Life cycle assessment of MD 110

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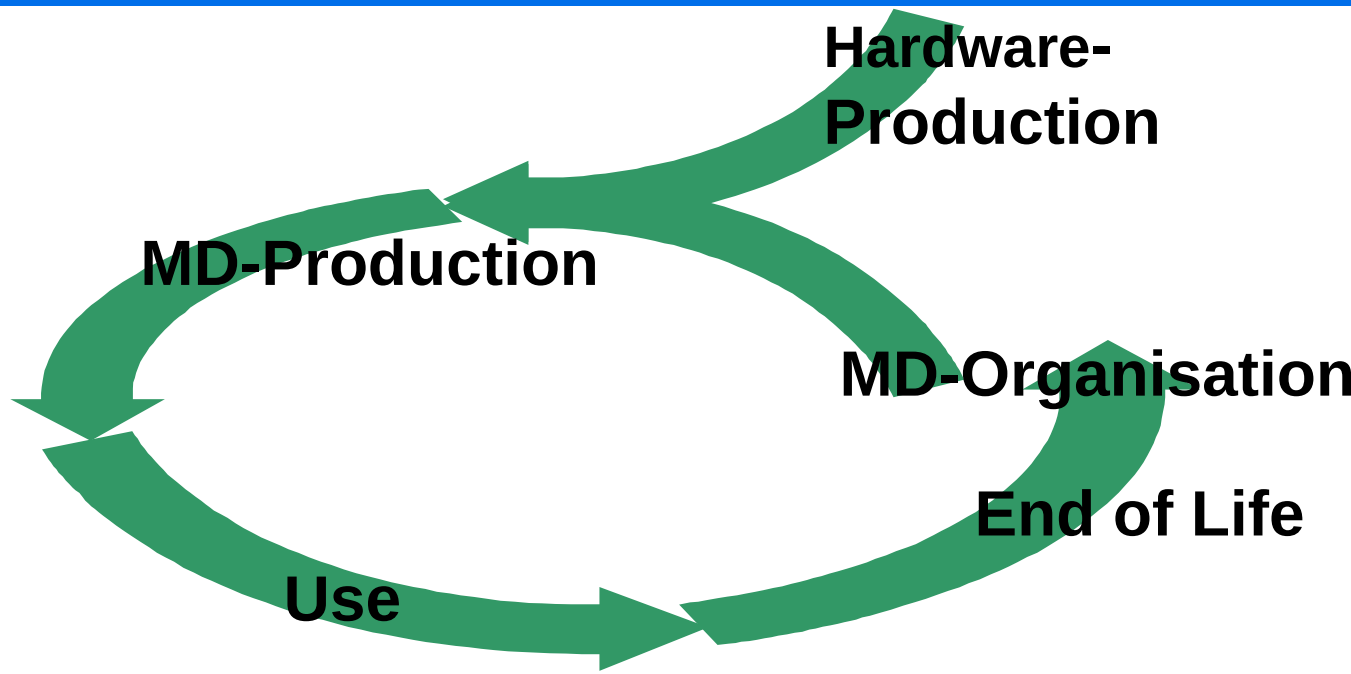

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- Purpose at project start:
  - The BC10 50% reduction of the total environmental impact compared with the BC8 release.
  - This should be quantified and verified with LCA
    - The project should practically use LCA within the product development of the MD110 system.
- Expected outcome at project start:
  - 50% environmental impact reduction for BC10

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- **Items predicted using EPS indices:**
- **Materials**

  - the MD110 BC10 system has to be fully material declared

  - establish a ”collecting-take-back-system” for used MD-goods

  - Not use banned and restricted materials from the Ericsson lists

- Power consumption

  – Digital telephones: reduce with an average factor of 50% using power down at night.

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Changed project goals

– The project goal “Factor-2”, (where the environmental impact between BC8 and BC10 should be halved), was cancelled for the project.

Why?

None of the nececcary measures were adopted.

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- New project goal and purpose

Goal: compare the potential environmental impacts associated with an old (BC 8) and a new model (BC 10) of MD110

Purpose: to learn, test and evaluate the LCA-methodology as a tool for environmental improvement in the product design process and

to collect data from suppliers and other sources in order to build up a database for this and future LCA activities

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Project quality goal

- The study should meet the requirements of the standards ISO 14040, ISO14041 and the draft standard ISO/DIS 14042 from the International Organization for Standardization, ISO

- A 3:rd party reviewer, according to the ISO14040 standards, should be an integrated part of the project

- **Questions and discussions, examples:**
- The usefulness of the study for Enterprise Systems and LME ?
  - The use within Enterprise Systems, examples:
    - Give the actual environmental aspects in the implementation of the Environmental Management System, ISO 14001, at Enterprise Systems
    - Guidelines for the Design
  - The use for Ericsson, example:
    - A large, quality reviewed and useful LCA inventory database (material declarations and LCI models for components)

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SPINE documented LCI models for electronics

SPINE@CPM Data Tool - [Activity/Flow Meta Data]

File Data sets View Help

O:'ECOP468' | O:'Capacitor for surface mounting assembly ' | A:'ECOP3223' | AT:'Undefined' | F:'N'

Direction	FlowType	Substance	Quantity	Min	Max	SDev	Unit	Environment	Geography
Input	Energy	Electricity	99.49				Wh	Technosphe	
Input	Energy	Natural gas	10.37				Wh	Technosphe	
Input	Raw	Ag	0.1				g	Technosphe	
Input	Raw	Butyl acetate	0.079				g	Technosphe	
Input	Raw	Ceramic	1.18				g	Technosphe	
Input	Raw	Dibutyl phthalate	0.072				g	Technosphe	
Input	Raw	ethyl acetate	0.79				g	Technosphe	
Input	Raw	Methoxypropanol	0.11				g	Technosphe	
Input	Raw	Naphtha	0.086				g	Technosphe	
Input	Raw	Ni	0.0064				g	Technosphe	
Input	Raw	Pd	0.0057				g	Technosphe	
Input	Raw	Polyacrylate	0.025				g	Technosphe	
Input	Raw	Sn	0.0093				g	Technosphe	
Input	Raw	Solvent	0.032				g	Technosphe	
Output	Emission	Barium Titanate	0.000358				g	Air	
Output	Emission	Butyl acetate	0.043				g	Air	
Output	Emission	CO2	3.57				g	Air	
Output	Emission	ethyl acetate	0.5				g	Air	
Output	Emission	Methoxypropanol	0.1				g	Air	
Output	Emission	Naphtha	0.0072				g	Air	
Output	Emission	Ceramic	0.00036				g	Technosphe	
Output	Product	Capacitor for	1				g	Technosphe	
Output	Waste	Ceramic	0.32				g	Technosphe	
Output	Waste	Hazardous	1.54				g	Technosphe	
Output	Waste	Solvent	0.61				g	Technosphe	

QMetaData
(•) General ( ) Specific

DateConceived: 1998

DataType: Derived, unspecified

Method: The data that are presented are calculated based on information

Represents:

LitteratureRef: One answer on the Ericsson

Notes: In the flow metadata for specific flows CM stands for component

Reload page | Save Page

Database:'C:\Ericsson000315_medAndringar.mdb' | Database ID:'' | DataTool ID Active:'EBCANRE'

Start | Exploring... | Inbox - M... | Microsoft... | Microsoft... | Ta vara ... | NYHET.... | SPINE... | 1:35 PM

Compared with all other activites in a company, what makes environmental activities special?

Nothing.

As usual, it is all about adapting to changing requirements and making better business.

In this process, life cycle assessment (LCA) is a tool to quantify environmental impacts.

How can LCA be used?

- Internally: quantify what is important and what is not within your product and organisation systems
- Externally: business relations, market communication

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Main conclusions of the project:

- The environmental impacts for BC10 is approximately 10-15% lower than for BC8.
- The electricity consumption during use dominates, thereafter the total production of the hardware.
- The environmental impacts reliably assessed (acidification, global warming and nutrification) primarily refer to energy consumption.

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Preliminary main design conclusions:

- For similar MD systems platforms:

focus electricity consumption

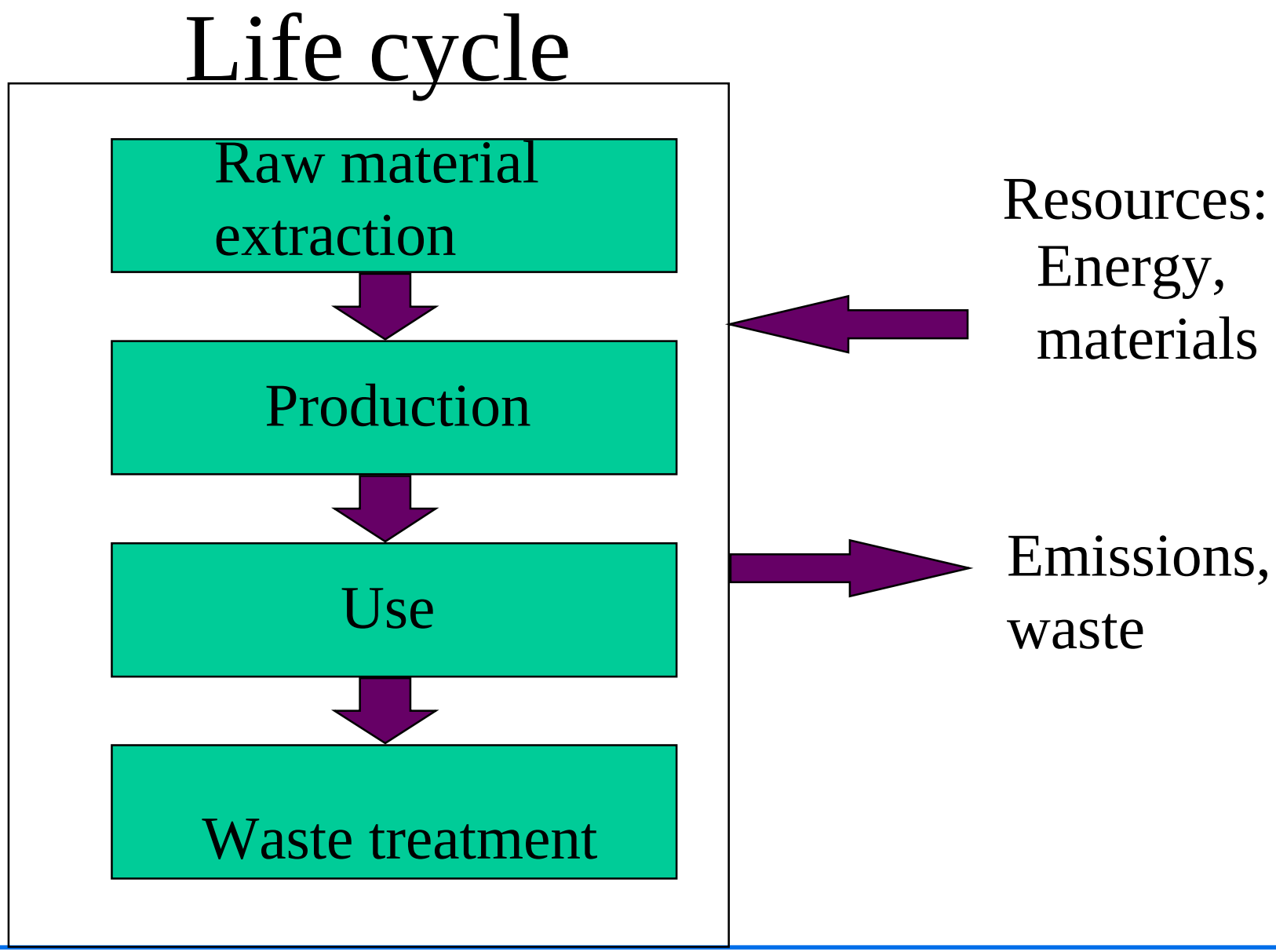
For future systems:

Take environmental aspects into account early in design process (largest potential for improvement)

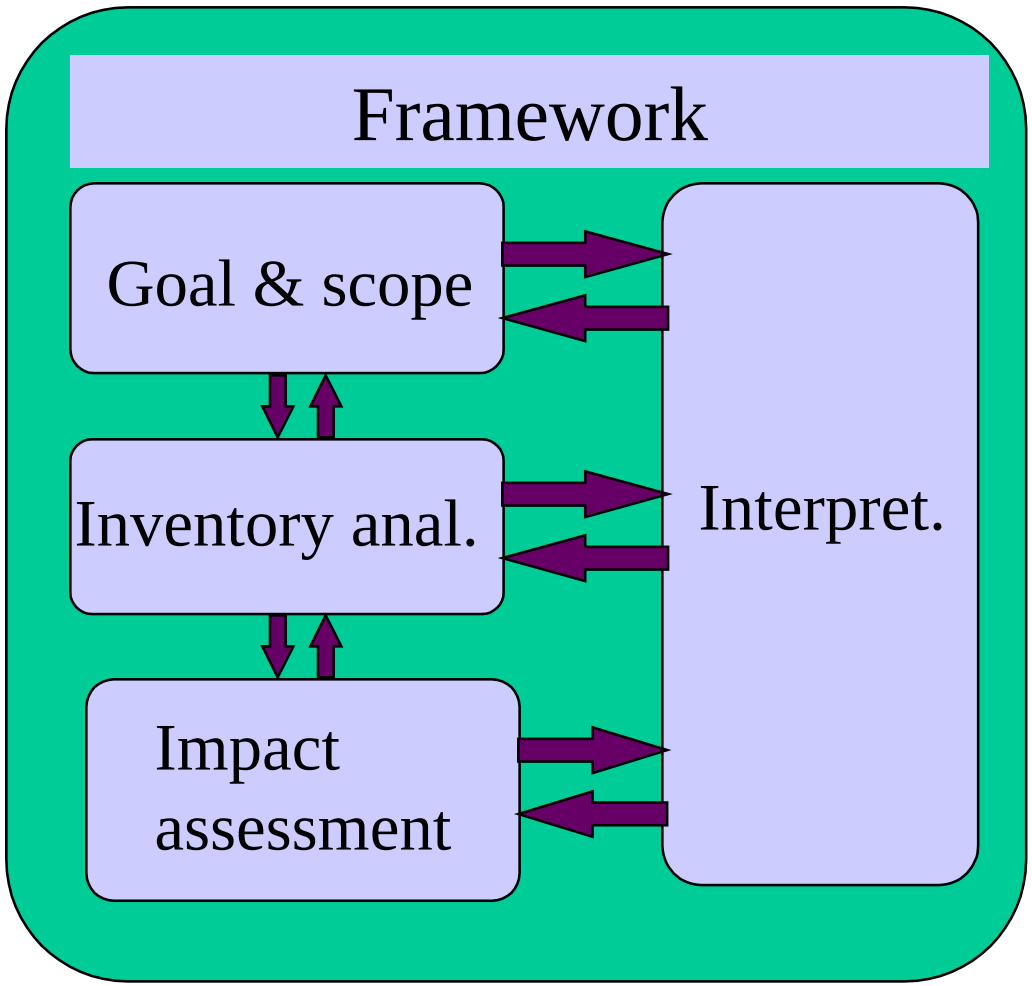
Preliminary main conclusions of the project

- The quality goals were fulfilled (ISO standards, including critical review of comparative assessment and data quality).
- A large database has been built up.
- Future work much faster and cheaper.

- **The product design process at Enterprise Systems:**
  - Requirement Collection & Analysis
  - Solution Definition
  - Product Management & Development
  - Solution Validation
  - Solution Introduction


Life cycle
Raw material extraction
Production
Use
Waste treatment
Resources: Energy, materials
Emissions, waste

Life cycle assessment (ISO 14040)



1. Goal and scope definition

- Overall goal: BC10 compared to BC8?
- Definition of systems to study…
- Functional unit: calculate per extension line (15 years)
- System modelling

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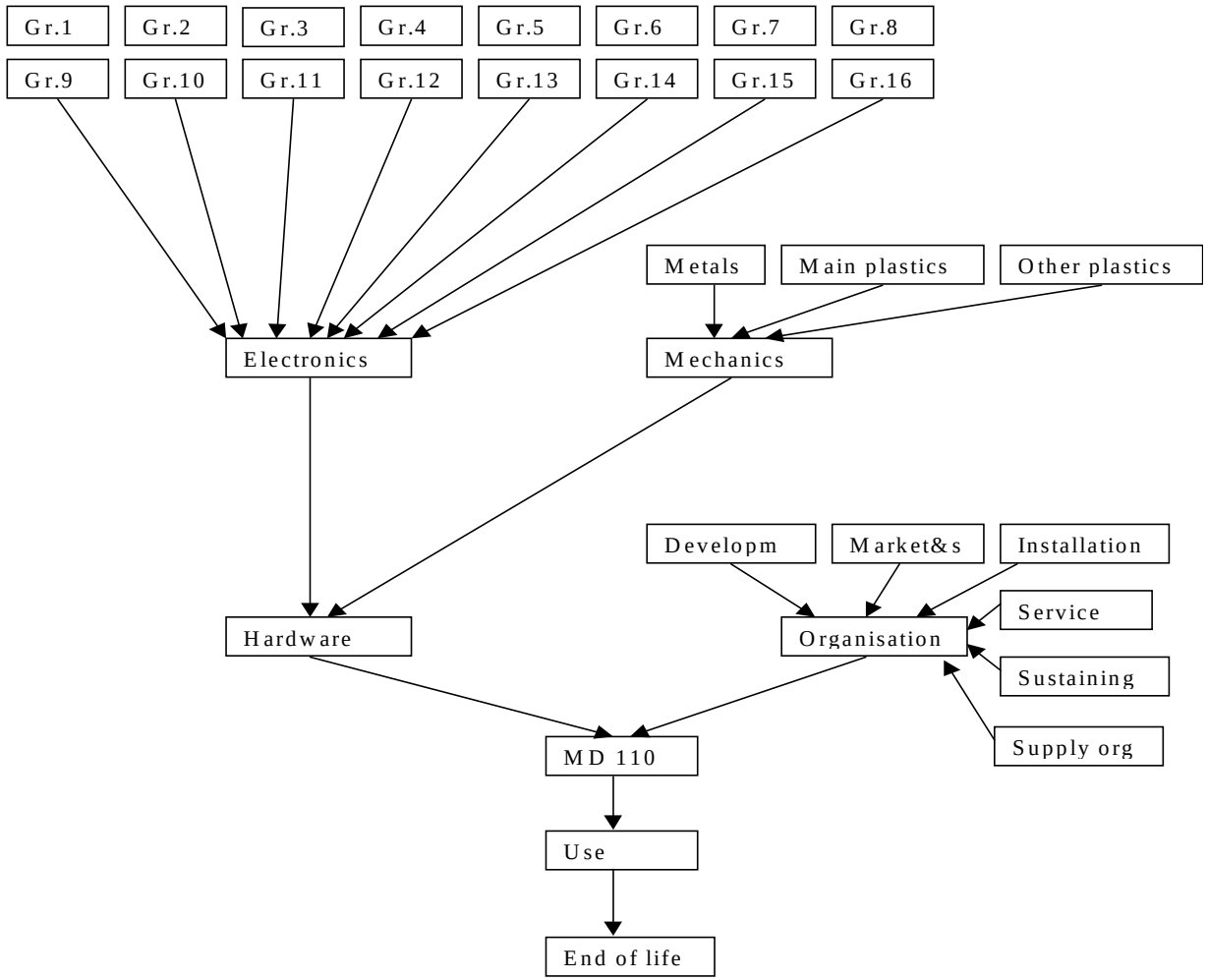

Figure 5.2. Schematic structure of the modelling of PBX system MD 110. Transports are included in the model, but not in the figure. Electronic components are divided in 16 groups: 1.Display units and indicators, 2.Diodes, 3.Microcircuits, oscillators, quartz crystal units and delay lines, 4. Transistors and opto couplers, 5. Connectors and holders, 6. Cables, 7. Relays, 8. Transformers and inductors, 9. Potentiometers, 10. Resistors, varistors and thermistors ; Hole

BC8 and BC10 Low end systems (320 extensions)

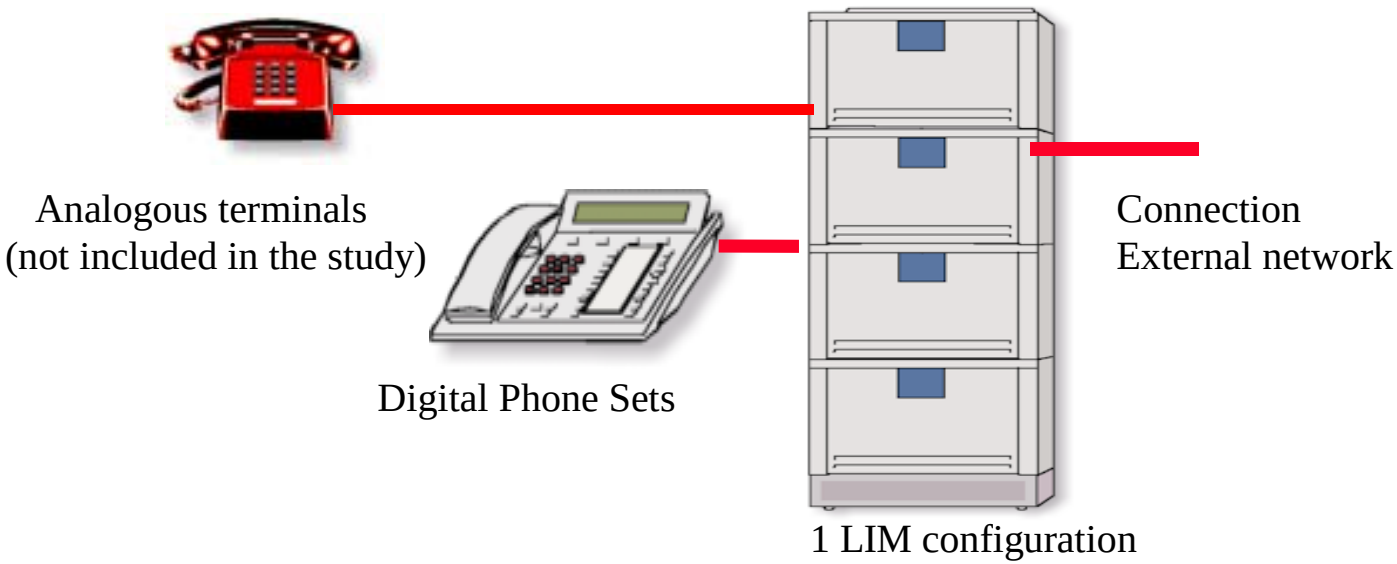

Figure 5.2. A typical configuration both for BC8L and BC10L, called system no.1 and system no. 2 in the study. Analogous terminals are not delivered by Ericsson and therefore not included in the study.

BC8 High end system (1510 extensions)

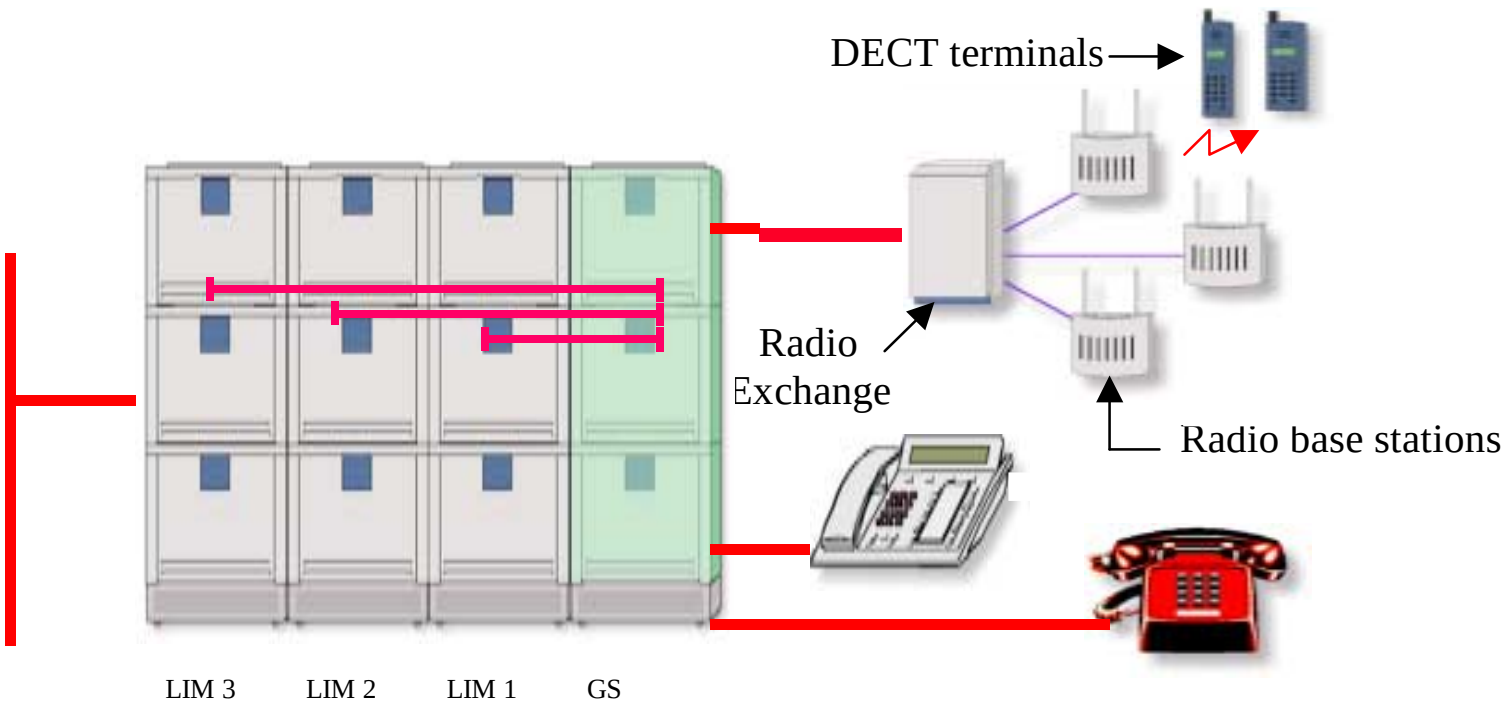

Figure 5.3. Typical BC8H configuration, called system no.3 in the study. Analogous terminals are not delivered by Ericsson and therefore not included in the study.

BC10 High end system (1510 extensions)

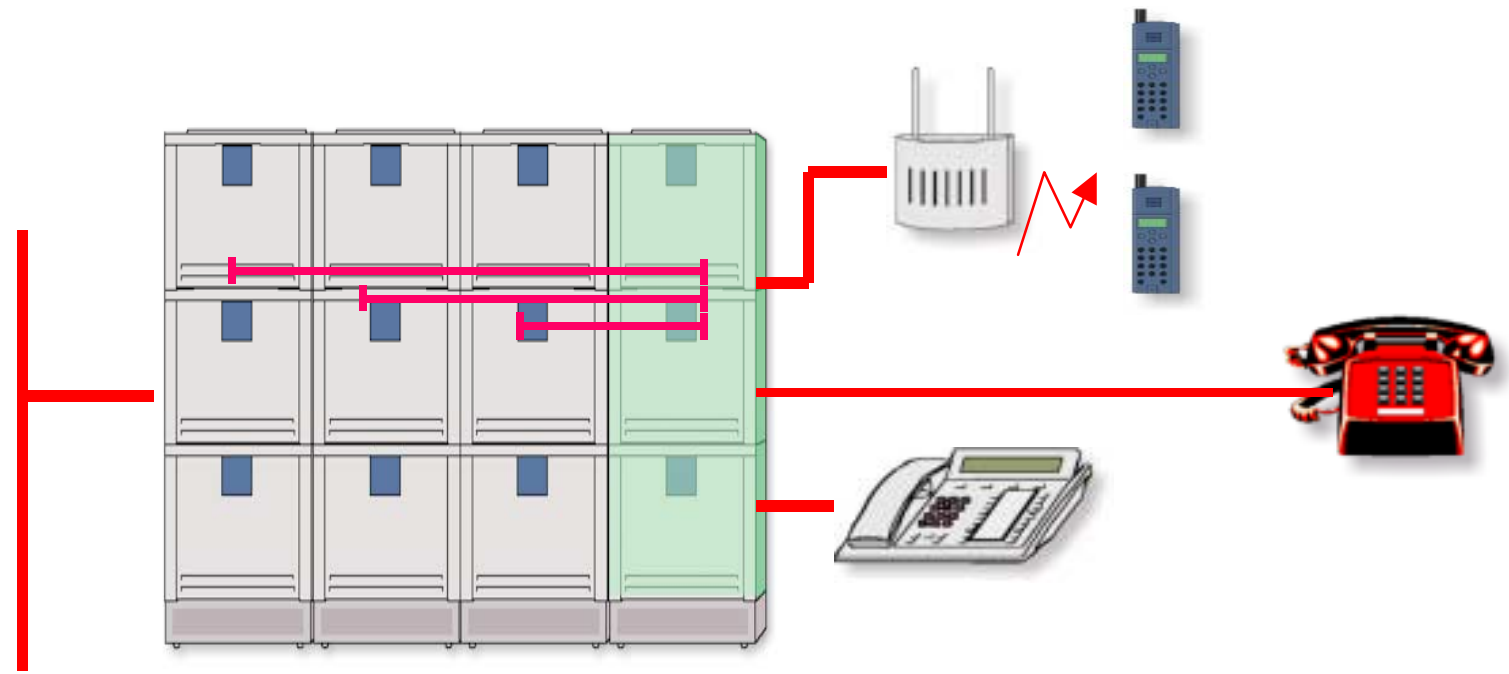

Figure 5.4. Typical BC10H configuration, called system no.4 in the study. Analogous terminals are not delivered by Ericsson and therefore not included in the study.

2. Inventory

- Collect data on resources used and emissions for each activity in the life cycle (each ”box” in the large process tree)

- add the resurces and the emissions for the whole life cycle…(900 parameters!)

Data collection - The inventory

- How gather significant data?
- Data collection is very time consuming
- Sources
- Production, Use, EoL (waste treatment) and Organization

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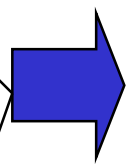
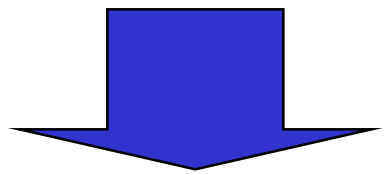
Data collection - Sources

- Literature studies
- Databases
- Reports
- On-site measurements
- Records
- Personnel estimates



Calculations



Storage in LCA software tool Ecolab

Data collection - Production of MD110

- Assembly in Karlskrona
  - on-site measurements and Flextronics environmental report combined with calculations.
- Component production
  - Preferred high volume suppliers (classed as 1 in ELIZA!) were asked to fill in a life cycle inventory questionnaire. Personal contacts helped to collect data.
- Raw material production
  - CIT database

Data collection - Organization

- Organization
  - Ericsson environmental report and data from Nacka Strands Real Estate Management
  - personal estimates and calculations
  - personal contacts with different business segments within Ericsson

Data collection - Use

- Together with MD110 system experts energy consuming parts identified
- Technical specifications --> power consumption figures
- The total figure was checked for reasonableness with experts

Data collection - End Of Life

- Energy: CIT database
- Transports: detailed analyze (atlases, estimations and CIT db)
- Smelter process: specific data
- Raw materials: CIT db

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Material inventory

- Thesis about MD110, BC8, 320 ext. contributed to the material declaration work
- Many components stored in ECOLAB
- Reproduced thesis method
- Component engineers part of the process
- Each component material declared - a strength!

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Material inventory

- 2455 different ABC-products (components on the lowest PRIM-level) constitute the parts lists for the four MD110-versions
- Condensed to 1200 different material declarations ---> type declarations
- Type declarations mostly applicable to electronics (e.g. capsules)

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substance	category	impactmedia	unit	8L	8H	10L	10H
1-Metoxy-2-propanolacetat	Emission	Air	g	5,14E-01	6,82E-01	5,06E-01	6,05E-01
2'-deoxyinosine-5'-diphosphate (DIDP)	Emission	Air	g	1,66E-03	1,92E-03	1,65E-03	1,36E-03
Acetaldehyde	Emission	Air	g	4,36E-05	4,68E-05	4,09E-05	4,42E-05
Acetic Acid (64-19-7)	Emission	Air	g	1,96E-03	2,26E-03	2,21E-03	2,51E-03
Acetone	Emission	Air	g	1,97E+00	4,79E+00	2,05E+00	4,74E+00
Acetylene	Emission	Air	g	9,26E-03	9,23E-03	8,78E-03	8,80E-03
Acid as H+	Emission	Air	g	3,45E-03	6,36E-03	3,35E-03	7,10E-03
Acids	Emission	Air	g	4,44E-01	1,14E+00	4,60E-01	1,10E+00
Ag	Emission	Air	g	8,37E-05	1,16E-04	6,96E-05	1,15E-04
Al	Emission	Air	g	7,80E-07	6,58E-07	3,10E-07	3,47E-07
Aldehydes	Emission	Air	kg	1,00E-05	8,93E-06	9,45E-06	8,62E-06
Alkanes	Emission	Air	g	4,26E-02	4,65E-02	4,00E-02	4,19E-02
Alkenes	Emission	Air	g	1,07E-02	1,09E-02	1,02E-02	1,03E-02
alpha-Chloroacetophenone (532-27-4)	Emission	Air	g	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Ar (g)	Emission	Air	g	1,62E+01	4,10E+01	1,67E+01	3,97E+01
Aromates (C9-C10)	Emission	Air	g	2,43E-02	2,69E-02	2,14E-02	2,58E-02
Aromatic VOC	Emission	Air	g	2,50E-01	2,63E-01	2,47E-01	2,49E-01
As	Emission	Air	g	3,14E-02	2,56E-02	3,04E-02	2,57E-02
Ashes	Emission	Air	g	1,90E-01	2,48E-01	1,90E-01	2,73E-01
B	Emission	Air	g	1,18E+00	1,27E+00	1,01E+00	1,25E+00
Barium Titanate (12047-27-7)	Emission	Air	g	5,60E-04	1,12E-03	6,89E-04	1,61E-03
Be	Emission	Air	g	9,83E-05	9,79E-05	9,47E-05	9,50E-05
Benzene	Emission	Air	g	2,25E-01	2,58E-01	2,01E-01	2,46E-01
Benzo(a)pyrene	Emission	Air	g	9,37E-06	1,04E-05	8,47E-06	1,02E-05
Bi	Emission	Air	g	1,71E-08	4,04E-08	1,41E-08	3,71E-08
BOD	Emission	Air	g	4,35E-03	7,37E-03	4,35E-03	1,03E-02
BOD5	Emission	Air	g	1,13E-07	9,53E-08	4,49E-08	5,03E-08
Butane	Emission	Air	g	2,53E-02	2,55E-02	2,44E-02	2,44E-02
Butyl acetate (123-86-4)	Emission	Air	g	1,85E-01	2,69E-01	2,15E-01	3,44E-01
C2F6	Emission	Air	g	2,00E-03	2,04E-03	1,39E-03	1,30E-03
Ca	Emission	Air	g	1,70E-03	2,16E-03	1,66E-03	1,81E-03
Ca2+	Emission	Air	g	6,32E-04	4,94E-04	6,21E-04	1,98E-04
Carbonic acid (463-79-6)	Emission	Air	g	1,47E-02	7,19E-03	8,38E-03	5,70E-03
Cd	Emission	Air	g	4,22E-03	4,60E-03	3,88E-03	4,27E-03
CF4	Emission	Air	g	1,80E-02	1,84E-02	1,25E-02	1,17E-02
CFC/HCFC	Emission	Air	g	1,17E-03	1,43E-03	1,12E-03	1,37E-03
CH4	Emission	Air	g	3,49E+02	3,81E+02	3,04E+02	3,71E+02
Chemicals, non-toxic	Emission	Air	g	1,74E-02	2,30E-02	1,71E-02	2,05E-02
Chemiclas, toxic	Emission	Air	g	7,89E-07	1,05E-06	7,77E-07	9,32E-07
Chlorinated organics	Emission	Air	g	3,51E-04	8,63E-05	1,87E-04	7,84E-05
Chlorinated VOC	Emission	Air	g	3,27E-02	2,45E-02	3,26E-02	2,15E-02
Cl-	Emission	Air	g	4,55E-04	4,75E-04	5,17E-04	2,91E-04
Cl2	Emission	Air	g	1,03E-03	1,29E-03	9,94E-04	1,22E-03
CN-	Emission	Air	g	2,19E-03	2,62E-03	1,93E-03	2,46E-03
Co	Emission	Air	g	7,67E-01	7,69E-01	6,66E-01	6,72E-01
CO	Emission	Air	g	1,71E+02	1,82E+02	1,52E+02	1,73E+02
CO2	Emission	Air	g	1,44E+05	1,57E+05	1,26E+05	1,51E+05
CO2 (bio)	Emission	Air	g	1,58E+01	3,10E+01	1,57E+01	3,38E+01

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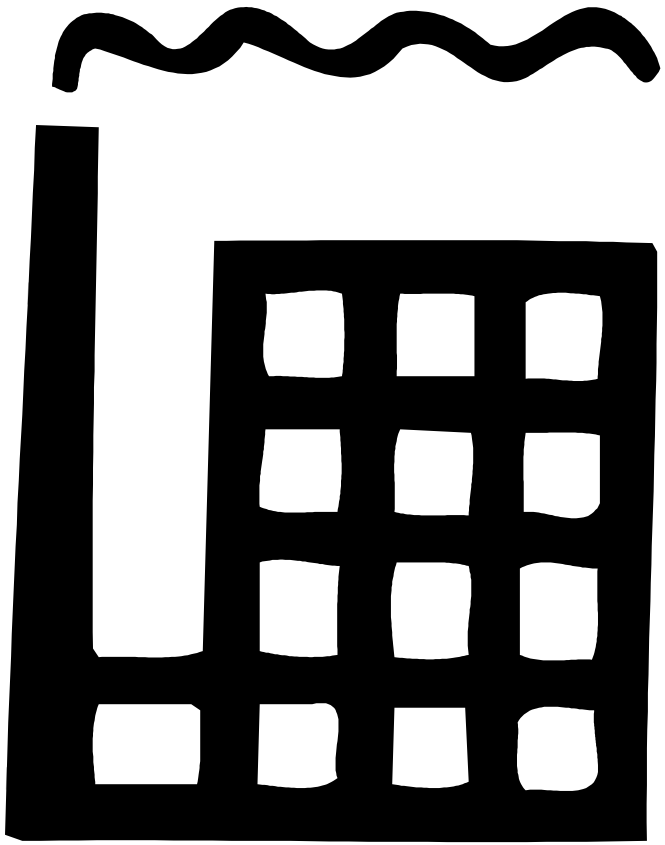
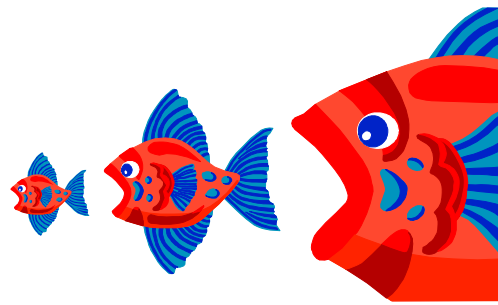
3. Impact assessment



CH4
CO2
SO2
NOx

- Global warming
- Acidification
- Nutriphication
- Resource depletion
- Smog formation
- Human toxicity
- Eco-toxicity

} Difficult!



4. Interpretation:which preliminary conclusions can be drawn?