwater
- Land use
- Raw material equivalent
- Carbon emissions
- Energy input
- Balance of trade
- Economic development
- Pollution control
- Administration and management
- Culture and society
- Value generation
- Ecosystems
-

HOW TO MEASURING CIRCULAR VALUE

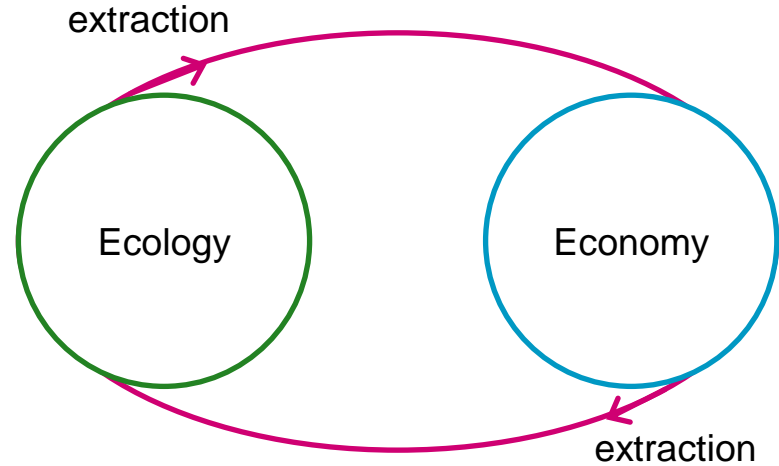
- The percentage **recycled material** in a product
- The percentage of **omitted waste** during the life cycle of a product
- The total **loss of material** of a product
- The **added value** of a product or **service to a achieve the circular economy**
- The **economic, social and ecological value** of a product
- The **change in thermodynamic value** (entropy)
- **Gained money** compared to linear system

- And at what level do we want to measure?
 - Micro (part, product)
 - Meso (company, region)
 - Macro (sector, product chain, country)



PREMISES CIRCULAR ECONOMY

- Open systems vs closed systems
 - Materials, energy, data
- Limited amount of materials
 - Ecological effect
 - Financial effect
 - Social effect
- Accumulation of materials
 - Ecological effect (toxicity, global warming)
- Energy is scarce as long as it is from non-renewable resources



FUNDAMENTAL PRINCIPLE

ASSEMBLY OF A TRANSFORMER

INPUTS

Physical Resources

- Materials (copper, steel, oil)
- Tools

Energy

- Electricity
- Labour
- Heat

ASSEMBLY



OUTPUTS

Physical Products

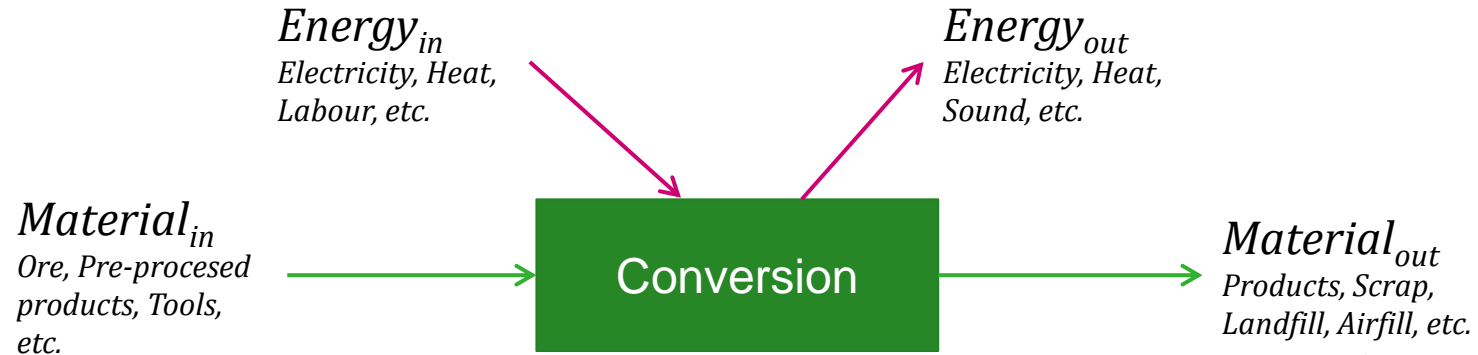
- Transformer
- Scrap
- Emissions
- Tools

Energy

- Heat
- Sound

MODELLING FUNDAMENTAL PRINCIPLE

MODELS SINGLE STEP IN PROCESS



Open system being part of a closed system

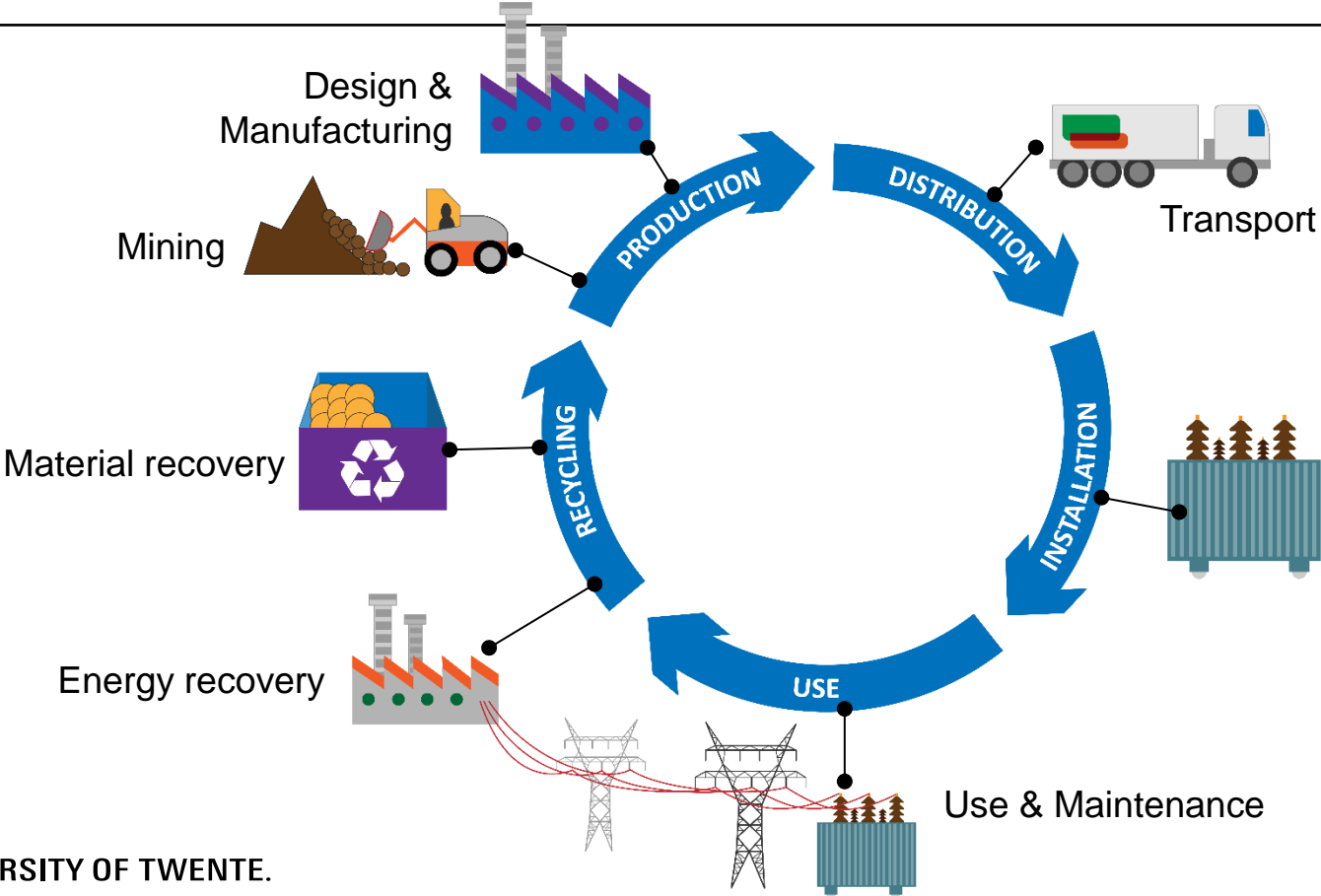
What is most important element?

What can we deduce?

- The **output materials** will once need to be **input materials** (resources) again.
- Material conversions are **dependent on energy** availability
- Material is more scarce than energy: material should have **higher priority** than energy (?)
 - Currently energy is often generated by **combusting material** (destroying)

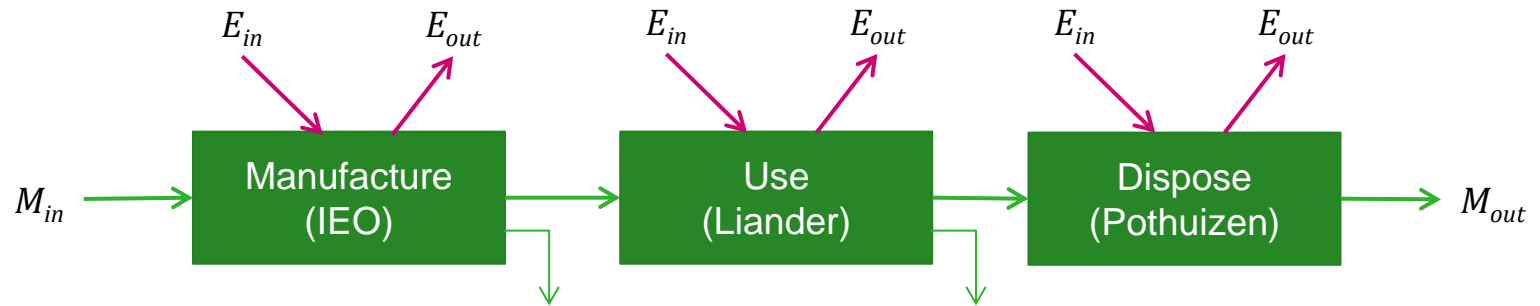
CO₂ measure for material output or energy usage?

LIFE CYCLE OF A TRANSFORMER



MULTIPLE CONVERSIONS

EXAMPLE OF A TRANSFORMER



- What can we influence?
- How do we know what to influence?
- Who has responsibility?

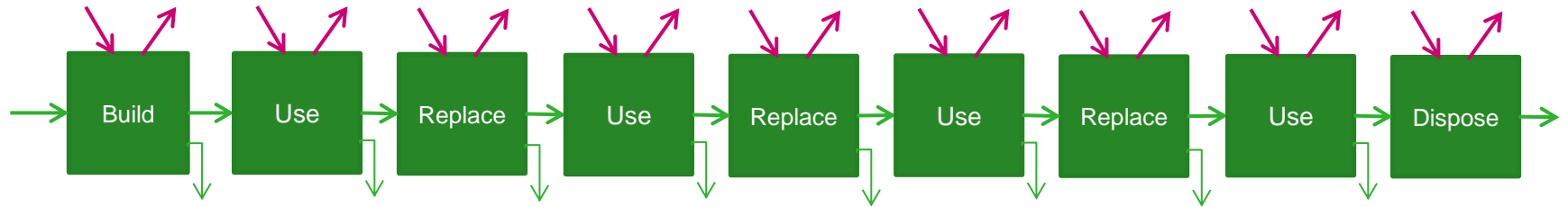
MULTIPLE CONVERSIONS

We can influence:

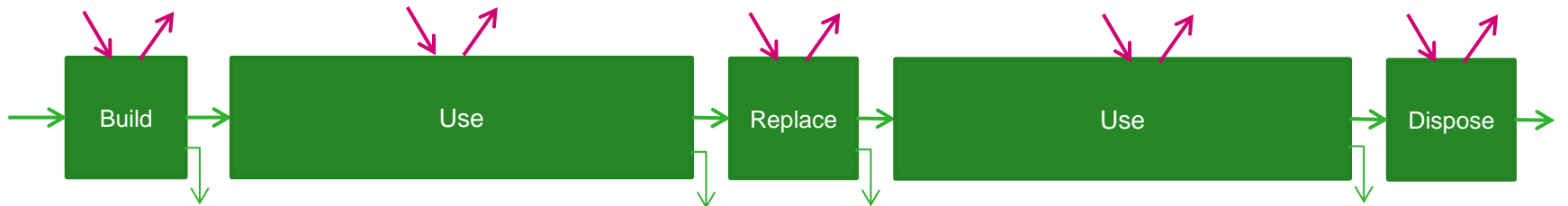
- Technology of the conversion
- Material input and output
- Energy input and output
- Chain
 - Dependency within the chain
 - Incentives for stakeholders
 - **Information availability** about conversion in other stages in the chain is important

HOW TO MEASURE CIRCULAR VALUE?

- Theoretical: Sum of conversions

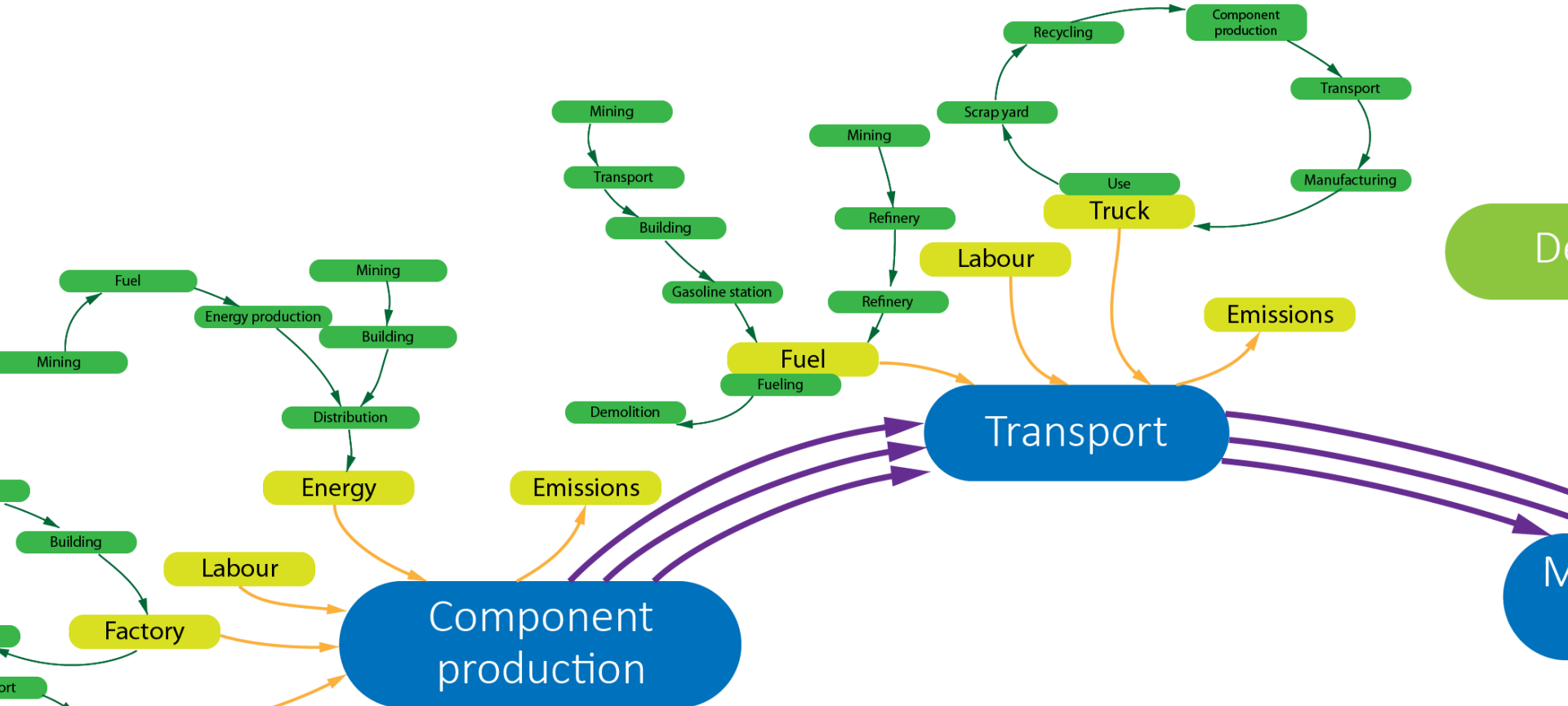


Verses



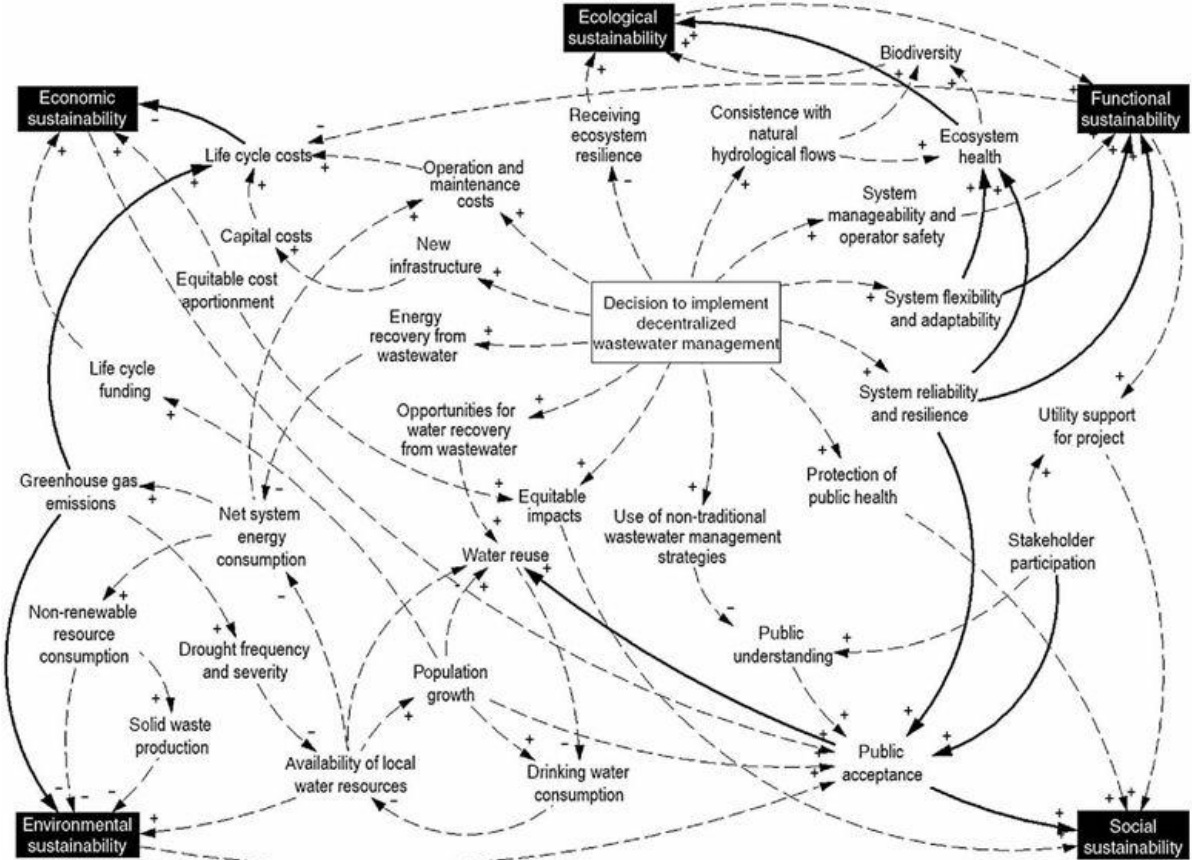
COMPLEXITY OF LIFE CYCLES

WHAT IS YOUR SCOPE?



INTERDEPENDENCIES

ECOLOGICAL, FINANCIAL AND SOCIAL ASPECTS





RESPONSIBILITY

- Realising future value
- Ownership and governance

FOKKE & SUKKE
HEBBEN EEN OPLOSSING


WE GAAN
DE FYRA'S
DUMPEN

OP EEN
VUILNISBELT IN
IVOORKUST



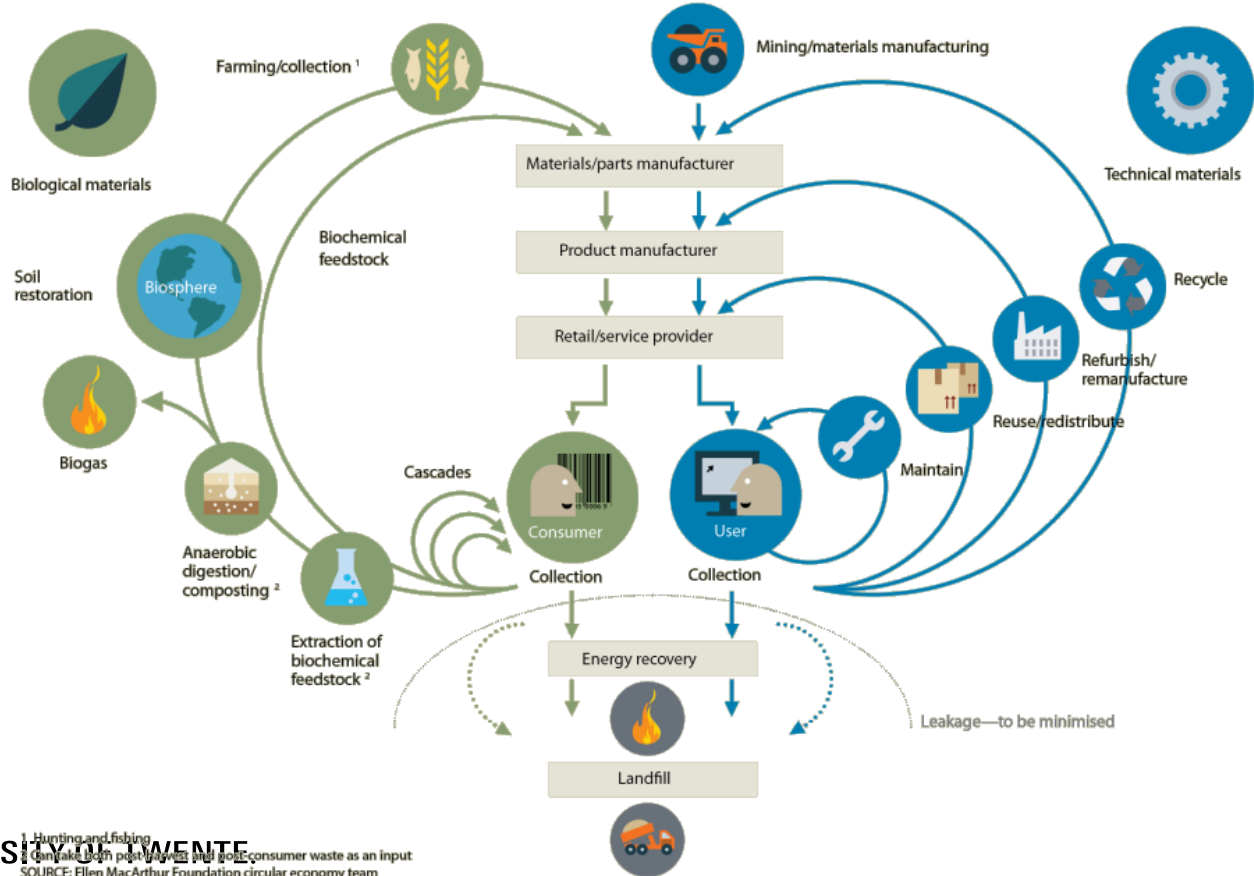
THEORY VERSES PRACTISE

- It is very complex...
 - Knowledge of process
 - Availability of data
 - Timespan (how to approach future uncertainties?)
 - Complexity (scope and interdependencies)
- How to tackle it? Or better who?
 - Engineers and designers
 - Management
 - Government



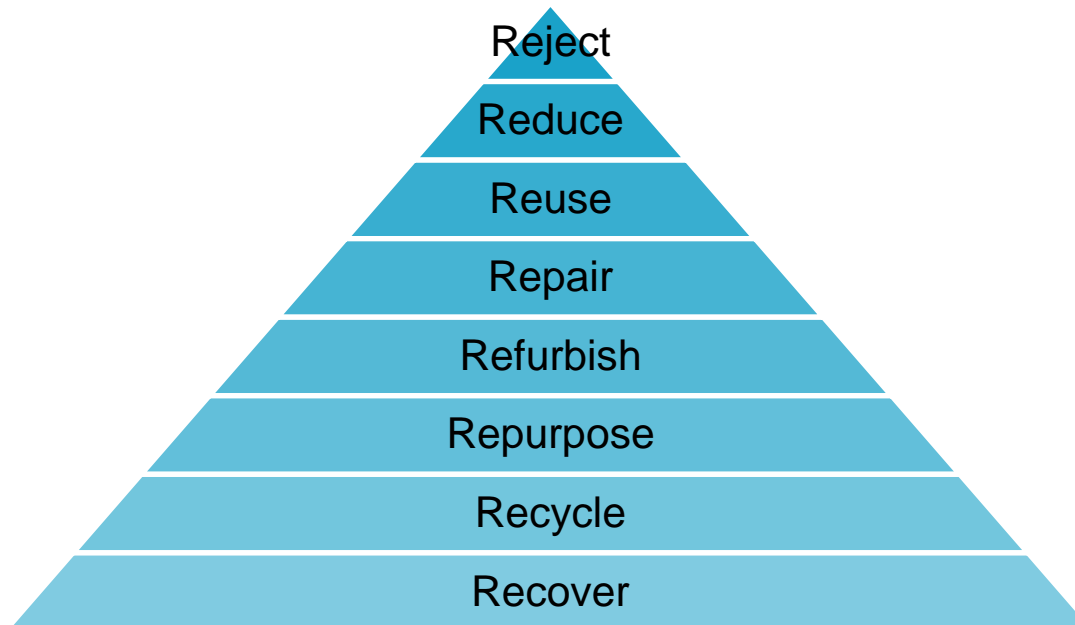
Information
Assumption

REUSING MATERIALS WHILE REDUCING ENERGY?



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¹ Hunting and fishing
² Can take both post-industrial and both consumer waste as an input
 SOURCE: Ellen MacArthur Foundation circular economy team

LANSINKS' LADDER EXTENDED



Very much
location
dependent!

INFLUENCE ON RESOURCE USAGE

Engineering

- 'Design for X'
 - Reuse
 - Maintainability
 - Recycling
- Effective verses Efficient
 - What if more materials means less energy usage?

Government

- Taxing resources (government), CO₂ certificates
- Eco policy of the European Commission



BACK TO THE BUSINESS

MANAGING YOUR RESOURCE USAGE

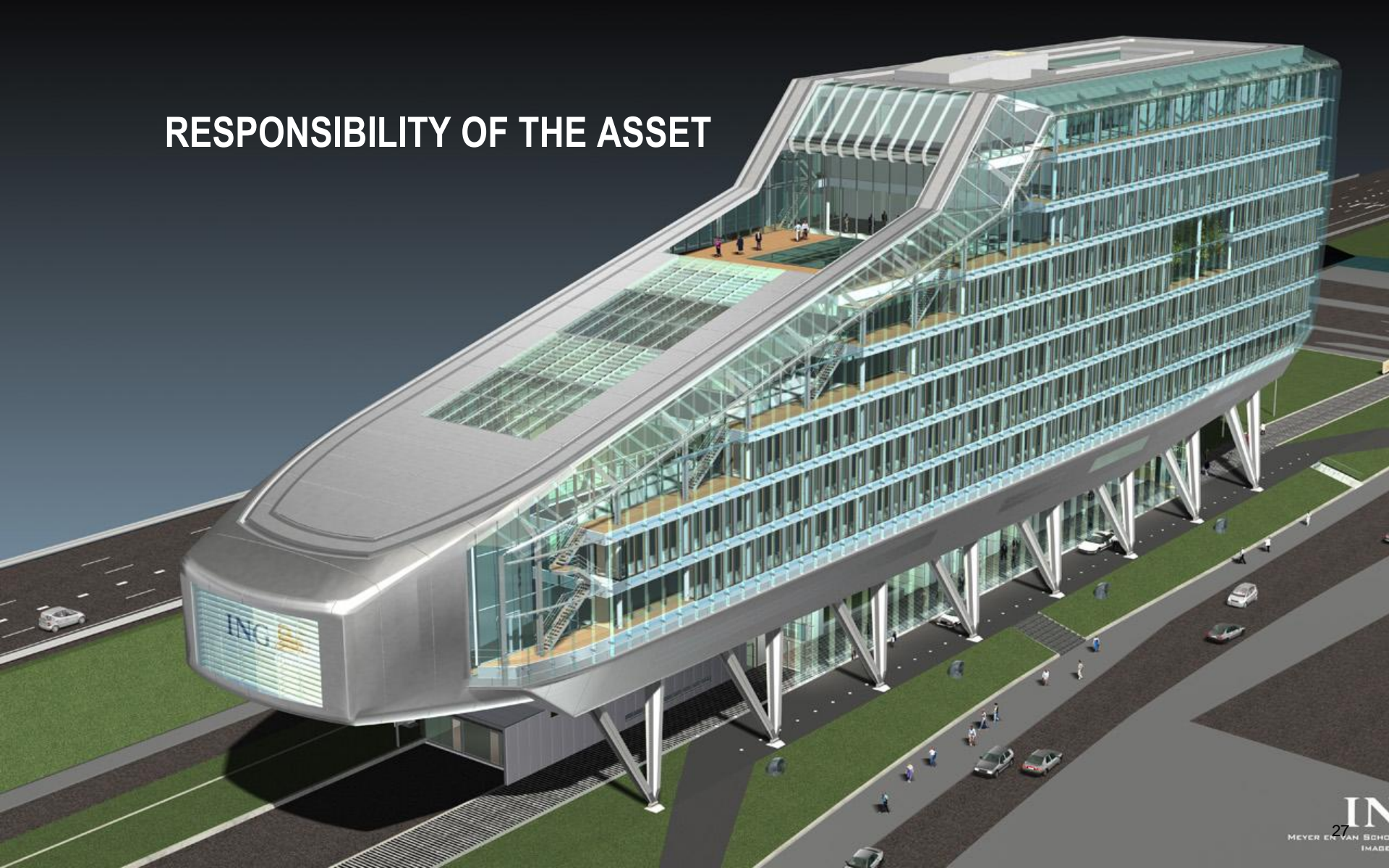
- Complexity verses Pragmatism
 - Engineers verses Managers
 - Trade-off between exact knowledge or general indication
- Supply management
 - Best value procurement
- Business Models
 - Business cases
 - Ownership
 - Performance, the performance economy



BUY A BULB, OR BUY LIGHT?



RESPONSIBILITY OF THE ASSET



EMBEDDING SUSTAINABILITY IN THE BUSINESS CASE?

- How to embed it in the business case?
 - What elements do you have in the business case?
- Sustainability as separate element
- Embed it in the TCO model
 - Material recovery at end of life
 - Value of omitted waste
 - Value of recycled materials used
- Embed it in the Investment decisions

EMBEDDING SUSTAINABILITY IN THE BUSINESS CASE

- Business Case elements (assessment criteria)
 - Technical, Financial, Risks, Strategic, Stakeholders, Sustainability, Strategic compliance.
- How to value and compare the different assessment criteria?
 - Various units (Euro's, kilograms, knowledge, social value, etc)
 - Translate all to a financial equivalent
 - Non-dimensional
- Multiple-criteria decision analysis

MULTIPLE-CRITERIA DECISION ANALYSIS

Assessment Criteria	Option A	Option B	Option C
Technical	4	4	5
Financial	5	4	3
Stakeholders	2	3	2
Strategic compliance	4	3	4
Sustainability	3	2	5
Risks	3	5	4
Total	21	21	23

Weighting

Critical acceptancy
Lower boundary

RECAP - SO WHAT IS THE BEST SOLUTION?

Understanding can bring improvement

- For what reasons are you pursuing circular value?
 - Economic, Ecological, Social, Technical..
- What are your fundamental premises?
- What is our scope?
 - Company level, chain level, regional level, country level..
 - Time span: long term or short term
- To what extent can we implement those premises?
 - What do we know, what do we not know

*Doing the right things
Or
doing things right?*

Q & A

