

Life Cycle Assessment of the Mobile Communication System UMTS: Towards Eco-efficient Systems

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Abstract: Goal of the project is to evaluate the environmental sustainability of the UMTS mobile communication system in Switzerland by means of a Systems Life Cycle Assessment (SLCA). The project will yield in a baseline environmental impact profile across the full life cycle of the UMTS mobile communication system. From this baseline necessary environmental improvement strategies on the technical level, such as Design for Environment for products (e.g. cellular phone and base stations), LCA improvement assessments (e.g. benefits from shared infrastructures), and on the socio-cultural level, such as service oriented product systems (telecommuting, m-commerce etc.) are developed and quantified in terms of their reduced environmental impacts.

1. Introduction

Nowadays mobile communication is a fast growing market. Telecommunication networks develop fast and are mainly driven by economic considerations. Environmental considerations have up to now mainly been restricted to individual problems such as radiation of cellular phones or to electricity consumption of network centers. A more or less entire picture about the diverse environmental impacts related to mobile communication with the forthcoming UMTS system allows the telecommunication companies to focus their environmental efforts in areas where the largest environmental benefits are to be expected.

2. Objective

Goal of the project is to evaluate the environmental sustainability of the UMTS mobile communication system built up by different companies in Switzerland including mobile phones, antennae, base stations, switches, net centers et cetera. The environmental sustainability is quantified considering the entire life cycle (resource extraction, construction, operation, dismantling and waste treatment) of products and infrastructure required. The baseline assessment is a necessary first step to evaluate the environmental impacts of the UMTS mobile communication systems use and growth and thus evaluating its environmental sustainability. From this baseline necessary environmental improvement strategies on the technical level, such as Design for Environment for products (e.g. cellular phones and base stations), and on the socio-cultural level, such as service oriented product systems (telecommuting, m-commerce etc.) are developed and

assessed in terms of their reduced environmental impacts. Furthermore scenarios concerning important parameters such as lifetime of the equipment and infrastructure or the possibility of a shared use of infrastructure (like for instance antennae) are evaluated and quantified. The purpose of the improvement strategies is to show ways for an increase in mobile communication while at the same time reducing the overall environmental impacts and thus showing ways towards sustainable (mobile) communication.

3. Methods and objects of analysis

The study relies on the internationally standardised method of Life Cycle Assessment (ISO 14040ff.). With SLCA the system of mobile communication is evaluated in terms of inputs, outputs and the potential environmental impacts (like global warming, hazardous wastes) throughout its life cycle (including manufacturing, use and disposal of products and the infrastructure). Economic aspects of UMTS will not be considered. The main environmental impacts and the main contributors of the UMTS system are identified and quantified using most recent life cycle impact assessment methods. Environmentally benign solutions for sustainable mobile communication systems are identified, defined and quantified selecting among technical and socio-cultural options such as Design for Environment and sustainable product-service systems, respectively.

The methodology applied to assess the environmental impacts of processes, technical systems and services, i.e. Life Cycle Assessment (LCA), is rather well developed. However, no life cycle impact assessment method exists which includes potential impacts of radiation on human health. Therefore results from and experiences gained within other projects on that subject (within the Research Cooperation and outside) are pre-evaluated in view of its applicability in LCA.

4. Results

The following results are expected:

- Environmental impact profile of the UMTS mobile communication system in Switzerland across its life cycle

- Environmental improvement strategies towards sustainable mobile communication
- Policy formulation for stakeholders
- Identification of future research in the area of sustainable mobile communication

5. References

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