

# Calculating the Ecological Footprint of a Data Centre to Identify Hot-Spots of Energy and Resource use

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## Basic Data



## Ecological Footprint for IT

### *Project duration:*

EcoFIT 1: Sept. 2008 – Mai 2009

EcoFIT 2: Jan. 2010 – Oct. 2011

### *Client and Partner:*

Siemens IT Solutions and Services GmbH

(As of July 1st, 2011 Siemens IT Solutions and Services is an Atos business)



### *Project Partner:*

Wolfgang Pekny, footprint-consult

STANTIS

THE NEWSPAPER  
SAYS THEY MAY  
STOP DELIVERING  
LETTERS ON  
SATURDAY.

WHAT'S  
A LETTER?

WHAT'S A  
NEWSPAPER?



## Challenge

- constant **growth** of IT sector
- increasing **energy consumption**
  - wrong user behavior
  - life time of equipment is shortening
- **high potential of saving resources**
  - substitution of non IT services
  - reduction of energy consumption of IT services

The goal is to provide :



**resource efficient IT services**

→ creation of a data centre with

low energy and resource use

Ecological Footprint according to GFN (2006)

### **secondary data**

ecoinvent V 2.2 (2010)

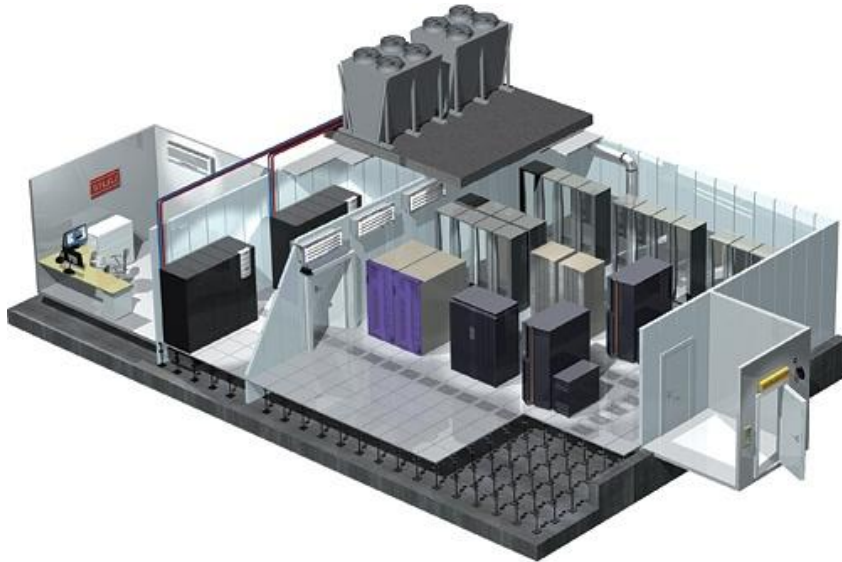
Adaption of data: deduction of part “nuclear”  
(methodological changes from 2005 to 2006)

### **primary data**

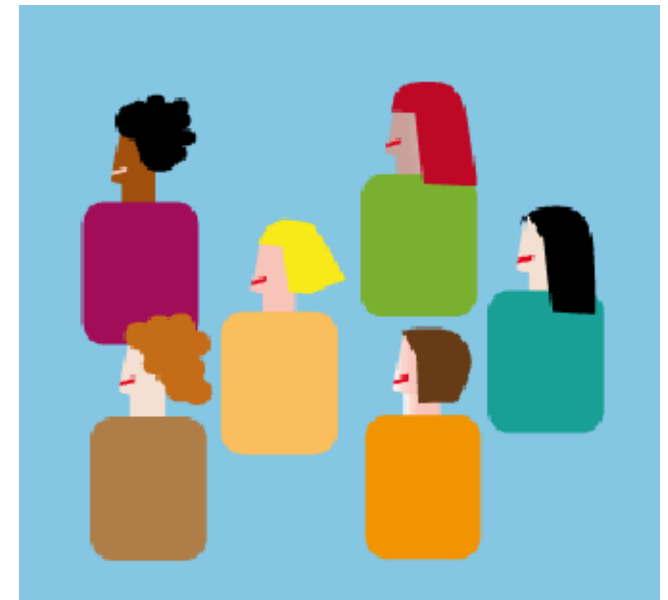
collected from the engineers of Atos  
(at that time Siemens IT Solutions and  
Services)

## Data Centre

(with about 800 physical server units)



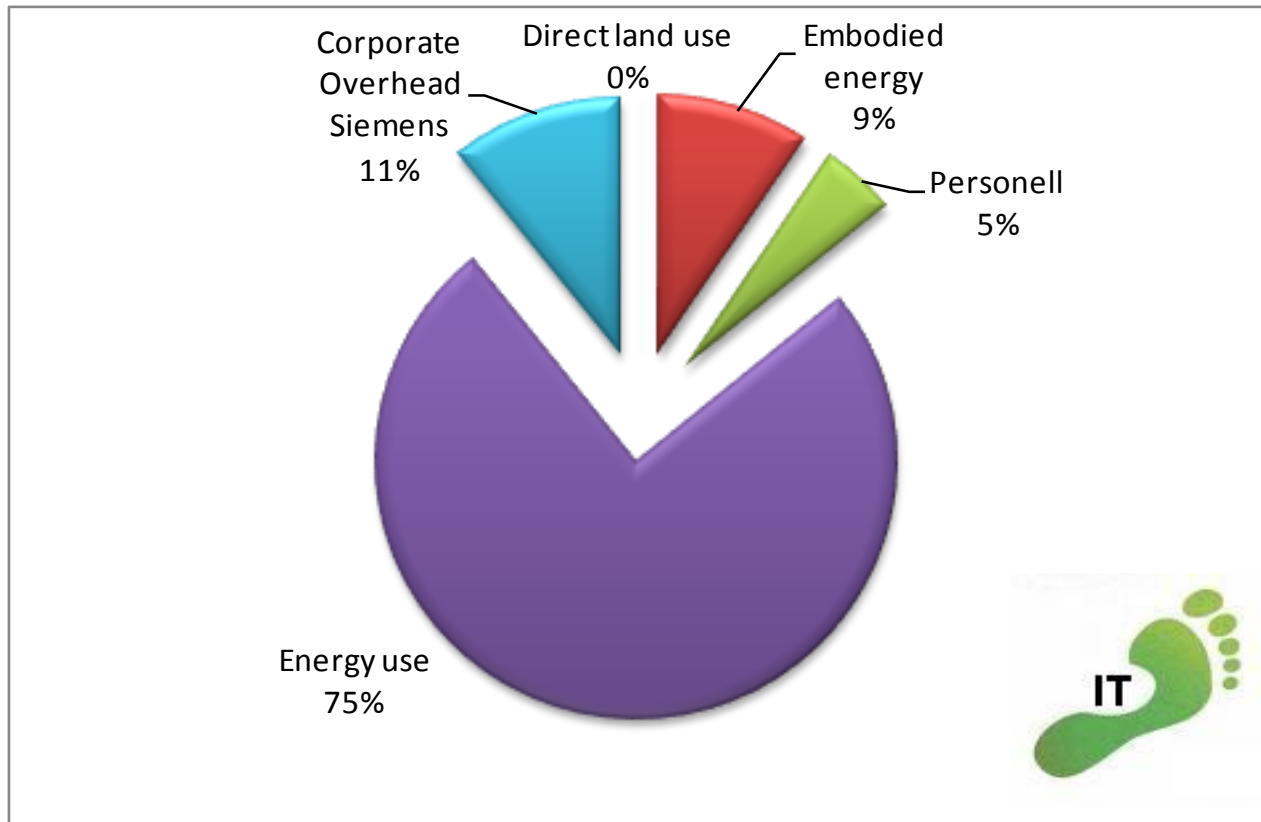
## 650 Austrians



**A data centre has the Ecological Footprint of about 650 Austrians.**  
(4,9 gha/person/year)

<b>Overview of assessed areas</b>			
	<b>Direct Energy Use</b>	<b>Embodied Energy</b>	<b>Direct Land Use</b>
<b>Data Center</b>	IT- and non-IT Equipment	IT- and non-IT Equipment	Yes
<b>Employees' Workplace</b>	IT Equipment	IT Equipment	Yes
<b>Infrastructure</b>	Non-IT Equipment	Non-IT Equipment, Building	Proportionally to Data Center
<b>Headquarter Siemens</b>			
<b>Nutrition behaviour of the employees and the employees' commute to the workplace</b>			

# Composition of Result



Ecological Footprint IT	gha/a	Anteil am EF
Direct land use	0,53	0,02%
Embodied energy	300	9,40%
Personell	151	4,73%
Energy use	2399	75,14%
Corporate Overhead Siemens	342	10,72%
<b>Gesamt EF IT</b>	<b>3193</b>	<b>100,00%</b>



## Direct Energy Use

### ... of IT Equipment

seperated into:

- **Computer room**
  - Servers, storages, backups, archives, IT components (switches, router, etc)
- **Support staff offices**
- **Operations room**
  - IT workplaces (computers, printers, IT network components, telecommunication devices)

### ... of non-IT Equipment

Cooling generation and circulation, UPS, security and safety devices, lightning

Composing of an specific **energy mix model**


## **... of IT Equipment**

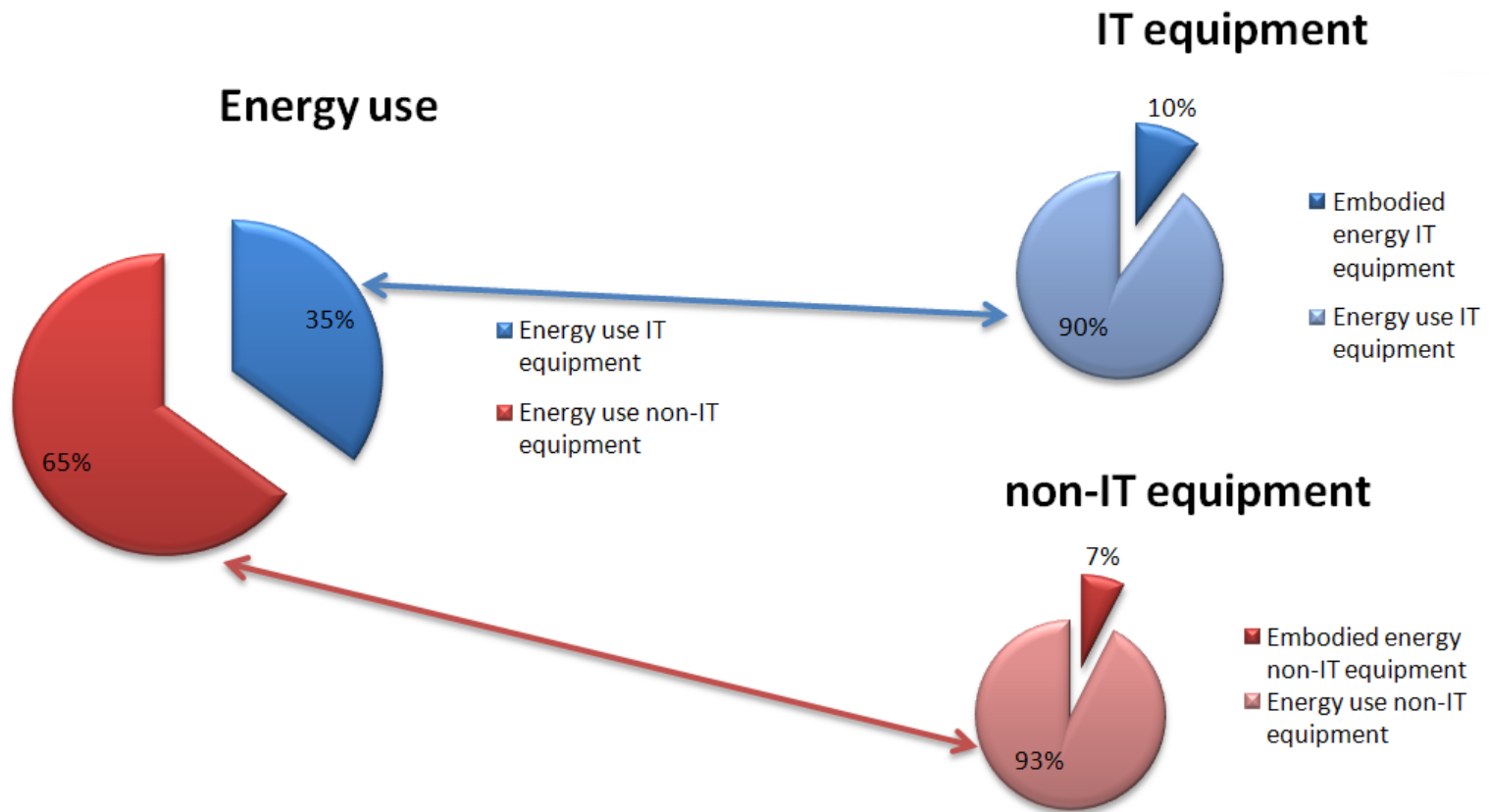
- **Data centre**
  - No reliable data available
  - Tool developed with technicians
  - Material, weight, usage time, replacement time, 5 years depreciation,
- **Employee's workplaces**
  - Computer, notebooks, monitors, printers (ecoinvent, Fraunhofer Institute)

## **.... of non-IT Equipment**

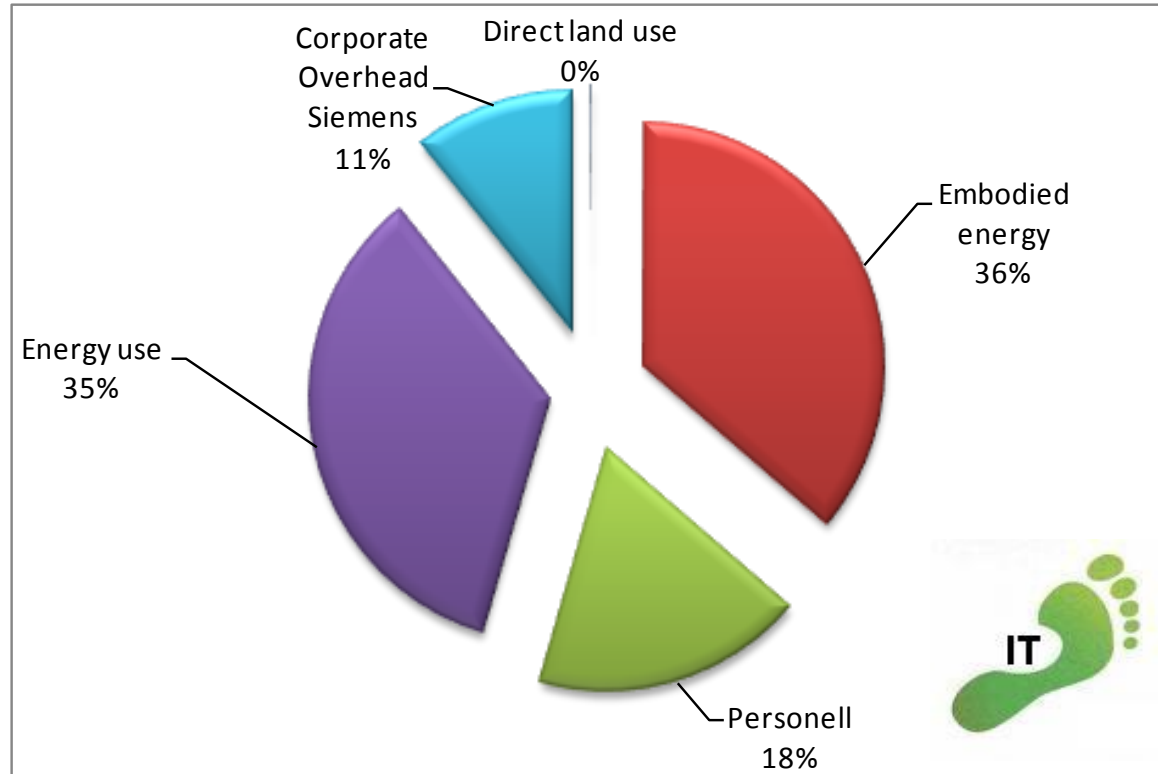
- Air-conditioning system (ecoinvent)
- No data on heating system and UPS
- Building materials (ecoinvent)

# Result: Energy Use

Energy use	IT  gha
Energy use IT equipment	840
Energy use non-IT equipment	1560
<b>Energy use Total</b>	<b>2399</b>



# Scenario: Certified Green Electricity



Ecological Footprint IT	gha/a	Anteil am EF
Direct land use	0,53	0,06%
Embodied energy	300	36,18%
Personell	151	22,67%
Energy use	288	34,74%
Corporate Overhead Siemens	89	11,24%
<b>Gesamt EF IT</b>	<b>829</b>	<b>100,00%</b>

## ... nutrition behaviour

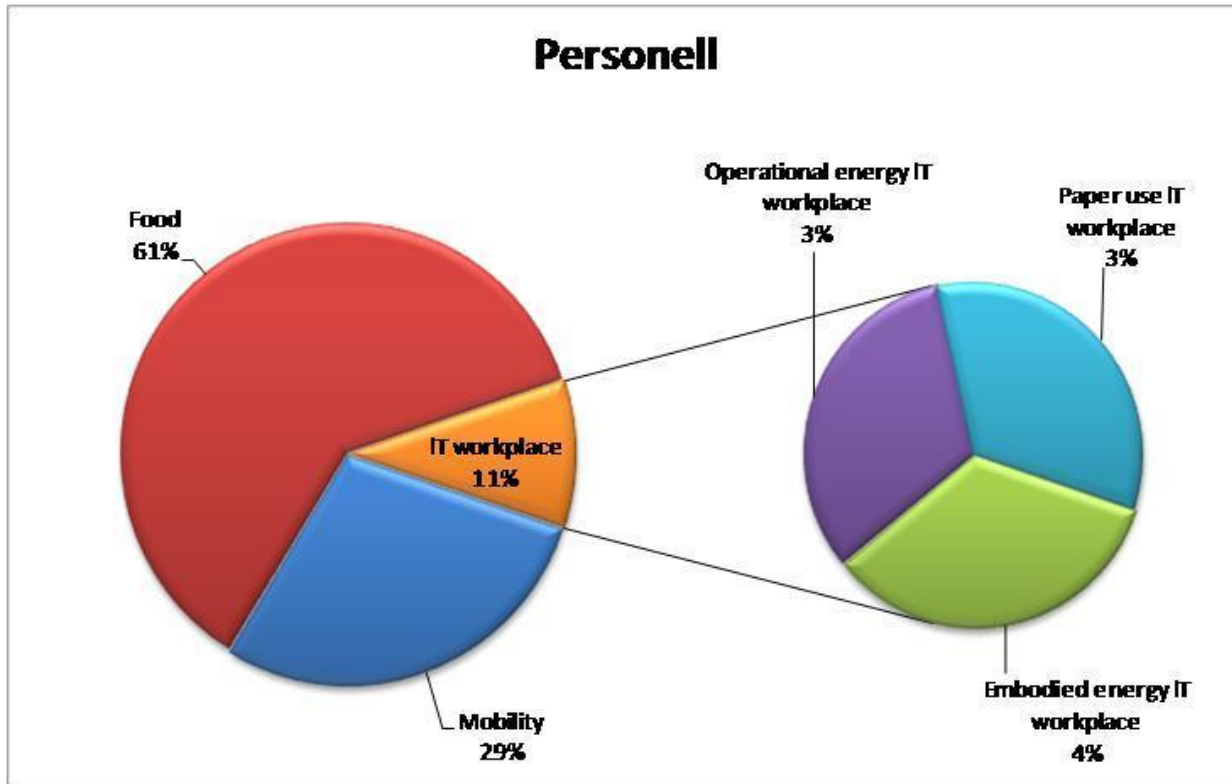
- Tool to identify nutrition behaviour
- 1/3 accounted to work life

## ... commute

- Tool to identify travel to work

→ For employee specific recommendations

# Result: Personell



Personell	gha
Mobility	43
Food	92
Embodied energy IT workplace	5,31
Operational energy IT workplace	5,08
Paper use IT workplace	5,27
Sum me Personell	151

## Further Research required

- Actual measurement of energy consumption of **non IT equipment**  
(not based on nominal power)
- Embodied energy of **IT and non IT Equipment**  
with up-to-date producer data
- Allocation of **Internet Footprint** to a data centre
- Allocation to **service units** (one IT service)  
→ To be compared to non IT processes (flights, postal services...)

Thank you!

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