Integration of Industrial Environmental Information Systems

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Industrial Environmental Informatics
Chalmers University of Technology

NORLCA Symposium 2006-10-09

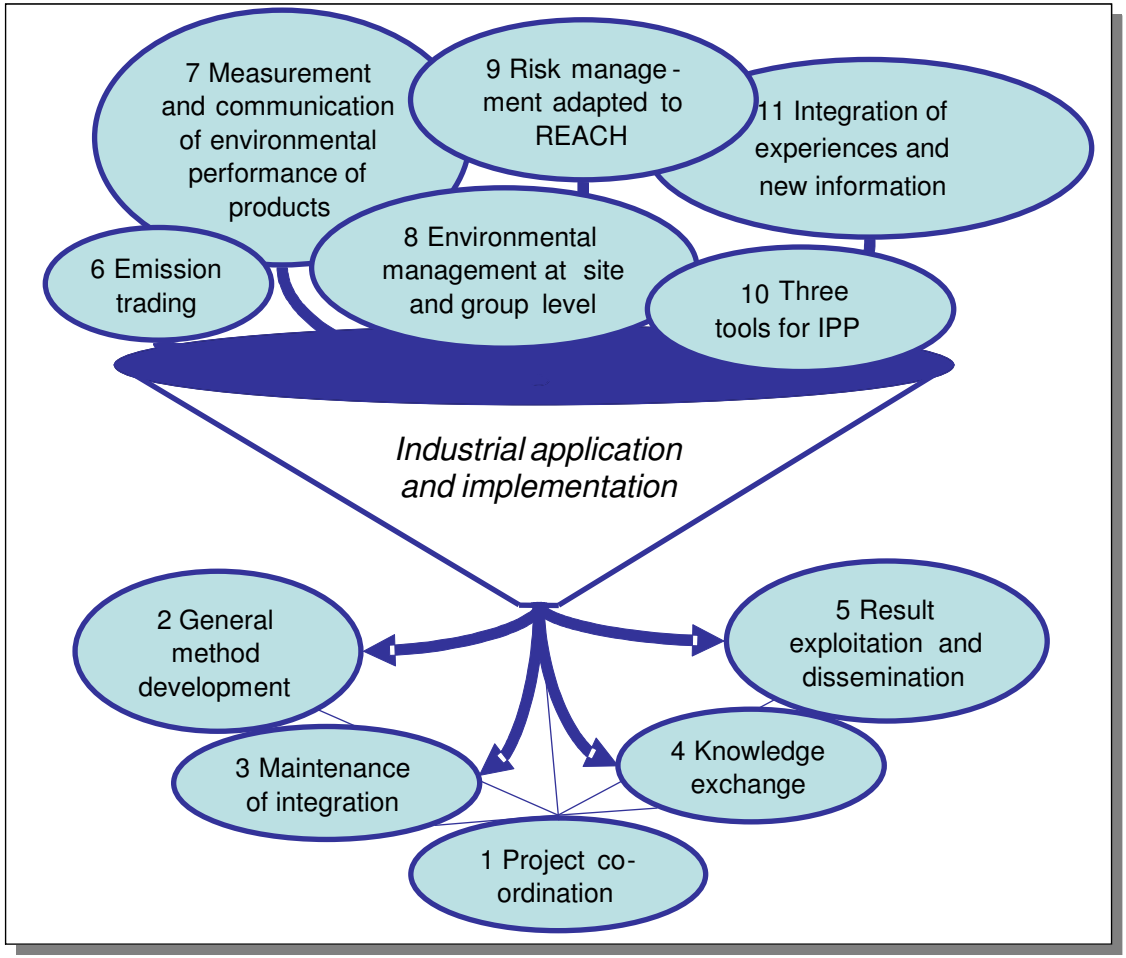
Integration of Industrial Environmental Information Systems

- Brief overview of the CPM project IMPRESS
- Integration methodology
  - Reference models
  - Method development
  - General method for integration of industrial environmental information systems
- Demonstration of integrated tools: VIEWS – Visualization of Integrated Environmental Work Spaces

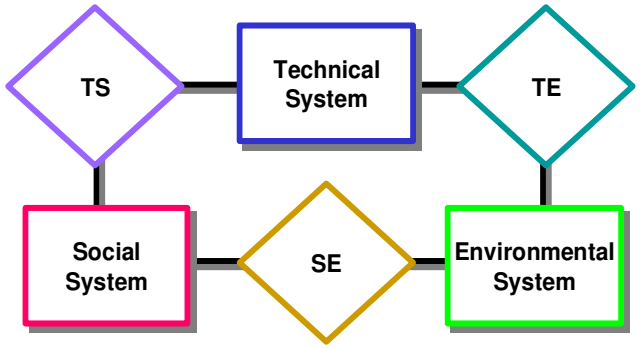
IMPRESS Project facts

- Acronym:
  - IMPlementation of integRated Environmental information SystemS
- Time line:
  - 2004-09-01 – 2006-09-30
- Personnel IMI:
  - Johan Tivander, Sandra Roos, Raul Carlson, Maria Erixon, Karolina Flemström, Markus Erlandsson and Ann-Christin Pålsson
- Company participants:
  - **ABB:** Lennart Swanström
  - **Akzo Nobel Sustainable Development:** Klas Hallberg, Sara Tholin, Johan Widheden
  - **Casco Products AB:** Peter Herder, Kjell Strindholm
  - **Akzo Nobel Industrial Coatings AB:** George Mirkov, Glenn Svensson
  - **Bombardier Transportation Sweden AB:** Ylva Bergkvist, Sara Paulsson, Ronny Öhman
  - **IKEA of Sweden AB:** Carina Andersson, Gunilla Clancy, Evamay Lawson, Ylva Roos, Annelise Larsen
  - **Swedwood International AB:** Victoria Olsson
  - **ITT Flygt AB:** Christian Wiklund
  - **SCA Hygiene Products:** Ellen Riise, Björn Spak, Helene Jacobsson
  - **Stora Enso AB:** Ola Svending, Ulrika Ågren

IMPRESS organization



Integration toolbox: Reference models



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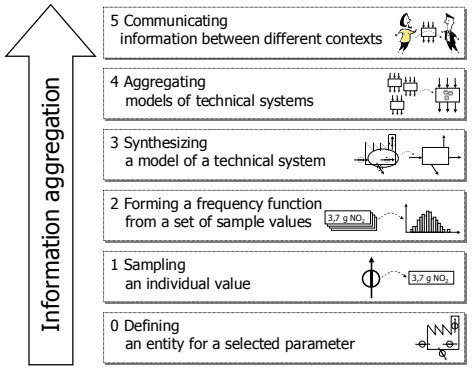
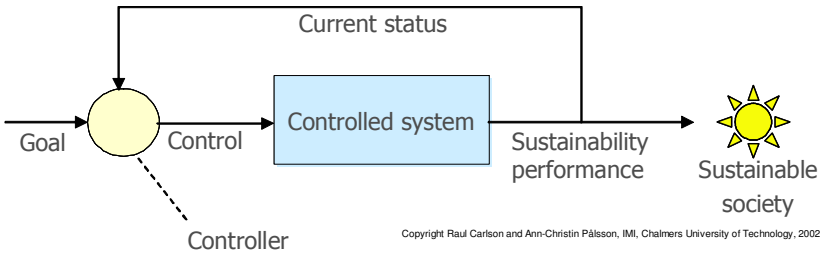
SPINE - scope and structure of environmental information



PHASES – relation between physical facts and aggregated end results



Cybernetic control model - purpose of an IS and controllability of environmental performance

Method development

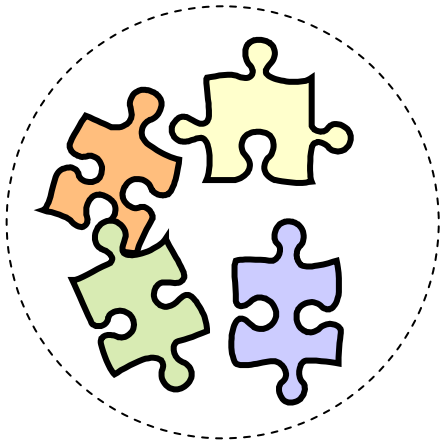
- Experiences from case studies in IMPRESS
- Previous experiences and toolbox of reference models and methods applied in the case studies
- Internal workshops
- Reference group
- Applying the integration method in three companies and for the development of VIEWS
  - ITT Flygt
  - SCA
  - Akzo Nobel
  - IMI – VIEWS

→ Report: ”General method for integration of industrial environmental information systems”, CPM Report 2006:14

General method for integration of industrial environmental information systems

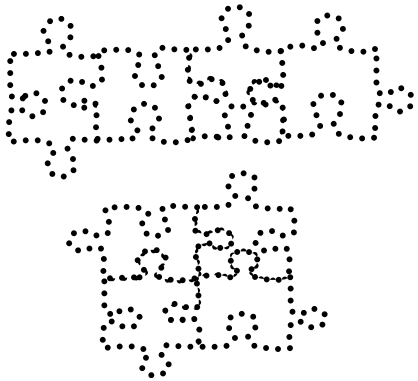
Analysis

- Identify integration purpose and scope
- Describe relevant properties of the current system within the scope
- Map the current information flow
- Identify gaps and overlaps



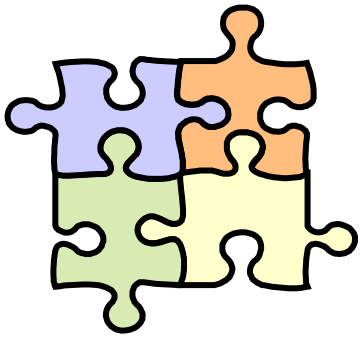
Synthesis

- Based on the result from the analysis
- Identify potential ways to integrate using the reference models
- Visualize the integrated information flow
- Compile decision support for Implementation



Implementation

- Prioritize and decide between integration measures
- Plan and perform the implementation
- Evaluate the results with regard to purpose and scope

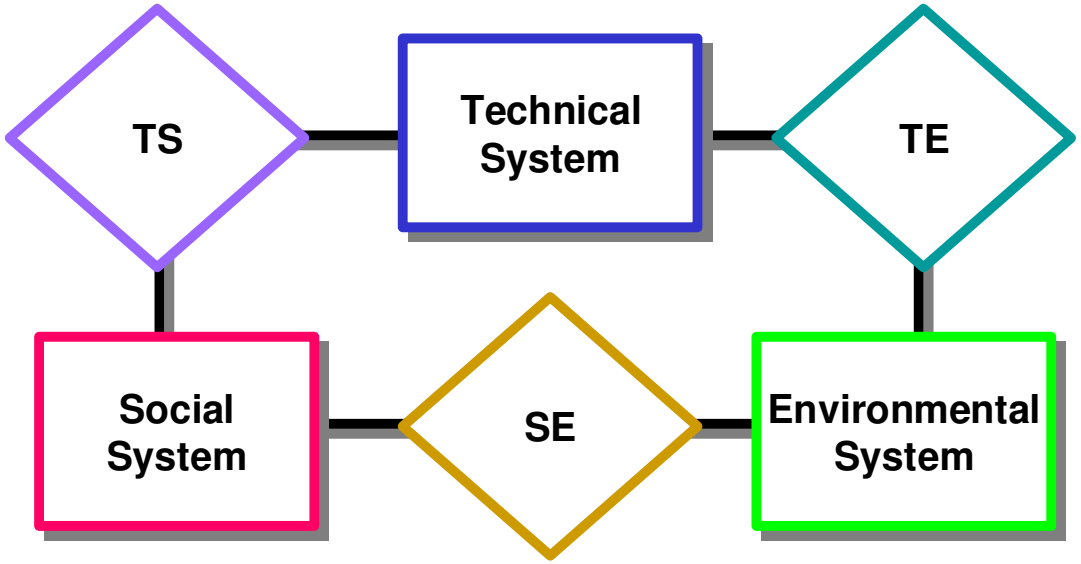


VIEWS
Visualization of Integrated Environmental Work Spaces

Sandra Roos
Industrial Environmental Informatics
Chalmers University of Technology
October 9th, 2006

Reference model: SPINE - an integrated model for environmental information

The information model SPINE defines the scope of environmental information and provides structure



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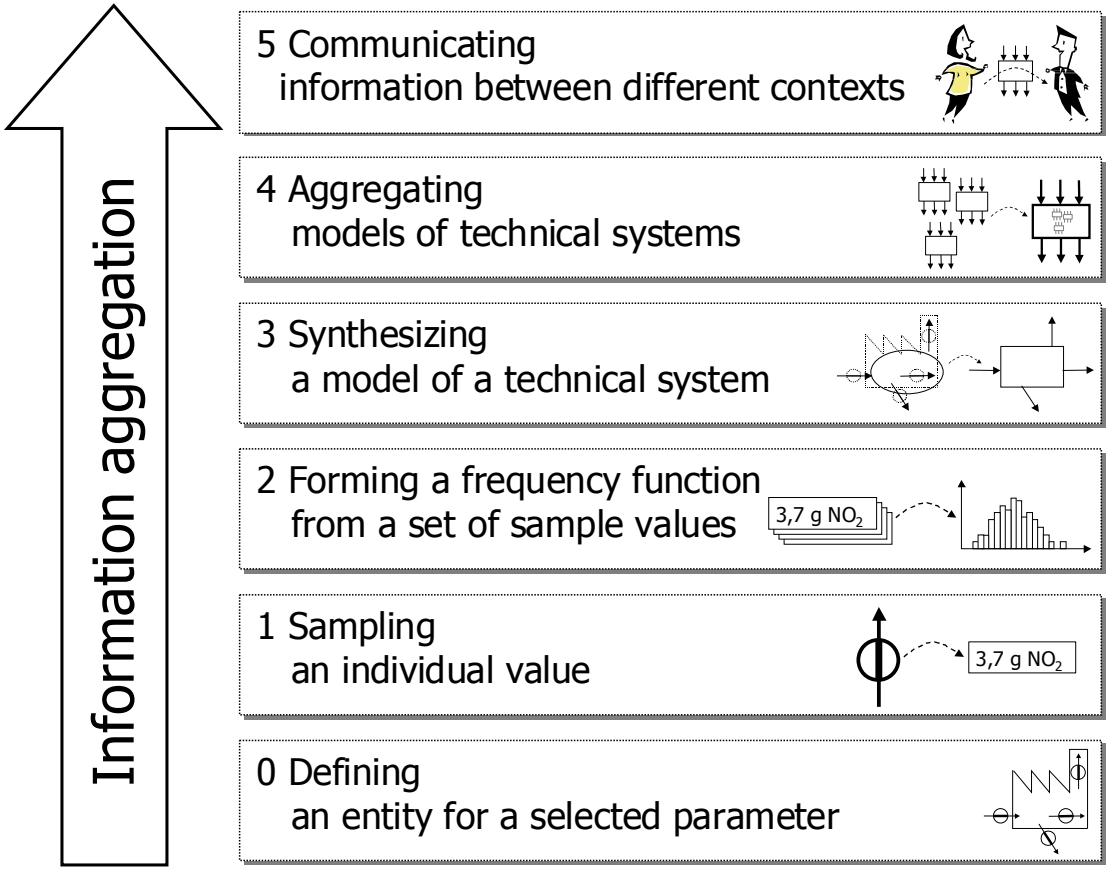
Reference model: PHASEs in the design of a model of a Technical System

PHASETS defines how basic data is aggregated into a report for communication of information



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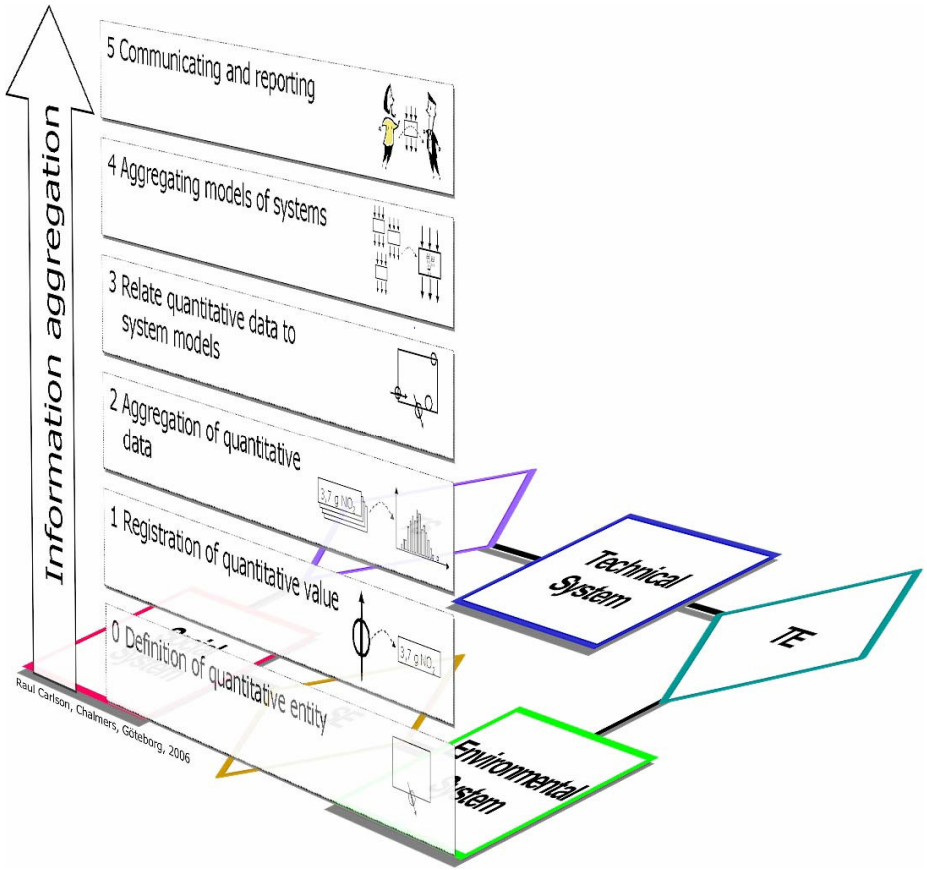
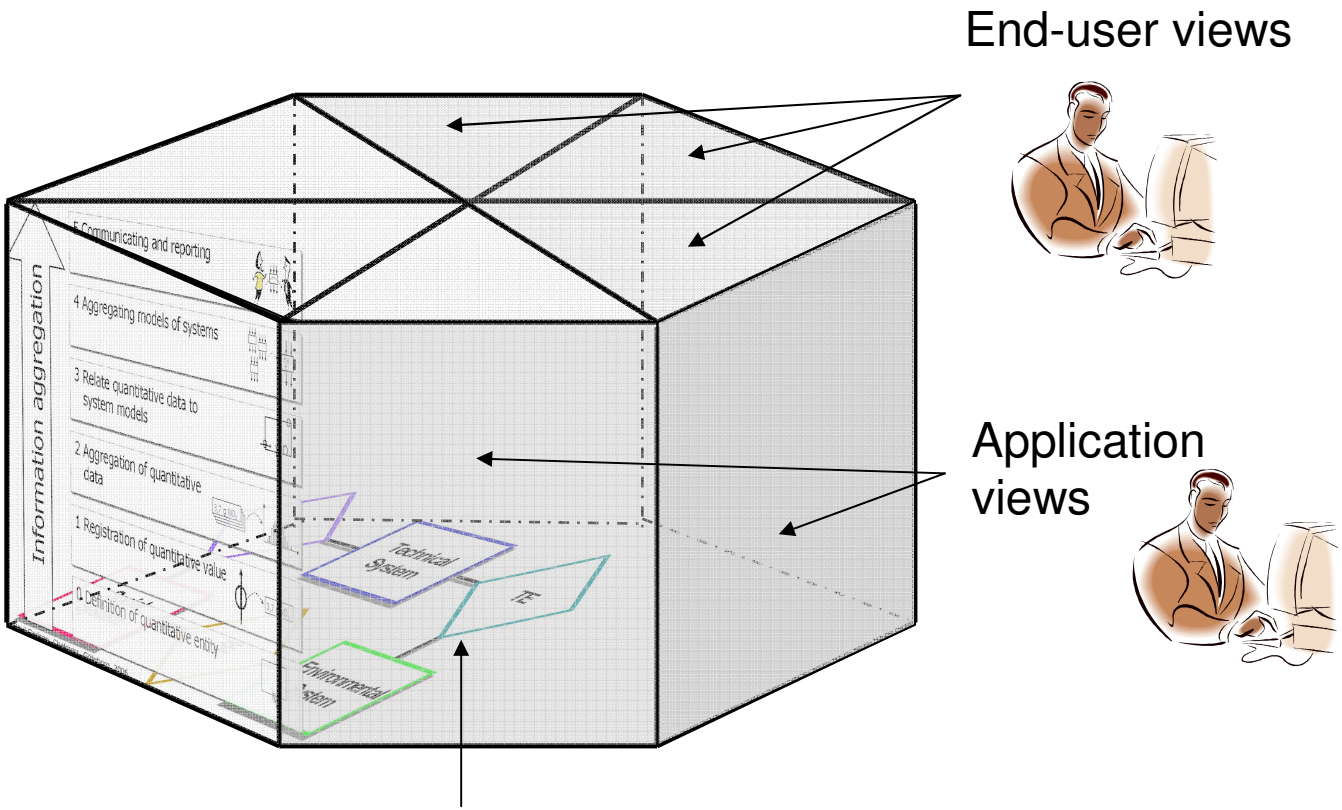
Connection between the reference models



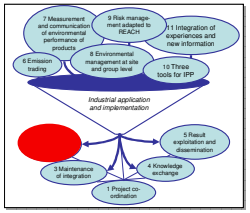
VIEWS

Visualization of Integrated Environmental Work Spaces

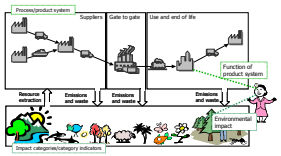


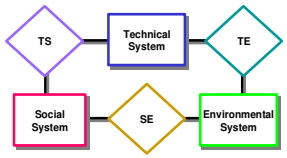
Base view: Database structure and primary data

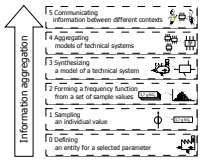
SP2 General method development

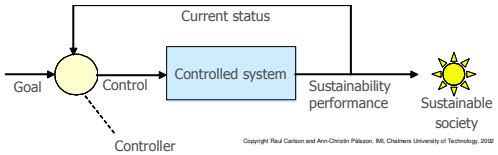


- Experiences from case studies in IMPRESS
- Previous experiences and toolbox of reference models and methods applied in the case studies









→General method for integration of environmental information systems

→Tested in 3 company case studies

→Applied for the development of VIEWS

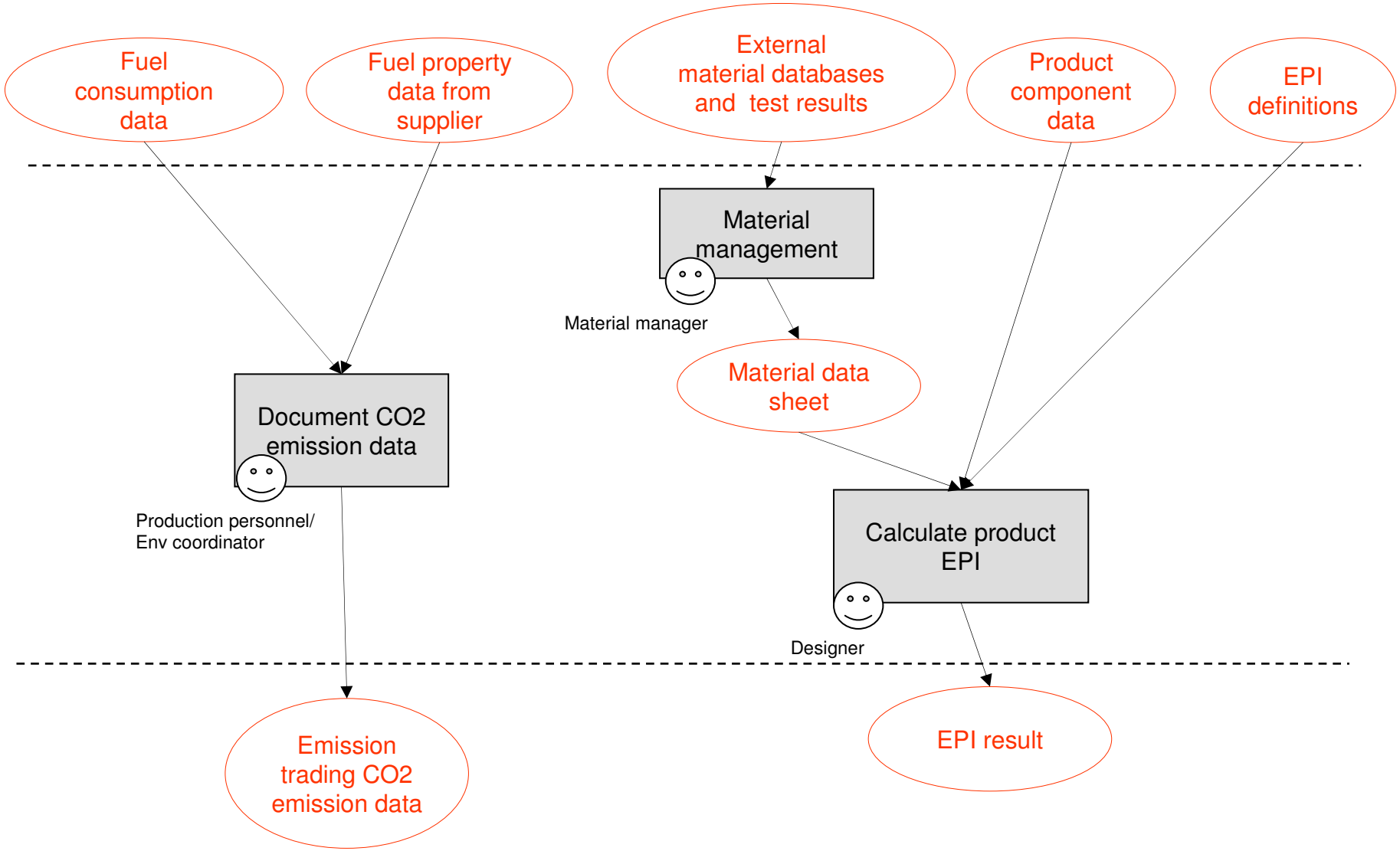
Analysis: Identify purpose and scope of the integration

Example:

Purpose:
Efficient management of material and substance properties
within the company

Scope:
Material management
Design for environment
Emission trading documentation and reporting meeting ETS requirements

Analysis: Map the current information flow within the integration scope



Material data sheet

GJUTJÄRN, gråjärn
Europa standarden EN 1561:1997-GJL-250 gäller som Flygt standard med undantag för hårdhet, se nedan under fordringar.

CAST IRON, grey cast iron
The European standard EN 1561:1997-GJL-250 has the status of Flygt standard except for hardness, see below under requirements.

Formvaror: Gjutgods

Product forms: Castings

Jämförbara standarder:

Comparable standards:

Europe: EN 1561:1997- GJL-250 alt. designation JL1040
USA : ASTM-A 48 - No 35 B
Japan: JIS G5501 - FC 25
International: ISO 185 - Grade 250

Fordringar

Requirements

Mekaniska egenskaper

Mechanical properties

Material beteckning Material designation	Tillstånd Condition	Brottgräns Tensile strength	Hårdhet Hardness
M0314.0125.00	Obehandlat / Untreated	Min 250 MPa[1)]	Min 170 HBW[2)]
M0314.0125.10	Härdat / Hardened	-	Min 45 HRC[2)]

1) Gäller för separat gjuten provstav / Valid for separately cast test bar.
2) Gäller i gods om inte annat anges på ritningen. / Valid in castings if nothing else is specified on the drawing.

Emission trading data

Type of fuel	Net calorific value	NC Unit	NC Tier
Diesel oil miljöklass 2	0.03528	TJ/ton	Tier 2a
Dieselolja miljöklass 2	0.03600	TJ/ton	Tier 2a
Biogas mix [fossil part]	0.03600	TJ/ton	Tier 1
Biogas mix [biomass part]	1.03600	TJ/ton ds	Tier 1

Structured material data

GJUTJÄRN, gråjärn
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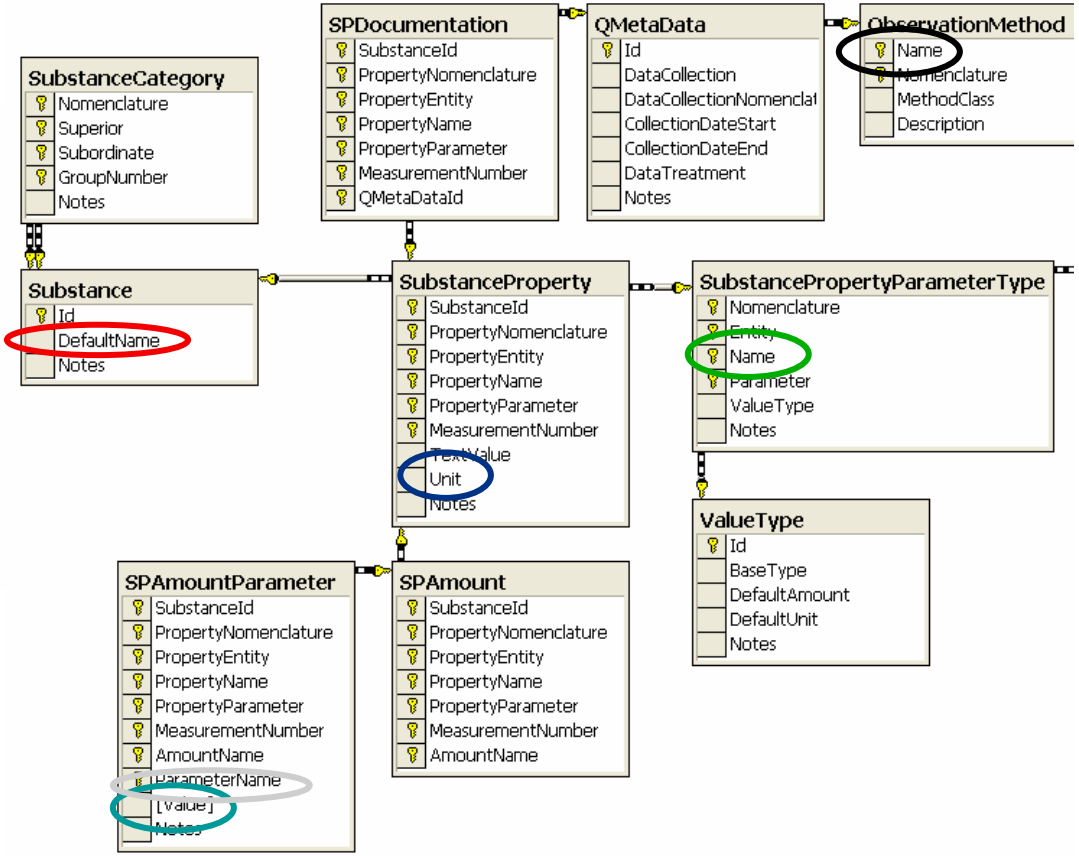
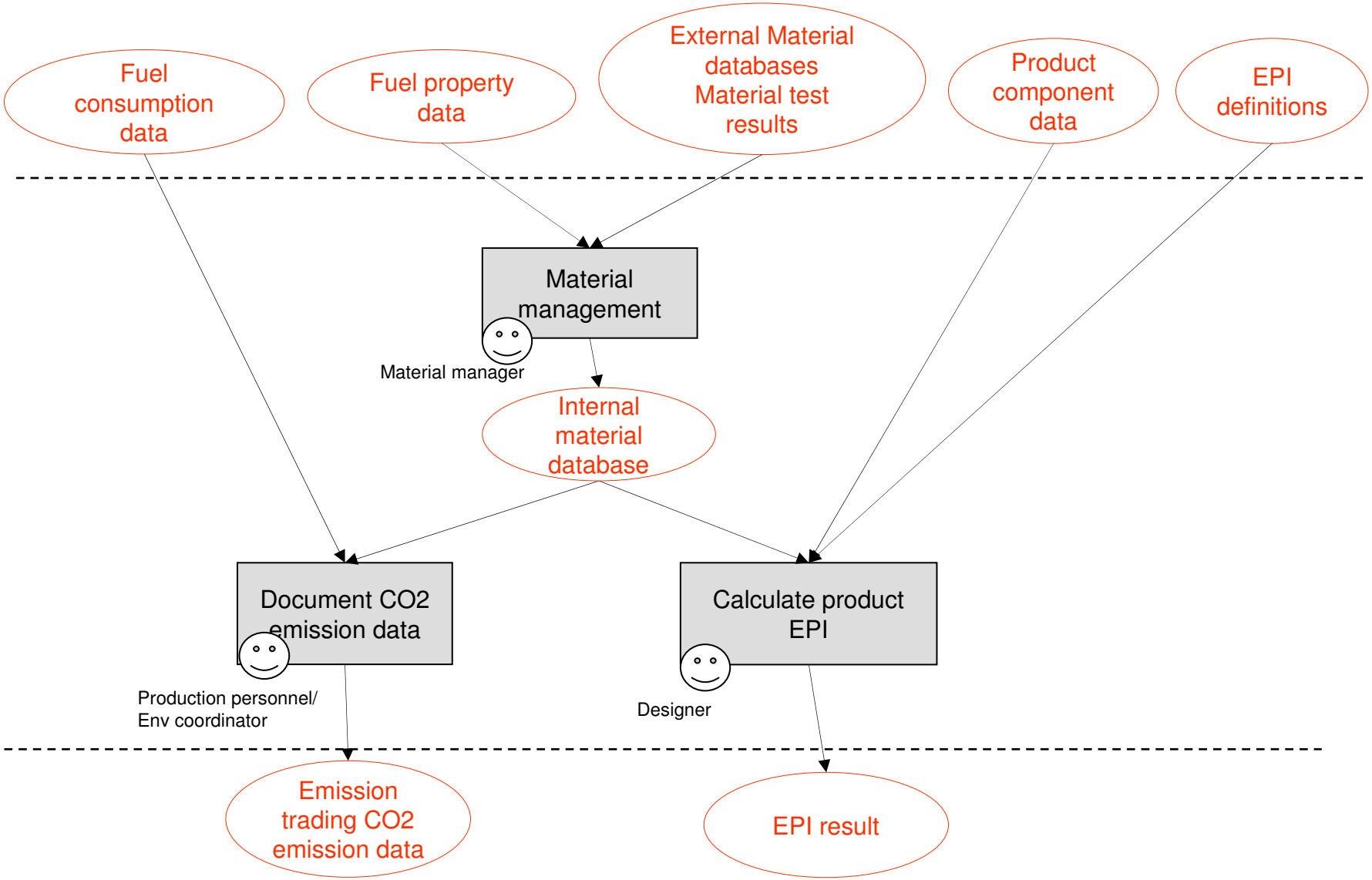
Reference data format



Synthesis: Vision of an integrated information flow



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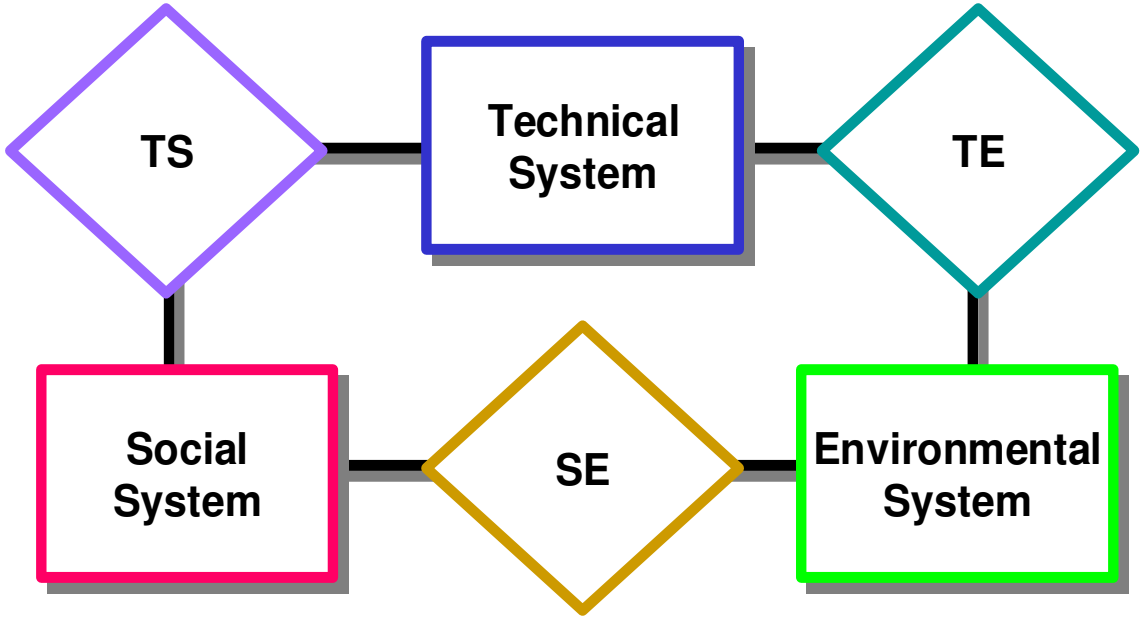

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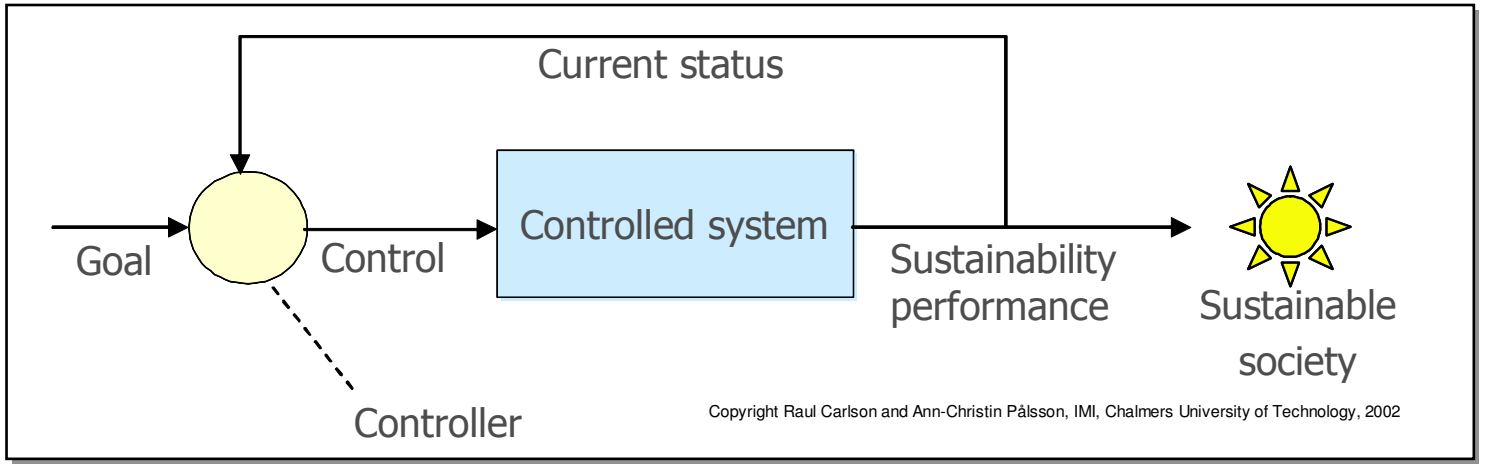
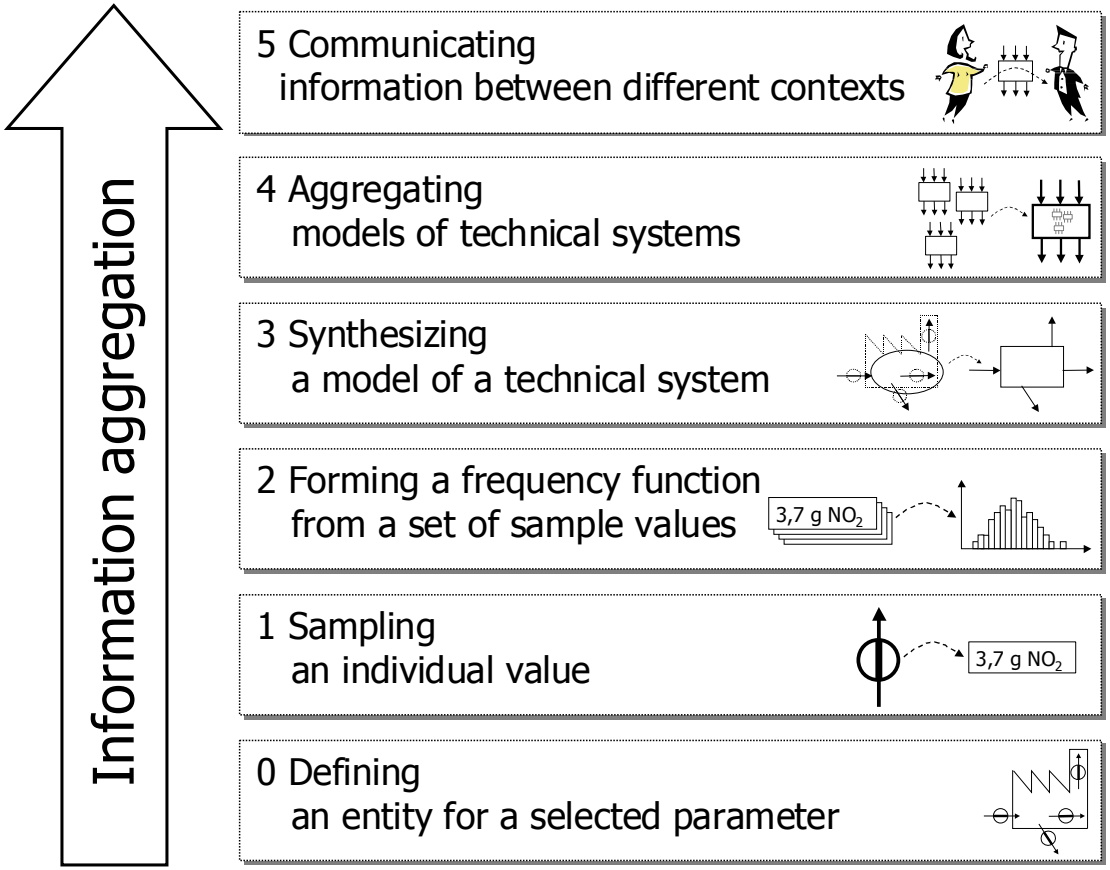
Reference model:
The navigation model



Reference model: PHASEs in the design of a model of a Technical System

A general model for structured management and communication of environmental information

Published 2001



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Practical results from IMPRESS

- Measurement and communication of environmental performance of products (Bombardier Transportation, ITT Flygt and IKEA of Sweden)
  - Adaptation of the rail industry DfE method to other industries and implementation of method in one company
  - Prototype software tool supporting transparent calculation and reporting of environmental performance of products in use
- Environmental management at site and group level (SCA Personal Care)
  - Operative indicators for EMS from practical implementation work with the policy controlled environmental management method
  - Quantitative measurement and communication of site performance
- Risk management adapted to REACH (Akzo Nobel, IKEA Group, SCA Tissue Europe)
  - Performed communication of REACH information between concerned CPM companies in practice
  - Practical example of communication between supplier and customer

Methodological results from IMPRESS

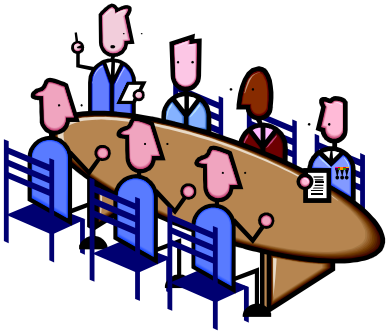
- General integration method report
  - Description of method for integrating industrial environmental information systems
  - Experiences of using the method in case studies (including VIEWS)
- Measurement and communication of environmental performance of products report
  - Experiences from applying the rail industry DfE method in other industry
  - Prototype software tool supporting transparent calculation and reporting of environmental performance of products
- Environmental management at site and group level report
  - Experiences from practical implementation work of a policy controlled environmental management system
- REACH information management report
  - Experiences from case study with communication of REACH information between concerned CPM companies in practice
  - Extensive description of information management requirements in REACH
  - Information management method integrated with existing information systems in companies
- Integrated data model report
  - Description of data model development and documentation of the integrated database format
- Emission trading report
  - ETS data documentation terminology and criteria mapped to ISO/TS 14048
  - Prototype software supporting transparent documentation and reporting of emission trading data
- Local environmental impact report
  - Description of method for adapting impact assessment methods to local conditions
  - Survey of local nature data availability
- Integration of experience and new information report
  - Methodology for practicing knowledge management in environmental information management work
- VIEWS demonstration tool
  - An integrated implementation of previously documented theories and prototypes
- LCA@CPM tool
  - Web-based prototype tool supporting work with LCA according to ISO 14040 series of standards
- IMPRESS Final Report
  - Conclusions and experiences from work with integration of industrial environmental management systems

Rationales for selected material for presenting at BT:

- Information about IMPRESS
- Supply-chain communication
- Eco-efficiency
- Environmental impact assessment
- Scenario modelling for supply, use and EOL
- Increased EPI coverage: product level, social dimension, risk etc.

Applications and methods

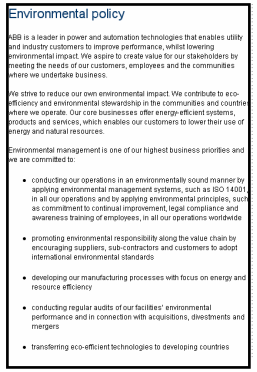
Environmental policy



- In VIEWS, the ”policy” is not only the value basis of the company but also all other policies under which the company is subject:
  - Laws and regulations
  - Market requirements
  - …

Environmental policy

- From the environmental policy, different safe guard areas/impact categories can be identified.
- These safe guard areas/impact categories can be turned into discrete elements, i.e. indicators



Environmental policy

ABB is a leader in power and automation technologies that enables utility and industry customers to improve performance, whilst lowering environmental impact. We aspire to create value for our stakeholders by meeting the needs of our customers, employees and the communities where we undertake business.

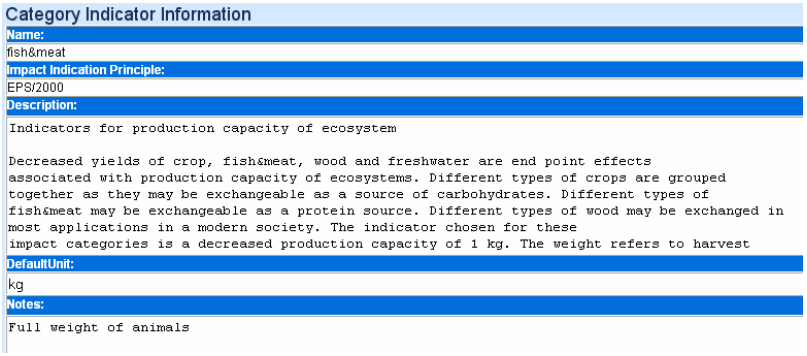
We strive to reduce our own environmental impact. We contribute to eco-efficiency and environmental stewardship in the communities and countries where we operate. Our core businesses offer energy-efficient systems, products and services, which enables our customers to lower their use of energy and natural resources.

Environmental management is one of our highest business priorities and we are committed to:

- conducting our operations in an environmentally sound manner by applying environmental management systems, such as ISO 14001, in all our operations and by applying environmental principles, such as commitment to continual improvement, legal compliance and awareness training of employees, in all our operations worldwide
- promoting environmental responsibility along the value chain by encouraging suppliers, sub-contractors and customers to adopt international environmental standards
- developing our manufacturing processes with focus on energy and resource efficiency
- conducting regular audits of our facilities' environmental performance and in connection with acquisitions, divestments and mergers
- transferring eco-efficient technologies to developing countries

Policy

Discrete meaning of issue in policy, i.e. safe guard areas/impact categories



Category Indicator Information

Name:
fish&meat

Impact Indication Principle:
EPS/2000

Description:
Indicators for production capacity of ecosystem

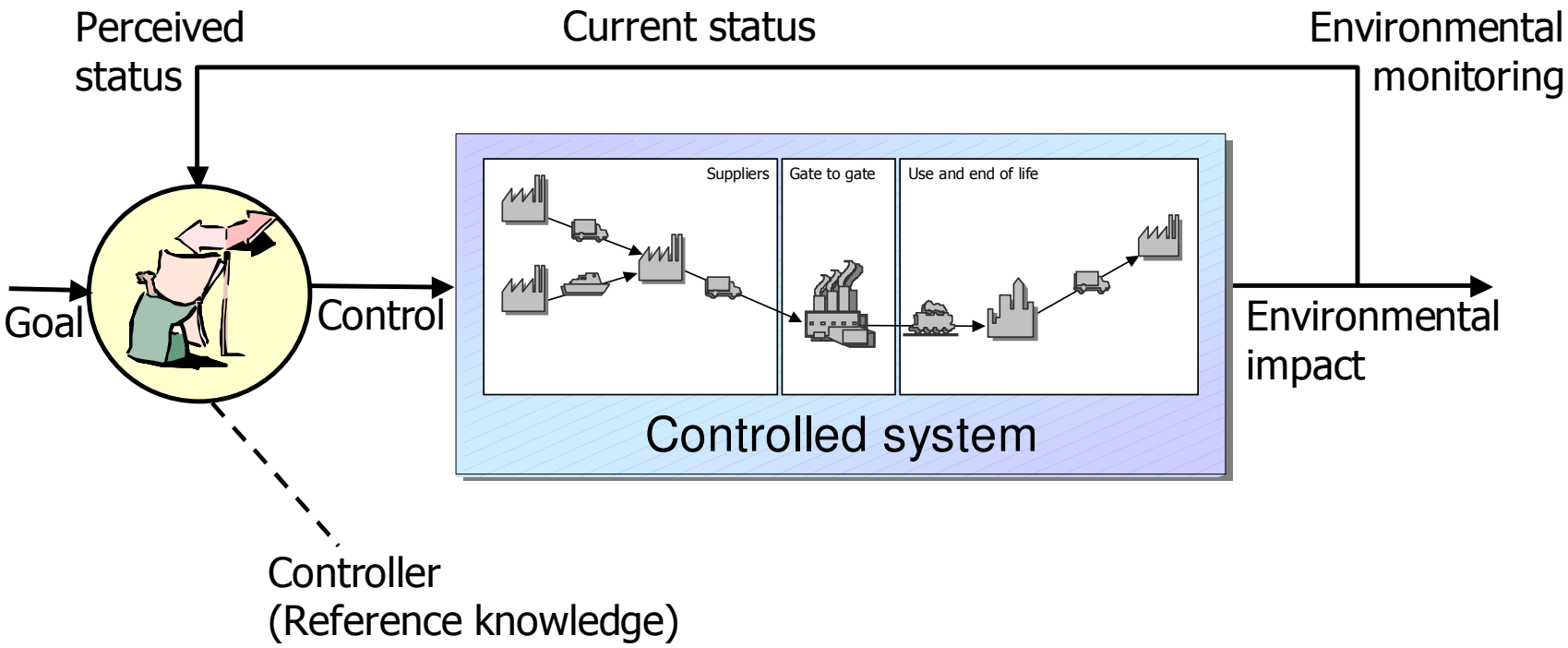
Decreased yields of crop, fish&meat, wood and freshwater are end point effects associated with production capacity of ecosystems. Different types of crops are grouped together as they may be exchangeable as a source of carbohydrates. Different types of fish&meat may be exchangeable as a protein source. Different types of wood may be exchanged in most applications in a modern society. The indicator chosen for these impact categories is a decreased production capacity of 1 kg. The weight refers to harvest

DefaultUnit:
kg

Notes:
Full weight of animals

Definition of indicator

Environmental control



Controllability

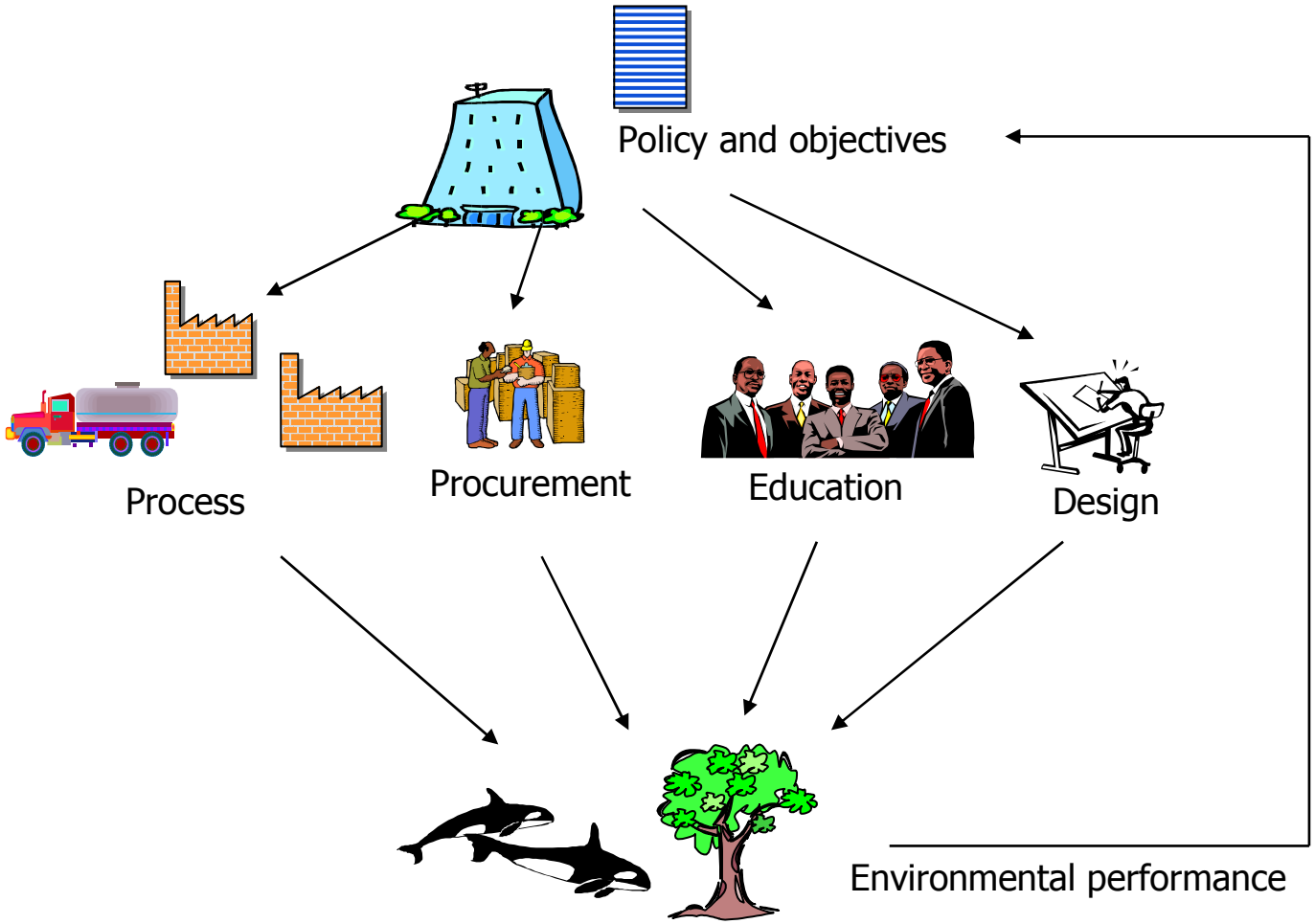
The policy…

…controls…

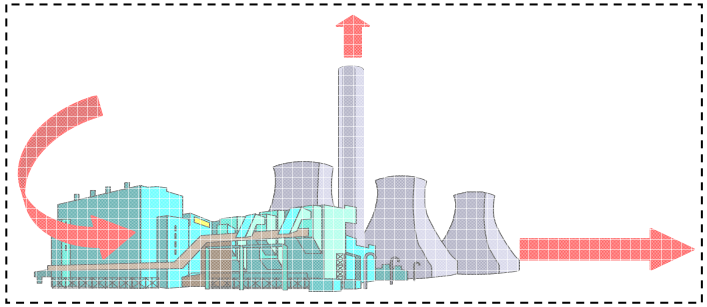
…aspects…

…that have impact on…

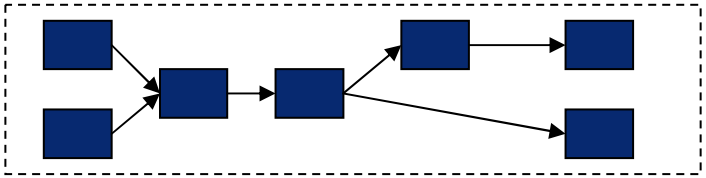
…indicators



Process

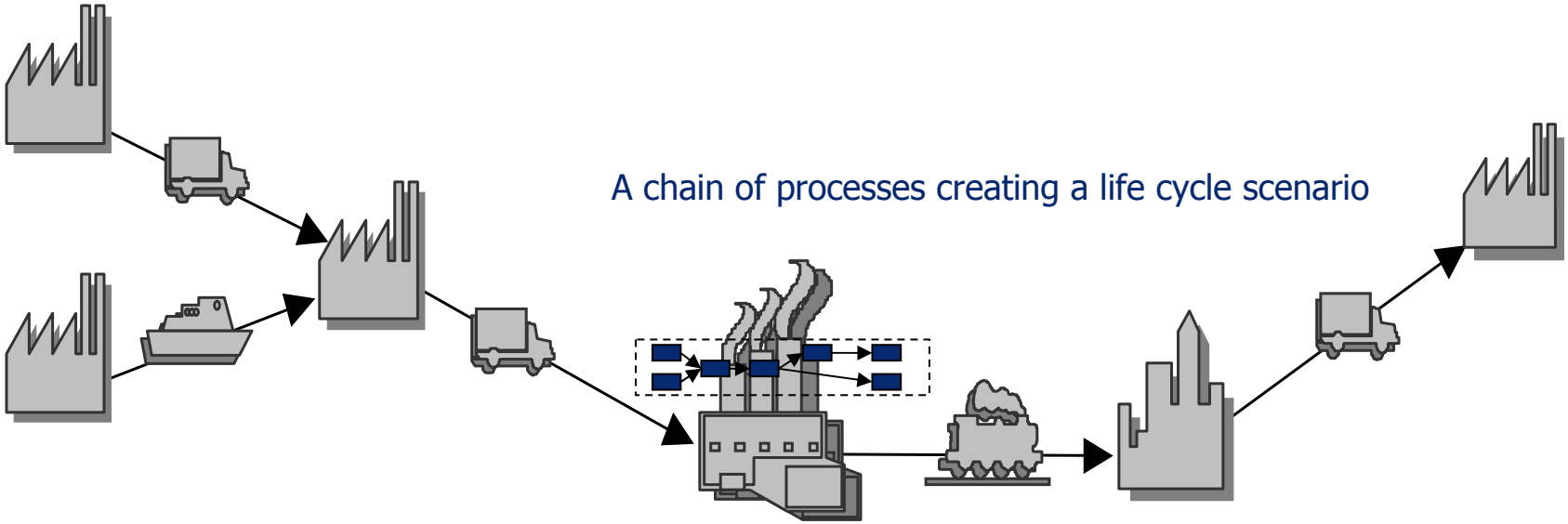


Result from conceptual process analysis



Pictures from the REPID project

A chain of processes creating a life cycle scenario



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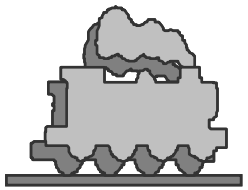
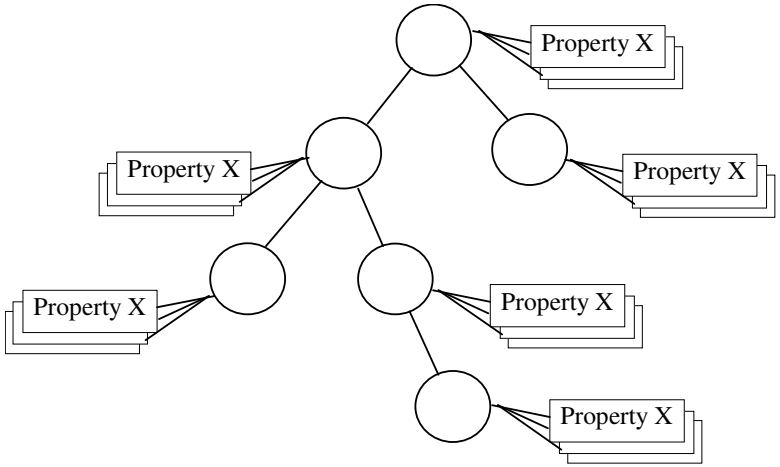
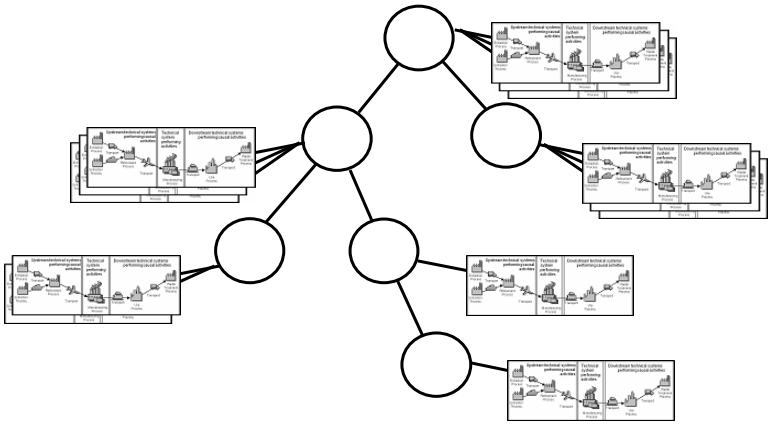
Product



Conceptual component structure:



Each material can be described in terms of its life cycle:



Pictures from: Carlson R., Framework for structuring information for environmental management of industrial systems, 2006

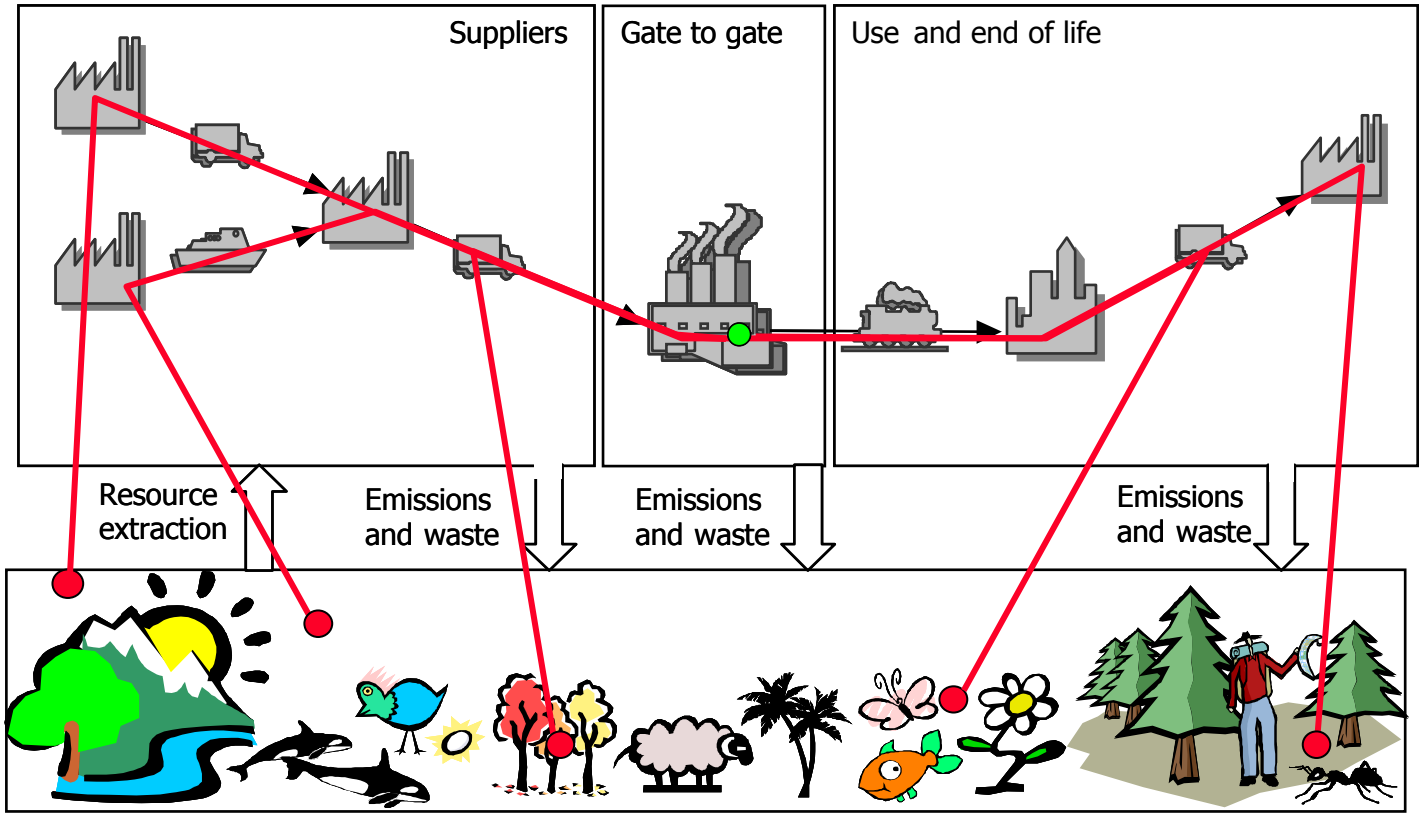
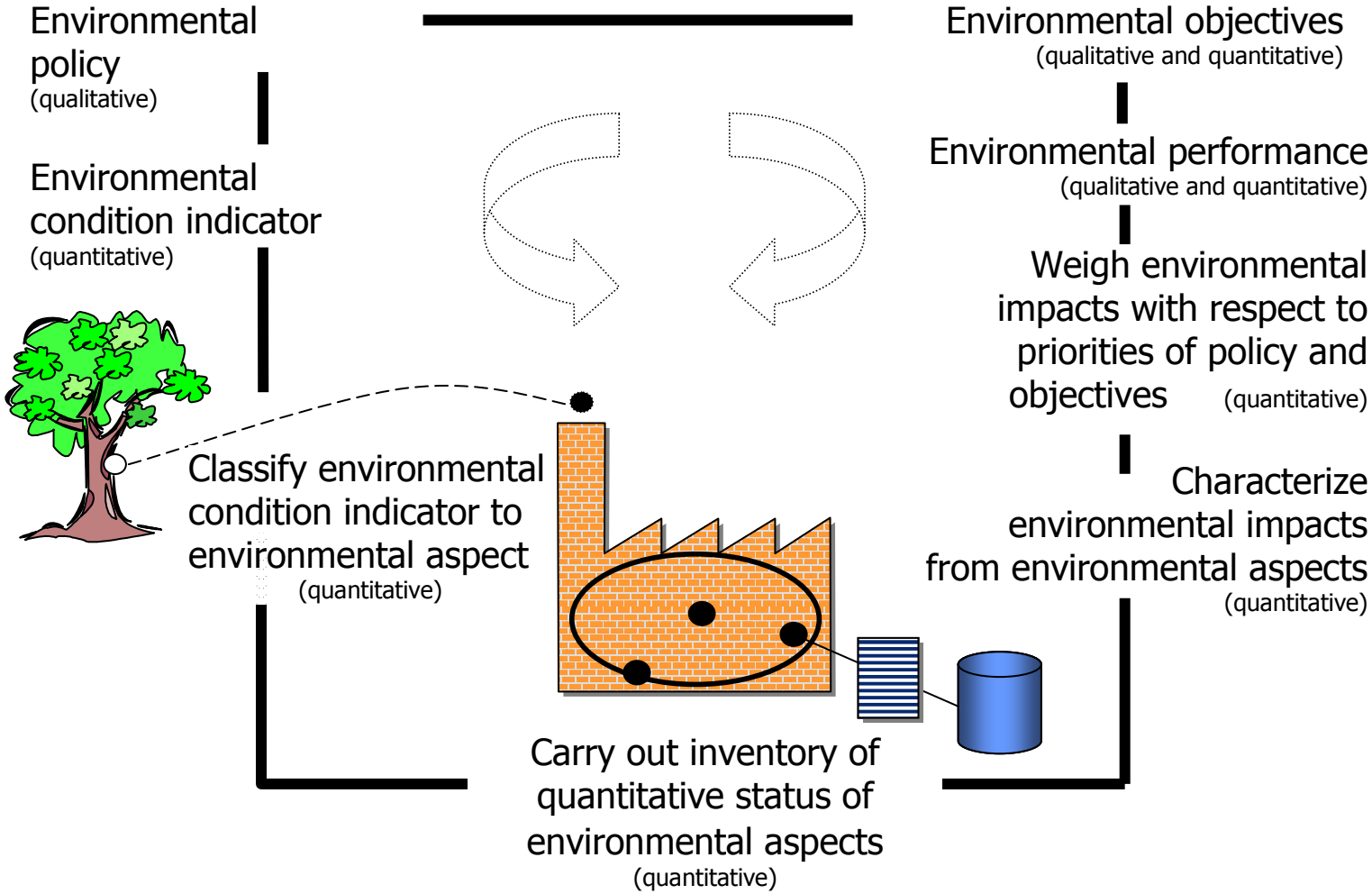
Life cycle indicators

- Design indicators (EPIs)

E.g. "Can be material recycled"

- Nature indicators (ECIs)

E.g. "Biodiversity"



Policy controlled environmental management work