Integrated Product Policy Pilot Project

Stage II Final Report:

Options for Improving Life-Cycle Environmental Performance of Mobile Phones

NOKIA

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With contributions from:
European Commission, AMD, BEUC, DEFRA, Epson, France Telecom / Orange, Intel, Motorola, Panasonic, SYKE, TeliaSonera, Vodafone and WWF

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Executive Summary

The Integrated Product Policy (IPP) pilot project at Nokia was initiated as a part of European Commission's (EC) effort to work together with stakeholders to develop the Integrated Product Policy. The objective of EC's IPP approach is to, "reduce the environmental impacts from products throughout their life-cycle, harnessing, where possible, a market-driven approach, within which competitiveness concerns are integrated".

This is the second (stage II) report in Nokia's IPP pilot and it builds on the issues identified in the first (stage I) report. The stage I report identified the life-cycle environmental issues of mobile phones and discussed the results from the environmental assessments conducted by Nokia. The stage I report also discussed Nokia's experiences with different environmental assessment tools, and its environmental initiatives.

The stage I report was discussed with the participating stakeholders - the European Commission, AMD, BEUC, DEFRA, Epson, France Telecom / Orange, Intel, Motorola, Panasonic, SYKE, TeliaSonera, Vodafone and WWF during the first stakeholder consultation meeting on 17 February 2005. As this pilot project is planed to run for a limited period of time the project team had to focus its activities. Three focus areas were identified for this pilot by the group:

- Energy consumption during the life-cycle of mobile phones
- Materials related environmental issues in the life-cycle
- Tools for conducting environmental assessments

However, this does not mean that there are no other environmental areas where improvement can be made aside from the ones selected. The stakeholder group also decided to limit the scope of the IPP pilot to just the product group - mobile phones - for all life-cycle phases, except for the use phase for which the environmental impacts and improvement options for the network infrastructure are also considered.

Nokia, the European Commission and all the participating stakeholders have contributed to the development of this stage II report. The report identifies numerous options for improving the life-cycle environmental performance of mobile phones on the basis of issues identified in previous report. This report also highlights the roles that stakeholders can play in developing/implementing these options in different stages of phone's life. The improvement options identified here have not been analysed yet. The analysis will be carried in the next stage of the pilot.

The improvement options, which are either technological, behavioural or policy solutions, are identified under eight themes:

- *Improvements in mobile phones:* Options to manage the energy and material related environmental issues of phones like development of chargers with low/no standby power consumption, reduction/elimination of certain materials of concern;
- *Optimisation of in-use life-span:* Options to optimise the in-use life-span of mobile phones, which have a fast turnover rate, like provision of possibilities for upgrade of phone software to add new features to an old phone, development of modular structure of phones to enable hardware upgrade, elimination of subsidies for buying new phones;
- *Reduction in energy consumption and environmentally relevant chemicals used during components manufacture:* Options to reduce the impacts from the component manufacturing phase like

use of Environment Management Systems (EMS), exchange of full/necessary information on the material contents of the components between component manufacturers and phone manufacturers to assist in eco-design efforts;

- *Influencing the buying, usage and disposal patterns of consumers:* Options to increase the demand for products (in this case mobile phones) with superior environmental performance like use of eco-information tools to communicate the environmental aspects of products to consumers, initiation of education programmes and specific campaigns to raise consumer awareness; Options to influence the consumer behaviour when phones are in use like development of consumer guides to provide information on how to lower the environmental impacts in use phase and; Options to increase the collection rate of unwanted mobile phones like offering incentives to consumers to deposit the old phones at proper collection points, exploring the potential of product service systems (PSS), provision of information to consumers on: benefits of recycling the phones, and the location of collection centres;

- *End-of-life management of disposed mobile phones:* Options to properly manage the collected old phones like research on appropriate end-of-life treatments, information exchange between the recyclers and the phone manufacturers on the materials of concern in the phones;

- *Reduction in environmental impacts from energy consumption of network infrastructure:* Options to reduce the impacts of the mobile system[1], excluding phones, when in use like increasing the use of renewable sources of energy to power the infrastructure, sharing of base stations, intelligent network management;

- *Development of suitable environmental assessment methods:* Options to develop the right set to tools which can be used for practical eco-design purposes in industry and by governments for policy making like further developing and standardising the Key Environmental Performance Indicators (KEPIs) approach suggested in stage I report, development of tools for assessing environmental impacts of materials and substances used in products, development of tools for policy makers to identify the priority sectors, products and environmental aspects :

- *Creation of a favourable policy environment:* Options for policy makers to further improve the existing policies, and to create an environment which stimulates the demand for environmentally superior products and provides incentives to their manufacturers like promotion of voluntary agreements for environmental improvements, promotion of the front-runners in the industry, greening of the public procurement.

This report also discusses the business related key factors that should be considered by the policy makers to assess the true impact of their decisions. These key factors include the market characteristics, technological innovations, net environmental benefits, standard product requirements like end user expectations, product acceptance, product reliability and manufacturing issues like costs of alternatives, properties of alternative materials, their suitability and availability for mass production, their origin and the yields.

[1] The mobile system consists of mobile phones, a radio network with radio base stations and radio network control equipment, and a core network with switches, routers, servers and workstations.

In the next stage (III) of this pilot all the improvement options identified in this report will be analysed for their economic, environmental, and social impacts by the participating stakeholders. The stakeholders will analyse these options on the basis of their experiences and judgements. This analysis will assist in prioritising all the identified options. The options will be classified as - Qualified, Ongoing or Disqualified based on the analysis. The 'Qualified' options will be further considered for implementation by the participating stakeholders in the stage IV of the pilot.

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1. Introduction

1.1 Integrated Product Policy Pilot Project

The Integrated Product Policy (IPP) pilot project at Nokia was initiated as a part of European Commission's (EC) effort to work together with stakeholders to develop the Integrated Product Policy. The objective of EC's IPP approach is "to reduce the environmental impacts from products throughout their life-cycle, harnessing, where possible, a market-driven approach, within which competitiveness concerns are integrated".

This is the second (stage II) report in Nokia's IPP pilot and it builds on the issues identified in the first (stage I) report. The stage I report identified the life-cycle environmental issues of mobile phones and discussed the results from the environmental assessments conducted by Nokia. The stage I report also discussed Nokia's experiences with different environmental assessment tools, and its environmental initiatives.

1.2 Objectives in Stage II

The principal objective of stage II is to identify options for improving the life-cycle environmental performance of the mobile phones on the basis of issues identified in the previous report. The economic, environmental and social impacts of these options will be analysed in the stage III of this pilot. Another crucial objective is to identify existing/planned policy tools that are relevant for the mobile phone industry. The report developed by the European Commission in this stage covers this aspect.

Other objectives include identifying the business related key factors that must be considered while making environmental policies and the main environmental activities of the participating component manufacturers.

1.3 Focus Areas for the Nokia IPP Pilot – Conclusions from the First Stakeholder Meeting

In the stage I of this pilot the main environmental aspects/impacts during the various life-cycle phases of a mobile phone were identified and analysed. The stage I report was discussed with the participating stakeholders[2] during the first stakeholder consultation meeting on 17 February 2005. Three focus areas were identified for this pilot by the group:

- Energy consumption during the life-cycle of mobile phones
- Materials related environmental issues in the life-cycle
- Tools for assessing life-cycle environmental performance

The stakeholder group also decided to limit the scope of the IPP pilot to just the product - mobile phones - for all life-cycle phases, except for the use phase for which the environmental impacts and improvement options for the network infrastructure are also considered.

[2] See appendix A for the list of participating stakeholders.

1.4 Scope of Second Report

Nokia's IPP pilot project is focused on mobile phones and its life-cycle, and has a global dimension. Only for the use phase, the improvement options for the network infrastructure are identified. Improvements options for the network infrastructure during the production and EoL (End-of-Life) phase of are not covered in this report.

1.5 Development of Second Report

Nokia, the European Commission, and participating stakeholders - AMD, BEUC, DEFRA, Epson, France Telecom / Orange, Intel, Motorola, Panasonic, SYKE, TeliaSonera, Vodafone and WWF - have contributed to the development of this report. The draft version of the report was published on the internet and comments were invited from all stakeholders. This final report was developed after considering the comments received from the stakeholders.

2. Options for improving life-cycle environmental performance

This chapter identifies numerous improvement options to reduce/eliminate the environmental impacts of mobile phones from the life-cycle phases. The identified options are for the mobile phone industry and its stakeholders and not just for Nokia or the stakeholders participating in this pilot. The life cycle economic, environmental, and social benefits and impacts of these improvement options will be analysed in the next stage of the pilot.

In the next stage (III) of this pilot all the improvement options identified in this report will be analysed for their economic, environmental, and social impacts by the participating stakeholders. The stakeholders will analyse these options on the basis of their experiences and judgements. This analysis will assist in prioritising all the identified options. The options will be classified as - Qualified, Ongoing or Disqualified based on the analysis. The 'Qualified' options will be further considered for implementation by the participating stakeholders in the stage IV of the pilot. There are already activities ongoing in many of the selected areas by the participating stakeholders.

This chapter is divided into several sections, each section corresponding to a theme of improvement ideas. These sections identify first the environmental issue(s) and then the corresponding improvement options. The role of stakeholders in implementing these improvement options and some of the related industry-wide initiatives are also identified.

2.1 Improvements in Mobile Phones

Environmental Issue: The stage I report identifies the components manufacture phase, and use phase as the most significant contributors to the life-cycle impacts of mobile phones. It was found that energy consumption causes the majority of impacts in these phases. Other significant impacts are related to the end-of-life phase where they may occur if the unwanted phones are mismanaged.

Improvement Options: The improvement options mentioned here cover the changes that could be made in the phones/accessories/packaging if viable. Many factors including economic, environmental and social may influence the viability of these options. These factors will be discussed in the next stage report.

For minimising the energy consumption of a mobile phone, from a life-cycle perspective, following improvement options are identified.

1. Reduce the amount of precious metals in the components of a mobile phone even if their amount is minute.

   The mining and production of precious metals is associated with significant environmental impacts.

2. Optimise the number and characteristics of the high impact components like Printed Wiring Board (PWB), Integrated Circuits (ICs) and Liquid Crystal Display (LCD) with respect to their environmental impacts.

3. Equip the chargers/phones with sound or visual reminders that go on if they are left connected to the power supply after the batteries in phones are charged.

4. Develop chargers that switch off automatically when phones are fully charged.

5. Standardise the interfaces of the battery chargers of mobile phones.

6. Reduce the standby power consumption of the charger.

   The consumers often leave chargers plugged into the socket, where they consume standby power. Even if the standby energy consumption is low, over time the related environmental impacts add up.

7. Develop chargers that use different energy sources like kinetic, solar and make them mainstream products.[3].

8. Reduce the size and mass of the product packaging.

9. Integrate more functions in the phones so that they can substitute other products and lower the overall environmental impacts.

   The life-cycle environmental impacts of a multipurpose mobile phone, which provides the functions of a music player, camera, Personal Digital Assistant (PDA), and alarm clock are less than the combined impacts of these individual products.

10. Use bio-based materials in the phone.

For managing the material related aspects of mobile phones the following improvement options are identified:

11. Eliminate the use of chlorinated, brominated, and antimony trioxide flame-retardants in PWBs, components, modules and parts[4] and substitute with substances that have better life-cycle environmental performance.

12. Eliminate the use of heavy metals as stabilisers and of certain softeners like phthalates in plastics.

    Stabilisers containing heavy metals (lead and cadmium) compounds were earlier used in certain plastics. This use has been reduced by voluntary steps and regulatory restrictions. The use of certain phthalate softeners, in plastics for mobile phones, is currently as a softener for charger cables and some accessory cables.

13. Reduce the use of beryllium and its compounds in the components of the phone.

14. Reduce/Eliminate the use of halogen containing polymers in the plastics used for product packaging.

Role of Stakeholders: The responsibility for the improvement options outlined above lies mainly with the Phone manufacturers and their Suppliers. In addition there are also roles which other stakeholders can play to steer these improvement options:

- Governments / Authorities[5] can use various policy tools to drive the environmental performance of the industry and stimulate the demand for environmentally superior

[3] A few chargers which work on solar/kinetic energy are already in the market but they are not mainstream products.

[4] There are no flame-retardants in the phone covers of Nokia.

 The economic, environmental, and social impacts of the identified improvement options will be assessed in the next stage.

products. Section 2.4 and 2.8 identify some options in this regard. The report developed by the European Commission on 'Policy Tools' identifies the existing/planned tools.

- Research Institutions could develop co-operations with industry and government to develop technologies with relatively lower environmental impacts.

- Network operators / Retailers could increase environmental criteria in the technical specifications to select the providers of mobile phones.

- Network operators / Retailers could consider environmental impacts of different kinds of materials while demanding specific sales package from phone manufacturers.

- NGOs including Consumer organisations could drive the environmental work of the front-runners in the industry by acknowledging them publicly and encouraging the laggards to improve.

- Industry associations could build up in house competence to support the member companies in life-cycle based environmental improvements

Existing Initiatives: The industry-wide initiatives that cover some of the improvement options identified above include:

- European Commission's Code of Conduct on Energy Efficiency of External Power Supplies (European Commission, 2004): Many companies including Nokia are signatories to this code and are committed to significantly reducing the standby energy consumption of the chargers.

2.2 Optimisation of In-Use Life-span of Mobile Phones

Environmental Issue: The mobile phones have a fast replacement rate. Many consumers replace their phones within a time span of two years after purchase.

The issue of optimising the lifetime has to be worked taking into account the consumer behaviour and technological evolution. Following trends should be considered:

a) Though the technical life-span of a mobile phone is approximately ten years, the consumers upgrade their phones much frequently. The consumers upgrade their phones for several reasons including technological advances, need/desire for new functions, changes in fashion trends, existing phone being tied to a particular network, availability of a subsidised phone and defects in the current phone.

b) When the consumers replace their phones they do not necessarily dispose their old phones. In many cases the old phones are passed within the families or friends or just kept as backup phones in case the need arises.

c) The old mobile phones are much different from the new generation of 'multiple-use mobile phones'. The multiple-use mobile phones have the potential to substitute other electronic products like PDA, music player, camera etc.

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[5] In the context of European Union the terms 'Governments/Authorities' mainly refer to the European Commission and member states.

Improvement Options: There are two sides to the issue of life-span extension. On one hand the product life-span should be maximised in order to minimise the amount of material flows and waste generated while on the other hand consumers should be encouraged to renew their old phones because the new models are more eco-efficient in condition that the take-back and end-of-life treatment of old mobile phones functions efficiently. In addition to the environmental factors, social factors should also be considered when discussing the life-span issues.

Following options have been identified to optimise the in-use life-span of mobile phones:

1. Identify and analyse the key drivers for the fast replacement of the mobile phones.

2. Reduce/Eliminate the subsidies, provided by the network operators, for buying a new phone.

3. Untie the phones from the networks of network operators.

   In many cases when users have to change their service provider they also need to replace their existing phones.

4. Provide possibilities for upgrading the phone software and downloading applications from remote locations.

   If there are new phone services or features being introduced then, with a capability of upgrading the software, new features could be used without replacing the phones. The upgrading of the software in phones also provides better service options. Consumers may no longer need to take their mobile phone to a repair centre when they experience problems due to its operating system. In many cases, the software upgrades also have the capability to increase the energy efficiency of the phone.

5. Develop a modular structure for mobile phones to enable upgrading of hardware as long as technically possible.

6. Make provisions for availability of spare parts and accessories of old mobile phone models.

7. Analyse the aspects of refurbishment of old phones.

   There are several issues related to refurbishment. There are safety concerns related to refurbished phones, they do not always function properly and meet the type approval criteria, they can be unreliable and can cause disturbances within the network, they may also have higher power consumption when compared to unfurbished phones, they may include components with restricted materials and finally they may be disposed in developing countries with no recycling infrastructure if they cannot be sold in EU for regulatory reasons.

Role of Stakeholders: The main responsibility for the above mentioned options lies with the Phone Manufacturers and Network operators.

2.3 Reduction in Energy Consumption and Use of Environmentally Relevant Chemicals during Components Manufacture

Environmental Issue: In the stage I, components manufacture phase was identified as the biggest contributor to the life cycle environmental impacts. The energy consumption accounts for a major

 The economic, environmental, and social impacts of the identified improvement options will be assessed in the next stage.

portion of environmental impacts from this phase. The manufacturing processes in this phase may also involve use of some chemicals that have significant environmental impacts.

Improvement Options: Reducing the energy consumption, reducing the use of environmentally relevant chemicals and substituting them, and gathering information and data on the properties of old and new chemicals and substances are key challenges for the components manufacturers. Following improvement options are identified:

1. Use Environment Management System (EMS), based on ISO 14001 international standard, to support and promote further reduction in the life-cycle impacts of components including
   - reduction in environmentally relevant chemicals from manufacturing processes,
   - elimination of materials of concern from components, and
   - reduction in energy consumption of manufacturing processes and overheads.
2. Collect data on the health and environmental effects of process chemicals and substances used in the components.
3. Exchange of full/necessary information on the material contents of the components between the suppliers and phone manufacturers.
4. Implement a system for selecting suppliers with lowest environmental impacts.
5. Provide a preferential supplier status to suppliers with lowest environmental impacts.

Role of Stakeholders: The primary responsibility of implementing these improvement options lies with the Components Manufacturers/Suppliers and the Phone Manufacturers.

Existing Initiatives:

- Many component manufacturers have taken significant environmental initiatives to improve the life-cycle environmental performance of their products. Chapter 3 provides an overview of some initiatives taken by the component manufacturers participating in this pilot.
- The Supply Chain Working Group (SCWG) under the Global e-Sustainability Initiative (GeSI) of UNEP is exploring ways in which ICT sector companies can work more closely together to more effectively manage social and environmental risks in their supply chains. The initial focus of the working group is to align the various Codes and Policies already used by member companies to manage their supply chain issue (GeSI, 2004).
- RosettaNet[6]: RosettaNet provides a standardised approach for information exchange between the suppliers and the manufacturers. The goal of RosettaNet is to develop a solution (or more precisely RosettaNet PIP specifications) for material composition exchange and make information exchange as an integral part of normal information delivery between business partners (Mäkirintala, 2003).
- Joint Industry Guide: This material composition guide provides minimum basic guidelines for suppliers to disclose information on materials that are regulated.

[6] For more information on RosettaNet see IPP Stage I report by Nokia and http://www.rosettanet.org

2.4 Influence Buying, Usage and Disposal Patterns of Consumers

The existing buying, usage and disposal patterns of the consumers need to be influenced to steer the life-cycle environmental improvements. The consumers can create a demand for products with superior environmental performance, and can significantly reduce the impacts of products from the use phase by proper/efficient usage and from the end-of-life phase by ensuring proper disposal.

INFLUENCING BUYING PATTERNS

Environmental Issue: Very few consumers directly choose products like mobile phones based on their environmental performance. Reasons for this could be the lack of awareness and information on environmental performance of the products. This results in little market demand for products with superior environmental performance.

Improvement Options: The consumers may make environmentally conscious choices if they are provided relevant environmental information on products that is simple and easy to understand. In a market economy the consumers must also have a right to choose products by making their own weighting of different product attributes. This makes the need of consumer education on the environmental impacts of their choices crucial.

The environmentally superior products offered to the consumers should also be at par with their counterparts in other aspects especially price and quality. Identified improvement options include:

1. Study consumer behaviour from the perspective of buying, usage and disposal patterns.

2. Use effective eco-information tools for providing information on the environmental aspects of the mobile phones.

   Eco-information has the potential to be an effective tool, provided that consumers understand what is said. An example of successful eco-information tool is the EU Energy Label for white goods, which allows consumers to clearly see the efficiency and energy consumption of products and makes it easy to compare the products while making their choices. Various sorts of eco-information tools could be analysed to identify what may work best for products like mobile phones. Appropriate tools could then be developed.

3. Stimulate demand for environmentally superior phones by providing cheaper calling tariffs for them.

4. Launch education programmes and initiate issue specific campaigns to increase the consumer awareness on environmental aspects of products.

Role of Stakeholders: These options require many stakeholders to play roles. The foremost action that can be taken by the Governments / Authorities in this regard is to stimulate the demand for environmentally superior products. This would have a straightforward, quick and very strong influence on the decisions of the industry.

- Governments / Authorities (in case of EU both EC and Member States) can stimulate the demand for greener products and have major role in

  - Education of the Citizens, Consumers, and Public organisations e.g. greening the public procurement

  - Getting prices right by

 The economic, environmental, and social impacts of the identified improvement options will be assessed in the next stage.

- Internalising externalities by using regulations: These regulations may put more burdens on unwanted environmental aspects and may make free riding difficult.

- Providing tax incentives: The prices of the green products could be brought at part with their non-green counterparts. The basis of assessing the products for which such incentives are provided must be clear, measurable and verifiable.

– Stakeholders should collectively analyse what eco-information is relevant for consumers and the best ways to provide it to them.

  - Consumer organisations and environmental NGOs who have the trust of consumers could coordinate the flow of environmental information to consumers by carrying awareness campaigns.

  - Governments / Authorities could provide a forum to bring journalists, NGOs including consumer groups, manufacturers where they discuss how to bring consumer awareness on environmental issues.

  - Retailers and Network operators have the most direct communication with consumers. They are the link between the manufacturers and the consumers. They could play an active role in providing information to consumers and could start that by training their sales staff.

  - Consumers could seek environmental information regarding the products before making their purchasing decisions.

– Stakeholders could cooperate to identify environmentally superior products. This should be done before governments/authorities can stimulate demand for environmentally superior products.

Existing Initiatives:

o There are many existing eco-information tools like Type I, Type II and Type III eco-labels. The Type I eco-labels are not widely used in this industry as they are not very appropriate for products where technologies, platforms and services change rapidly.

  The preferred option on communicating environmental information in this sector is via self-declarations. An existing industry-wide initiative is the international standardised format TR/70, provided by ECMA, for self-declarations. "TR/70 addresses product related attributes, not the manufacturing processes and logistic aspects. The environmental attributes include, but are not limited to data on: power consumption, emissions, materials, product packaging, batteries, and end of life management. Although the attributes are listed without differentiation between product categories, not all attributes necessarily apply to each product category"[7].

INFLUENCING USAGE PATTERNS

[7] For more information on TR/70 self-declaration format of ECMA see: http://www.ecma-international.org/publications/techreports/E-TR-70.htm

Environmental Issue: The stage I report identifies that the standby power consumption of the charger accounts for a significant portion of the environmental impacts from the use phase. This energy consumption occurs when the users do not unplug the chargers after their phone is charged. One reason for consumers to leave their charger unplugged could be the lack of awareness.

Improvement Options:

1. Develop consumer guides to provide information to consumers on using and disposing products.

2. Launch campaigns to spread awareness in consumers on the environmental impacts of standby energy consumption of electronic products.

   Information could be provided to the consumers on efficient usage and unplugging of chargers after use like in the manual of the phone or the guidelines for use.

Role of Stakeholders:

- Phone manufacturers, Network operators and Retailers could provide easily understandable information on efficient use of the products to the consumers by including it in product papers, websites, packaging, product or software. Consumer guides could be developed in cooperation with the consumer organisations.

- NGOs and Consumer oganisations could spread awareness on the environmental impacts of the standby energy consumption of electronic products.

- Governments / Authorities could produce media (like TV, radio) programs on sustainable lifestyles in cooperation with the stakeholders.

Existing Initiatives:

- Many ICT companies already provide instructions on minimising the standby energy consumption of products in the user manuals and on their websites.

INFLUENCING DISPOSAL PATTERNS

Environmental Issue: The most important issue for a proper EoL management of EEE is to get the used equipments back. Statistics from countries that have take-back systems identify that only a small percentage of the mobile phones are returned to disposal/recycling centres. To improve this situation there is a need to enhance the environmental awareness among the consumers and develop effective and easy to use take-back systems.

Improvement Options: Influencing the consumer behaviour is crucial to get unwanted mobile phones back for recycling. Mobile phone is a small product that the consumer can easily get rid off by just storing it in the house or even disposing it anywhere.

1. Research what sort of incentives will be most useful to collect significant amounts of used/unwanted phones.

2. Based on research results,offer some form of incentives like loyalty card reward points, ring tones, games, and screen savers to attract significant quantities of used/unwanted mobile phones.

 The economic, environmental, and social impacts of the identified improvement options will be assessed in the next stage.

3. Assess the potential of deposit-refund scheme for mobile phones.

4. Explore the potential benefits of using Product Service System (PSS) model for mobile phones.

   This may mean changing the existing model of phone ownership to phone rental. The customer will have to hand in the old phone when renting a new one.

5. Provide information to the consumers:

   - On returning the phone when they purchase a new phone.

   - On what happens to the phone after they return it. This information may cover the environmental benefits from proper disposal and recycling of the phones to the consumers.

   The product user manual/website of manufacturers could include information on the possibilities to return used mobile phones. This education could be done in the form of awareness campaigns, special events like 'recycling day' where proper disposal is encouraged.

6. Develop take-back systems especially tailored for small electronic devices like mobile phones, music players.

Role of Stakeholders: The retailers, distributors, including network operators, and authorities have a decisive role in getting the used equipments back.

- Governments / Authorities should reduce possible regulatory barriers that hinder the development of environmentally effective, easy and efficient take-back models.

- Governments / Authorities could mandate development of environmentally effective and economically affordable mechanisms, that make sure, that waste mobile phones actually arrive in the foreseen end-of-life routes of recycling etc. They could e.g. carry out research on the viability of specific take-back systems for small electronic devices.

- Several Stakeholders like Governments / Authorities, NGOs including Consumer organisations can play an important role in educating the people on environmental issues and the benefits of recycling. Retailers / Network operators / Authorities could develop incentives for users to return their phones.

Existing Initiatives:

- Implementation of WEEE directive may/shall:

  - Make collection points available for all consumers in whole EU

  - Discourage the disposal of WEEE with normal unsorted household waste

  - Make the flow of information to consumers mandatory

  - Set collection targets with intentions to improve them in the future

  - Push for improvements in the recycling industry

- In Norway, the Consumer Council has cooperated with the trade to develop guidelines for use of a mobile phone. These guidelines are delivered together with every phone sold, and they include a request to return scrapped mobile phones and accessories to authorised centres.

2.5 End-of-Life Management of Disposed Mobile Phones

Environmental Issue: The stage I report identifies that there are certain materials in the phone that may be of concern during the end-of-life phase. The report also mentions that the end-of-life phase may yield environmental benefits if phones are recycled properly. It is thus important that the collected phones reach the right recycling centres where they can be managed properly.

Improvement Options:

1. The agencies that collect/take-back the phones should ensure that they are sent to appropriate recycling plants and also ensure their proper EoL treatments.

2. Carry research on what sort of end-of-life techniques like reuse, recycling may yield most environmental benefits.

   In order to make recycling of mobile phones a true benefit to the environment, assessments on the environmental effectiveness of disassembly requirements and recyclability rates needsto be carried out.

3. Recycling firms should design their operations so that the environmental impacts are minimised/eliminated.

4. Recycling firms and phone manufacturers could cooperate on information exchange on material and substance contents of the phone that may cause environmental or occupational, health & safety (OH&S) concerns during recycling operations.

5. Research institutions with support from Governments / Authorities could find out more about the environmental impacts and the feasibility of different recycling techniques etc & develop guidelines on Best Available Technology (BAT) & Best Environmental Practice (BEP).

Role of Stakeholders: The recycling firms play the most crucial role for these improvement options. In addition the Governments / Authorities have the key role here when creating regulatory framework for EoL management:

- Governments / Authorities could encourage environmentally preferable recycling options.

- Governments / Authorities should reduce possible over regulation / regulatory barriers that hinder the development of effective, environmentally sound, economically efficient, safe EoL services and technologies.

Existing Initiatives: Some of the existing initiatives include:

- Mobile Phone Partnership Initiative (MPPI)[8], Basel Convention, UNEP: The aim of the MPPI is to promote the objectives of the Basel Convention in the area of environmentally

[8] For more information on Mobile Phone Partnership Initiative see http://www.basel.int/industry/index.html

sound management of end-of-life mobile phones. Under the MPPI, a Mobile Phone Working Group (MPWG) was established which is working on four specific projects (MPPI, 2004):

Project 1: Reuse of Used Mobile Phones.

Project 2: Collection and Transboundary Movement of Used Mobile Phones.

Project 3: Recovery and Recycling of End-Of-Life Mobile Phones.

Project 4: Awareness Raising and Training.

- ReLCD a co-operative research project under EU sixth framework aims at the development of methodology for EoL LCD testing, reuse and recycling. Nokia is a member of the 'user group' in this project.

- RePlast FinEst is a research cooperation project between Finland and Estonia in which Nokia is participating. The project aims at the development of collection and recycling of plastics (including fractions from WEEE) in Finland and Estonia.

- The European Commission's future Thematic Strategy on Waste Prevention and Recycling aims at facilitating, through a number of measures, the recycling and recovery of waste taking into account the whole life-cycle. The Thematic Strategy envisages actions on two issues related to common standards on recycling. On one hand it foresees setting facility standards through proposing to extend the IPPC directive in the future, and a provision in the revised Waste Framework Directive on setting standards through Comitology. Secondly, it proposes to introduce recycled product standards through the use of the end of waste criteria in the Waste Framework Directive.

2.6 Reduction of Impacts from Energy Consumption of Network Infrastructure

Environmental Issue: The Stage I Report identifies energy consumption of the network infrastructure as one of the most significant environmental aspect in the life-cycle of a mobile system[9].

Improvement Options: Identified options include:

1. Share base stations and ensure that they are used up to their peak capacities.

   Intelligent network management and network sharing may help reduce the energy consumption of the network infrastructure.

2. Use renewable energy sources for powering network infrastructure whenever possible.

It should be noted that for the network infrastructure only options for reducing the impacts from energy consumption in use phase are identified.

[9] The mobile system consists of mobile phones, a radio network with radio base stations and radio network control equipment, and a core network with switches, routers, servers and workstations.

Role of Stakeholders: Network operators are mainly responsible for the improvement options identified above. In addition the Governments / Authorities can have a decisive role in including energy considerations into standardisation mandates.

Existing Initiatives:

- European Telecommunications Standards Institute (ETSI) work item DTR/EE-00002 was established on the "The reduction of energy consumption in telecommunications equipment and related infrastructure". The aim is to study and produce a report on the various methods (hardware and software) of controlling/reducing energy consumption in telecommunications network equipment and related infrastructure.

2.7 Development of Environmental Assessment Methods/Tools

Environmental Issue: The first IPP report identifies the issues related to environmental assessment methods currently used. It also highlights the need for further developing the existing methods in addition to the new ones. If the governments / authorities and industry have the right set of tools then effective policies and products with better environmental performance can be developed.

Improvement Options:

1. Develop and standardise environmental assessment methods/tools needed by policy makers to:

    a. Assess the environmental performance of various sectors and identify the priority sectors

    b. Assess the environmental performance of products in a particular sector and identifying the focus products

    c. Identify the key environmental aspects of focus products.

2. Further develop, evaluate and standardise the KEPIs approach suggested in the stage I report.

    KEPIs can be used to assess the products in an industry for the purpose of eco-design.

3. Develop tools for assessing the environmental impacts of different materials and substances to assist in eco-design efforts.

4. Suppliers should provide life-cycle inventory data to phone manufacturers to allow for the required quantification of environmental burdens of different components and manufacturing stages.

5. Develop an assessment system for IPP purposes where the key business related factors are taken into account.

Role of Stakeholders:

- Governments / Authorities could provide a platform for communication and know-how exchange on environmental assessment methods/tools for all stakeholders.

 The economic, environmental, and social impacts of the identified improvement options will be assessed in the next stage.

The platform can support development and harmonisation of these methods, data and tools. Industry should actively participate in this so that practical methods/tools are developed rather than abstract concepts.

- Governments / Authorities could encourage the development of simple assessment approaches like KEPIs and methodological guidance for their use in industry.

- Research Institutions could develop competence on material flows (and their environmental impacts) in different sectors and in different regions. Based on this competence they may identify key environmental areas, and key industrial sectors where major environmental improvements can be made and provide this input to the governments/authorities.

- Research Institutions could develop tools for assessing the environmental performance of different materials and substances.

- Stakeholders could develop criteria for assessing environmental performance of products.

- NGOs including Consumer Organisations could develop in-house competence on reliability of various measures, methods and tools for assessing the life-cycle environmental impacts as well as consumer-health aspects in order to make sure their effort is directed towards real improvements and avoid contradicting activities.

Existing Initiatives:

- The European Commission has launched an EPIC-ICT project, which aims at the development of Environmental Performance Indicators for ICT Products on the example of Personal Computer.

- Several EU Member States are systematically collecting the life-cycle data required for conducting Life-cycle Assessments (LCA), which are one type of assessment tools.

- The EC started work on identifying the products with the greatest potential for environmental improvements within the IPP framework. The EIPRO project is presently in its first stage[10], and identifies products with the greatest environmental impact from a life-cycle perspective.

- The EC has issued a mandate to the European Standardisation bodies for programming work to produce standards related to the environmental performance of products and supporting the implementation of the eco-design framework Directive EuP[11].

- Standards exist on LCA, the ISO 140040 series.

- The EC is initiating a platform for LCA to develop agreed upon guidelines and reference data in support of LCA.

- DG JRC's ENSURE (Environmental Assessment of European Wastes and the Sustainable Management of Resources) action: A key aim of this activity is to improve the quality and level of agreement related to the underlying core data and methodology that is needed for any life-cycle assessment study.

[10] For more information see http://europa.eu.int/comm/environment/ipp/identifying.htm

[11] For more information see http://www.europa.eu.int/comm/enterprise/eco_design/relactiv.htm

2.8 Creating a Favourable Policy Environment

Environmental Issue: The industry will continuously improve the life-cycle environmental performance of its products if there is a sufficient demand for products with superior environmental performance and a policy environment encouraging such improvements.

Improvement Options and Role of Stakeholders: This section identifies the improvement options to provide suitable drivers and an encouraging environment to the industry. Governments /Authorities play the most crucial role in these options.

The Governments / Authorities could:

- Harmonise the implementation of regulations if appropriate: In the case of EU it means that EU should be considered as one market and the regulations should be based on article 95.

- Assess the effectiveness of existing regulations and deregulate the areas where regulation creates false/unnatural/unnecessary burden/obstacles/costs for activities without adding environment, health and safety benefits.

- Provide incentives for developing products with improved life-cycle environmental performance.

- Develop regulations that put more burdens on unwanted environmental aspects and may make free riding difficult.

- Develop transparent criteria that use a scientific basis and include life-cycle based aspects for choosing priority environmental improvement areas. Provide higher funding for research on these priority aspects/areas. Communicate these priority aspects/areas stakeholders and provide input and mandate to industry standardisation bodies, research institutions to work with the defined aspects/areas.

- Promote use of voluntary agreements like codes of conduct wherever possible for the priority aspects/areas.

- Promote the environmental front-runners in the industry by providing suitable incentives.

- Develop minimum environmental performance standards for the products to be sold in the market. These standards can be developed and revised along with the top runners in the industry.

- Better consider the key business related factors while developing regulations.

- Work to make the implementation of new policies/regulations as efficient as possible.

- Foster the demand for green products by:

    - Advancing green public procurement.

    - Providing tax-incentives to products with superior environmental performance & their manufacturers.

The Research Institutions could:

 The economic, environmental, and social impacts of the identified improvement options will be assessed in the next stage.

– Provide scientific inputs to the governments / authorities and assist them in meeting their strategic intentions.

– Assist governments / authorities in identifying areas:

  - Where legislation is needed

  - Where voluntary measures can be promoted

The Industry Standardisation Bodies could:

– Define voluntary methods for initiating work in priority aspects/areas.

  For example, European Telecommunications Standards Institute (ETSI) could have a key role in defining voluntary ways of optimising the energy efficiency.

Existing Initiatives: The European Commission among others has the following existing initiatives in relation to the above improvement options:

- The European Commission has developed an initiative on better regulation. The Commission Communication[12] seeks to ensure the quality of legislation in Europe and to promote the objectives of the Partnership for Growth and Jobs. The initiative focuses on the withdrawal or modification of pending proposals, the simplification of existing EU-law and on better quality of new Commission proposals. It encourages that the Commission's initiatives would be accompanied by impact assessment. It also puts emphasis on the implementation of legislation.

- A European Commission project has started to identify products with the greatest potential for environmental improvement. At the first stage of the project a study was prepared identifying products with the greatest environmental impact from a life-cycle perspective (EIPRO) on European level. Based on this study the second stage will have the objective to focus on some products with the greatest environmental impacts and examine the ways in which their environmental impacts can be reduced. Following this, the Commission may seek to address some of the products with the greatest potential for environmental improvement at least socio-economic cost.

- Setting Performance targets for products were included as one of the actions in the European Commission's Environmental Technology Action Plan (ETAP)[13].

- There is ongoing research supported by the European Commission under the Fifth and Sixth Framework Programmes on Research and Development on the possible health effects of Electromagnetic Fields (EMF), particularly related to mobile phones and base stations. These include the following projects:

  - Potential adverse effects of GSM cellular phones on hearing (GUARD)

  - Risk evaluation of potential hazards from low energy electromagnetic field exposure using sensitive in vitro methods (REFLEX)

[12] COM(2005) 97 final

[13] COM(2004) 38 final

- Combined Effects of Electromagnetic Fields with Environmental Carcinogens (CEMFEC)

- In vivo research on possible health effects related to mobile telephones and base stations (carcinogenicity studies in rodents) (PERFORM-A)

- International Case-Control Study of Cancer relation to Mobile Telephone Use (INTERPHONE)

- Development of Advice to the EC on the risk to health of the General Public from the use of Security and Similar devices employing Pulsed EMFs.

- Risk assessment for Exposure of Nervous System Cells to Mobile telephone EMF: From in vitro to in vivo Studies (RAMP 2001)

- Tera-Hertz Radiation in Biological Research, Investigation of Diagnostics and study on Potential Genotoxic Effects. (THz-BRIDGE)

- Effects of the Exposure to Electromagnetic Fields: from Science to Public Health and Safer Workplace. (EMF-NET, Coordination Action under FP6)

- Further research has been suggested by the Commission to be carried out on the health effects of the exposure to electromagnetic fields under the 7th Research and Development Framework Programme.

o The European Commission recognises the role of voluntary agreements in the environmental field in its Communication on Environmental Agreements at Community Level within the framework of the Action Plan on the Simplification and improvement of the Regulatory Environment[14].

2.9 Summary on the Role of Stakeholders

The roles of the stakeholders in the improvement themes are highlighted in the following table. It should be noted that in the case of network infrastructure both the network equipment manufacturers and the network operators have primary responsibilities for improving the energy efficiency of the network. This report however covers only the use phase of the network infrastructure. Thus, the responsibility of the network equipment manufacturers has not been identified in the following table.

[14] Communication from the Commission to the European Parliament, The Council, The Economic and Social Committee and the Committee of the Regions on Environmental Agreements at Community Level within the framework of the Action Plan on the Simplification and improvement of the Regulatory Environment, COM(2002) 412 final, 17.7.2002

Table 2-1: Role of Stakeholders in Improvement Options

Stakeholders	**Improvement Themes**							
	Improvements in Mobile Phones	Optimisation of Life-span	Reduction in Energy Consumption and Use of Environmentally Relevant Chemicals during Component Manufacture	Influence Buying, Usage and Disposal Patterns of Consumers	End-of-Life Management of Mobile Phones	Reduction in Energy Consumption of Network Infrastructure	Development of Environmental Assessment Methods / Tools	Create a Conducive Policy Environment
Phone Manufacturers	Primary Role	Primary Role	Secondary Role	Secondary Role	Secondary Role	-	Secondary Role	Secondary Role
Component Manufacturers	Primary Role	Secondary Role	Primary Role	-	Secondary Role	-	Secondary Role	Secondary Role
Governments/ Authorities	Secondary Role	-	Secondary Role	Primary Role	Secondary Role	Secondary Role	Secondary Role	Primary Role
Network operators	Secondary Role	Primary Role	-	Primary Role	Secondary Role	Primary Role	Secondary Role	Secondary Role
Retailers	Secondary Role	Primary Role	-	Primary Role	Secondary Role	-	-	-
NGOs	Secondary Role	-	Secondary Role	Primary Role	-	-	Secondary Role	Secondary Role
Consumer Organisations	Secondary Role	-	-	Primary Role	-	-	-	Secondary Role
Recycling Companies	Secondary Role	-	Secondary Role	-	Primary Role	-	Secondary Role	Secondary Role
Research Institutions	Secondary Role	Secondary Role	Secondary Role	Secondary Role	Secondary Role	Secondary Role	Primary Role	Secondary Role
Standardisation Bodies	Secondary Role	-	-	-	-	-	Primary Role	Secondary Role
Consumers	Secondary Role	Primary Role	-	Primary Role	-	-	-	-
Investors	Secondary Role	-	Secondary Role	-	-	Secondary Role	-	-

Primary Role: The stakeholder has a direct role in making the improvements.

Secondary Role: The stakeholder has a role in setting an environment conducive for the improvement options to take place and also in supporting the improvements.

3. Environmental Activities of the Component Manufacturers

The participating component manufacturers - AMD, Epson and Intel have provided the text for developing this chapter. The chapter identifies the main environmental initiatives of these companies. In the first report, the components manufacturing phase was identified as one of the most significant phases in the life-cycle of mobile phones.

3.1 To reduce energy consumption during component manufacturing

The main initiatives of the participating component manufacturers towards reducing the energy consumption are identified in this section.

AMD

AMD is taking technically and economically feasible actions to reduce global warming gas emissions. AMD is buying energy from more efficient sources (e.g. from cogeneration and renewable energy) and has implemented a number of projects to increase the energy efficiency of manufacturing and building operations.

As an example, AMD is committed to a 30 percent reduction in normalised energy use by 2007 measured against a 2002 baseline. Manufacturing energy efficiency rose significantly in 2004 and AMD has already surpassed the company's 2007 goal, decreasing normalized energy consumption by 56 percent below the 2002 baseline. The normalisation factor is a Manufacturing Index (MI) derived from the number of wafers processed, the complexity of the fabrication process, and the wafer size.

AMD and Spansion are systematically also addressing energy efficiency in product design. The goal is to design new products with improved energy efficiency, considering that the device delivers the same service or operation with less energy or delivers increased service or operation with no increase in energy. Increased energy efficiency is achieved through a variety of approaches ranging from improving power management technology through new chip and transistor design to new materials of construction.

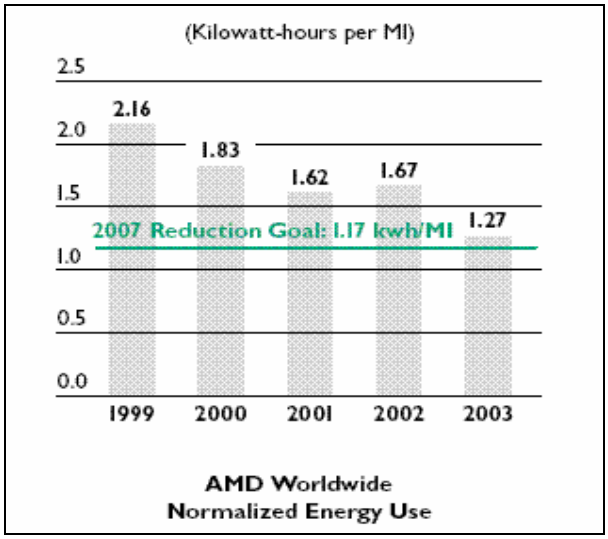

Figure 3-1: AMD worldwide normalised energy use

EPSON

In 2001, Seiko Epson Corporation opened a new factory (Toyoshina green factory) for the production of colour LCD panels particularly for small and medium sized LCD used in mobile information devices such as mobile phones. The electricity requirements of the new plant have been measured individually and listed by process. The analysis showed that the photolithography, etching and cleaning processes consume most of the energy. As a result, the focus of energy saving activities switched from production equipment to facilities that offered greater potential for energy savings.

Measured in crude oil per month, the new plant has reduced the energy consumption by over 40% in 2002. The aim is to reduce the energy consumption by at least 60% in 2010 compared to a 1997 base line. Currently, the majority of Nokia LCD panels are produced in the green factory with the intention of producing all Nokia LCD panels here in the near future.

Since 2000 Epson Seiko started using the TFD panel. Compared to the traditional TFT panels, the TFD technology has major advantages in terms of energy efficiency. During the use stage, the power consumption per hour for the TFD panel is reduced to 0.8 mW compared to 6 mW for the TFT technology while at the same time having the same reflectance. At present, all LCD panels for Nokia are TFD panels.

INTEL

In 2002, Intel set a goal to reduce its normalized energy consumption by 4% per year from 2002 through 2010. In 2003, Intel reduced its normalized energy consumption by 12% over 2002. This improvement was driven by the energy reduction projects that have been implemented over the last few years, as well as the fact that stronger business conditions in 2003 resulted in Intel factories being more loaded. Energy use is tied closely to company growth and facility expansion. Intel's energy management team is working to reduce energy consumption, and expects normalized energy use to continue to decrease in future years in keeping with its established goal[15].

In addition to reducing power consumption of its operations and facilities, Intel has put programs in place to improve the energy efficiency of its products. A holistic approach has been taken towards power management to tackle the issue at all levels of design: silicon, package, circuit micro/macro architecture, platform and software. Research and development are ongoing in each of these areas[16].

SEMICONDUCTOR INDUSTRY

In addition to above, there is voluntary action by the Semiconductor industry in Europe to reduce the emissions of Per Fluoro Carbons (PFCs). Various goals are as follows:

- World Semiconductor Council (WSC) set a goal of 10% (baseline 1995) reductions by 2010; announced in 1999.

- European semiconductor industry agreed a Memorandum of Agreement to implement this global commitment in Europe.

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[15] See Intel's environmental goals at: http://www.intel.com/intel/other/ehs/goals.htm

[16] For a full overview see ftp://download.intel.com/technology/silicon/power/download/design4power05.pdf. Intel's product ecology web-site can be seen at http://www.intel.com/intel/other/ehs/product_ecology/index.htm

– The 10% reduction target stands for a total reduction greater than 95% on a component basis.

3.2 To reduce use of environmentally relevant chemicals and waste from component manufacturing

The main initiatives of the participating component manufacturers towards reducing the use of hazardous chemicals are identified in this section.

AMD

The goal of AMD's Design for EHS (DfEHS) program is to produce products with a reduced overall environmental footprint. AMD accomplishes this by introducing environmentally preferable—and technically and economically feasible—materials, manufacturing processes, and features into products at all stages of product development. One example is the systematic reviews of the environmental, health and safety properties of materials considered for use in the chip package, e.g. antimony trioxide is not used in any new Spansion packages. AMD has also taken measures to reduce the environmental impact and increase the recyclability of our packing materials. For example, AMD has replaced PVC with cardboard in its Processor-In-a-Box product packaging.

Another example is that each AMD site has established a pollution prevention program as required by a corporate standard. This is to prevent or reduce waste at the source, and recycle or reuse waste whenever feasible. The philosophy behind is that wastes that cannot be prevented or recycled must be treated in an environmentally safe manner with disposal used as a last resort. For additional information AMD publishes an annual report[17] on its environmental, health and safety (EHS) activities.

EPSON

The LCD modules of Epson are free from any of the six RoHS Directive substances and therefore compliant with this Directive well ahead of the schedule banning them in 2006. Furthermore, in order to create eco-friendly products, Epson studies the status of all chemicals used in the production process and practices hazard assessment. As a consequence, Epson has a list of chemicals that are prohibited from inclusion in a product[18].

The Epson's group zero emissions initiative has lead to a 100% recycling of business waste. At the same time, continuous efforts are being made to reduce the total volume of waste. To reduce global warming, Epson reduces substances other than CO_2, such as PFCs and SF_6 by decomposing the gases and by slashing their use.

In 2001 Epson introduced the ecology label, a voluntary labelling system applicable to all Epson products. Epson develops products based on an evolving set of eco-standards and disclose the products' compliance through the label. Since April 2004, this is being complemented by providing the Epson Ecology Profile that includes information on chemical substances.

[17] See AMD's 2004 Corporate Responsibility Report at http://www.amd.com/us-en/assets/content_type/DownloadableAssets/24995D_CRReport_72.pdf

[18] See www.epson.co.jp/e/community/environmental_gpurchasing.htm

INTEL

In 2003, Intel recycled 74% of the solid waste generated and 67% of the chemical waste generated at all facilities worldwide.

Figure 3-2: Solid and chemical waste recycled at Intel

Intel applies the Design for Environment (DfE) approach for managing its environmental issues. The DfE program at Intel includes proactive management of suppliers and the inclusion of environmental goals during the initial design and technology development of products. Some results achieved by using DfE at Intel are:

- Intel strictly controls the materials contents provided by suppliers ensuring compliance to the Intel Product Environmental Content Specification. This specification identifies materials that are restricted ensuring that Intel products meet content restrictions and regulations around the globe. Furthermore, its suppliers are required to use an environmental screening tool to identify potentially environmentally sensitive materials and eliminate their use in favour of more ecologically friendly alternatives. Due to this, Intel was that it was able to ship more than 1 million lead-free Intel Flash Memory products shipped in 2003.

- By setting goals for improving environmental performance with each new product, Intel has:

  - Reduced Hazardous Air Pollutant (HAP) and Volatile Organic Compound (VOC) air emissions by more than 50% on a production unit basis since 1999.

  - Reduced water use per unit of production by 25% over the same period.

  - Since 2003, packaging reductions in products from the Intel Communications Group has resulted in the elimination of 250,000 lbs of paper and 46,000 lbs of non-recyclable plastics annually.

- Since 1999, over 800,000 lbs (363,636 kgs) of electronic waste has been diverted from landfills attributing to Intel's End-of-Life management initiatives.

The economic, environmental, and social impacts of the identified improvement options will be assessed in the next stage.

4. Key Factors for Consideration

This chapter identifies the key factors, which the regulators and/or other stakeholders must consider while developing/discussing environmental policies.

4.1 Market Characteristics

The market characteristics significantly influence the phone types. Issues like consumers awareness on environmental issues, their willingness to pay, their preferences of designs may vary across markets.

4.1.1 Operator Requirements

Network operators are increasingly asking the phone manufacturers to customise the phones for their services. Customised phones are optimized around the services of a particular operator. These phones support and drive the content and data applications that operators are investing in. In many cases the operators also require the phone manufacturers to deliver the phones in some specific sales packages.

4.1.2 Consumer Preferences

In many cases the consumers drive the demand for products with relatively higher environmental impacts.

4.1.3 Functions

The functions that a phone provides also vary by the markets. In mature markets the consumers are increasingly looking for phones that can serve multiple functions.

4.1.4 Perceptions

People generally buy products based on a subjective criteria – because of the looks, the ease of use or just because their friend has the same. Due to this, in many cases it is not relevant what are the features and attributes of the products. The consumers may not buy a product, even if it has good environmental profile, because of a negative perception.

4.2 Technological Innovations

The Information Telecommunication (IT) industry is driven by innovations in technology. Any policy that limits the innovations may seriously impact this industry.

4.3 Manufacturing considerations

Aside environmental considerations, there are several other issues related to manufacturing of products, which are considered before a decision is made. Some of the main considerations related to manufacturing are

1. Costs
2. Material Properties

3. Suitability for mass production
4. Availability for mass production
5. Origin of materials
6. Yields
7. Safety (product and production)

4.4 Standard Product Requirements

The purpose of standard product requirements is to ensure that the products are developed in line the same technical standards ensuring good product quality and customer satisfaction. Standard product requirements cover requirements from reliability, mechanical functionality, operational conditions, field performance, product safety, regulatory, accessibility, and environmental issues.

4.4.1 Product Reliability

The product reliability covers mechanical reliability including mechanical, thermal, chemical, radiation and electrical requirements for portable, automotive, stationary use.

4.4.2 End User Expectations

The end user expectations focus on product performance and its usability.

4.4.3 Product Acceptance

Product acceptance focuses on regulatory requirements and the requirements set by different certification bodies, ElectroMagnetic Compatibility (EMC), product safety requirements and the requirements and guidelines for product accessibility of mobile devices in every region.

4.4.4 Environmental Issues

These requirements cover the basic environmental requirements that must be met by each and every product.

4.5 Existing legislation

The policies should be consistent with each other and the different policy tools used for a product should reinforce each other's effect.

4.6 Net environmental benefits based on Life-cycle thinking

The net environmental benefits that may arise of policy measure should be analysed beforehand. This means that the impacts of all alternative scenarios are analysed. In many cases the alternative scenarios may be better on some environmental aspects but worse on others.

5. Conclusions and Outlook

This report identifies numerous options for improving the life-cycle environmental performance of mobile phones and highlights the crucial role that stakeholders can play. The improvement options are identified under eight themes: improvements in mobile phones; optimisation of in-use life-span; reduction in energy consumption and environmentally relevant chemicals used during components manufacture; influencing the buying, usage and disposal patterns of consumers; end-of-life management of disposed mobile phones; reduction in impacts from energy consumption of network infrastructure; development of suitable environmental assessment methods; and creation of a favourable policy environment.

Influencing the existing consumption patterns in addition to the production patterns is crucial for reducing the life-cycle environmental impacts of products including mobile phones. This means increasing consumer awareness on environmental issues, creating a demand for products with superior environmental performance, providing eco-information on the products to the consumers, and encouraging the consumers to use and dispose the product in proper ways. A demand for environmentally superior products has a straightforward, quick and very strong influence on the production patterns. All stakeholders play important roles in influencing these patterns.

This report also discusses the business related key factors that should be considered by the policy makers to assess the true impact of their decisions. These key factors include the market characteristics, technological innovations, net environmental benefits, standard product requirements like end user expectations, product acceptance, product reliability and manufacturing issues like costs of alternatives, properties of alternative materials, their suitability and availability for mass production, their origin and the yields.

The improvement options, identified in this report, shall be analysed in the next stage. The analysis will identify the economic, environmental, and social impacts of these improvement options and assist in prioritising the options. The stakeholders who have the primary responsibility for implementing these improvement options will conduct the analysis based on their experiences and judgements. The next report will also discuss the policy tools which are best suited for this product group.

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Abbreviations

BEP	Best Environmental Practice
BAT	Best Available Technology
BEUC	The European Consumers' Organisation
DfE	Design for Environment
EEE	Electrical and Electronic Equipment
EMS	Environmental Management System
EHS	Environment, Health and Safety
ETSI	European Telecommunications Standards Institute
EoL	End-of-Life
EU	European Union
GeSI	Global e-Sustainability Initiative
HAP	Hazardous Air Pollutants
ICs	Integrated Circuits
ICT	Information Communication Technology
ISO	International Organisation for Standardisation
KEPIs	Key Environmental Performance Indicators
LCA	Life-cycle Assessment
LCD	Liquid Crystal Display
MPPI	Mobile Phone Partnership Initiative
MPWG	Mobile Phone Working Group
NGOs	Non Governmental Organisations
PVC	Poly Vinyl Chloride
PWB	Printed Wiring Board
UNEP	United Nations Environment Programme
WEEE	Waste Electrical and Electronic Equipment

Appendix A: List of Stakeholders Participating in this IPP Pilot Project

Phone Manufacturers

- Motorola
- Panasonic

Components Manufacturers

- AMD
- Epson
- Intel

Network Operators

- France Telecom / Orange
- TeliaSonera
- Vodafone

Government Agencies

- Department of Environment, Food and Rural Affairs (DEFRA), UK
- Finnish Environment Institute (SYKE), Finland

NGO

- World Wide Fund for Nature (WWF)

Consumer Organisation

- The European Consumers' Organisation (BEUC)