

Life cycle assessment of the mobile communication system UMTS

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Partners

- Motorola  **MOTOROLA**
- Swisscom 
- Deutsche Telekom 
- ESU-services

Funding

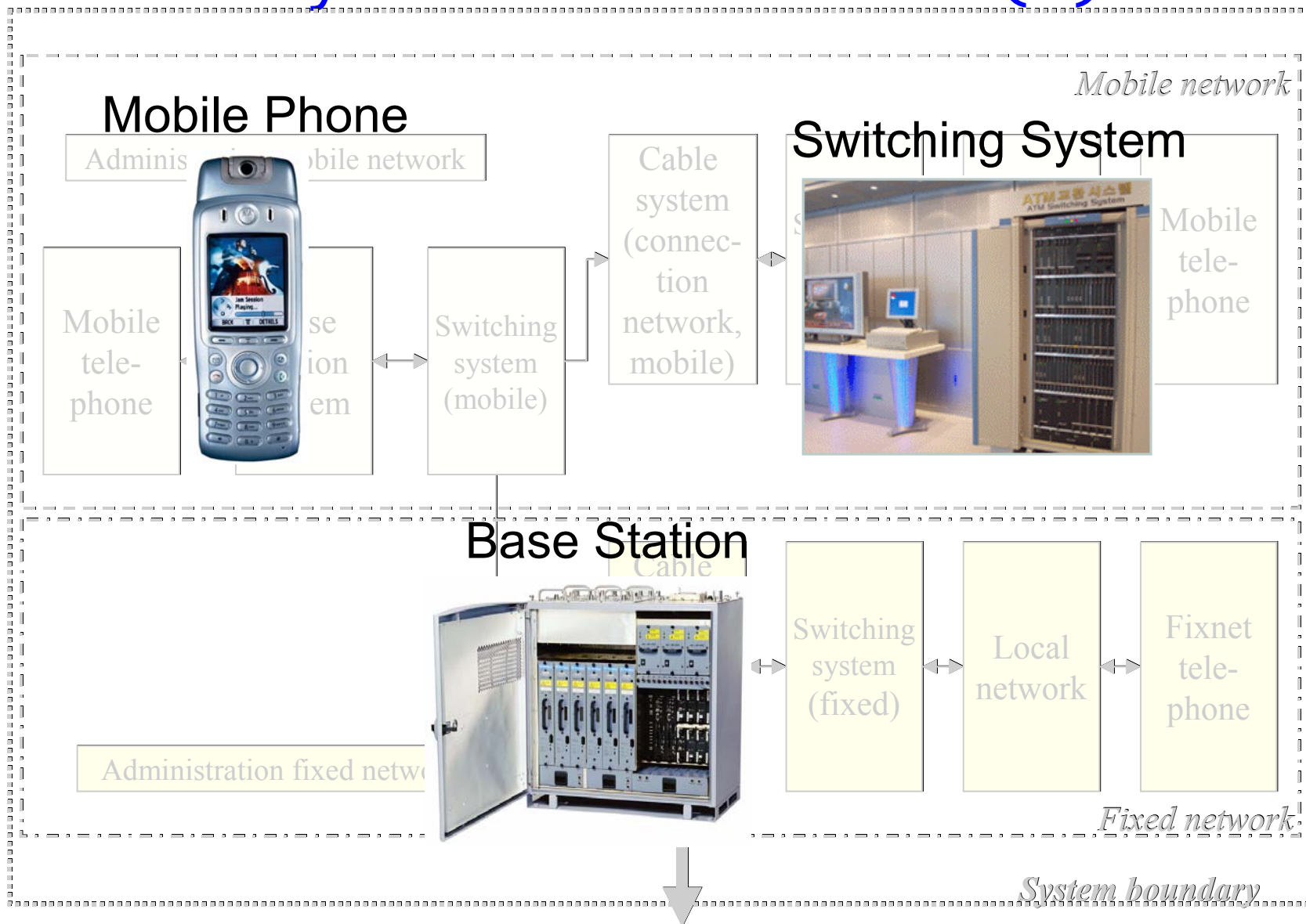
Research foundation on
mobile communication



Goal of the study

- Environmental assessment of the UMTS mobile communication system in Switzerland
- Basis for further improvements of the system and its components
- Life cycle approach

System definition (1)



System definition (2)

- Functional units:
 - 1 Gbit (= 1'000'000 kbit) data transfer
 - data transfer per client
- 1Gbit = 30 hours talktime
- Equivalence of calls and data packages needed for standardisation
- Basis: average transmission rate of data packages and calls, average use of the UMTS

Specific data for UMTS network elements

- Mobile phone, base station (manufacturing and operation): Motorola
- Fixed network (material composition): Deutsche Telekom
- Network build-up and operation: Swisscom
- Electronic components: Motorola, env. reports
- Precious metals: env. reports, literature

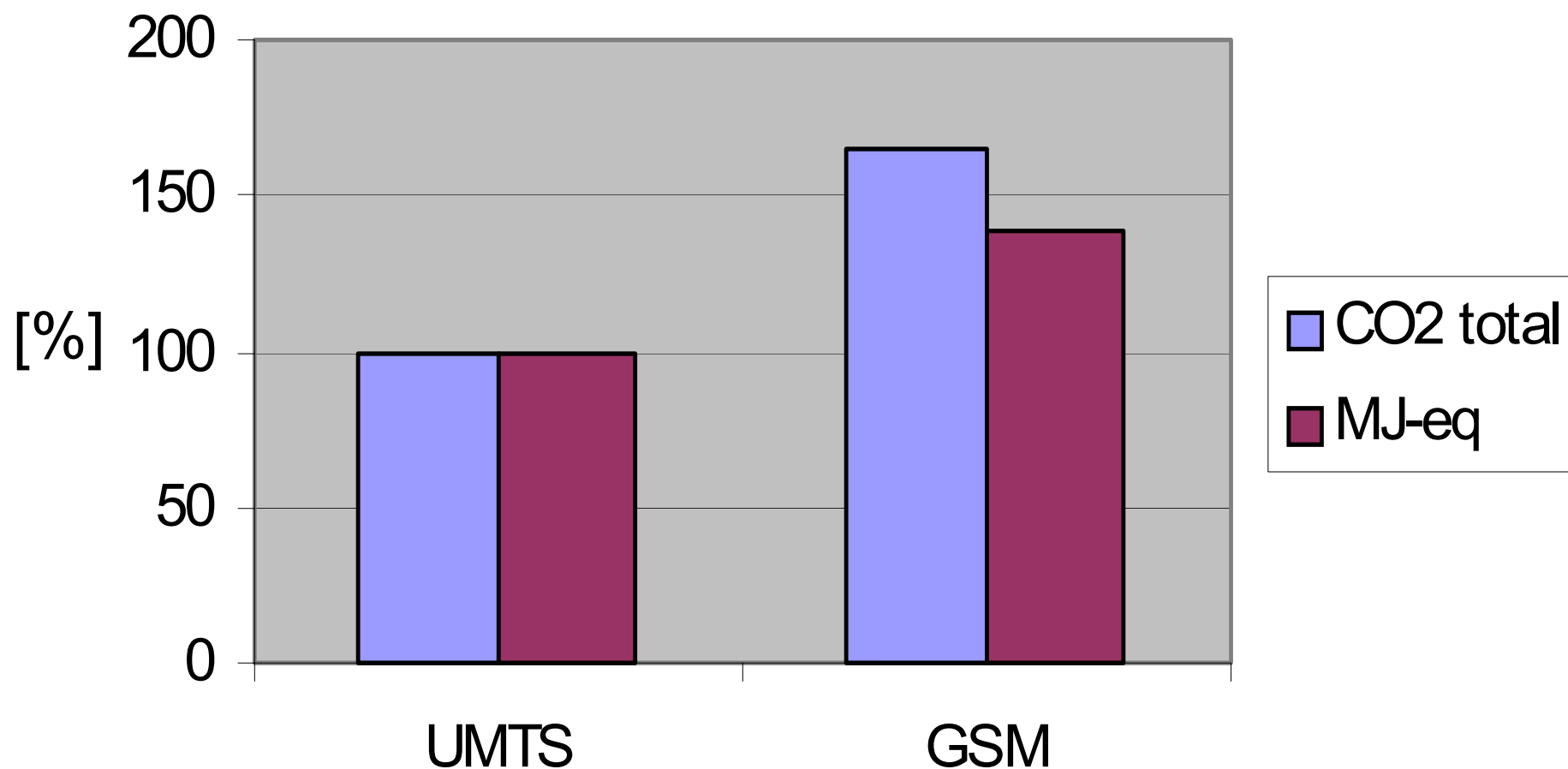
Life cycle inventory results

	Resources	Emissions		
	Cu [kg]	CO ₂ [kg]	SO _x [kg]	Zn (in water) [g]
Mobile to Mobile	0.07	25	0.14	0.2
Mobile to Fixed	0.12	20	0.12	0.1

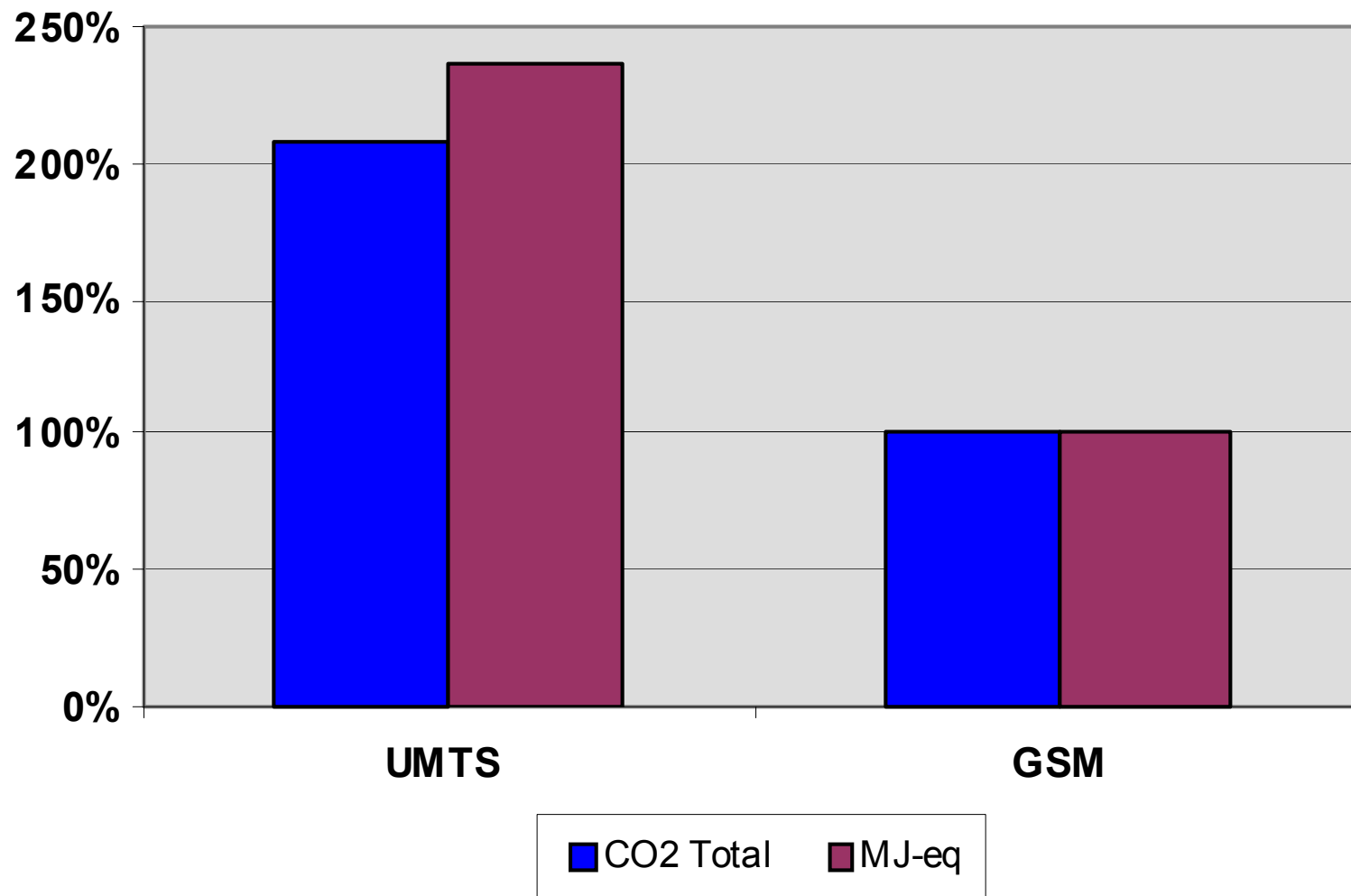
1 Gbit UMTS communication vs. driving a car

km car / Gbit	Cumulative energy demand	Greenhouse effect 100a 2001	EI'99 (H,A)- points
Mobile to Mobile	180	80	60
Mobile to Fixed	140	60	60

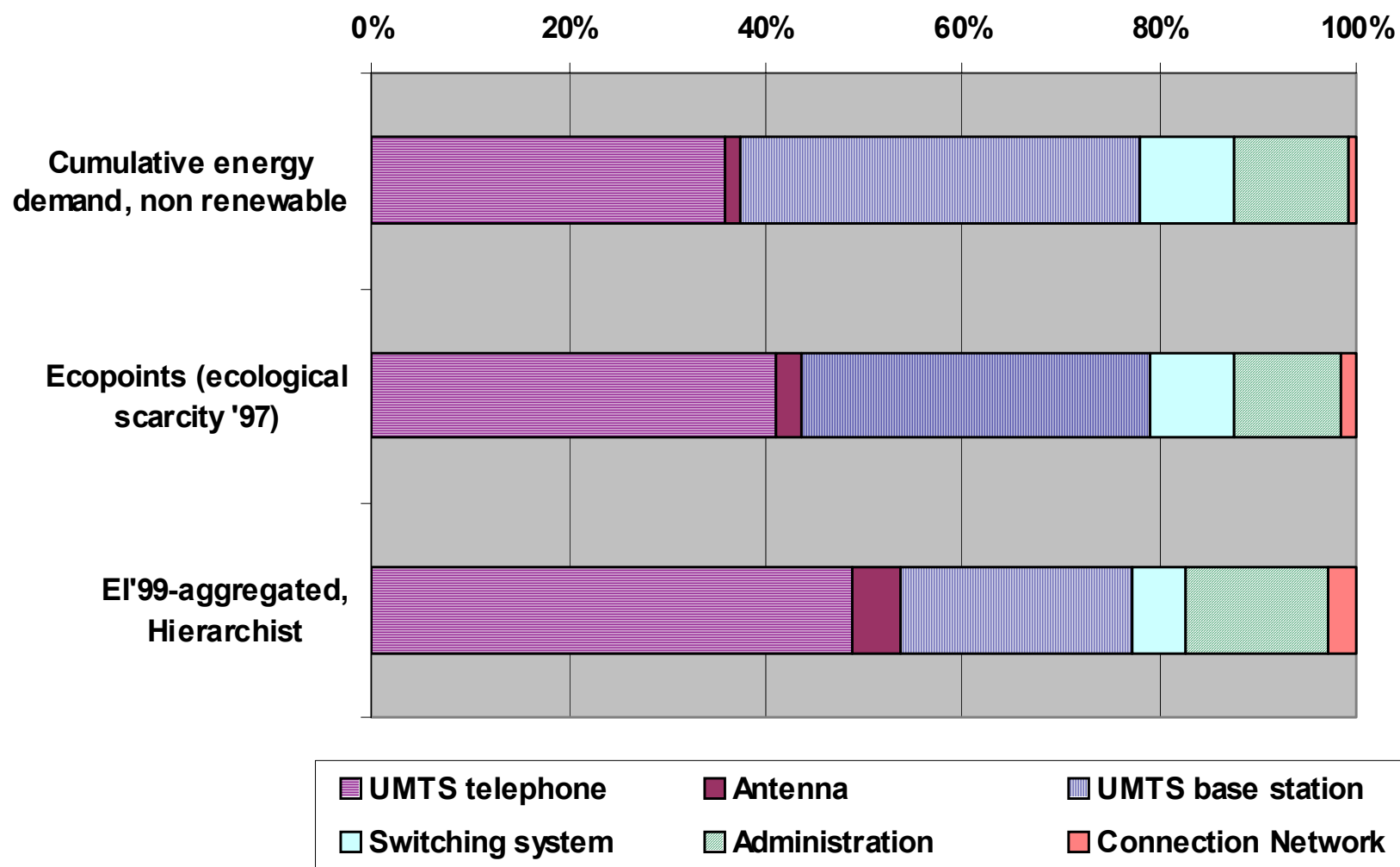
UMTS vs. GSM per data transferred (in Gbit)



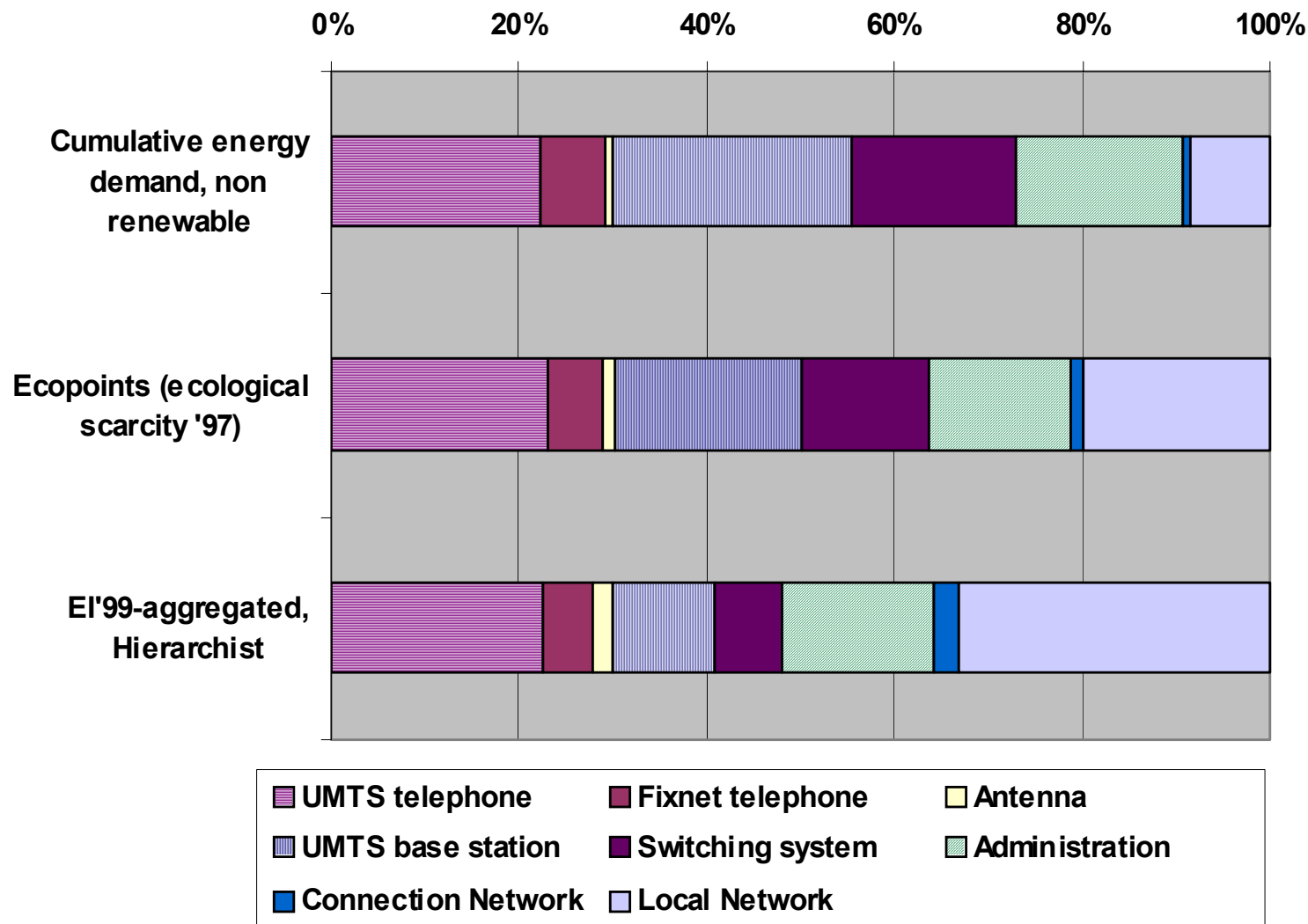
UMTS vs. GSM per user and year



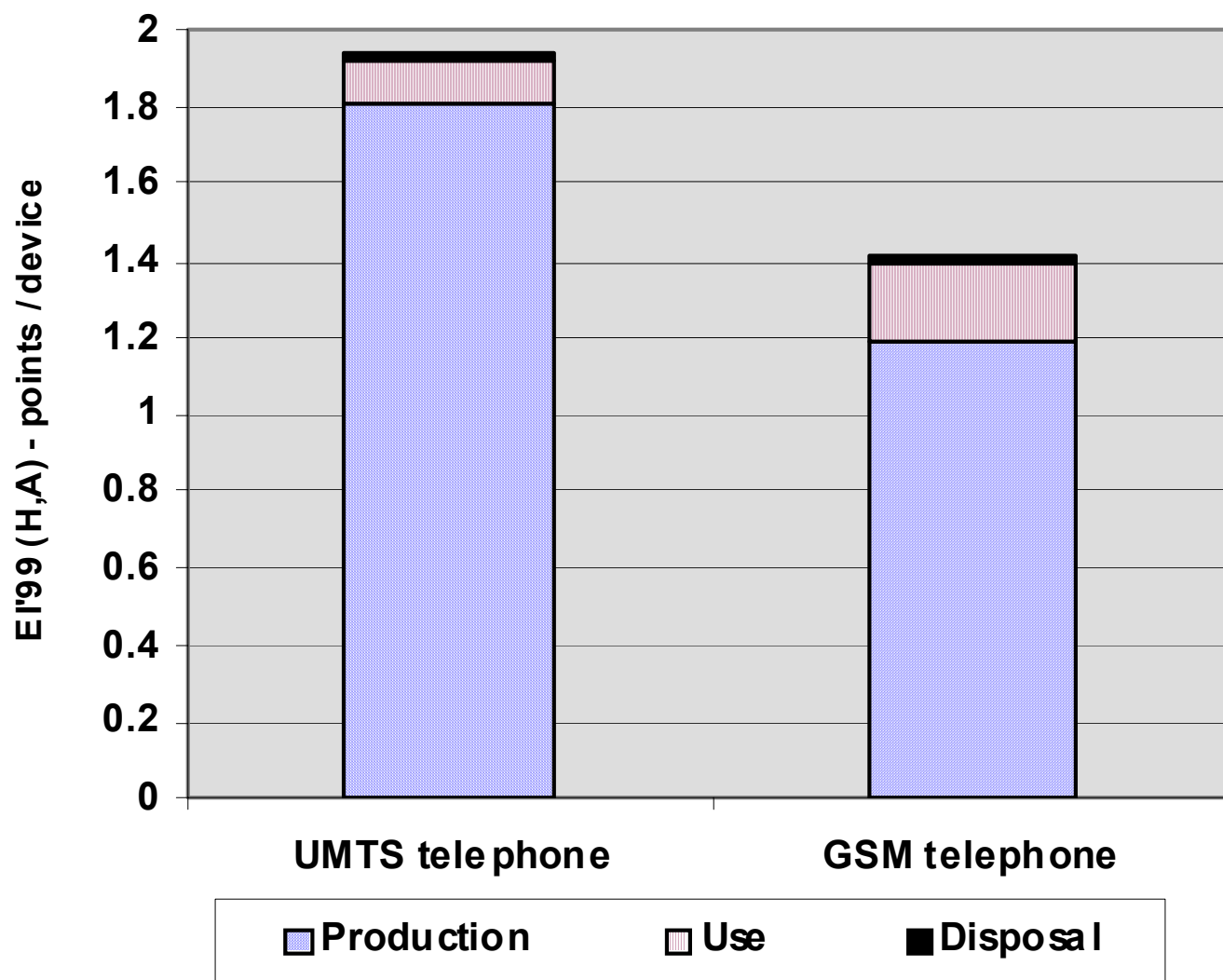
Dominance analysis: 1 Gbit mobile to mobile



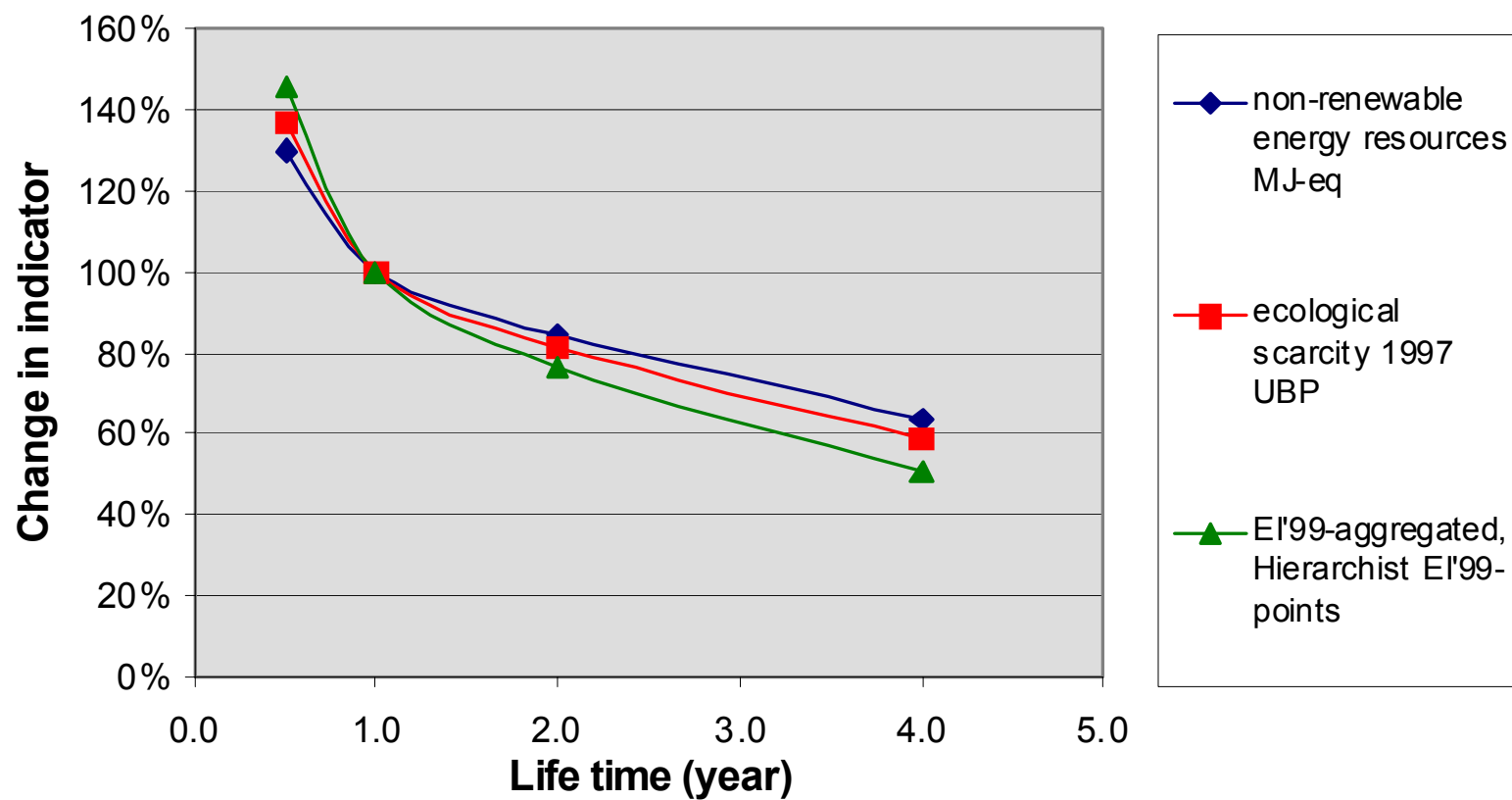
Dominance analysis: 1 Gbit mobile to fixed network



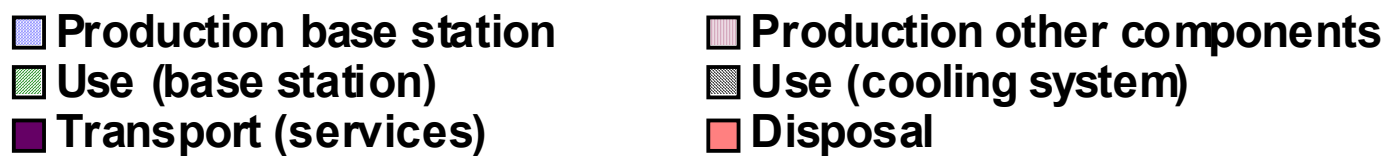
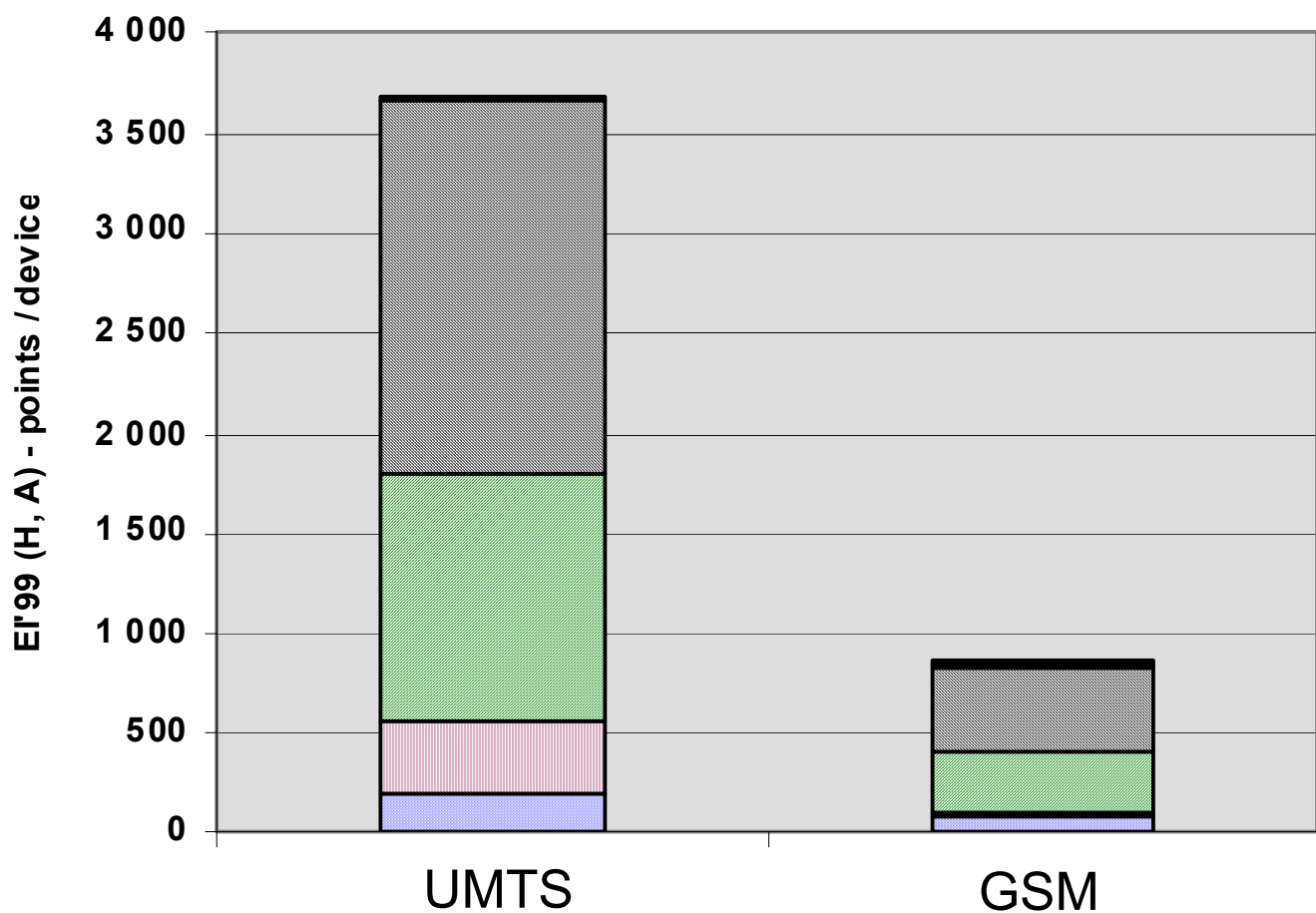
Dominance analysis: mobile phone



Sensitivity analysis: service life time, mobile phone



Dominance analysis: base station



Data quality

- UMTS components (mobile phone, Node B):
little experience in manufacturing and operation
- Data volume UMTS: estimations (2001)
for 2004
- LCIs of some scarce metals (e.g.,
antimony) missing

Main processes / components

- Manufacturing mobile phones
(production electronic components,
precious metals mining)
- Operation base stations
- Material requirement fixed network
(lead, copper)
- Administration (heating,
electricity, travelling)

Conclusions: UMTS vs. GSM

- Changing from GSM to UMTS: decrease in environmental impact per Gbit.
- However, on a per client basis: increase in environmental impacts
- But: UMTS is at the beginning of its learning curve

Strategies for lowering impacts of UMTS

- Increase use time of cell phone (reuse?)
- Reduce electricity consumption in base stations (especially for cooling?)
- Increase share of renewable energy sources in electricity mix