Key Environmental Performance Indicators (KEPIs): A New Approach to Environmental Assessment

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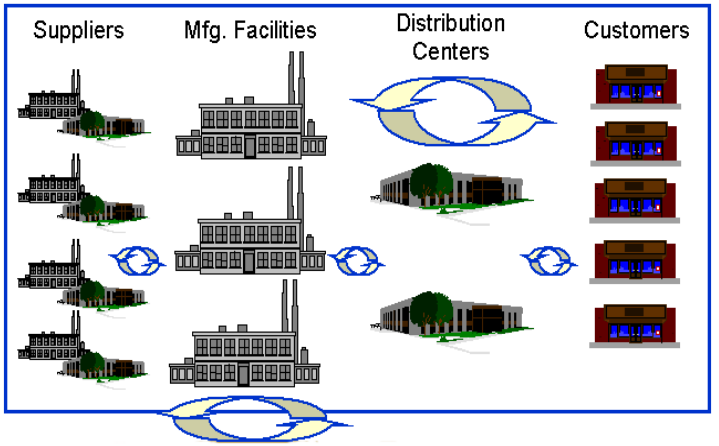
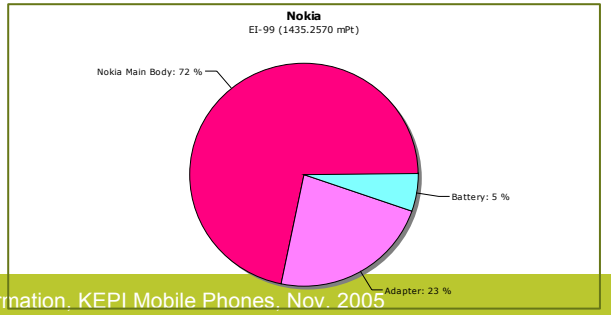
Motorola General Business Information, KEPI Mobile Phones, Nov. 2005

Life Cycle Assessments





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Objective

- **To develop a simple approach**
  - for assessing the environmental impacts of mobile phones
  - which concentrates only on a few key indicators
    - **that are faster and easier to measure than traditional life cycle inventory data**
    - **that can be used to simulate and evaluate the environmental impacts of a product during its life cycle**
  - which assists in initial stages of product development
    - **by identifying those stages in a product life cycle that have the most crucial effect on the environment**

Wishlist

The approach should:

- **Provide clearcut results**
- **Have low data requirements**
- **Require little calculation time**
- **Account for physical & chemical characteristics**
- **Require no interpolation from impacts**

Key Environmental Performance Indicators (KEPIs)

- **KEPIs are physical and chemical parameters of components of the mobile phone**
- **These parameters indirectly account for the environmental impacts of the phone**
- **They are simply to evaluate**
- **They can be used for**
  - Eco-design
  - Benchmarking

Desirable Characteristics of KEPIs

- **Independent of each other and collectively account for most of the life cycle impacts**
- **Scientific base**
- **Easy to use**
- **Reliable**
- **Extendable to other electronic products**
- **Applicable in all regions**

Approach

- **LCA Perspective**
- **Identify environmentally relevant components and significant materials by**
  - Analyses of results of LCAs conducted by Motorola, Nokia, Panasonic & Philips
  - New Eco-Indicator 99 analyses of several mobile phones
- **Legal Perspective**
- **Determine causes of embedded toxicity of the phone and its component by**
  - Using Green Design Advisor (GDA) tool of Motorola

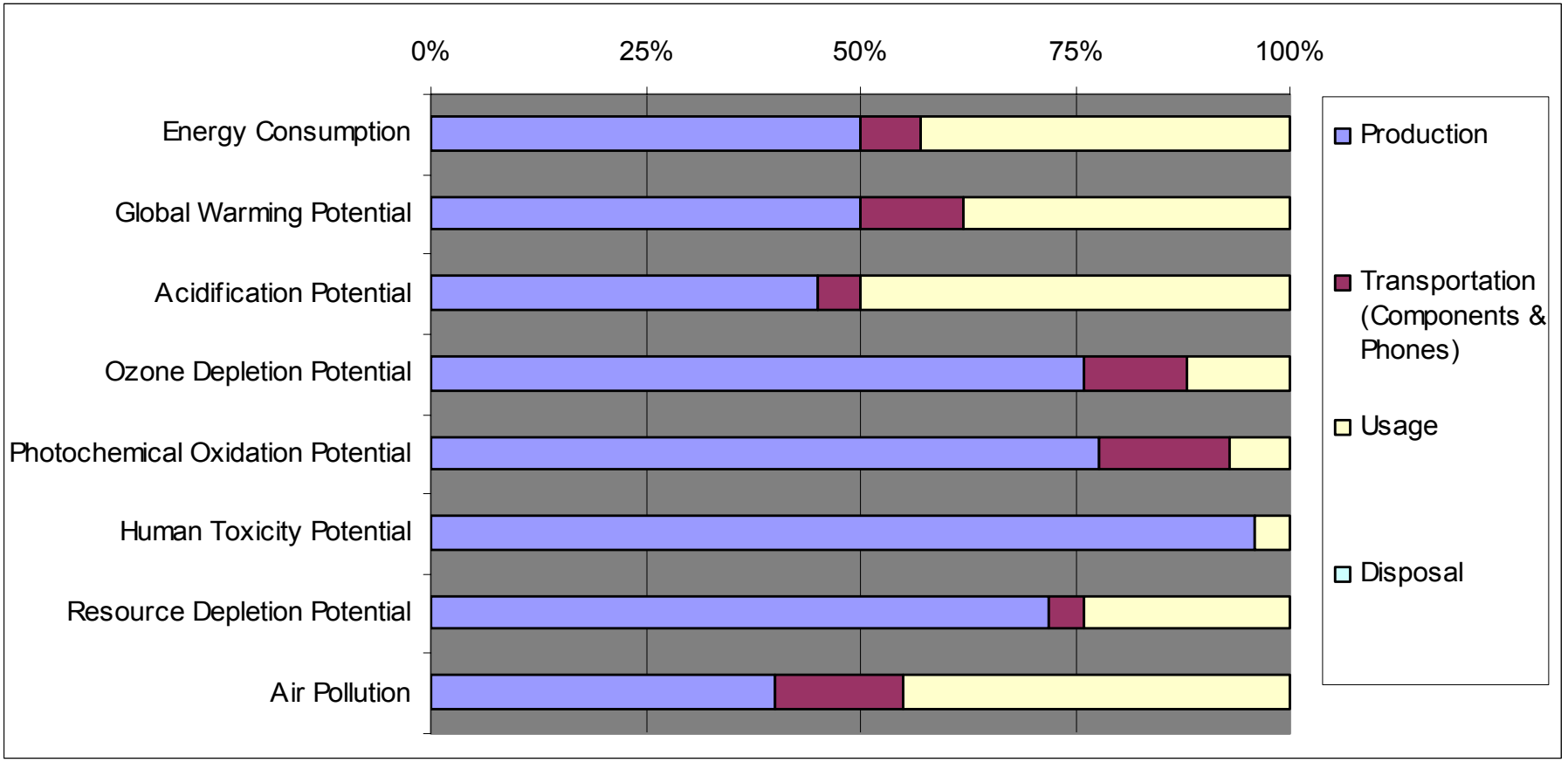
LCA Impact Categories Analysed (LCA Perspective)

- **Energy Consumption**
- **Global Warming Potential (GWP)**
- **Acidification Potential**
- **Ozone Depletion Potential (ODP)**
- **Photochemical Oxidant Potential (POCP)**
- **Human Toxicity Potential (HTP)**
- **Resource Depletion Potential (RDP)**
- **Air Pollution**
- **Eco-Indicator 99**

Embedded Toxicity Assessment by GDA (Legal Perspective)

- **Identification of**
  - components with most embedded toxicity
  - materials in components responsible for embedded toxicity
- **GDA accounts ”Toxicity Index” based on**
  - hazardous substance legislation in Europe
  - standards of telecom customers

Environmental Impact Distribution for Mobile Phones



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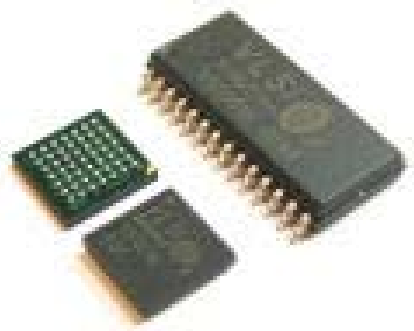
Main Causes of Environmental Impacts

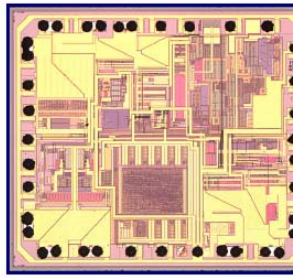
- **Production Phase**
  - Environmentally relevant components
    - **PWBs, ICs, LCD, Solder**
  - Environmentally significant materials
    - **Gold, Copper, Bromine**
- **Transportation Phase**
  - Air transport of components
- **Usage Phase**
  - Standby power consumption of charger

Printed Wiring Board

- **Impact distribution**
  - Raw Material Acquisition ~ 65%
    - **Main contributor: Gold in surface finishes; partially Copper**
  - Manufacturing ~ 35%
    - **Dependent on Surface Area and Number of Layers**
- **Indicators**
  - Amount of Gold
  - Total Area = Surface Area x Number of Layers

Integrated Circuits





- **Impact distribution**
  - Raw Material Acquisition ~ 35%
    - **Main contributor: Gold in substrate and wires of Package**
  - Manufacturing ~ 65%
    - **Impacts proportional to Surface Area of Fabricated Die & Number of Mask Steps**
- **Indicators**
  - Amount of Gold
  - Areas of Fabricated Dies (for ICs with similar number of mask steps)

Liquid Crystal Display

- **Impact distribution**
  - Raw Material Acquisition ~ 10%
    - **Mainly contributor: Glass**
  - Manufacturing ~ 90%
    - **Impacts proportional to Surface Area**
- **Indicator**
  - Surface Area of LCD

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Proposed KEPIs

Production Phase	Transportation Phase	Use Phase
▪ Amount of Gold ▪ Area of PWB x No. of Layers ▪ Area of Fabricated Dies ▪ Amount of Bromine ▪ Area of LCD ▪ Amount of Solder Paste ▪ Amount of Copper in Charger and its Cables	▪ Number of Components in the Phone	▪ Standby Power Consumption of Charger

Test of KEPIs

- **LCAs of a Notebook PC and Desktop PC by a Japanese Corp.**
- **LCAs identify that Notebook PC has lower environmental impacts**
- **Results obtained by using KEPIs are in conformity with LCA results**
  - Three days for data gathering and assessment

Summary & Outlook

- **Accomplishments:**
  - Developed a simple approach based on KEPIs
  - Tested KEPIs in a first case study
- **Next steps:**
  - Discuss approach and results within ongoing EuP discussion
  - Carry out case studies
  - Further develop approach in EPIC-ICT project
  - IPP case study

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- **Thank you!**

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Thank you!