

Nokia and the environment



NOKIA

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Preface

Nokia and the Environment is designed to introduce the readers, including our employees, customers and other stakeholders, to Nokia's activities related to environmental issues, covering aspects from environmental management, stakeholder relations, management and operational performance, product related issues and sustainability. This publication is based on information collected during the year 1998. In previous years an overview about Nokia's environmental issues has been included in the company's annual report.

This report discusses developments in the main focus areas of Nokia's environmental work today; environmental management systems, design for environment, supply chain management, end-of-life practices and packaging. Along with presenting Nokia-wide actions and policies, we have included examples highlighting successful environmental work carried out in the different parts of the organization.

We have noted with interest the emerging global trend to standardize reports of this nature and have applied, for the purposes of this publication, the general framework proposed by the Global Reporting Initiative (GRI) in its Sustainability Reporting Guidelines.

We have started systematic collecting of environmental data from production sites, but the scope and focus differs to some extent from site to site. Much of the data collection necessary to effectively measure the success of our environmental work at the group level is not yet in place. We will provide more comprehensive data in future years.

By producing this report, Nokia hopes to help the reader to better understand the various environmental impacts, risks and opportunities that the company faces in its everyday operations. Nokia also hopes that this report can serve the company by initiating discussion on various environmental aspects. In electronic format, Nokia and the Environment 1998 can be found at Nokia's Internet address: www.nokia.com.

Environment





Building a sustainable mobile information society

At Nokia, we believe that success in today's globalizing economy is determined not only by the efficient use of financial capital. It is quite as important to seek for the ability to build, sustain and effectively develop human, social and natural capital. Our aim is to meet the needs of the present without jeopardizing the rights or resources of future generations.

The guiding philosophy behind Nokia's operations, the Nokia Way, lays the ground also for Nokia's approach to the environment. The cornerstone of our approach is the commitment to sustainable development – the objective of Nokia's environmental policy that sets the direction for our environmental work.

Our environmental work is based on life cycle thinking. Together with eco-efficiency, life cycle thinking is of primary concern in developing, producing and marketing new Nokia products and solutions. We continuously strive to develop and provide advanced human technology, products and services that have no undue environmental impact, are efficient in their consumption of energy and natural resources, or even help to save them. At the same time, we continue to enhance the reuse, recycling and safe disposal of our products.

Nokia has four company values – customer satisfaction, respect for the individual, achievement and continuous learning. Every employee is instructed in these values from their first day with Nokia and encouraged to apply these values in all aspects of their daily activities. We believe that these values provide a unique and useful perspective on the linked aspects of sustainability that are needed for a successful global economy – the environmental, economic and social aspects. Nokia has always recognized that the long-term interests of the company as well as of its various stakeholders depend on adopting the highest standards of ethical conduct and applicable law. We also believe that an open and ethically sound approach helps us in supporting our stakeholders' interests.

The information and communications industry is an exciting field of business with great potential for solving some of the major obstacles to global sustainable development. Nokia wants to play a key role in creating a sustainable mobile information society.

*Jorma Ollila, Chairman and CEO
Nokia*

Key figures 1998

	EUR million
Net sales	13 326
Operating profit	2 489
Profit before taxes	2 456
R&D investments	1 150
Capital expenditure	761
Market capitalization	59 796
Personnel at year-end	44 543

1. Profile of Nokia

Nokia in brief

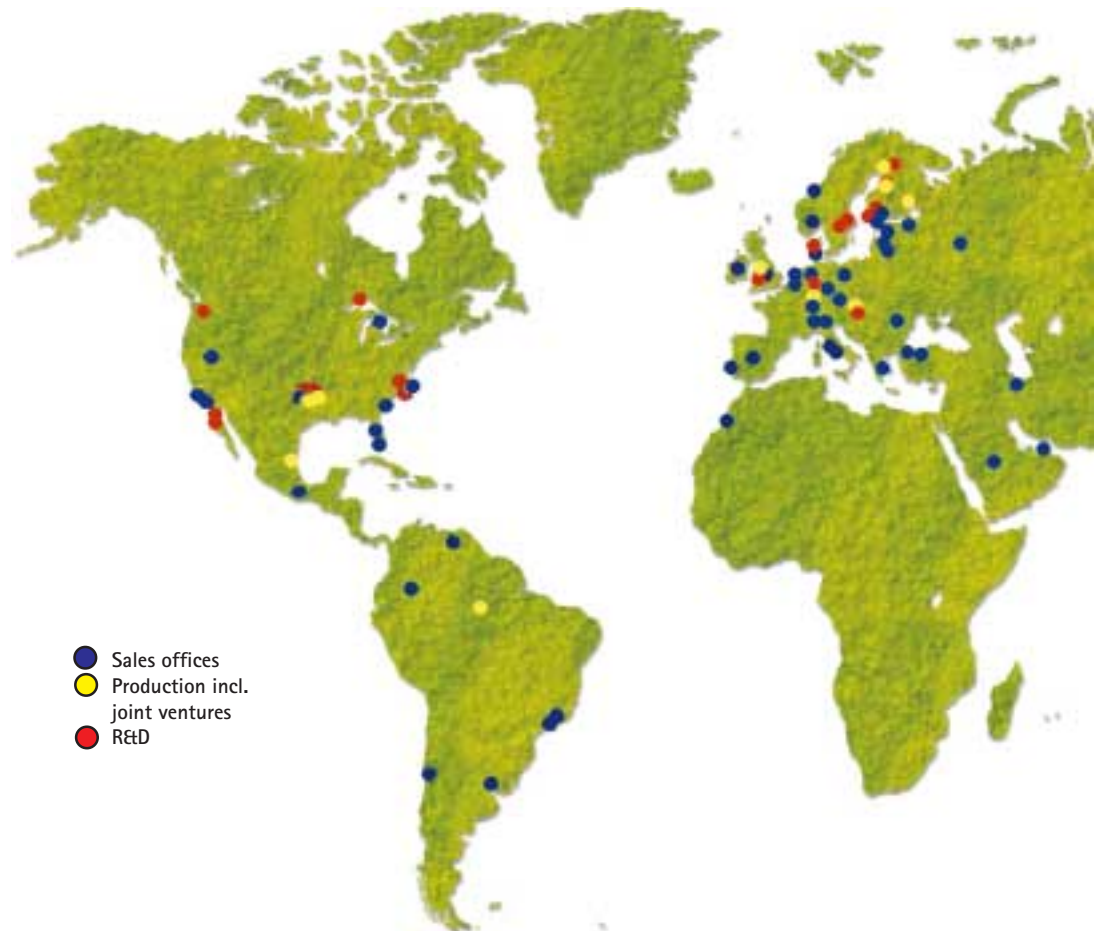
Nokia Corporation is a public limited company incorporated under the laws of the Republic of Finland. Nokia's business objective is to strengthen its position as a leading systems and equipment supplier in the rapidly evolving global communications industry. To achieve this, Nokia's strategy focuses on

- Leadership in the most attractive global communications segments
- Speed in anticipating and fulfilling evolving customer and market needs
- A global business approach
- Strong consumer recognition and leverage of the Nokia brand.

Nokia is the world's largest mobile phone manufacturer and a leading supplier of digital mobile and fixed networks. Nokia also supplies multimedia equipment, satellite and cable receivers, computer monitors as well as other telecommunications related products. Nokia is Finland's largest publicly traded company with marketing capitalization totaling EUR 59.8 billion on December 31, 1998.

At the end of 1998, Nokia comprised three business groups: Nokia Telecommunications, Nokia Mobile Phones and Nokia Communications Products. In addition, Nokia includes a separate Nokia Ventures Organization and the corporate research unit, Nokia Research Center.

Nokia Telecommunications develops and manufactures a broad range of advanced infrastructure solutions to meet the needs of a variety of customers, including fixed operators, mobile operators and Internet service providers. In addition, Nokia Telecommunications provides related service creation and network management solutions, customer services and system integration. It is a world-leading supplier in GSM infrastructure, including wireless data solutions. A key player in focused areas of fixed and datacom networks, Nokia Telecommunications is also a significant supplier of broadband and IP networks.



Nokia Mobile Phones is the world's largest mobile phone manufacturer with sales in over 130 countries worldwide. With a comprehensive product portfolio, covering all major standards and consumer segments, Nokia is in a strong position to lead the development toward the third generation of mobile communications. Building on its know-how in core infrastructure as well as the design of software and user interfaces, the company is leading the development of new wireless data applications.

Nokia Communications Products includes two business divisions: Nokia Multimedia Terminals and Nokia Industrial Electronics. Nokia Multimedia Terminals is a pioneer in digital satellite, cable and terrestrial network terminals for interactive multimedia applications. Product development focuses on the transmission of broadband digital video, audio and data services as well as the terminals for these services. Nokia Industrial Electronics is one of Europe's leading manufacturers of advanced PC and workstation monitors, including applications for professional desktop communication and new technologies. It is also one of the leading suppliers of mobile phone battery chargers.

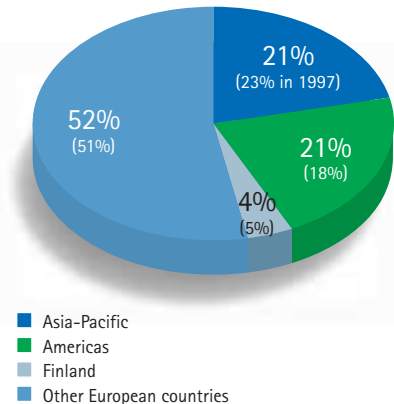
Nokia Ventures Organization explores new business areas facilitating future growth and boosting Nokia's product and long term business development. Nokia Ventures Organization includes two units: Wireless Business Communications focusing on the development of new wireless solutions for corporate customers, and Wireless Software Solutions focusing on the development of software products based on the Wireless Application Protocol (WAP) standard. The Silicon Valley based Nokia Ventures Fund focuses on start-up businesses and technologies globally.

Nokia Research Center interacts closely with all Nokia business units to enhance the company's technological competitiveness. The center covers the full range of activities from exploration of new technologies and product/system concepts to their exploitation in actual product development undertaken in the business units.

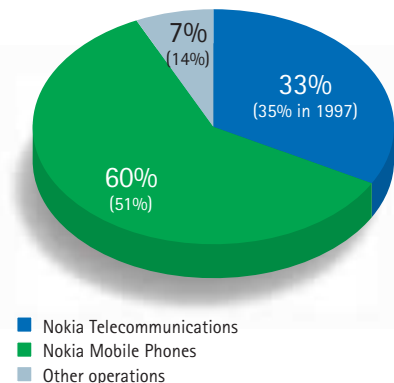


At the end of 1998, within its continuing businesses, Nokia had 26 production facilities, including joint ventures, in 11 countries. In addition, Nokia had 44 R&D centers in 12 countries, and a global network of distribution, sales, customer services and other operational units. Nokia employed 44,543 people at year-end 1998, had activities in some 45 countries and supplied its products in over 130 countries worldwide.

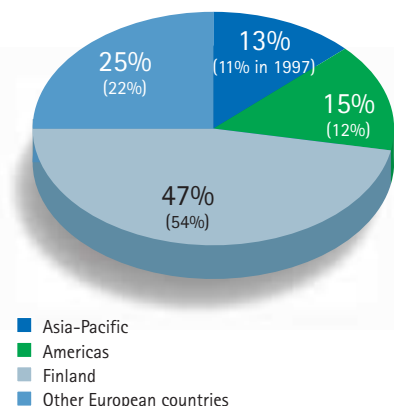
Net sales by market area 1998



Net sales by business groups 1998

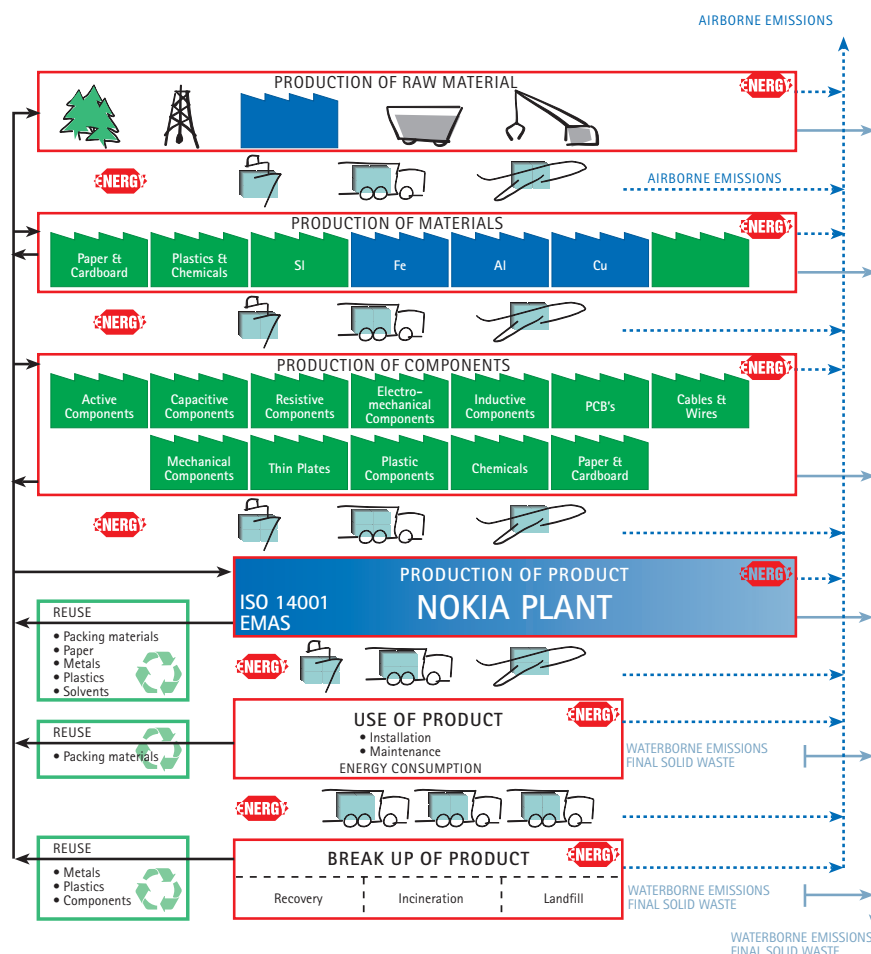


Personnel by market area 1998



Life cycle thinking

Life cycle thinking is a holistic approach to map a product's environmental aspects. The manufacturing phase is just one of the many stages the product goes through during its life cycle. The product life cycle starts when raw materials are extracted and ends with waste treatment. In every stage of the product life cycle there are emissions causing impact on air, water or soil. Life cycle thinking covering all the environmentally significant impacts of a product from the cradle to the grave is the basis for all Nokia's environmental activities and provides the framework for action.

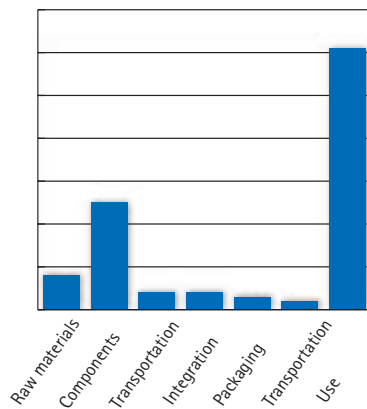


Simplified flowchart of the different stages of a product life cycle. At each stage there is an input of materials and energy, and an output of products and recoverable materials accompanied by emissions to the environment causing impacts on air, water and soil.

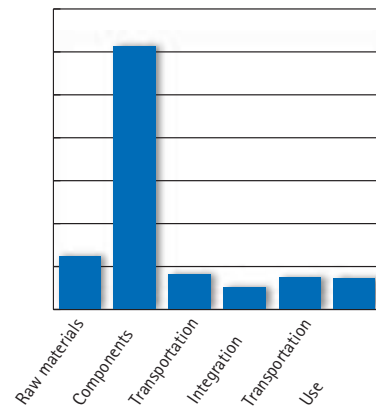
The basis for emphasizing the life cycle concept is the long process chain that is characteristic of the communications industry. Due to the long process chain, activities at Nokia's production sites account for only a fraction of the overall environmental impact and thus the total impact over the whole life cycle of Nokia products is more product specific than Nokia manufacturing site specific.

Nokia has conducted life cycle assessments (LCA), where the environmental impacts of a product during its entire life cycle are studied, for certain products to identify which phases in a product life cycle have the most significant environmental impact. According to the results, the environmental load is most crucial in the use phase of the product due to energy consumption and at the manufacturing phase of different components.

Energy burden of a CRT-monitor



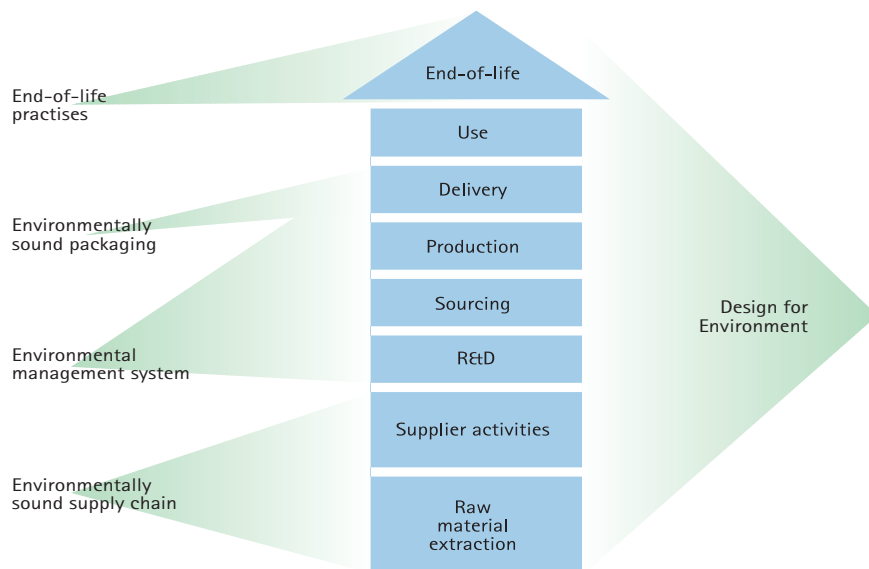
Energy burden of a mobile phone



In 1998, the environmental impacts of a computer monitor were analysed in connection with a graduate thesis. The results showed the largest energy burden to be in the use phase of the monitor. An LCA study on a mobile phone indicated that the largest energy burden is caused at the component manufacturing phase.

Life cycle thinking in practice

Based on the environmental aspects of the product life cycle, Nokia has identified its main focus areas for environmental work today. These include an environmentally sound supply chain, environmental management systems, environmentally sound packaging and end of life practices. All these areas can be influenced with Design for Environment.



The Nokia Values

- Customer Satisfaction
- Respect for the Individual
- Achievement
- Continuous Learning

2. Nokia policies and environmental organization

The Nokia Way

Nokia is proud of its historical and current commitment to being a company based upon principles and values. A few fundamental and inter-related values and principles unite the company across its locations and form the basis of Nokia's distinctive culture as well as its business success. These values and principles will continue to provide the foundation for our long-term success also in the future.

Nokia Values

The Nokia Values are a statement of how Nokia should operate and a cornerstone of the company's corporate culture. They are the standards of behavior expected of all Nokia employees. The values form a common bond and language as well as a shared philosophy for working together.

Nokia's values are Customer Satisfaction, Respect for the Individual, Achievement and Continuous Learning. Customer satisfaction is the basis of all Nokia's operations. Respect for the Individual means that Nokia believes in the individual, whether she or he is an employee, a business partner or a customer. It also means open and candid communication, fairness, mutual trust and acceptance of diversity. Achieving results requires that every Nokia employee is working according to a strategy and well-defined goals. Everyone in the company must know the goals of the company as well as those set for him or her. To be a leader in the telecommunications industry takes innovation, courage and a constant willingness to learn. Continuous learning means that everyone is entitled to look for ways to improve their performance.

Nokia wants to create an environment where employees, customers and suppliers and other cooperation partners feel the empowerment to develop and improve their relations through a common exchange and development of ideas.

Nokia's Ethical Principles

Nokia has been and continues to be deeply committed to being an ethically sound business; no long-term customer, employee or other stakeholder relation can exist without organization and personal integrity. Nokia is committed to the highest standards of ethical conduct, and full compliance with all applicable national and international laws. Nokia's goal is to be an industry leader in these areas as well as a good corporate citizen wherever it does business.

Nokia employees are strictly expected to avoid conflicts of interest. Nokia and Nokia people do not pay or offer to pay bribes or illicit payments to obtain or retain business.

Nokia respects and promotes human rights. Nokia recognizes that certain human rights should be considered as fundamental and universal. Among those rights are freedom from discrimination based on race, color, sex, language, religion, political or other opinion, national or social origin, property or birth.

Freedom of peaceful assembly and association as well as freedom of thought, conscience and religion are respected in everyone's actions at Nokia. Freedom of opinion and expression are very much in line with Nokia's open and straightforward way of working and its corporate value, "Respect for the Individual."

Nokia does not use child or forced labor, and does not use subcontractors or suppliers who do so.

To remain successful, Nokia respects and encourages teamwork, and the strength that comes from diversity. Working in a multicultural environment is considered to be an advantage and privilege.

Equal opportunity is a key part of the Nokia Way. Nokia invests in the personal and professional learning of all its employees. Its target is to learn something every day and to secure the continuous learning of the entire team. Nokia also considers



Information technology helps to yield reductions in the amount of physical resources used. Video conferencing brings together Nokia employees from different parts of the world.

the balance of the personal and professional lives of its employees to be important.

Everyone at Nokia is encouraged to follow strict ethical rules in their own work environment. Discrimination, for example, can sometimes be hard to detect. Whenever a problem in the workplace is detected, it is tackled immediately.

Towards sustainable development

Nokia signed the ICC Business Charter (see appendix) in 1991, underlining the company's commitment to sustainable development as defined in the Charter. Over the years the message of the Charter has intensified in Nokia's daily operations. At the same time, Nokia has cultivated the Nokia Way of doing business, including the company's values and the concept of good corporate citizenship. Together these issues have supported implementation of a broader concept of sustainable development within Nokia's operations. This development is in line with the concept of sustainable development, the requirements of which have now expanded to embrace social issues as well as environmental and economic ones.

In the future, communications technology will play an increasingly important role in society. It has the potential to enhance the wellbeing of people through developments like telematics, telelearning and health applications. For Nokia this presents major opportunities as well as challenges. Nokia wants to ensure that technological development has a sound impact on society.

The implementation of sustainable development along with information technology requires a far-reaching viewpoint taking into account the frame conditions set by nature. Nokia recognizes its role in developing technological solutions that support sustainable development ecologically, economically and socially.



Nokia has developed display products with interactive on-line communications capabilities opening the door to entirely new ways of working, educating and remote teaching, also within the health-care industry. CATRED (Computer Assisted Telematic Remote Education and Development) is a collaboration project in Finland to improve the educational opportunities of people working at primary health care centers.



Nokia's environmental policy sets the direction for the company's environmental work.

Nokia's approach to the environment

Nokia's strategic intent is to strive for leadership in the most attractive global communications segments through speed in anticipating and fulfilling evolving customer needs, quality in products and processes, as well as openness with people and to new ideas and solutions. Based on its resources including technological know-how, market position and the continuous building of competencies, Nokia believes that it is well positioned to achieve its future goals also in environmental issues. Nokia strives to implement environmental management and works continuously towards good corporate citizenship using the principles of sustainable development.

The means to this end include integrating environmental activities into Nokia's management system, active and open external and internal communications and Nokia-wide cooperation in environmental matters.

Environmental policy

The commitment to continuous improvement in environmental issues is stated in Nokia's Environmental Policy, published in 1994. The line organizations of Nokia's business groups and divisions are in charge of implementing the policy.

Basic principles in Nokia's environmental policy include:

- A successful business requires solid product life cycle-based environmental performance.
- The Nokia Way means an active, open and ethically sound approach to environmental protection.
- The objective of Nokia's environmental policy is sustainable development in accordance with the ICC (International Chamber of Commerce) business charter.

To implement these, Nokia applies the following principles:

- The environmental policy is a part of the general management process.
- Line organizations plan and implement the action programs by using environmental specialists and the best available technology.
- The action programs are based on a thorough understanding of the environmental impacts of a product throughout its life cycle.
- Minimizing the environmental impacts requires continuous efforts and follow-up of the results; it is thereby a part of the total quality improvement process.

Nokia uses the international environmental management standard, ISO 14000 series, as guidelines for environmental management. The results of environmental work are reviewed on an annual basis, plans are updated and special goals are set where needed.

Goal areas within Nokia's environmental management are.

- Design for Environment is integrated into Nokia's product development.
- Environmental management systems of all main Nokia production sites have to meet the requirements of ISO 14001 by the end of year 2000.
- Environmental aspects are integrated into supply chain management.
- End-of-life practices are supported.

Environmental organization

The Nokia Environmental Steering Group was established in 1994 to coordinate and give direction to Nokia's environmental activities. Nokia-wide management of environmental activities was further strengthened in 1997 by the establishment of the Nokia Environmental Initiative Team, which comprises representatives of Nokia's business groups and coordinates the implementation of Nokia's environmental activities.

The Nokia Environmental Initiative Team prepares proposals on environmental issues to be implemented on a Nokia-wide basis to the Nokia Quality Initiative Steering Group. The Quality Initiative Steering Group is chaired by the President of Nokia. This group gives guidelines for business groups and line organizations for their environmental work. The decision-making body in environmental issues and in quality issues in general is the Nokia Quality Board, whose members include the presidents of the business groups.

The Nokia-wide environmental bodies aim to ensure that the business group and unit level implementation of environmental activities is consistent with Nokia's environmental policy and that cooperation between business groups is efficient.

At the business group and unit level, environmental work is integrated into normal business activities. The quality and process organization act as facilitators in environmental issues and the daily environmental work is carried out in the line organization. Each production site has a designated person responsible for the implementation and development of the site's environmental management system.

In 1999 the reporting structure for Nokia-wide environmental issues has been simplified by appointing Mr. Tapio Takalo as Head of Environmental Affairs. He is in charge of all Nokia-wide environmental issues and reports to Mr. Veli Sundbäck, Executive Vice President, Corporate Relations and Trade Policy, who is responsible for environmental issues at the Nokia Executive Board.

3. Stakeholder relations

Nokia's external stakeholders comprise the company's customers, shareholders, suppliers, cooperation partners and members of societies in which Nokia operates. Nokia's internal stakeholders are its employees.

Internal stakeholders

Nokia conducts global employee opinion surveys on an annual basis. In the "Nokia - Listening to You" survey employees have the opportunity to tell their opinion about the company and their working environment. The results are utilized in developing the working environment throughout Nokia.

The table below describes the favorable answers to the categories included in the survey 1998. There is a 2 - 4% improvement in all categories from the year 1996 survey results. Environmental issues were included under the category Organizational Integrity.

Answers to the environmental questionnaire in 1998 suggest that Nokia's image as an environmentally responsible company has improved among employees. In 1998, 74% of employees agreed that Nokia is an environmentally responsible company, while in 1996 the figure was 70%. Only 12% were not sure or did not believe in this statement in 1998.

Category	Favorable %	Difference vs 1996
Teamworking	68	+ 4
Organizational Integrity	66	+ 4
Training and Development	59	+ 4
Internal communication	71	+ 3
Employee Motivation and Awareness	70	+ 3
Quality Improvement	55	+ 2

The high response rate (72%) in 1998 shows that employees are strongly committed to the company. According to the survey, employees also have a clear understanding of the objectives of their departments and business units.

Internal environmental communication

Nokia considers its employees as one of the key audiences in its work within environmental issues. The company believes that an environmentally responsible company has better opportunities to attract and retain employees.

Each employee contributes to the company's environmental performance. It is thus important that all employees have a basic understanding of Nokia's environmental aspects and environmental work. Internal communications have a key role in this.

In 1998, Nokia launched a global environmental program for its employees. The program aims to ensure that all employees:

- have an understanding of the effect environmental management has on their daily activities
- have basic information on the actions Nokia has taken to minimize the environmental impact of its products throughout their life cycle
- understand the terminology in Nokia's environmental thinking.

The program comprises a video and a slide set to be used in training sessions globally. The video presents a comprehensive view on Nokia's environmental policy and life cycle thinking at Nokia and communicates management commitment.

In addition, Nokia employees worldwide have access to an intranet database for environmental information. It is structured according to a comprehensive list of topics, and all relevant environmental material can be downloaded through it. The database is updated regularly to ensure availability of up-to-date environmental information.

Environmental issues are also dealt with in Nokia's global in-house magazine, Nokia People. In 1998, a total of eight articles dealt with environmental issues.

External stakeholders

Customer satisfaction is one of the four Nokia values and the company wants to ensure customer satisfaction also in environmental issues. Customer needs are always evaluated in determining the direction of our environmental work.

Nokia's annual customer satisfaction surveys include questions on environmental issues and Nokia's environmental performance.

Nokia Mobile Phones' Customer Satisfaction Survey 1998 was conducted in the United States, Europe and Asia-Pacific as face-to-face interviews with approximately 100 operators and distributors. The table below summarizes the answers to "Dealing with a manufacturer who implements sound environmental policies".

Answer	Number of respondents	% of total	% excluding 'not relevant'
Not Relevant	117	51	
Unimportant	25	11	22
Given	61	26	54
Critical	21	9	19
Differentiating	6	3	5
Total	230	100	100

The results of the Nokia Mobile Phones' Customer Satisfaction Survey from 1998 showed that 12% of customers considered environmental issues as critical or differentiating, while approximately one quarter considered dealing with an environmentally responsible supplier as given.

The latest full customer satisfaction survey for Nokia Telecommunications is from year 1997, as the survey period was since adjusted to better support the annual planning cycle. In the 1997 survey, customers were asked to evaluate Nokia's capability to fulfil their needs in environmental issues. The answers are summarised below.

Answer	% of answers
Extremely satisfied	19
Satisfied	54
Slightly unsatisfied	20
Unsatisfied	7
Total	100

The results of the Nokia Telecommunications' Customer Satisfaction Survey 1997 show that three quarters of customers were satisfied with Nokia's capability to fulfill customers' needs in environmental issues.

Customer satisfaction surveys are conducted as interviews to allow for in-depth discussion also on environmental issues. This has been proven to give Nokia important information about customers' needs on environmental issues. Another important source of information on customers' environment-related needs is the tendering process, where environmental work carried out at Nokia and the environmental aspects of Nokia's products are often discussed.



Environmental training material is used in employee training sessions globally to communicate Nokia's approach to the environment.

Nokia in society

Nokia believes that economic, social and environmental responsibilities are not distinctly separate issues. In addition to providing technology, products and services that have as little environmental impact as possible, Nokia respects and promotes human rights and acts as a responsible member of the society. Nokia sees ethical conduct and corporate citizenship issues as an integral part of environmental thinking. This includes supporting charitable, educational, human rights and community activities through donations and other resources.

Participation in industry cooperation

Aiming to develop closer cooperation between businesses, governments and other organizations concerned with the environment and sustainable development, Nokia participates actively in association work both at national and international level. Nokia cooperates in creating a framework that allows businesses to contribute effectively to sustainable development, to demonstrate progress in environmental and resource management and to share best practices.

Membership in associations is a channel to contribute to the development of legislative requirements and voluntary agreements. Nokia is e.g. a member of the European Association of Consumer Electronic Manufactures (EACEM). It has also participated in the pilot project of ECTEL for the takeback of mobile phones. In Finland, Nokia has a representative in an environmental working group under the Co-federation of Finnish Industry and Employers. Nokia participated in a pilot project for takeback of electronic products arranged by the Federation of Finnish Electrical and Electronics Industry during 1997 - 1998. This project has progressed to its second phase to developing the takeback scheme further. In addition, a number of individual Nokia employees participate actively in various associations and forums within in the industry.

Worn around the neck, the Nokia LPS-1 inductive loopset is an easy-to-use device for smooth interaction between a hearing aid and a mobile phone. Introduced in 1998, the product was the first of its kind. In 1999 Nokia received the prestigious Access Innovation Award from the Association of Access Engineering Specialists for the product. The award recognizes innovations and advancement in access technology.



4. Management performance

Nokia applies global operating standards for business practices, transfer of technology and management systems throughout its business units. These standards are applied when establishing a new site in any country. Nokia has several joint ventures and a large number of contract manufacturers who share the company's technology and expertise. The company encourages its partners to adopt Nokia's guidelines as far as they are applicable, taking into account local requirements.

Environmental matters are not isolated from the overall management but are integrated into Nokia's unified management system. Environmental issues are included in product development and manufacturing, supply chain, real estate management, legal compliance and risk management.

Environmental management systems

Nokia has started the implementation of environmental management systems from manufacturing plants. All sites are required to build an ISO 14001 based environmental management systems. The alternative for external certification is internal verification by internal environmental auditors. The audit is led by a lead auditor and the auditors come from other Nokia units.

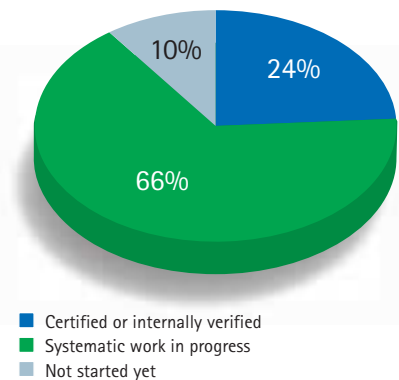
When environmental work was started at production sites, internal experience was shared to avoid overlapping work. In 1998, three internal training sessions for production-related personnel were arranged with participants from different production sites worldwide. The main objective of the sessions was to deliver information, collect experiences and share the best practices in the implementation of environmental management systems.

First ISO 14001 certifications in 1998

The first ISO 14001 certificates within Nokia were awarded in 1998 to two production sites in Finland and to one production site in Hungary. At the end of 1998 Nokia had a total of 21 main production sites and production joint ventures in nine countries. Of these five had a certified or internally verified environmental system. Another 14 were in different stages of implementation ranging from the initial review to a state of readiness for internal verification. The last two production sites started systematic work for environmental management system during the spring of 1999.

In the future, it is likely that building and implementing of Environmental Management Systems will expand to office sites to support the good housekeeping of real estate. A Nokia campus in Tampere, Finland is already piloting building an environmental management system for an office-only site. Approximately 40 percent of Nokia's sites are office facilities occupied mainly by R&D, sales, marketing and administration.

EMS status at the end of 1998



Environmentally sound supply chain

Nokia buys an increasing amount of components and assemblies from suppliers around the world for its production. A major part of environmental impacts of the product life cycle occurs within the supplier's production. Ensuring supplier compliance with Nokia's environmental standards is an integral part of Nokia's supply chain management.

Nokia has a comprehensive global Supplier Assessment Procedure, where suppliers are regularly monitored by Nokia's supplier quality engineers and sourcing personnel. The criteria are identical for Nokia's suppliers and contract manufacturers regardless of the country they operate in. Local and national development is nevertheless taken into account in assessing the schedules of suppliers.

Environmental issues are a key part of the overall quality assessment. Nokia requires its suppliers to have an up-to-date environmental policy and to develop an environmental management system, documented in accordance with the ISO 14001 or other nationally or internationally recognized standard. The suppliers are required to conform to legislative requirements and applicable industry codes of practice for the protection of environment. They are expected to have programs for waste management and air, water and soil emissions, and have already eliminated or have a detailed plan to eliminate the use of all ozone depleting substances. Finally, the suppliers should have a register for recording all incidents affecting the environment and a system for reporting such incidents to the appropriate local and governmental authorities.

The suppliers' environmental performance is monitored in connection with quality audits. In case of non-conformities, suppliers are required to submit detailed corrective action plans and reports for all failed elements. A full or partial reassessment will then be made by Nokia to check the effectiveness of the corrective actions made by the supplier.

The reusable plug-in-unit packaging won the packaging industry's prestigious Worldstar international award. The package was designed in Finland in 1996 in cooperation between Nokia and the national packaging material industry. Based on the recycling concept, the same package is reused 20-30 times between the supplier and Nokia before recycling the material.



Legal compliance and risk management

Nokia is committed to compliance with all applicable laws and regulations. Nokia's legal offices assist the personnel dealing with environmental issues in interpretation of legislation. Nokia has personnel at regional level responsible for following the development of new legislation and delivering information to the personnel concerned. At the local level the personnel responsible for environmental issues follow the development of environmental laws and regulations, working in active cooperation with local authorities.

Nokia is also actively following the development of international accounting standards and including of environmental considerations in such standards. The idea behind this development is to ensure that the financial implications of environmental matters are adequately considered, measured and reported. So far there are no standardized guidelines or instructions for their interpretation.

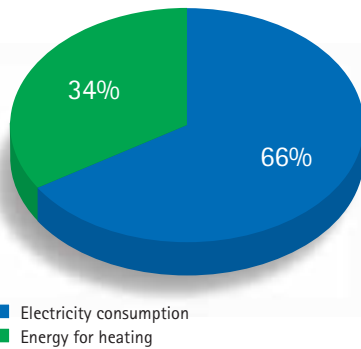
The ultimate goals of Nokia's risk management are to ensure customer satisfaction, to protect shareholder value, protect company brand and image and instill risk management principles into the daily operating procedure of all Nokia personnel so that all employees implement proactively risk management practices in their daily work.

Nokia Risk Management support business units in mitigating risks that threaten the health and safety of people, company assets, environment and continuous production.

In order to manage the risks, systematic risk analyses and surveys are conducted together with a corporate risk manager, line management and an insurance company. The Risk Management department works continuously to increase risk awareness within Nokia, conducts risk surveys and risk assessments, brings up loss prevention aspects in design and building of real estate, and sees to insurance matters. The risk surveys and assessments form a base for further design of building and establish alternative operating strategies to restore critical functions quickly after accidental damages.

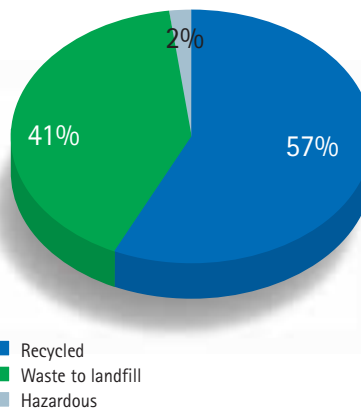
In mergers and acquisitions due diligence is conducted among other things to control the validity and conditions of permits and related responsibilities.

Energy consumption



Electricity use (including air conditioning and cooling) accounts for two thirds of the total energy consumption in Nokia's production. Half of the production sites are based in countries where there is practically no need for heating.

Waste fractions by weight



57% of total waste at Nokia production sites is recycled.

5. Operational performance

Environmental Management System implementation

At Nokia, site-related environmental activities are a part of plant and real estate management. They are structured as site-specific environmental management systems (EMS), covering both production related environmental aspects and environmental aspects of the facility itself. Each production site has a designated person in charge of facilitating the EMS which is integrated to the sites' quality management system. This way, environmental considerations form a natural part of day-to-day operations.

Plant and real estate management of each site collects information on energy consumption, waste management, air emissions, water consumption and environmental training. The information presented below is gathered from 21 production sites during 1998. The harmonization of environmental metrics continues and more comprehensive group level data will be provided in the coming years. Some sites have started EMS implementation already earlier and examples of improvements achieved are included in this chapter.

Energy consumption is one of the single most significant environmental aspects of Nokia's production. Energy consumption has an impact on the environment in the form of greenhouse gases, e.g. carbon dioxide emissions by the utility companies producing the energy.

Nokia consumes energy in the form of electricity and district heating. Some of the sites use gas and small amounts of oil, which are included in the energy consumption.

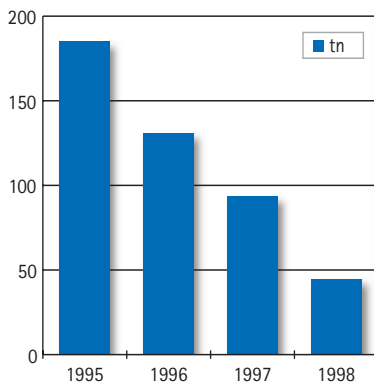
Efficient waste management requires collecting and recycling systems to be in place for the sorted waste fragments. In certain countries, this infrastructure is advanced and working, while in some others it is still in the early stages of development. Nokia's goal is to minimize all waste fractions and especially those destined to go to landfill.

In many countries, the waste handling processes of different fractions have developed considerably during the past few years. Waste is sorted at source into different material fractions in order to optimize the efficiency of end-of-life possibilities. At Nokia, materials currently suitable for recycling include cardboard, paper, metals, plastic, electronic scrap, wood and toner cartridges. Some sites also collect biowaste/food for composting, which is included in the graph in the recyclable fraction.

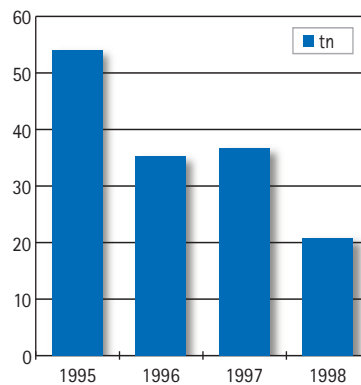
The quantity and quality of packaging materials used is an important aspect of waste management. Packaging materials for incoming components include mainly cardboard, paper and different types of plastic. Nokia reduces, reuses and recycles incoming packaging materials as much as possible. Employees have actively sought opportunities to reduce packaging materials and exchange non-recyclable materials to recyclable ones. This requires close cooperation with our suppliers. Improvements in packaging include abandoning the use of polyvinylchloride (PVC) plastic and replacing polyurethane foam with materials based on natural fibers. A growing volume of packages is returned to suppliers to be reused.

Improvements in waste management at the Mäkkylä site

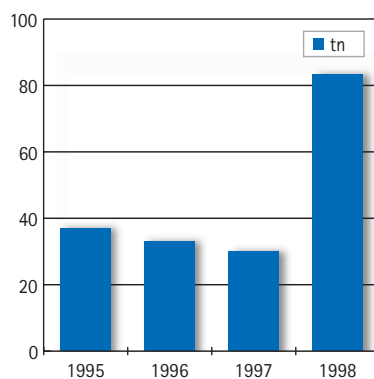
Waste to landfill



Cardboard for recycling



Paper for recycling

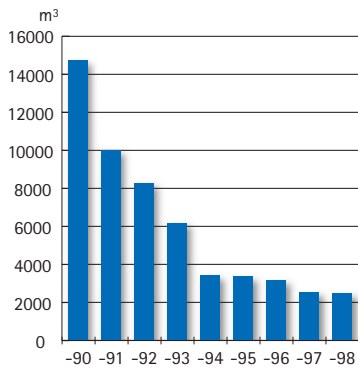


Significant improvements in waste management have been achieved at the Nokia Telecommunications Mäkkylä site in Finland. The site's production has increased over the years, but the total waste taken to landfill has decreased (a fall of 75% from 1995 to 1998) due to effective sorting of waste at source. The amount of cardboard for recycling has decreased as a result of increased efforts to reuse the incoming packaging. While paper consumption has remained stable, paper recycling has been intensified considerably.



Recycling of office paper is a standard practice at Nokia. The recycling systems in place vary to some extent from country to country.

Water consumption at the Äänekoski site



The change in soldering technology dramatically reduced the consumption of water in production during 1990 – 94 at the Nokia Telecommunications Äänekoski site in Finland.

Air emissions of volatile organic compounds (VOC) are owing to the use of different solvents in the soldering process. Nokia wants to be a step ahead of the upcoming solvent directive and is working to minimize use of such solvents. VOC often contribute to odors and to the production of low-level ozone. Low-level ozone is harmful to animal and plant life and is also a major constituent of photochemical smog.

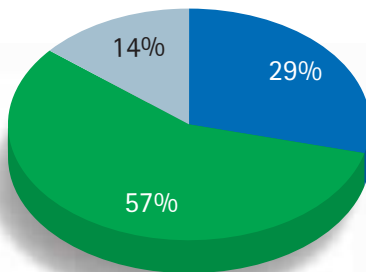
In electronics products the environmental concerns about the paint used in parts and components are minimal compared with most other industrial sectors. A thorough study and screened life cycle analysis of paint systems is ongoing at Nokia. VOC emissions are controlled either via abatement or by using compliance coatings.

Water at Nokia's sites is mainly used for sanitary and catering purposes, while a minor amount is used in production processes. The water consumption per site is dependent on the number of people working at a site. In a typical Nokia site, the water consumption is less than half of the average household water consumption in Finland (50 m3/year/person). Over the years, production technology has switched to non-clean fluxes in the soldering process. To further minimize the water use, it is Nokia's policy to install new water-saving armatures when renovating Nokia buildings.

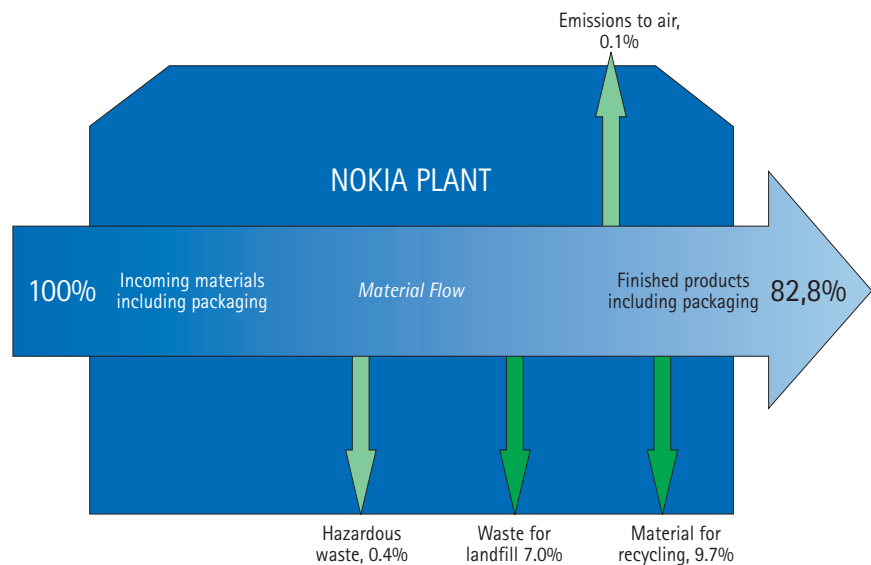
Environmental training of employees is a key element in environmental work and also one of the requirements for the ISO 14001 environmental standard. Environmental training improves know-how, creates understanding and promotes involvement in daily environmental work.

At Nokia, all sites where the implementation of environmental management systems is ongoing have arranged internal training sessions for their personnel. Training comprises general environmental issues, Nokia's environmental policy and its implementation, as well as site-specific, tailored training covering daily working practices. Tailored training is organized also for specific target groups, including e.g. R&D, manufacturing, marketing, customer service and sourcing personnel.

Environmental training at production sites by the end of 1998



Environmental training is a prerequisite in building an environmental management system. Two thirds of Nokia's production sites include environmental issues in their employees' induction.



Material balance of a typical Nokia production plant illustrates the efficiency of how incoming materials are integrated into final products and how the amount of emissions are minimized.

Transportation of products

To support life cycle thinking, Nokia seeks continuously to identify new important areas, where actions should be taken to improve environmental performance. One of these new areas is logistics.

Transportation of products is an essential part of logistics. Transportation of components from suppliers to Nokia's production sites and of products to customers is an activity, which has an impact on the environment e.g. in the form of greenhouse gas emissions. Nokia works towards reducing these impacts on many fronts ranging from product design to logistics planning.

In analysing the environmental impact of transportation, Nokia has calculated driven ton kilometers for two types of products, a mobile phone and a base station controller. In one case product parts were imported to Finland, where the products were assembled and the final product transported to China. In the other case product components were imported to Germany for assembly and the products were transported to customers all over the world. In both cases the conclusion was that the transportation of the products to customers consumes two to three times as much energy as the transportation of parts to a production site.

The transportation distances of products to customers are decreasing, as Nokia has established new production sites to the growing markets of its products in Asia and America. This near-to-the-customer policy supports eco-efficiency and decreases environmental impacts as the transportation of products to customers is minimized.

Reducing the weight and size of products is one of the Design for Environment objectives. Besides increasing material efficiency, it has a beneficial impact on transportation. Smaller products with more software to substitute hardware take up less space in transportation. Similarly, improved package design saves space in transportation.



In the packaging of the Nokia 6110 phone, the size of the package was reduced by 28% and the weight of packaging materials by 18% from those for the Nokia 2110 phone. Today it takes roughly 41 trucks instead of the previous 66 to transport one million Nokia mobile phones.

Safety of people and property

Nokia continuously strives to maintain and to improve the working ability and wellbeing of its employees. Nokia's occupational Health Service acts as a non-partial expert body in matters connected with health and safety aspects of work. Occupational health care gives guidance and assistance in developing work practices in the work environment and work communities. The aim is to provide goal-oriented and high-quality occupational health services to the Nokia units.

The occupational health care works in close cooperation with line organizations, research and development, real estate, risk management and other expert functions including environmental specialists. This cooperation encompasses proactive chemical control (substances, preparations, materials), physical work environment factors, ergonomics and work management.

Nokia's occupational health and safety issues are implemented in compliance with local legislation, agreements and practices. In addition, Nokia applies internal guidelines and procedures on health and safety issues. Nokia also uses external professionals specializing in occupational health and health promotion to help in developing and coordinating fitness programs and other activities as well as generally promoting wellbeing.

Nokia has a system for identifying, evaluating, eliminating, and controlling factors affecting employees' health and safety in the workplace. For example, Nokia strives to achieve good indoor air quality by using good design practices and selecting low emission materials and furniture. Measurements of air quality are carried out regularly both in offices and at production sites.

Chemicals are used in some stages of Nokia's production. The exposure is typically only a fraction of the exposure limit values. This is achieved by thorough process design and control, and by strict adherence to standard operating procedures.

Since 1979 Nokia has had a chemical control instruction in place covering the approval process for chemicals to be tested or used at any Nokia plant. The purpose of the instruction is to ensure that all units obtain all expert advice needed, and all applicable legal requirements are met. No chemicals are ordered or used by Nokia without the necessary information on their potentially hazardous properties and assurance of their proper end-of-life handling.

Nokia has a Chemical Control Group, which approves the chemicals used at any Nokia site. The group is responsible for checking the Material Safety Data Sheets and, if needed, obtaining additional information from the suppliers. Employees dealing with chemicals within production are trained on the properties and proper handling of chemicals.

Emergency preparedness

Nokia maintains site specific emergency response programs to ensure the safety of people and the protection of property in case of emergencies. Local requirements are respected from country to country. Each site must maintain response capability to meet any emergencies that reasonably might be expected to occur.

In Finland each Nokia site has documented emergency response plans. These plans are completed in close cooperation with local community emergency services. Each site has a named organization to be responsible for actions taken in case of any hazard. The on-site emergency responsible teams are trained to perform an evacuation in case of fire and to control fire and other emergencies. Cooperative actions with local fire departments include regular inspections and training drills.

6. Product performance

Design for Environment

Design for Environment (DFE) integrates environmental objectives and considerations systematically into the design of products, processes and services. DFE practices are intended to develop environmentally compatible products and processes while maintaining or improving cost, performance and quality standards.

In practice DFE means minimizing the use of materials and energy and maximizing reuse and recycling. This includes identifying environmentally compatible materials that meet the strict standards for efficiency, quality and cost. The seven principles of eco-efficiency, based on the dimensions defined by World Business Council for Sustainable Development, are used as general guidelines in Design for Environment. Where applicable, these features have been for years a natural part of Nokia's product design, as they support the overall objective of adding value to products and processes.

In order to improve the environmental compatibility of Nokia products, Nokia has started implementing Design for Environment in its R&D units with the aim of integrating environmental practices into product development.

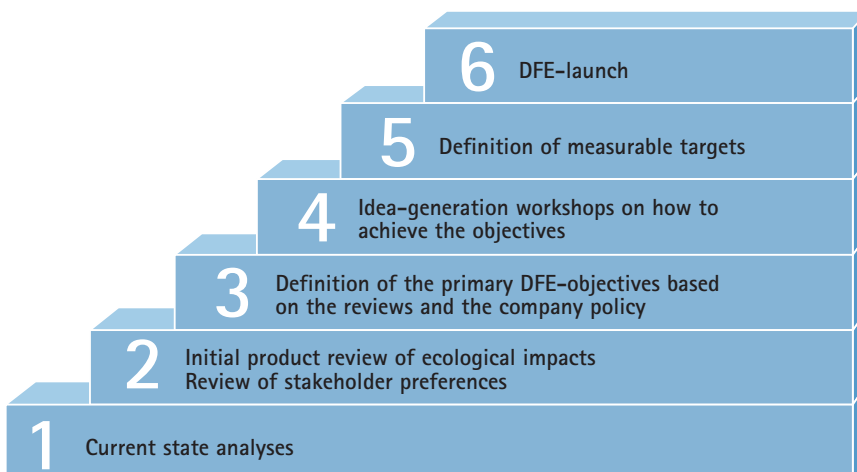
The implementation of DFE in product programs and projects starts with current state analyses. This is followed by a review phase where the environmental impacts of the new product are studied together with stakeholder environmental preferences. When these have been reviewed, objectives are set based on the review results and on the Nokia eco-efficiency principles. These objectives include e.g. energy efficiency, material quantity, material selection, recyclability and identification of relevant substances. The objectives of DFE vary within Nokia depending on the nature of the product. After setting objectives, product or project specific guidelines and instructions are developed, training is given and measurable targets are developed.

Design for Environment is an on-going process, and design reviews are conducted at appropriate intervals to measure achievement. The initial phases of the implementation of DFE are on-going in all Nokia's business units. Examples of typical DFE objectives, metrics and achieved improvements in a number of Nokia's business units are presented in the info boxes on the next page.

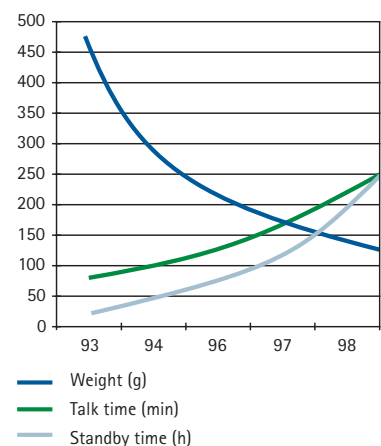
Seven dimensions of eco-efficiency

- Minimizing of energy intensity
- Minimizing of material intensity of goods and services
- Minimizing of toxic dispersion
- Enhancement of recyclability
- Maximizing of the use of renewable resources
- Extension of product durability
- Increasing of total efficiency in process

Step by step implementation of DFE



The evolution of weight, talk and standby times in Nokia mobile phones



Eco-efficiency is a natural feature of product development at Nokia.



DFE improvements have been implemented in Nokia Telecommunications' base station Metrosite.

Objectives of Design for Environment work vary depending on the products. At Nokia Communications Products these objectives include:

- Using less materials and a higher percentage of recycled material content.
- Improving design to facilitate easy disassembly and improve material identification.
- Using fewer electronics components; higher integration means using fewer materials, diminishing the area of printed circuit boards thus minimizing the non-recyclable fraction of the product.
- Reducing power consumption.

Improvements resulting from Design for Environment work range from lower energy consumption to easy disassembly and recycling. Also, such improvements often result in cost savings in production, in the use phase and even at the end-of-life phase. These improvements have been achieved in Nokia Telecommunications' new base station product by:

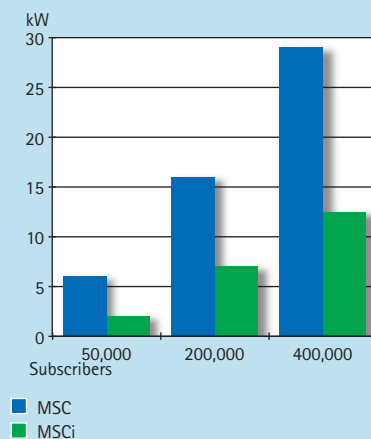
- Reducing the machining of mechanics, resulting in less waste, less energy consumed at the part manufacturer, and major cost savings.
- Adding material identification and marking of recyclable mechanical parts in order to facilitate recycling.
- Reducing the number of yellow chromated parts and decreasing the amount of relevant substances.
- Reducing the power consumption by increasing the level of integration.
- Reducing the use of fasteners in the product, which facilitates both assembly and disassembly.

Measuring achievement is an integral part of Design for Environment. In the Nokia DX 200 switching product line, the environmental objectives for design are reliability, flexibility, upgradability, remote manageability and ease of use, low energy consumption, efficient material use and recyclability. Progress is measured by comparing the product being developed to the previous product generation in the following areas:

- Energy consumption
- Size of the product by weight and area and volume
- Flexibility of hardware and software
- Reliability
- Memory requirement
- Recyclability
- Modularity

Lower power consumption

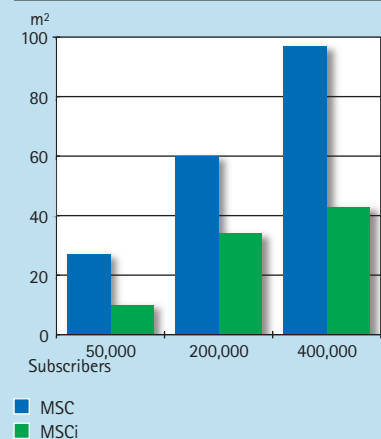
Due to highly integrated components



Example of metrics (energy consumption and size of the product) in Nokia Telecommunications switching product line's DX 200 new product family MSCi compared to its predecessor, MSC.

Floor space savings

Due to compact design



Environmental labels

One example of how Nokia communicates environmental achievements is its use of environmental labels. The purpose of environmental labels is to inform consumers that the designed product meets the requirements set for the product's environmental load during different phases of the product life cycle.

Nokia has participated in the development of Sweden's TCO (Confederation of Professional Employees) labeling, an internationally respected eco-label. TCO labeling is aimed at influencing technical development in information technology for the benefit of professional PC users, and the criteria cover ergonomics, energy consumption, emissions, and environmental impact.

In 1993, Nokia was the first supplier to receive the first TCO'92 label for its monitors. TCO'92 was applied to displays only. All Nokia monitors currently on the market meet the requirements of the TCO'95 label, which applies to all components of PC systems. Nokia displays have been awarded TCO labeling for good ergonomics, low energy consumption, low electromagnetic emissions and low loading of the environment in manufacturing, use and disposal.

Cooperation with TCO has continued in the drafting of the new TCO'99 standard. TCO'99 introduces alterations in the following areas:

- Visual ergonomics: the requirements on luminance uniformity and contrast, flicker and front frame reflection are revised and tightened.
- General ergonomics: noise level limits are introduced.
- Energy consumption: standby power level is lowered, with a restart restriction of three seconds.
- Electromagnetic emissions: values stay unchanged, but will be measured more restrictively.
- Environmental impact: new criteria for e.g. variety of plastics, painting and metal coating of plastic components and co-operation with electronic equipment recycling companies.



The monitor 800 XA is the first Nokia LCD monitor to receive the TCO'99 environmental label. All new Nokia monitor models are designed to meet the TCO'99 requirements.

Environmentally sound product packaging

Nokia prefers packaging suppliers who are aware of their environmental responsibility and prepared to contribute to the development of environmentally sound packaging. Nokia's packaging designers work in close cooperation with material suppliers to develop recyclable packages and continuously seek to reduce the amount and weight of packaging materials, without compromising requirements for adequate protection.

The eco-efficiency principles applied in product design are also relevant for packaging. Material intensity means smaller products and packaging. A smaller amount of packaging requires less space and is lighter to transport. More products can be transported in the same space thus reducing the driven kilometers. This supports minimizing of energy intensity when less fuel is consumed and accordingly fewer emissions are released to air.

Benefits from environmentally sound packaging can also be expressed in terms of cost reductions. By changing the packaging for telecommunications equipment from a wooden box to a plywood one, the weight of packaging fell by approximately 30%, resulting in a reduction of 10% in material costs.

Infrastructure products, such as switches, base stations and other telecommunications network equipment are packed to provide the necessary protection against changes in climate conditions, biological and chemical changes as well as electrostatic discharge during transportation and storage. Adequate protection requires six different packaging materials: plywood, cardboard, pulp, thermoplastics, steel and aluminum coated plastic foil. With the exception of the foil all of these materials have recycling opportunities in place. Nokia continues to explore the possibilities of replacing the foil, used to protect against humidity and atmospheric corrosion with a recyclable alternative.

Packages of mobile phones are subject to aesthetic requirements in addition to providing protection for products. At Nokia, significant environmental benefits and cost savings have been achieved by improved packaging design for its various mobile phone models. Nokia's active cooperation with the material suppliers resulted in the start of manufacturing of thin corrugated board in Finland. This material is now available also for the needs of other companies.

End-of-life practices

A fundamental principle in end-of-life (EOL) practices is the collection of all end-of-life equipment with an aim of recovering their material content and ensuring the safe treatment of relevant substances.

At Nokia, improving EOL practices is closely linked to Design for Environment. EOL treatment of products is considered already at the design stage. EOL treatment

In the packaging of mobile phone accessories, a new packaging design resulted in a decrease of 60% in the amount of plastic used. This reduction was achieved by replacing a part of the plastic with paper-based material. Package weight fell by 42%.



is facilitated by for example material identification, material efficiency, minimizing the types of material used and other design considerations, such as easy disassembly. These design practices aim at advancing reuse and recyclability of the materials, which is one of the dimensions of eco-efficiency.

Proper handling of EOL products is another eco-efficiency aspect. There are both economical and environmental benefits to be gained by the reclamation of materials from electronic scrap. Electronic products and appliances often contain constituents which may cause potential hazard, if not disposed of properly at their EOL stage.

To ensure that obsolete products are treated in an environmentally sound manner, Nokia applies strict criteria when selecting EOL subcontractors. Components containing relevant substances are removed for reuse, recycling or other proper EOL treatment. Precious and other metals are recovered for use as raw material. The rest of the product is recycled when possible and the remainder is sent for safe disposal.

Recycling service of infrastructure products

Nokia has actively developed end-of-life practices of its infrastructure products. Since the beginning of 1999, Nokia Telecommunications' Customer Services has offered recycling service for infrastructure products. Depending on customer needs, Nokia offers services covering disassembly, transportation, selection of an authorized recycler and contracts with the recycler. Whenever possible, end-of-life treatment is subcontracted locally to authorized recyclers to minimize the environmental impact of transportation.

Collection of mobile phones

Nokia has also actively addressed the question of end-of-life management of its terminal products. The factors involved in the development of end-of-life management of mobile phones include policy and regulation, development of takeback collection systems and funding mechanisms, recycling infrastructure, environmental impacts of products, product design and customer requirements.

Nokia has examined different product recovery routes and investigated various reuse, recycling and recovery options. The methods for collecting products from the market include participation in collaborative industry-managed schemes, participation in EU member state municipal schemes and creation of proprietary collecting programs.

Nokia has participated in the mobile phone takeback pilots organized by ECTEL, the representative body of the European Telecom equipment and Systems industry and the professional Electronics industry, in Sweden and in the UK together with other major mobile phone manufacturers. Under the scheme, owners of mobile phones were invited to return end-of-life products to their nearest collection point to be disposed of in an environmentally responsible manner. The scheme has demonstrated a practical and economically viable alternative for recovering mobile phones. The pilot programs turned out to work well and have been continued as full-scale schemes in both countries.

Battery end-of-life issues

The Ni-Cd batteries used in mobile phones are regarded as hazardous waste and are to be disposed of in licensed waste treatment plants for metal recovery. There is also a draft proposal for a new EU directive on batteries and accumulators whereby all battery types are to be collected and treated appropriately.

To ensure controlled recovery and disposal of end-of-life batteries and accumulators, they are marked and collected separately. In most countries it is the responsibility of the individual communities to arrange for the collection while battery importers pay taxes or fees for this service. Some countries have arranged for the collection through industry-funded programs.

In the United States, Nokia has joined the Power Rechargeable Battery Association (PRBA) to help to response to the growing need for a battery-recycling program. A spin off from the PRBA is the Rechargeable Battery Recycling Corporation (RBRC) in which Nokia is a licensee. Several states require manufacturers of products that contain a rechargeable battery to develop and implement a take-back program for the spent battery. The RBRC's take-back program complies with these states' legislation.

Research & Development

Nokia's research and development supports the advancement of environmentally sound products and production. This work is managed in Nokia's business groups and units.

A special area of interest is the possibility to replace relevant substances in Nokia's products with more environmentally sound options. Nokia has already studied alternatives for the use of lead in the soldering process, and halogen-free flame retardants in components like cables and printed circuit boards.

To-date, research continues to explore for example possibilities to replace chrome as the surface material in certain infrastructure products. Another area of interest is the use of recyclable plastics, where it is of utmost importance to make sure that no such additional substances are added to the plastics that they become non-recyclable. This problem may appear e.g. with coated plastics. This field of research is continued within Nokia.

A further research field is battery technology, where the aim is to get more capacity in the same space at reduced cost. This means smaller batteries by weight and volume with more capacity to allow a longer standby and talk time. Improved battery quality extends the products' life time, resulting in fewer batteries to be recycled.

Nickel-Cadmium (Ni-Cd) batteries are being replaced by Nickel Metal-Hydride (NiMH) batteries. In addition light Lithium-ion (Li-ion) batteries are becoming more and more popular. Especially the first two include metals which might cause negative environmental impact if not handled properly at the end-of-life stage. Nokia aims to eliminate the use of all batteries that include heavy metals. Nokia works in close cooperation with the battery industry supporting the development of lighter batteries with better recyclability.



Unnecessary energy consumption by the mobile phone battery charger can be reduced by keeping it in the socket only when actually charging a battery.

Electromagnetic fields (EMF)

Electromagnetic emissions exist everywhere in our environment. Background emissions come from the sun, the electric grid, radio and TV and other sources. In telecommunications, cellular technology uses low-powered radio waves to transmit voice and data communications in ultra-high frequency bands and like all electrical devices, mobile telephones produce electromagnetic fields (EMFs). A substantial amount of scientific research conducted all over the world over many years demonstrates that radio signals within established safety levels emitted from mobile phones and their base stations present no adverse effects to human health.

Nokia is responsive to customer satisfaction including mobile phone and base station safety. Through contributing to high quality research programs globally, Nokia supports the development of better scientific and public understanding of these issues.

It is also important to note that research findings are reviewed by government agencies, international health organizations and other scientific bodies. These reviews support the scientific conclusion that the radio signals at levels below the limits prescribed by safety standards and recommendations around the world present no adverse effects to human health. All Nokia products fulfil relevant national and international safety standards and limits that are set by public health authorities.

Nokia is currently funding research into the use of electromagnetic fields. Below are some examples of the programs Nokia is or has contributed to:

- Wireless Technology Research –WTR, a USD 25 million program over four years funded by the cellular industry through the CTIA.
- FGF (Forschungsgemeinschaft FUNK), a German national program considering the possible environmental and health effects caused by electromagnetic fields from mobile and fixed radio transmitters.
- COST 244 “Biomedical effects of electromagnetic fields”, a pan-European Cooperation in the Field of Scientific and Technical Research (COST), where Nokia is co-funding some national projects.

For further information, Nokia’s EMF website at <http://www.nokia.com/safety> provides a number of links to Nokia and third party information on EMF research.

7. Sustainability overview

The emerging information society is based on extensive use of knowledge, which can be stored, transmitted and used in a digital form. This provides both businesses and individuals completely new ways of communication and access to conventional and emerging services. Digital convergence will integrate speech, data and pictures into multimedia services and ultimately, the gradual shift towards the mobile information society will eliminate dependence of space and time in the use of these services.

The links between the mobile information society and the environment are by no means fully understood. Basically, the information and communications technologies are regarded as dematerializing technologies.

- Firstly, information technology helps to reduce in the amount of physical resources used in the product manufacturing processes and contributes to products getting lighter and smaller. At the same time, the information content of physical products is increasing. Another trend is replacing physical goods by immaterial services, such as software, design, new media and other telematic services.
- Secondly, information and communications technologies may facilitate a more precise control of production processes and thus decrease hazardous effects of production.
- Thirdly, new design methods based on IC-technologies provide designers with an expanded variety of opportunities to select environmentally conscious constructions and material.
- Fourthly, the improved IC-technologies combined with increased analytical capacity facilitate sufficiently accurate surveillance of ecological processes and thus it will finally become possible to make credible causal analysis of the environmental effects of human behavior and the different activities of a society.

The mobile information society allows completely new ways of communication and access to services, which previously had to be visited physically. The IC-technologies are so-called enabling technologies, which affect the productivity development of the whole society. The productivity gains enhance demand, which may take different directions. The increased demand may enhance the demand for new information services or other environmentally conscious products, which become available as the technologies develop, or they may take a different course, which leads to an increase in the absolute level of environmentally damaging consumption.

In the same way, new communications opportunities may decrease the need to travel. On the other hand, increased leisure time can be spent on travel, which may counter-balance the environmentally beneficial effects. Ultimately, there is the issue of social exclusion that needs to be addressed when exploring the relationships between the information society and the environment. Therefore, the attempt to get all people to become active partners of the information society is an important goal for us all.

These examples emphasize the crucial importance of values and attitudes prevailing in a society. The choices of each individual influence the links between the emerging mobile information society and environmentally sustainable development. The nature of this development requires a contributions from all stakeholders. Nokia is actively following the debate and contributes to the development of the 'environmentally sustainable' information society.

Definitions and abbreviations

Base station

fixed transceiver (transmitter and receiver) equipment used for communicating with mobilephones in a mobile network. A base station may cover one or more cells or a part of a cell.

DFE

Design for Environment integrates environmental considerations systematically into the design of products, processes and services.

EACEM

European Association of Consumer Electronics Manufacturers

ECTEL

A representative body of the European telecom equipment and systems industry and the professional electronics industry. Its members comprise the relevant trade associations in the member states of the EU and EFTA.

EMAS

Eco Management and Audit Scheme

EMF

Electromagnetic fields

EMS

Environmental Management System

EOL

End-of-life

GRI

Global Reporting Initiative was established late 1997 with the mission of designing globally applicable guidelines for a sustainable report linking the environmental, social and economic aspects of enterprise performance.

GSM

Digital cellular network operating in the 900, 1800 or 1900 MHz frequency band.

Hazardous waste

Waste, or combination of wastes, which because of its quality, or physical, chemical or infectious characteristics may cause or significantly contribute to an increase in serious irreversible, or incapacitating reversible illness or pose a substantial present or potential hazard to human health, safety or to the environment when improperly treated, stored, transported, used or disposed of, or otherwise managed.

ICC

International Chamber of Commerce

IC technology

Integrated circuit technology

ISO 14001

International Organization for Standardization's standard for environmental management systems including specification and guidance for use.

IP

Internet protocol

Connectionless, best-effort packet switching protocol that corresponds to the OSI (Open System Interconnection) layer 3 (network) and forms part of the TCP/IP protocol

LCA

Life-Cycle Assessment

An objective process to evaluate the environmental burdens associated with a product, process or activity by identifying and quantifying energy and materials used and wastes released to the environment, and to evaluate opportunities for environmental improvements.

LCD monitor

Liquid crystal display monitor

Life cycle

The life cycle of a product begins with the acquisition of raw materials and includes bulk materials processing, engineered materials production, manufacture, use, retirement, disassembly and disposal of residuals produced in each stage.

POCP

Photochemical Ozone Creation Potential (POCP). This is a measure of the potential of a VOC to participate in the reaction to convert nitrogen monoxide to nitrogen dioxide, and contribute to episodes of photochemical ozone.

Relevant substances

Substances, preparations or materials that are considered relevant due to
1) their hazard to human or to the environment in their applications or end-of-life treatment methods,
2) their availability as natural resources,
3) their known high impact during their life cycle.

TCO

The Swedish Confederation of Professional Employees

WAP

Wireless Application Protocol

A global license-free and platform independent protocol designed for Internet content and advanced telephony services on digital cellular phones and other wireless terminals.

VOC

Volatile Organic Compounds

A VOC is any organic compound having at 293.15 K a vapour pressure of 0.01 kPa or more, or having a corresponding volatility under the particular conditions of use.

Appendix

The ICC Business Charter for Sustainable Development

Principles for Environmental Management

Foreword

There is widespread recognition today that environmental protection must be among the highest priorities of every business.

In its milestone 1987 report, "Our Common Future", the World Commission on Environment and Development (Brundtland Commission) emphasised the importance of environmental protection to the pursuit of sustainable development.

To help business around the world improve its environmental performance, the International Chamber of Commerce created this Business Charter for Sustainable Development. It comprises sixteen Principles for environmental management which, for business, is a vitally important aspect of sustainable development.

This Charter will assist enterprises in fulfilling their commitment to environmental stewardship in a comprehensive fashion, in line with national and international guidelines and standards for environmental management. It was formally launched in April 1991 at the Second World Industry Conference on Environmental Management in Rotterdam, and continues to be widely applied and recognised around the world.

Introduction

Sustainable development involves meeting the needs of the present without compromising the ability of future generations to meet their own needs.

Economic growth provides the conditions in which protection of the environment can best be achieved, and environmental protection, in balance with other human goals, is necessary to achieve growth that is sustainable.

In turn, versatile, dynamic, responsive and profitable businesses are required as the driving force for sustainable economic development and for providing managerial, technical and financial resources to contribute to the resolution of environmental challenges. Market economies, characterised by entrepreneurial initiatives, are essential to achieving this.

Business thus shares the view that there should be a common goal, not a conflict, between economic development and environmental protection, both now and for future generations.

Making market forces work in this way to protect and improve the quality of the environment - with the help of standards such as ISO 14000, and judicious use of economic instruments in a harmonious regulatory framework - is an ongoing challenge that the world faces in entering the 21st century.

This challenge was recognised by the nations of the world at the 1992 United Nations Conference on Environment and Development, which called on the co-operation of business in tackling

it. To this end, business leaders have launched initiatives in their individual enterprises as well as through sectoral and cross-sectoral associations.

In order that more businesses join this effort and that their environmental performance continues to improve, the International Chamber of Commerce continues to call upon enterprises and their associations to use the following Principles as a basis for pursuing such improvement and to express publicly their support for them.

Individual programmes to implement these Principles will reflect the wide diversity among enterprises in size and function.

The objective remains that the widest range of enterprises commit themselves to improving their environmental performance in accordance with these Principles, to having in place management practices to effect such improvement, to measuring their progress, and to reporting this progress as appropriate internally and externally.

Note: The term environment as used in this document also refers to environmentally related aspects of health, safety and product stewardship.

Principles

- 1. Corporate priority** To recognise environmental management as among the highest corporate priorities and as a key determinant to sustainable development; to establish policies, programmes and practices for conducting operations in an environmentally sound manner.
- 2. Integrated management** To integrate these policies, programmes and practices fully into each business as an essential element of management in all its functions.
- 3. Process of improvement** To continue to improve corporate policies, programmes and environmental performance, taking into account technical developments, scientific understanding, consumer needs and community expectations, with legal regulations as a starting point; and to apply the same environmental criteria internationally.
- 4. Employee education** To educate, train and motivate employees to conduct their activities in an environmentally responsible manner.
- 5. Prior assessment** To assess environmental impacts before starting a new activity or project and before decommissioning a facility or leaving a site.
- 6. Products and services** To develop and provide products or services that have no undue environmental impact and are safe in their intended use, that are efficient in their consumption of energy and natural resources, and that can be recycled, reused, or disposed of safely.
- 7. Customer advice** To advise, and where relevant educate, customer, distributors and the public in the safe use, transportation, storage and disposal of products provided; and to apply similar considerations to the provision of services.
- 8. Facilities and operations** To develop, design and operate facilities and conduct activities taking into consideration the efficient use of energy and materials, the sustainable use of renewable resources, the minimisation of adverse environmental impact and waste generation, and the safe and responsible disposal of residual wastes.
- 9. Research** To conduct or support research on

the environmental impacts of raw materials, products, processes, emissions and wastes associated with the enterprise and on the means of minimizing such adverse impacts.

10. Precautionary approach To modify the manufacture, marketing or use of products or services or the conduct of activities, consistent with scientific and technical understanding, to prevent serious or irreversible environmental degradation.

11. Contractors and suppliers To promote the adoption of these principles by contractors acting on behalf of the enterprise, encouraging and, where appropriate, requiring improvements in their practices to make them consistent with those of the enterprise; and to encourage the wider adoption of these principles by suppliers.

12. Emergency preparedness To develop and maintain, where significant hazards exist, emergency preparedness plans in conjunction with the emergency services, relevant authorities and the local community, recognizing potential transboundary impacts.

13. Transfer of technology To contribute to the transfer of environmentally sound technology and management methods throughout the industrial and public sectors.

14. Contributing to the common effort

To contribute to the development of public policy and to business, governmental and intergovernmental programmes and educational initiatives that will enhance environmental awareness and protection.

15. Openness to concerns To foster openness and dialogue with employees and the public, anticipating and responding to their concerns about the potential hazards and impacts of operations, products, wastes or services, including those of transboundary or global significance.

16. Compliance and reporting To measure environmental performance; to conduct regular environmental audits and assessments of compliance with company requirements, legal requirements and these principles; and periodically to provide appropriate information to the Board of Directors, shareholders, employees, the authorities and the public.

Support for the Charter

The ICC undertakes to encourage member companies and others to express their support and implement the Charter and its Principles.

A list of these companies can be obtained from ICC Headquarters. The ICC also publishes regularly a Charter bulletin which provides more specific information on the Charter Principles and different interpretations possible - an attribute of the Charter that has been widely commended.

The Business Charter for Sustainable Development provides a basic framework of reference for action by individual corporations and business organisations throughout the world. It has been recognised as a complement to environmental management systems. To this end, the ICC, the United Nations Environmental Programme (UNEP) and the International Federation of Consulting Engineers (FIDIC) have developed a kit to help enterprises integrate environmental management systems in the daily management practices, a step consistent with the objectives set out in this Charter.

The Business Charter is also published in over 20 languages, including all the official languages of the United Nations.

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