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# *Corporate Environmental Incentives*

*With case studies from the Japanese cellular phone industry*

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Master Thesis  
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# ***Corporate Environmental Incentives***

*With case studies from the Japanese cellular phone industry*

**Master's Thesis**

**Industrial Economics and Management, The Royal Institute of Technology (KTH)**

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## Abstract

The environmental consciousness has increased in the developed world during the 90's. Many companies have, however, at large still not been able to implement concrete environmental strategies into their business goals since they have not always seen what values such efforts may give them in the long term. The reason for this is the struggle between private economic interests and social ecological benefits according to the article *Green and Competitive* by Porter and Van der Linde (1995a).

Companies have to take a social responsibility covering the triple bottom line social, environmental and economic aspects. Today, companies put considerably more efforts into marketing themselves as environmentally conscious actors than they did one decade ago. Today cellular phones are everywhere and the industry has exploded during the 1990's. This study focuses on international cellular phone companies based in Japan. Japan does not have many natural resources and needs to be resource efficient. At the same time Japan is a mass-consumption society and it is estimated that Japan only has space left to put waste in landfill until the year 2008 (Clean Japan Center, 2002). This is a crucial problem for Japan and they need to take action now. This thesis is a comparative study with case studies of operators and manufactures in the Japanese cellular phone industry and government in Japan. The purpose of this study is to find out how Japanese actors within the cellular phone industry view the environmental strategies related to the business logic and the differences in environmental strategies between the actors.

The study showed that the incentives for operators to collect cellular phones, batteries and chargers are higher than for the manufacturing companies. This is because the manufacturing companies do not have the distribution network as the operators have. This network is essential when setting up a collection network. The recycling firms today receive subsidies from the government and this creates a new market where the operators get competition from the retailers who also collect cellular phones. This competition decreases the needs for smaller operators to invest in a collection network where big operators already today have distribution. This makes it possible for the operators to compete in equal conditions. Manufacturing companies' main incentive to work with environmental issues is market based due to the pressure from operators. The manufacturing companies are more innovative regarding coupling business and environmental activities. The level of integrated environmental work within companies depends on the strategic importance for the specific company to work with environmental activities.

The industry associations in Japan have an important role to play in Japan, enabling communication between the government and companies. This study focuses on the environmental activities regarding the End of Life Treatment. The industry associations collect important data regarding this issue and provide this to the government, companies and the public. The government has been reactive and is now trying to catch up on the proactive Japan-based-international actors. This may appear odd since Japan has crucial environmental problems, due to the economy being dependent on mass consumption, not supporting a recycling society. Today the government is working hard but the time is running out and more efforts have to be done to inform the citizens about the problems the country is facing.



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## Abbreviations

AEE – Research Center for Advanced Economic Engineering at The University of Tokyo  
CAC – Command And Control  
CIAJ – Communications and Information network Association of Japan  
CJC – Clean Japan Center  
CSR – Corporate Social Responsibility  
DfE – Design for Environment  
EIA – Environmental Impact Assessment  
EoL – End of Life  
EoLT – End of Life Treatment  
EPA – Environmental Protection Agency  
EU – European Union  
GNP – Gross National Production  
GPN – Green Purchasing Network  
IAIA – International Association for Impact Assessment  
IPP – Integrated Product Policy  
ISO – International Organization for Standardization  
JEITA – Japan Electronics and Information Technology Industries Association  
KTH – Kungl Tekniska Högskolan, Royal Institute of Technology  
LCA – Life Cycle Assessment  
METI – Japanese Ministry of Economy, Trade and Industry  
NGO – Non-Governmental Organisation  
NTT DoCoMo – Nippon Telegraph and Telephone Corporation Do Communication over Mobile  
PPP – Polluter Pays Principle  
SIM – Subscriber Identity Module  
TCA – Telecom Carriers Association  
WEEE – Waste Electrical and Electronic Equipment

# 1 Introduction

The environment is something that concerns everyone and is vital to our survival in the long run. Baba *et al* (1997) writes that one of the fundamental ideas in biological ecology is that there is no concept of “waste” within the whole system. Anything that comes out of a process is not left as a waste but utilised in the same or another process in the ecological system. It is important to understand that we, the people, sooner or later will have to deal with the waste that today is abandoned in the environment.

Why should this be a point of matter? Companies as a part of our society also have to take their responsibility as everybody else to make such a progress work. Today, companies put considerably more efforts into marketing themselves as environmentally conscious actors than they did one decade ago. Companies are eager to show the latest environmental innovations at the same time as they present new technological innovations, in the opposite direction, which can do more harm than good for the environment. The reason why the companies not always take their responsibility is the lost of incentives and also the fact that the industry is strongly connected to the system that caused the environmental crisis in the first place. (Welford, 1998) It also calls for other actors to take their responsibility.

One area where it is important for the companies to take their responsibility is the cellular phone industry. Today the cellular phones are everywhere. During the 1990’s the number of phones have exploded and by 2005 the number is expected to reach one billion cellular phones in the world. Also the time to market is decreasing, with more sophisticated production methods, and more features on the products developed. This has resulted in that the average life of cellular phones today has decreased to about six months in Japan. (Consumer & Embedded In The News, 2002)

Porter and van der Linde (1995a) shows in their article *Green and Competitive* by coupling the ecology with the economy, that a company can be both green and competitive through looking at the pollution as a form of economic waste. They introduced the concept of *resource productivity* showing that environmental innovations can also result in more competitive products.

Many researchers have, since then, showed different ways to accomplish a more resource- and productive efficiency by using concepts like, eco-efficiency (e.g. Weizsäcker *et al.*, 1997), competitive advantage, and value for shareholders etc. Ever since, there has been a common trend to present corporate environmental reports or sustainability reports in order to show and market the corporate responsibility actions.

## 1.1 Problem

Companies market themselves as green companies and show the market that they put a lot of efforts in R&D to develop environmental innovations, improving the environmental performance. But what lies behind these efforts? Do companies really care for the environment or is it just another marketing trick from the companies’ perspective? (cf. Welford, 1997) The environmental consciousness has increased in the global arena during the 1990s. Is this something that the companies now are trying to take advantage of either by environmental innovations or merely by creating a green image? A miscorrelation often originates from the fact that the business goals normally

have a short-term perspective and the environmental goals have a long-term perspective (Strannegård, 2000).

## ***1.2 Purpose***

Companies have increased their environmental consciousness and developed strategies on how to interact with policy bodies today. The purpose of this thesis is:

*To find out how Japanese actors within the cellular phone industry view the environmental strategies related to the business logic and the differences in environmental strategies between the actors.*

This is a qualitative empirical study about the technology-based companies' efforts to develop, maintain and work with environmental strategies in a policy development arena. This study will also show how Japanese firms and other actors, such as industry associations, interact in the policy development arena.

## ***1.3 Choice of research topics***

Japan was the first country to implement a law (the revised Waste Management Law) in 1991 addressing a standard in order to make products easier to recycle. This shows that Japan has the ability to make changes. Japan has also shown the international arena many times before that it know effective management. (Barrett and Therivel, 1991)

Japan does not have many natural resources and the country need to be resource efficient. At the same time Japan is a mass-consumption society and it is calculated that Japan only have landfill for their waste until the year 2008. This is a crucial problem for Japan and it needs to take action now!

Japan has the most sophisticated cellular phones in the world and the technology is very advanced. According to a study made by PhD student Tsutomu Uryo (July 30 2002) the cumulative number of disposed cellular phones in Japan is calculated to be 610 millions in 2010. The cumulative amount of gallium and arsenic in disposed products by 2010 is estimated to be 142 kg and 93 kg, respectively.

## ***1.4 Scope and delimitations***

This study focuses on international cellular phone companies based in Japan. It is a comparative study with case studies of companies in the cellular phone industry. Furthermore, this study concentrates on the relationships between the actors, working together to establish new environmental standards, which are manufacturers, operators and government.

Within the environmental strategies a spectrum of various disciplines are treated. It ranges from how humans are affected through technological innovations to the cooperation between government and industry. External factors as the globalisation process and the fact that the global climate has changed also needs to be taken under consideration. This study will look at the relationship between companies' environmental work and the aim of government. Hence, this study will not try to get a deeper understanding in specific environmental friendly techniques. Neither will there be a discussion on globalisation issues.

A company's responsibility includes the responsibility for their stakeholders (employees, stockholders, government, customers, NGO's, suppliers *et cetera.*), but also the

responsibility to take care of the society and environment. In this study will only the companies' responsibility for the environment be treated.

In order to make the thesis more finite the focus in environmental activities will be on the End of Life (EoL) phase where products are treated after use. How are the companies working to reach a competitive advantage in this area? The focus will, hence, be on the recycling process and how to gain business value from this.

### **1.5 Definitions**

This thesis will include words that need to be defined in accordance to avoid misunderstandings and misinterpretations.

- “Cellular phones”, “mobile phones”, “terminals” and “handsets” are in this thesis referring to the same thing, a portable telephone that works by means of a cellular radio system. (WordReference.com, 2002)
- “Environment”, (the quality of) the air, water and land in or on which people, animals and plants live.
- “Environmentally friendly” is defined that a product, activity or company will not harm the land, sea or air, or that it will do less damage than other similar products, activities or companies. (Cambridge Dictionaries Online, 2002)
- “Green”, all human activities does effect the environment in one way or another. To become “green” a company has to work proactive to decrease the environmental affect of their products.
- “Incentives”, something that encourages a person to do something. (Cambridge Dictionaries Online, 2002) In this thesis the substitute of *the person* is a company or the government.
- “Industry association” is a conjunction of two words, industry and association. Industry means an organized economic activity concerned with manufacture, extraction and processing of raw materials, or construction or a branch of commercial enterprise concerned with the output of a specified product or service. Association is a group of people having a common purpose or interest. (WordReference.com, 2002)
- “Operators”, in the studied industry sector operators provide tele- and data communications. The focus here is on mobile operators that provide mobile telephone calls.
- “Recycling” is in this thesis defined as “to pass (a substance) through a system again for further treatment or use.” In this case the substance is the cellular phone and the system is the collecting and recycling system. (WordReference.com, 2002)
- “Policies”, a set of ideas or a plan of what to do in particular situations that has been agreed officially by a group of people, a business organization, a government or a political party. (Cambridge Dictionaries Online, 2002)

- “Strategy” comes originally from the military. It means distribution of resources among the different arms of the defence forces to meet a fixed enemy (Ljung *et al.*, 1998). It is a detailed plan for achieving success or the skill of planning for such situations. (Cambridge Dictionaries Online, 2002)

## 1.6 Thesis outline

The common way to read this master’s thesis would be to read from the first page to the last. If the reader does not know very much about the environmental history of Japan the author suggest starting with section four as shown in figure 1. Section two includes the method on how this thesis was carried out. Theories used to interpret the empirical findings are presented in section three. To facilitate for the reader section four present a historical view of Japan’s economic development after World War II, in an economic perspective. Section five and six will show the empirical findings. Section seven will analyse the findings and section eight concludes.

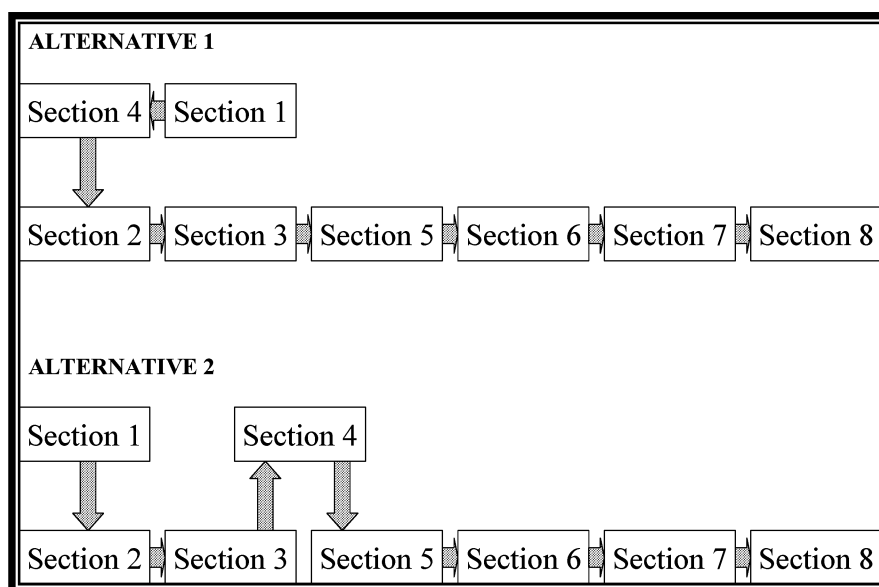


Figure 1. Thesis outline

## 2 Method

*This chapter will explain what interview method used in this study and how the thesis was carried out.*

The methodology should not be seen as a separate part of the research. It should instead permeate the whole research, from the beginning to the end. It is very important to be consequent and use the same methodology of the research, either it is a quantitative or a qualitative method. The methodology is the plan used to approach the empirical material and should be seen as the link between the theory and the collected data. (Alvesson and Deetz, 2000)

### 2.1 Course of action

The purpose with the qualitative collection of data is to understand how the companies are working with their environmental issues. This study will be using a qualitative method where the purpose is “to receive balanced description of different qualitative aspects of the interviewee’s view of life” (Kvale, 1997:36). To facilitate the process of interviewing, Kvale (1997) has divided the method into seven different stages (see figure 2).

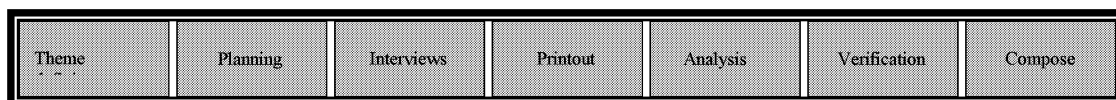


Figure 2. Kvale’s research method, Source: Kvale, 1997

First of all a *theme* has to be defined and the purpose of the theme is to formulate the purpose with the research. Specific questions that was answered were: “why” and “what”. The purpose of this research is “to find out how Japanese actors within the cellular phone industry view the environmental strategies related to the business logic and the differences in environmental strategies between the actors.” After the purpose was defined and the two questions was treated, the question “how” was answered, this is shown in this section. To increase the understanding of the research area literature was chosen and reviewed. This resulted in a development of tools to use for the analysis of the empirical data and an understanding of the history of environmental policy making in Japan was also given.

Next stage is called *planning* and concerns the planning of the future stages. This was done in collaboration with the supervisors in Sweden and Japan and a timetable was created. Also the selection of companies was done in collaboration with the AEE. The persons that were interviewed had a high position in their company (Senior Environmental Coordinator, Environmental Specialist and Managers). Afterwards a review of studied companies’ environmental reports was done in order to identify their environmental strategies.

After acquired a greater understanding of the environmental strategies at the companies, interviews with environmental managers at the chosen companies has been carried out. The third stage is called *interviews* and was done with an interview guide and with a reflective approach to the demand knowledge. During the interviews it was important to see if the accessibility of material have been sufficient. The information that is given during an interview can be based on different aspects, e.g. either to the person’s own

thoughts or to the complex social environment that surrounds them (Kvale, 1997). This can be described in two ways, firstly Alvesson and Deetz (2000) call the naïve humanism that assumes that the researcher can pick up standardized and ready feelings, experiences and knowledge. The other part is the narrow hyper-sceptics predicting that humans are connected to rules of how to use the language. These are affected of the social context that has to be reviewed critical when doing interviews since the complexity of the Japanese language. The interviews gave information about how companies implemented their strategies and what kind of approach they have e.g. proactive or reactive.

Fourth stage starts after the interview, when a *printout* of the interview should be done in order to prepare the material for analysis. This was facilitated through recording the interviews on tape before transcribe them on the computer.

The *analysis* depends on what kind of method that has been chosen on the basis of the purpose of the study. (Kvale, 1997) Alvesson and Deetz (2000) have in their book divided the complexity of problems to critically review collected data into three elements. The first element is called *insight* and is based on a hermeneutical understanding how individuals understand the world. Insight could be consider as a successful interpret and by that mean create meaning and enrich the understanding through focusing on the not obvious. The purpose with the second element, *critique*, is to become aware of how discourses and significances are systematically privileged. Critique can not been separated from the insight since there in every insight is a critique element, i.e. a prior understanding can be considered as incomplete in that time an insight appears. The third element is called *transformative reassessment* and involves alternative ways to interpret and conduct oneself to the reality.

An analysis was performed on how well they succeed to make a coupling of environmental and business strategies, or if they merely made a de-coupling of them. This will hence show if companies' environmental strategies are business driven, or not. As a last step in the empirical data collection the environmental activities was illuminated, focusing on End of Life Treatment (EoLT). Are companies working pro-active and if so, how do the information and knowledge flows look like - are they satisfying the social demand from stakeholders (customers, NGO's, government etc.)?

After the analysis was done a *verification* was performed as a sixth stage in order to see the validity and reliability of the study. Welford (1998) mean that a new critical research agenda has to be presented. The old eco-modernism philosophy (that believes that the future is a path of the history) and with eco-efficiency as the major tool, must be changed. Welford propose a postmodernist approach were the definition of sustainable development does not have to be complete. The purpose should be to increase the awareness, knowledge and enlightenment of the humans.

During the study the researcher has tried to keep distance to the research and to be self-critical. At the same time it is important within a qualitative study to get close to the objects that ought to be studied. In this case it is the persons that are interviewed who are the objects of the discussion, and a sub-object of the entire phenomenon being studied, and it is important to understand them as good as possible. (Alvesson and Deetz, 2000)

The last stage involves the actual product of the research, to *compose* the thesis. This research has been carried out in English.

When conducting a study the time perspective may be very important and this study is no exception. Since the first step has been to identify the environmental strategies of today this will be done in present time. Today's perspective will also be used to see the relationship between environmental goals and business goals. To understand how the company work with the environmental strategies, however, it is essential to go back in time. The incentives behind the development and the implementation of these environmental strategies have been done through interviews.

## ***2.2 Sources***

The sources to this thesis consist of two main parts, literature and interviews. The literature has been reviewed and interpreted into the experiences drawn from the empirical data retrieved.

Interviews have only been held with people who have a good knowledge of and working with environmental issues. This means that there will be an emphasis on environmental aspects. However, efforts have been made to make these people understand the purpose of the study and to bring in the economic aspect.

The interviews have normally been held in English, a second language, for both interviewer and interviewees. This has sometimes affected the thoroughness in the answers given. However, efforts have been made to understand the Japanese culture to reduce this problem. When interviews have not been possible to be carried out in English an interpreter have been used. Due to the complexity of the Japanese language there have even been, in addition to cultural obstructions, some communicational problems since there are specific words that sometimes not have been able to translate from Japanese to English. This have only been a minor problem and have not effected the research in a great extend.

## 3 Theory

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*The theories that are introduced in this section will be used to study the environmental management and the communication between the companies and policy makers. The section is divided into four parts treating national environmental policy, corporate environmental management, corporate environmental strategies and Life-Cycle perspectives.*

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### **3.1 National environmental policy**

#### **3.1.1 From End-of-Pipe to a more holistic view**

The budding of environmental policies emerged in the late 1960's as a distinct field of public policy. The focus was on reduction of emissions, e.g. End-of-Pipe solutions to attend to the most urgent environmental problems. The tools to achieve this were based on Command-And-Control (CAC) instruments, mainly regulations, bans and standards. (cf. Dobers, 1997:115)

With time, the business started to understand the coupling between environmental process efficiency and traditional business effectiveness. The more efficient the company could be at using energy and materials, the more profit they would gain. The concept eco-efficiency was then established during the 1980's. At the same time being eco-effective companies gain goodwill among their stakeholders. The voluntary environmental activities started to increase during this time with some policies providing incentives. (Dobers, 1997)

During the eco-efficiency period the production process of business improved and the share of environmental impacts from the production process fell. At the same time the environmental impact of other stages in the product life increased, especially that of use and waste disposal. In the beginning of the 1990's this started to motivate the policy makers and the industry to expand the focus on the environment from only being a concern of the production process to treat the complete life of a product. Now issues like concepts, design and recycling of products got a new dimension. (Dobers, 1997) The energy consumed during the use stage decreased and successful companies did not only gain a new environmental sales argument and customer goodwill, direct consumer savings were also induced as the cost of product use was reduced.

During the 1990's the Life Cycle thinking has increased in popularity. Today new conceptions like Integrated Product Policy (IPP) and End of Life Treatment (EoLT) are being developed. Especially in the EU, but as a result of this the environmental consciousness in the market and companies doing business in the EU have to adapt these new policies to be able to be competitive in the European market. (Stenberg, Lennart, April 25 2002)

#### **3.1.2 Trends in environmental policy making (governmental approach)**

Strannegård (1997, 2000) claims that politicians often are reactive. In most countries, governmental authorities and policy makers follow, rather than direct, environmental development. This approach enables politicians to handle contradictory demands that change over time. Political targets, decisions and activities can consequently become inconsistent, while political objectives and the idea of the strived for ideal, win-win situation, is vague and change continuously.

Dobers (1997) characterises development of environmental policies as a learning process that starts with the most noticeable and manageable problems. As the polluting point sources have switched to use more environmentally sound technology, further similar efforts have marginal effects and are often very costly. To deal with diffuse emissions, an expansion of focus from the supply to demand side of the market is required, including a more holistic perspective. As diffuse environmental effects are caused by a larger number of actors, a larger number of actors have to cooperate to reduce them. Dobers (1997) argues that this makes the work with indirectly influencing attitudes and activities more appropriate than direct regulation. This development has induced governmental recognition of the need for a new control system and a reformation of public environmental policy. The result is life cycle-based policies that attempt to deal with environmental impacts at all activity stages for a product, from cradle (raw material) to grave (recycling) based on cooperation between the companies' stakeholders.

A sound understanding of the regulated problem is necessary to enable control with centralised, detailed regulation and legislation, Dobers (1997) claims. The closed reform process, which was used in the reduction of environmental impacts from point sources, is characterised by problem identification, negotiation of legal proposals, enacting, ratification and control. Dobers (1997) suggests that this often results in a development of legally induced bubble markets that are restricted in volume, time and space and that arises to comply with the requirements of the law. To reduce diffuse environmental problems, law and regulations of the closed control system can be complemented with an open control philosophy. Dobers (1997) suggests that this in part can result in the creation of different and at times contradictory, policy solutions. The complexity of diffuse environmental problems makes the choice to cope with political strategies less obvious. As a consequence, the political process is characterised by experimentation and the open steering and control philosophy leaves larger room for learning and innovative approaches. More precise and detailed regulation can be introduced as the understanding of the environmental problem increases. If governments have little knowledge of new environmental problems, policy makers must rely on innovations of various stakeholders, typically scientists and businesses, to find solutions. (Dobers, 1997)

Another way to describe this is using Nyström's (1990) theories that describe how a planning perspective is replaced with an entrepreneurial perspective. Nyström (1990) describes that traditional economic theory calls for use of a planning perspective with rational decision-models. Both public policy makers and the business community are assumed to be able to formulate clear objectives, predict future events and act accordingly. In an entrepreneurial context, development of an environment that is appropriate for creative problem solving is more important than direct regulation (Nyström, 1990). In an entrepreneurial context successful approaches are spread along and cooperation is based on a confidence between participating actors. Governments depend on leading companies' sharing of expertise and experience to enable development of action programs for less environmentally sound companies. The traditional governmental role is complemented with responsibility to inform and educate less environmentally committed authorities, business and citizens. Dobers (1997) suggests that the responsibility sharing of the open control philosophy and entrepreneurial perspective results in increased business motivation to voluntarily carry out environmental improvements.

Among the cases when governmental regulations have had a negative impact on business innovation reasons were: lack of clarity and precision in regulations; lack of proper scientific basis for regulations; too stringent time pressures for compliance; lack of industry/government consultation and technical exchange; inter-agency ambiguities; and the regulatory lag (Porter and van der Linde, 1995a; 1995b). Rothwell (1992) assert that governments' essential task are to minimise the negative effects of environmental regulations while at the same time stimulating the development and adoption of more effective technologies and methods. Ashford (1993) claims that stringent and certain regulatory demands are necessary to effect pollution prevention. He identifies five types of policy intervention; regulatory initiatives, including strict standards with flexible provisions; economic instruments such as tax policy; requirement of stakeholder participation; technical assistance to firms; and international harmonisation of regulations. He further advocates that the articulation of regulatory demands should be managed in the policy development process to create the type of technological responses that can be obtained from firms.

When looking at policies on recycling a division is generally done into two categories. The first category is those that affect the supply of recyclables include materials charge, product charge, waste disposal charge, deposit-refund and marketable permits. The second category is the companies that encourage their demands, include minimum content laws, governmental procurement policies and tax credits for producing recycled products. (McClain, 1995, Tietenberg, 1992)

Porter and van der Linde (1995b) claimed that environmental regulations have been seen to erode the competitiveness among companies. However, they show in their article that this is not necessarily the case. Instead they argue that properly designed environmental standards can trigger innovations that lower the total cost of a product or improve its value. They claim that efforts to eliminate pollution can follow the same basic principles widely used in quality programs (to use inputs more efficiently, eliminate the need for hazardous, hard-to-handle materials and eliminate unneeded activities).

According to Porter and van der Linde (1995b) "Businesses spend too many of their environmental dollars on fighting regulation and not enough on finding real solutions." In their article they identifies six types of reasons for the need of regulations:

1. To create pressure
2. To improve environmental quality
3. To alert and educate companies
4. To make more product innovations environmentally friendly
5. To create demand for environmental improvement
6. To level the playing field during the transition period to innovation-based environmental solutions

Porter and van der Linde (1995b) divide the regulations into good and bad regulations. At the same time a good regulation can enhance the competitiveness a bad regulation can damage it. They show this by taking examples in the U.S. were regulation forced the companies to adopt best available technologies and compare this with regulations in Scandinavia, which provided a more flexible approach.

However, Palmer *et al.* (1995) believe that there is an actual cost when transforming a company to be greener. They mean that the transforming cost has been articulated for a

long time. When Jaffe *et al.* (1995) did a comparative study over regulations in different countries they found that the regulations in the U.S. were much stricter and did not provide more flexibility in the choice of techniques than other countries did. When a technological shift occurred the companies had to do new expensive investments. On the contrary, companies in northern Europe that did not have strict regulations regarding technologies had a more cooperative relationship between regulators and regulatees about to develop more environmentally friendly techniques.

## **3.2 Corporate environmental management**

### **3.2.1 Internal and external demands**

Today, companies have to deal with a large number of different types of demands. These demands can be separated into two parts, internal and external. Within the internal demands the managers have to deal with factors as the history of the company, its values and priorities. The external demands come from customer pressure, supplier pressure, shareholder pressure and governmental pressure (e.g. regulations) among others (Dobers and Wolff, 1997, Baba *et al.*, 1997). These demands can also have different time perspectives. The stakeholders want to see maximum profit and the government wants to see a long-time perspective when dealing with the environment for example. Managers have to priorities between the different demands.

A study made of Hendriques and Sadorsky (1996) of large Canadian companies showed that customer pressure, shareholder pressure, community groups and governmental regulatory pressure had a positive influence on the environmental plan. On the other hand, lobby groups as environmental organisations had a negative influence on these plans.

### **3.2.2 Porter and van der Linde's improvements of environment**

By looking at the pollution as a form of economic waste Porter and van der Linde (1995a) introduced the concept of resource productivity. Before this the policy makers, business leaders, and environmentalists had focused on the static cost and the impacts of environmental regulation and ignored the offsetting productivity benefits from innovation. This new concept opens up a new way of looking at both the full system costs and the value associated with any product.

Structuring Porter and van der Linde's (1995a) description on how managers can accelerate companies' progress towards a more competitive environmental approach (see figure 3). They (Porter and van der Linde) first propose that companies' should measure their direct and indirect environmental impacts. One of the reasons why companies are not very innovative about environmental problems is ignorance. Companies that use the resource productivity framework and go beyond current regulations will get the greatest benefits. Within the company, some poorly utilized resources will be supposed within the plants, some discharged, and some put in dumpsters. Indirect resource inefficiency will occur at the level of suppliers and customers. At the customer level this is shown by resources left in used products and resource inefficiency in the use of products. By using Porter and van der Lindes first suggest, measuring the direct and indirect environmental impacts, the firms become more aware where the actual problem is.

Secondly, firms can also gain knowledge of recognising the opportunity cost of under-utilized resources. Today, companies evaluate their environmental projects<sup>1</sup> as isolated

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<sup>1</sup> Environmental project is a project, which purpose is to make the company less environmental dangerous.

and discrete investments and many companies do not track their environmental investments orderly. Few companies have analysed the customer value and the opportunity cost of wasted resources at the customer level. Better information and evaluation methods will help managers reduce environmental impacts while improving resource productivity.

To encourage innovations within companies the management should create a bias, in favor of innovation-based and product-intensified solutions. Companies should trace their and their customers' discharges, scrap, emissions and disposal activities back into the company activities to get a greater understanding about beneficial product design, packaging, raw material or process changes. Finally, companies must be more proactively in defining new types of relationships with policy makers and NGOs. (Porter and van der Linde, 1995a)

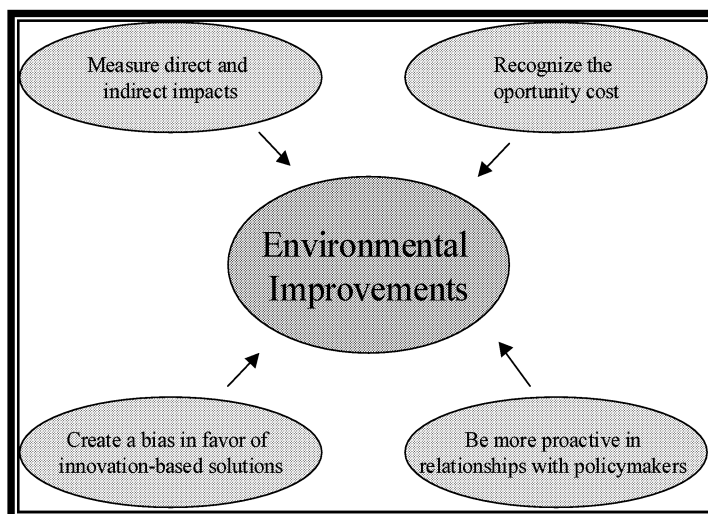


Figure 3. Structuring Porter and van der Linde's (1995a) text on environmental improvements

### 3.2.3 Reactive and proactive

A business can work with environmental issues in two main categories, *reactive* and *proactive*. (Strannegård, 1997) The reactive companies do not take any initiative to work with the environment and they adopt reactive positions in debates on environmental damaging issues. On the other hand firms can take a proactive position in environmental issues where the company itself comes into a good appearance. Cerin (2002a) shows this that corporate environmental reports contain a variety of information, which makes it very difficult to compare the environmental performance of two companies.

According to Ljungdahl (1999) one reason that some companies do not communicate their environmental activities (the author refers to the finance, IT, mining and metal industry and agriculture industry) is the absence of demand from the customers. Cerin (2002b) found this to still to be the case on the OM Stockholm Exchange, where larger companies of these sectors and those that emit more Greenhouse gases tend to report more than others. Recently the finance sector had also started to report due to increased focus on them in the environmental debate.

A by-pass solution is a concept that can involve companies providing contradictory information to various stakeholders. The reason that this is done is because the companies want to move the focus away from environmental problems. (This can be shown when comparing how companies are communicating their environmental issues in e.g. environmental reports compared to the information in annual reports and to how they actually are acting.) To try to overcome this problem Cerin (2002a) calls for stricter reporting rules.

When a company has such a diversity of demands and possibilities to approach these issues, they have to establish their corporate strategies. There have been many different suggestions on how to describe the different types of management. Freeman (1982) divided the corporate strategies into six alternative categories: offensive, defensive, imitative, dependent, traditional and opportunist. In a similar way Steger (1993) divided the strategies into four groups: offensive, defensive, innovative and indifferent. They were determined according to two conditions, the company's potential for market opportunities resulting from an environmental protection stance and the level of environmental risk of the company's activities. Companies that face small potential for market opportunities and a small environmental risk take the indifferent strategy to environmental issues. When a company just follow the regulations it is said to take a defensive approach. A company that manage to develop environmentally sound products and add value to their products is applying an offensive strategy. The last one, the innovative strategy, involves companies that under large environmental risk can realise the market potential only with a major change in the production process or by developing a new product.

### 3.3 Corporate environmental strategies

In today's society the conditions for the companies' activities are continuously changing. New technology, products, competitors, and regulations are always added at the same time as old ones disappear. To diminish the negative affect that changes can have, the companies have to predict the future and plan their activities to be able to decide what kind of actions to take. The overall aim with plans is, according to Ljung *et al.* (1998), to formulate a strategy that can bring out a movement from one position to another new and better position, and by doing so reach a higher economic efficiency.

#### 3.3.1 Strategy

Together with the conceptions of tactic and operative activities, the strategic activities constitute the company's entire activity.

The definitions treat goals, actions and resource distribution, which at the same time is affected by environmental demands. The long-term goals are affected by what kind of resources that are available in the surroundings and the prices of those. Other definitions regarding economic strategies are shown in figure 4.

The aim of a strategic plan is to collect information that makes it easier for the decision makers to decide on the company's future activities. Hence, strategies point to the future (Ljung *et al.*, 1998). According to Dobers and Wolff (1997) strategic decisions distinguish from other decisions in three major ways:

**Other definitions regarding economic strategy are:**

“The determination of the basic long-term goals and objectives of an enterprise.”

“The adaptation of courses of action.”

“The allocation of resources necessary for carrying out these goals.”

Figure 4. Definition Economic Strategies, Source: Dobers and Wolff, 1997

- They are unstructured and do not follow any given routine. Every decision is unique and cannot be taken in accordance with basic decisions rules. This means that strategic decisions deal with new situations for the company where there is

no previous experience or routines for. Old experiences and rules must first be modified and adapted before they can be applied on the new situation.

- They are very important for the organisation. Strategic decisions have a great economic impact on the organisation and affect the result and its future existence.
- They are complex. In taking a decision, various issues have to be evaluated, and balanced to each other such as; changes in the world, strengths and weaknesses within the company, the dynamic in the industry etc.

The challenge, both regarding the financial- and environmental strategy activities, is to transform the uncertain future into concrete activity plans with help of perfunctory treatment in a strategic process (Dobers and Wolff, 1997). The routine facilitates iterations of the procedure since the same problems can be used every year to secure the topicality of the strategy. Strategic planning can here be seen as a process that continuously iterates strategy evaluation to update company strategy (Ljung *et al.*, 1998).

### 3.3.2 Strategic roles

Companies that work with environmental issues as a part of their overall business strategies are normally handling environmental problems and always develop new and less environmentally harmful work procedures and products (IVA, 1995). But not all companies find it profitable to be driving environmental issues. This is due to the capacity (knowledge, personnel, financial resources etc.) that is needed. The companies' customers might not accept the changes in price or quality, due to increased environmental

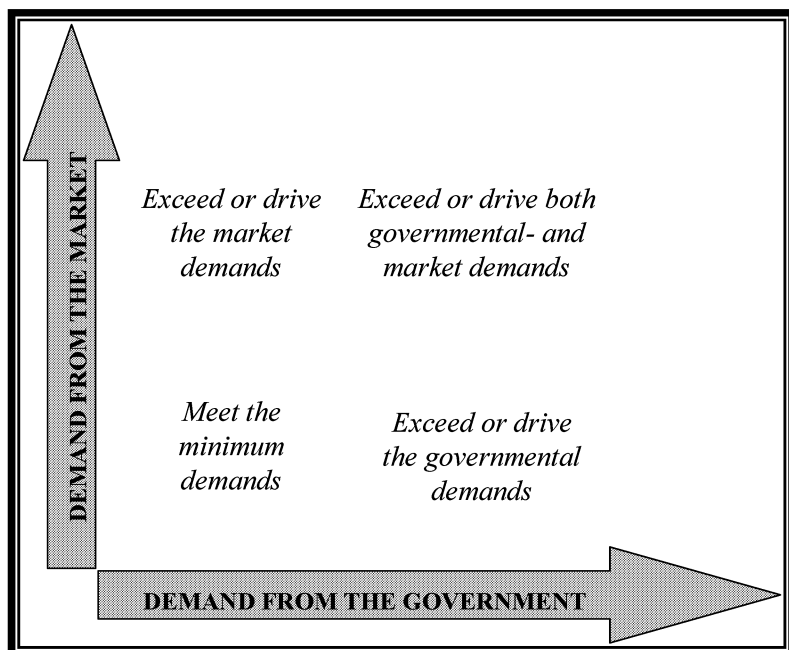


Figure 5. Environmental strategies, Source: Freely after IVA, 1995

performance. To cater for such customers, a pending way of action would be better. When the company think they have the resources to compete with the most environmentally advanced companies and win market shares from their competitors the strategy could be modified to be more proactive. IVA (1995) have identified four different types of strategic roles that are shown in the figure 5 above and described below. The roles can be separate or combinations of each other.

- *Meet the minimum demands*  
This is a suitable role for companies that have decided to merely follow the prevailing regulations and the market demands. In this way the company will be protected from negative publicity, but will not get any long-term advantages. To meet the minimum demands can also be a way for companies that do not regard themselves ready to urge environmental issues. Perhaps new process solutions, products or competence are needed? The role can also suit companies that have been known for having a poor way of dealing with environmental activities. For these companies it can be hard to suddenly try to market themselves as a green company and it is favourable to get time to integrate the environmental work in the entire company.
- *Exceed or drive the governmental demands*  
Companies are often faced with stricter regulations (e.g. discharge reductions) and in the long-term it can be expensive to make minor changes to fulfil the demands, or to see big investments get “out-of-date” too early. For companies it can then be more profitable to look ahead in advance and through research and development find new processes that exceed the new demands with margin. Through building up a knowledge based advantage, which makes it possible for companies to meet new demands before the competitors, earnings can be achieved even through the company is pushing the government to adapt stricter regulations.

To be able to urge governmental regulations, a company need to have sufficient knowledge and credibility. Companies that work with environmental issues and have high investment costs because the environmental problem is complicated and undeveloped can with advantage choose this strategic role (IVA, 1995). Problems that are well established can be difficult to use for this rule since the industry normally already have found good solutions on this kind of problems. It is difficult to get a better position on the market through such problems.

It can also be negative to exceed the governmental demands. One example of this could be if the demands on discharge reductions are defined a percentage reduction of existing discharge levels. Then the companies, which previously have invested more in environmentally friendly technologies, will be negatively affected compared to the ones who still not have done investments and will, thus, receive a larger discharge allowance.

- *Exceed or drive the market demands*  
If there is a demand for environmentally friendly products from the market, the company can respond to this demand and develop the market by exceeding the requirements from the market, or by driving them. Companies can get cost advantages by driving the demands on to their competitors, goodwill will be received and this can at the same time increase the possibility to entice personnel to the company. One example is when Canon noticed that one of the main reasons for people to search for employments at Canon was because of their environmental profile.

To drive market demands it is important for the company to have a thorough understanding of the structure of the demands and how to affect them. The company should have an insight into what kind of environmental issues that

should be prioritised and what kind of improvements the customer is prepared to reward. An environmental problem that has reached an awakening in the society or already has matured is suitable to prioritise. The market must also be aware of the environmental value of the product, something that is facilitated if the environmental measures are easy to detect for the customers.

In this role the company is largely restricted to the arbitrariness of the market. It is important that the environmental activities are working in the entire company. If some part of the organisation should work bad compared to other parts this could decrease the company's credibility.

- *Exceed or drive both governmental- and market demands*  
This is a combination of the two roles described above, "Exceed or drive the governmental demands" and "Exceed or drive the market demands". This role combines the positive affects from the two roles. To drive the demands on both fronts can increase the credibility at the companies and increase their chances to success further. But this requires usually great investment and innovation efforts and not all companies can afford this approach.

### ***3.3.3 Environmental strategic work***

The possibilities to take the right decisions on environmental issues will increase if the environmental problems will be integrated with the daily business. The level of integrated environmental work within the company depends on the strategic importance for the specific company to work with environmental activities.

For an extensive integration to get the expected effect it is important that the entire company looks at the environmental work as something natural and necessary. Therefore, it is important for the board to take an active interest and having a common view on the problems, as all the employees' attitudes should be focused in the right direction. Other important factors in order to reach a success with environmental integration is whether the organisation is mature enough for a changeover and whether the communication is good between company and the stakeholders during the whole process.

## ***3.4 The Life-Cycle perspectives***

When scanning different literature a variety of different Life-Cycle methods have been detected. However, all share the same purpose, to get a better understanding of what parts in a product's life that is most harmful to the environment. Today, it is common to deal with the usage phase and the recycling phase. This thesis will concentrate on End-of-Life Treatment (EoLT).

Another way for companies to get a greater understanding of their environmental impact is to use the EIA (Environmental Impact Assessment). EIA can be defined as "The process of identifying, predicting, evaluating and mitigating the biophysical, social and other relevant effects of development proposals prior to major decisions being taken and commitments made." The objectives of EIA are to ensure that environmental considerations are explicitly addressed and incorporated into the decision-making process by anticipating, minimizing and avoiding the adverse significant biophysical, social and other relevant effects of development proposals. Furthermore, as well as LCA it also aims to protect the productivity and capacity of natural systems and the ecological processes which maintain their functions. It should also promote development that is

sustainable and optimises resource use and management opportunities. (IAIA (International Association for Impact Assessment), 2002)

All products have impact on the environment in some way, whether from their design, manufacturing, use or disposal. The Integrated Product Policy (2002) by the European Union seeks to minimise impact by looking at all phases of a product's life cycle and taking action where it is most effective.

The life cycle of a product is often long and complicated. It covers all areas from handling natural resources, manufacture, assembly, marketing, distribution, sale and use to their eventual disposal as waste, including its design. This means that many different actors are involved, such as designers, industry, marketing people, retailers and consumers. The IPP attempts to stimulate each of these phases to improve their environmental performance.

With so many different products and actors there cannot be one simple policy measure for all kinds of issues. Instead there are a whole variety of tools, both voluntary and mandatory, that can be used to achieve a greener society. These include measures such as economic instruments, substance bans, voluntary agreements, environmental labelling and product design guidelines. The aim in Europe is to find a balance between them all and the overall objectives for the policy. (Integrated Product Policy, 2002)

#### **3.4.1 End of life considerations**

End of Life consideration puts a focus on the last stage in the Life Cycle Assessment (LCA), the stage where the products are supposed to be collected and recycled. This is a step that, after production has been in focus for environmental improvements, now is becoming more and more discussed. The Waste Electrical and Electronic Equipment (WEEE) directive is being developed in the European Commission. The objectives of the directive are to encourage reuse, recycling and other forms of recovery for electronics. The main measures are: elimination of lead, mercury, cadmium, hexavalent, chromium, PBB and PBBDE before 2008 within the production; Governments should establish separate collection facilities for waste electrical equipment; Producers to take physical or financial responsibility for recycling; Producer-paid systems to reuse or recycle waste electrical equipment; labelling requirements for certain electrical equipment.

In Japan a law, implemented in April 2001, required that manufacturers must recycle appliances, televisions, refrigerators and air conditioners. The manufacturers charge a recycling fee to the customers (\$20-\$40) for every new product that they sell. One of the main reasons that Japan have moved very quickly in this subject is due to the fact that Japan does not have much land and it is estimated that all the available land left for landfill will be saturated by 2008. (EPA – Product Stewardships – International Initiatives for Electronics, 2002)

The U.S. has developed a similar directive called *Product Stewardships*. It was developed by the Environmental Protection Agency and they try to turn the focus away from the manufacturers and point out that more sound environmental products can not be developed by the manufacturers alone, but that manufacturers, retailers, customers and the government has to work together to be successful. The *Product Stewardship* initially uses the life cycle perspective and focuses thereafter on the End of Life Treatment, to take care of the products after they have gained their value. (EPA – Product Stewardships – International Initiatives for Electronics, 2002)

## 4 The History of Japan, an economic – environmental perspective

*This chapter will treat the history of the Japanese industry after the World War II until today. It will explain how the Japanese industry has grown on the cost of the environment*

### 4.1 Japan's economic development

Japan has a large population (over 120 millions) on a surface of 378000 km<sup>2</sup> (317 inhabitants per km<sup>2</sup>). But two-thirds of the country is steep mountains and the population is therefore concentrated around the cities. Since Japan lacks natural resources, the Japanese have become specialists in importing raw material, processing them, and then selling the final product. In 1960, the Prime Minister Hayato Ikeda instituted the Ten-Year Income Doubling Plan, through implementing new laws that focused on 21 “special industrial development regions” and aimed to redistribute population and national income. A plentiful and inexpensive petroleum supply, an open international export market and a close cooperation between the government and the industry created

Japan's economic boom in the 1950's and 1960's. The Ten-Year Income Doubling Plan (figure 7) of 1960 aimed for 7,2 per cent annual growth but the actual annual growth achieved was 10,7 per cent, with a peak of 14,5 per cent in 1961

(see figure 6). (Barrett and Therivel, 1991)

Through rising private incomes, the spending increased and led to an upwardly spiral of mass production and mass consumption. The emphasis on economic growth implied that other problems were ignored. Japan's rapid industrialization changed the traditional way of living in Japan and resulted in severe environmental problems. The oil crises did however lead to a decline in

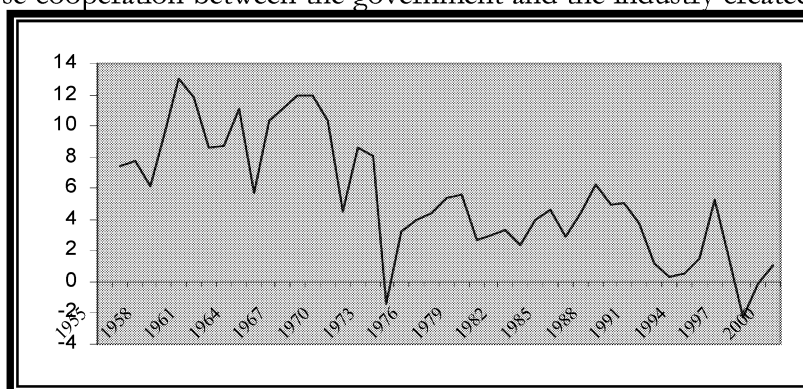


Figure 6. Japan's annual GNP growth (%), Source: Economic and Social Research Institute, 2002

Plan period	Plan Title	Growth plan (%)	Actual (%)
1955-60	Five-Year Economic Self-Support Plan	5.0	8.7
1958-62	New Long-Range Economic Plan	6.5	9.9
1961-70	Ten-Year Income-Doubling Plan	7.2	10.7
1964-8	Medium-term Economic Plan	8.1	10.6
1967-71	Economic and Social Development Plan	8.2	10.9
1070-5	New Economic and Social Development Plan	10.6	5.9
1073-7	Basic Economic and Social Plan	9.4	4.2
1976-80	Economic Plan for the latter half of the 1970s	6.0	5.1
1979-85	Seven-Year Economic and Social Plan	5.5	4.2
1983-90	Economic and Social Guidelines for the 1980s	4.0	

Figure 7. National Economic Plans, Source: Barrett and Therivel (1991)

the manufacturing sector and instead the service- and information sectors started to grow. This resulted in radically decreased pollutions that harm human health. But the quality of life and the natural environment was still bad since such improvements required a change in consumer habits and living patterns rather than more technological improvements. Since the mid 1970's the secondary industry that increased during the post-war era stagnated. The reasons were many; increased oil prices, the worldwide recession, competition from rapidly developing countries and increased protectionism from Europe and US.

#### 4.2 *The environmental cost of economic growth*

Japan's environmental problems are interwoven linked with its economic growth as illustrated in figure 8. The 1950s economic development determined the environmental problems that affected Japan in the late 1960s and early 1970s. Similarly, present changes in Japan's economic structure will affect the future state of its environment. During the 1990s Japan has become a leader in pollution control technology and has acquired a reputation for improving its air and water quality at little harm to its economy. However, more deep-rooted environmental problems remain such as: forestation, agriculture and industry that have destroyed almost all of Japan's wild areas. Making it very difficult for the environment to withstand stress and restore itself. Japan has a poor record on nature conservation, and despite improvements, many areas are still badly polluted. These problems stem from a combination of political, economic and social factors. However the universal nature to some of the problems indicate that Japan's solution may also serve as model for other nations in Asia.

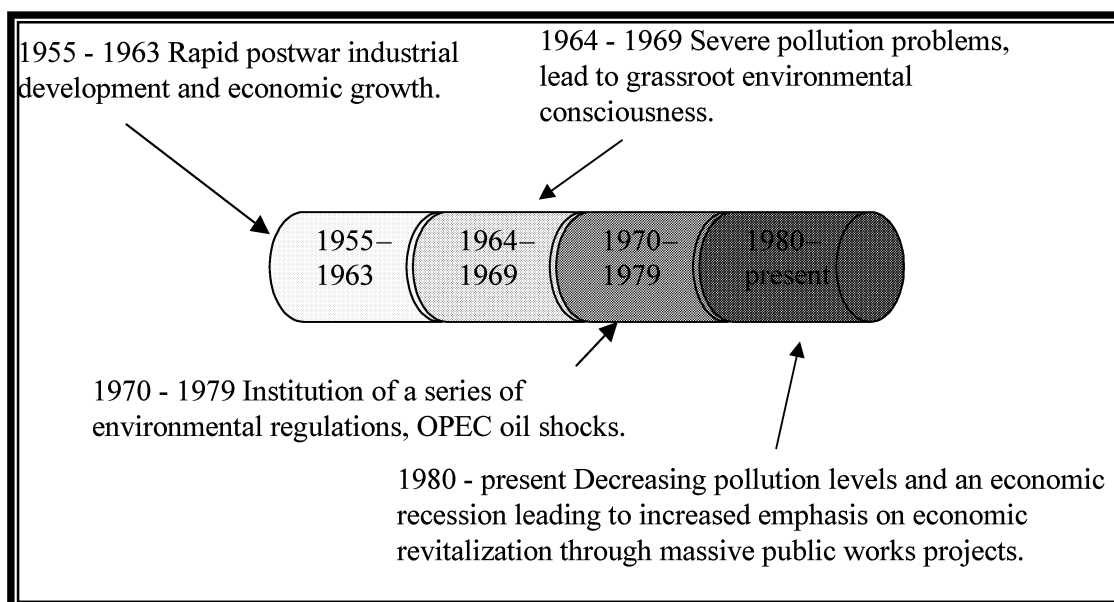


Figure 8. Japan's history, Source: Barrett and Therivel (1991)

Japan's system of environmental protection has today a number of limitations. First, the system is heavily oriented towards preventing harm to human health, and much lesser emphasis is put on protecting the natural environment. Second, Japan's attempt to protect the environment has been focused on technological solutions rather than on solutions that require a change in social attitudes. Third, Japan's system of environmental protection emphasises on symptoms rather than on the root of the cause. Such an approach does not solve environmental problems but merely treats their symptoms. (Barrett and Therivel, 1991)

### ***4.3 The history of governmental measures***

Due to the public criticism on companies polluting the environment and the concern for the worsening pollution problems made the government gradually take action. In 1963 MITI (Ministry of International Trade and Industry, today called METI (Ministry of Economy, Industry and Trade) set up an environmental pollution control division. In 1970, a turning point in Japan's environmental policy was reached. During July that year a severe case of photochemical smog in Tokyo was discovered. This occurrence resulted in 14 environmental-related laws that were enacted or amended in December the same year. In February 1971 the Cabinet proposed the establishment of an independent administrative agency to coordinate pollution control and environmental conservation programmes. During the 1970s the government established one of the strictest and most effective antipollution programs in the world. The program was based on the Polluter Pays Principle and did not affect the GNP growth. Also during the OPEC oil crises during the 1973/74 and 1978/79 many companies forced to curtail energy use, a major cause of pollution, and make the production methods more efficient. But an important aspect in the beginning of the 70's was that the government showed a genuine willingness to counteract pollution, even at the risk of limiting economic growth. It is however difficult to differentiate between the economic effects of Japan's pollution control strategies and those of the oil shocks. But, the overall effect of implementing pollution control equipment has been positive. Despite the increase in cost of certain goods (pulp/paper, 5.6%, chemicals, 3.7% and metals, 3.3%) and the simultaneous declination of demand of these products the demand of pollution control equipment increased. (Barrett B., Therivel R. 1991)

Prior to the establishment of Japan's Environment Agency in July 1971 to handle the environmental situation in Japan. Japan's planning system was very complicated. They focused on economic growth, development and technology features. Japan has planned, developed, consumed and produced its way to be a great economic actor in the world. But the environmental management in Japan lacked a legal framework. This resulted in that environmental policy-making was affected by several agencies' economic and land use plans. (Barrett B., Therivel R. 1991) The environmental situation at both the national and global level has undergone substantial changes. At the national level, the Environment Agency has accomplished in combating severe pollution during the time of high economic growth. However, air pollution by nitrogen oxides in major urban areas, water pollution due to household effluent and waste disposal have continued to pose even more difficult problems. Furthermore, due to the various development projects such as resort the threat to the natural environment has increased. (Environmental Protection Policy in Japan, 2002)

On the other hand, concerns about the global environment issues are mounting worldwide: i.e., the impact of the global warming, the depletion of the ozone layer, deforestation, biodiversity loss, transboundary movement of acid rain, and hazardous waste, etc. Many countries are urged to implement concrete actions and measures in order to realize sustainable development, as were agreed at the Earth Summit. In Japan, the *Basic Environment Law* setting out basic principles and directions for the making of environmental policies was enacted in November 1993. In December of the same year, the "National Action Plan for Agenda 21" was submitted to the United Nations. The following year, in December 1994 an action plan was adopted, the Basic Environment Plan, being the most important measure that was newly introduced with the aid from the *Basic Environmental Law*. This plan systematically clarifies what needs to be done by the beginning of the 21st century in terms of national measures and local government,

corporate and individual actions. It also defines the roles of the parties involved and ways and mean for effectively pursuing environmental policies. (Environmental Protection Policy in Japan, 2002)

Today, environmental issues are a common challenge to all of us as they range over diverse matters from those of direct daily concern to the wider global arena and even into the future of generations to come. Thinking about the cumulative effects of separate environmental problems and the great impact they can have on the earth, our survival base, it is vital that the central and local governments, enterprises and individuals are required to take well-coordinated cooperative action, both international and domestic, to effectively respond to these issues. (Environmental Protection Policy in Japan, 2002)

## 5 The cellular phone industry in Japan

*Within this chapter the investigation and the interviews will be presented. This section shows the current situations of the cellular phone industry in Japan. It discusses the manufactures', operators', the industry associations' and the governments' activities.*

### 5.1 Actors

Japan is a country that is well known for their advanced cellular phones. NTT DoCoMo's i-mode has been very successful and the amount of subscribers has increased every year since the first cellular phone was introduced. Today there are more than 70 million (71,236,900) subscribers in Japan shown in figure 9 (TCA (Telecom Carriers Association), 2002) and the penetration rate is about 60%.

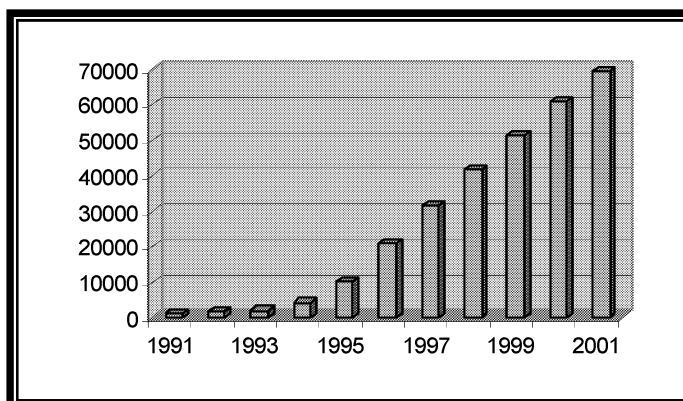


Figure 9. Subscribers 1991-2001 (Unit: Thousands), Source: TCA (Telecom Carriers Association), 2002

The cellular phone industry in Japan consists of manufacturing companies who produce the cellular phones; operators that provide the service, the shops who sell the phones and the end-customers. The shops are divided into direct shops and shops owned by the operators and cellular phone shops. Operator-owned shops and cellular phone shops do more than 90 % of the new sales (see figure 10). (Zanma, Asako, 3 July 2002)

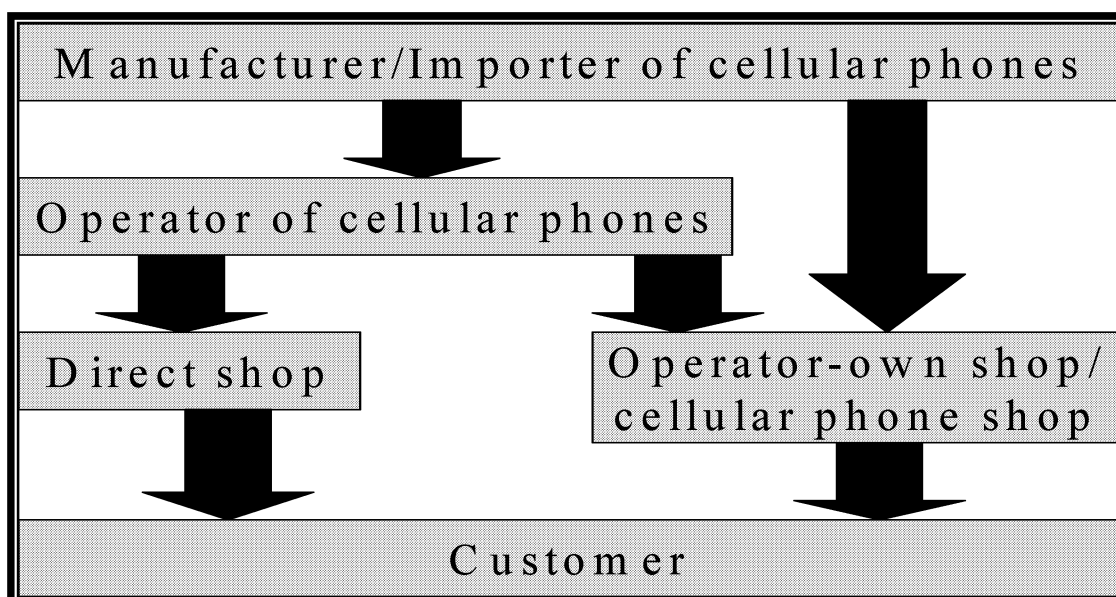


Figure 10. Sale scheme for cellular phones, the black arrows indicate the flow of the cellular phones, Source: Zanma, Asako, 3 July 2002

## 5.2 Manufactures

The manufactures are both national and international. The shipment of the national manufactures was for the fiscal year<sup>2</sup> 2001 42,811 million handsets (see figure 11). The manufactures of cellular phones used in Japan today are: Aiwa, NEC, Casio, Kyocera, Kenwood, Sanyo, Sharp, Sony Ericsson, Denso, Toshiba, Sanyo Tottori, Nippon Victor, Nihon Musen, Nokia Japan, Pioneer, Hitachi, Fujitsu, Panasonic, Mitsubishi and Motorola. (Zanma, Asako, 3 July 2002)

### 5.2.1 Case study: NEC

#### Intro

NEC was established in 1899. Today its major business is Internet solutions including the manufacture and sales of computers, communications equipment, electronic devices and software. It has 141,909 employees and had a net sale of US\$42,508 millions in the fiscal year of 2002. Its basic environmental management policy is: “Promote activities throughout the company and in all processes make sure that all employees maintain a high level of environmental awareness.”

#### Environmental management

NEC presents in their Annual Environmental Report five key themes of environmental management:

- Make **all** products environmentally sound.
  - Apply the green procurement method to **all** products
  - Recycle **all** used products
- Reduce the environmental impact of **all** processes.
- Include the environment in **all** IT solutions.
- Involve **all** employees in environmental communication.

(NEC Annual Environmental Report 2002)

To be able to link the environmental activities to its business NEC is now working with Environmental Management Indicators. (A chart showing the indicators to check NEC’s environmental activities from the viewpoint of the resource productivity, prevention of global warming, reduction in chemical substances and waste reduction composes it.) NEC used to focus only on environmental activities, but today the company understands that the environmental activities need to be linked to its costs. NEC wants to connect environmental issues to its business operations. So through these environmental indicators NEC want to check the efficiency of NEC’s environmental activities against

MONTH	AMOUNT (Millions)	% of last year
April 2001	4,62	124
May 2001	4,23	117
June 2001	4,14	99
July 2001	3,58	100
August 2001	3,98	100
September 2001	4,35	86
October 2001	3,04	71
November 2001	2,99	75
December 2001	2,96	68
January 2002	3,08	74
February 2002	2,80	80
March 2002	2,97	51
<b>TOTAL:</b>	<b>42,81</b>	<b>84,9</b>

Figure 11. Shipment of cellular phones on the fiscal year 2001, all Japan (millions, % of last year), Source: JEITA Web Site [Statistics], 2002

<sup>2</sup> A fiscal year is from April 1 – March 31.

its business operations. This year is the first time the company use Environmental Management Indicators and NEC will continue to use this as a tool to link the environment to their business in the future.

NEC environmental affair talks to their top management about environmental issues, when those issues are linked to sales or business issues, top management get a greater understanding and can easier make decisions. The top management team wants to know the relation between current sales and the environmental activities. One example where this has been shown is NEC's electronic department, which has a very high environmental cost that in this case arose from the high usage of chemical substances.

#### *Incentives*

NEC started their environmental activities in late 1960s, in that time Tokyo had very serious pollution problems. So NEC focused on the pollution problems (end of pipe solutions), but now the relation between the product and the environment is getting stronger, especially with the green procurement law enacted in 2001. Government and local authorities now select green products, and these actors are NEC's biggest customers. NEC has now started to promote especially the sound issues of their products. From this point of view the external reasons makes NEC much more motivated to work with environmental activities. E.g. NEC has an environmental month every June. During this month the company investigates and put out environmental questioners for all NEC employees (only in Japan). But the actual awareness of the environmental issues among the NEC employees is quite low, lower than the environmental management first thought. The conclusion is lack of internal reasons for environmental activities. Japanese are very sensitive to the energy savings and the oil chock during the 70's taught them to save energy. Recently the people also started to consider the waste segregation. The result has been that every local government in Japan today have their system or way to separate the waste. When NEC buys products there are only a few people who consider the greenness of the product. The number of green consumers is rather small, but the number is increasing. There is a green demand from the market especially from the business users and this has increased during the last years. (Takata, Noriko, August 2 2000)

NEC has two major environmental challenges to deal with now. First, NEC is an IT company so when it promotes environmental activities it wants to utilize its IT solutions. Secondly, NEC awareness of environmental issue is quite low so they want to promote their activities in the company with all employees' participation. (Takata, Noriko, August 2 2000)

#### *Environmental work*

According to NEC the market, or customer's need, is not that large. So the environmental affair at NEC is now talking to top management of changing the business style towards a more environmental business style. But NEC has to make profits, and the business system for rental or lease is not big right now, so NEC has to wait with that. For the time being cellular phone is a small product, but for other major electronic products like TV, air conditioners or refrigerators there can in the nearest future be a change in business style to only just sell, rentals or leases.

In order to make cellular phones more environmental friendly, NEC checks if their suppliers are environmentally certified (e.g. ISO14001). NEC reviews their suppliers in order to see if they have environmental targets to reduce their environmental impacts.

The company also checks its manufacturing process. NEC is now promoting green procurement activities and they have a system to select green suppliers when buying parts from their suppliers. NEC has now completed the control of the suppliers in Japan. But since NEC purchases parts from all over the world they have to look closer on their suppliers. This is very difficult especially in countries such as China or the Philippines where there are no routines in declaring these kinds of issues. On the other hand, Environmental Protection Agency (EPA) in the US has stringent regulations, which facilitate this process. Not only the EU directives but also the US, have already environmental laws to abandon the lead.

Regarding the interaction with other actors NEC is member of many different industry associations and at these meetings NEC aims to disclose the environmental information. At these meetings competitors exchange environmental information. When the meetings are held, not only the companies but also the government attend and exchange information and the companies can always get some information regarding new legislation in advanced, before the regulation is implemented. The government give the companies some time to prepare for the legislation. The government and companies can always cooperate to establish new technologies to find new markets for these issues. (Takata, Noriko, August 2 2000)

On April 1, 2001, the Law to Promote the Efficient Usage of Resources was enacted. Under this law, compact secondary battery manufacturers and manufacturers of equipment using secondary batteries are required to collect and recycle used batteries. In conjunction with the law's enactment, NEC became a member of the Japan Battery Association. NEC uses the Association's collection method to collect compact secondary batteries. NEC carries out its collection method by setting up collection boxes at collection sites for used batteries. Operators, like the NTT DoCoMo, are a big customer to NEC and NEC has exchanged information about recycling issues. NEC informs the end customers that the association a take back system. Through the Internet NEC inform the end users that batteries should be recycled through this take back system. So NEC itself does not recycle or take back the batteries. The Battery Association has to collect the batteries and NEC is responsible for putting a label on the battery to identify the battery type and where it should be sent after use. The operators are responsible for taking back the cellulars and batteries. Operators are now taking back the batteries for free. Basically the final users are responsible for the recycling cost in the social system. But regarding the regulation of mobile phones Mr. Ugo do not know. (Ugo, Ryosuke, August 2 2000) The Japanese recycling law says that the manufacturing companies have the responsibility to recycle the products, including the batteries. NEC has a contract with the Battery Association. The firm can simply ask the Association to take back the batteries.

One of NEC's key themes of environmental management is to recycle all used products. Right now NEC does not have any information about recycling the cellular phones even though they uses a design process for DfE (Design for Environment). (Takata, Noriko, August 2 2000)

NEC has implemented an Eco-station; this is a station where they collect all information about environmental issues and this means that they don't use hardcopies any more. Every year they implement an environmental audit and during this time they have to see many documents to check that their activities are right. But now they have implemented the audit through a database. It was implemented four-five years ago. Since NEC is a

technological and information company they are trying to use IT to make the company more environmental friendly.

GPN – Green Purchase Network started 1996 and was established to promote a greener market. When they started in 1996 they had about 100-200 members but in the end of last year there were around 2700 members. To become a member a company has to pay a certain fee. The merit to be a member is that GPN introduces the member's green products in their web page or in a catalogue. So many companies want to become a member. The reason why the Japanese government enacted "The Green Procurement Law" was because GPN was doing their business and the greenmarket was getting bigger and bigger. So Japanese government decided to enact the Green Procurement Law.

### **5.2.2 Case study: Sony Ericsson**

#### *Intro*

Sony Ericsson is a joint venture between the Sony Corporations and Ericsson and it was merged in 2001. The company is divided 50-50 between the companies. The HQ is situated in London, England, Sony Ericsson has about 1000 employees in Japan and nearly 10000 worldwide. Both Sony and Ericsson have a lot of experience of working with environmental issues.

#### *Environmental management*

It is a very difficult balance between business strategies and environmental strategies. The reason is that sometimes it might cost more to make an environmental investment than not doing it. For Sony Corporations it is a lot easier to say that they have to do it now because their products and the industry is more stable than the cellular phone industry. For a company like Sony Ericsson it is difficult because the cellular phone market is really competitive. The customers are very price sensitive and corporations are struggling to reduce costs. Sony Ericsson has a strong brand image but when operators sell the cellular phones in Japan they sell them under their own brand name and it can be difficult to make Sony Ericsson a brand that the customers will pay for. (Nagai, Asako, July 31 2002)

It is very hard for Sony Ericsson to push their environmental agenda forward. It is rather easier for Sony Corporation because they have TV's. A lot of consumers care about the power consumption because the consumers will use a TV for a very long time, like 10 years.

#### *Incentives*

The reason, according to Nagai (2002), why Sony Corporation works with environmental issues is because it is a mixture of governmental regulation and consumers demand. But the most important incentive for Sony Ericsson, as a corporation, is the corporate responsibility, to take care of the environment, since it operates and sell products. Mrs Nagai thinks it is very different compared to the US because Japan does not have any resources and the Japanese people have to think about their energy resources. Even if Sony is a global company their strategies will be based on Japanese thinking. At the same time the EU is working with stronger regulations regarding hazardous waste. Since Sony is producing products all over the world and it is very difficult to separate the different markets, it is easier to have strict standards everywhere. The other big issue is that it is much cheaper to do environmental investments than not doing it, because if they do not prepare for e.g. WEEE now, then it will be more costly in the next five to ten years. For an example, if Sony Corporation has an environmental accident in one of their

manufacturing plants, it will damage Sony's reputation, which will be very costly. In the short term these investments may look costly, but in five to ten years it will not.

The main challenge for Sony Corporation is that it has to double its overall eco-efficiency from 2000 to 2010, which is very important because then the Kyoto protocol will take actions. In their Social and Environmental Report 2002 they have put up a list of different issues that they shall complete until 2010. They try to see things from the entire product lifecycle's point of view and try to see the resource consumption and the energy consumption at every stage of the lifecycle. The manufacturing companies find the manufacturing phase much smaller than the products use phase, in aspect of the energy consumption. The green house gas emissions are about twice as large in the usage phase than in the manufacturing phase. This indicates that the energy consumption during usage has to be reduced. It might be a small difference for the cellular industry since, the life cycle is very short, and electronic products (for example TV) is expected to last for ten years. The company tries to see at the entire life cycle to find out the most effective way to reduce energy consumption. They look at every product to see where they can double the eco-efficiency. (Nagai, Asako, July 31 2000) Sony Ericsson's largest environmental challenge is their Life-Cycle Assessment (LCA) actions program that has to be implemented. They are working with the second generation of LCA, LCA 2. This generation covers the whole assessment and that's why Sony Ericsson has to implement LCA 2 in all areas. (Sunada, Yuusuke, July 31 2000)

Sony Ericsson does not receive any feedback from the government but they get feedback from the Communications and Information network Association of Japan (CIAJ). At the same time CIAJ asks the manufacturing companies to write a report about their situation regarding their environmental issues. Basically the business association represents all the manufacturing companies. (Nagai, Asako, July 31 2000)

In Japan the operators are responsible for the products. It will be more reactive for the manufactures in the Japanese system where the operators put demands on the manufacturing companies. The basic idea is that everyone should have a responsibility. Today this works well in Japan. (Nagai, Asako, July 31 2000)

The Europeans and the Japanese governments have different means of regulating environmental conduct. In Europe the regulations focuses on the toxic material in products and are regulated before you sell the products. In Japan the regulation only treat the disposal of the products.

#### *Environmental work*

Regarding the recycling issues Sony was invited for discussions with different associations and academics, NGO's, government etc. Before Home Appliance Law became effective they had a really long discussion for a couple of years before it came affective. Hence, it takes time and a lot of discussions and it is really hard for one manufacture to look for the perfect model or even for cooperation. Consumers or the government may not think that way, so it is difficult to find a consensus. (Nagai, Asako, July 31 2000)

According to regulation Sony has to recycle their TVs. KDDI and J-Phone are in similar situation as NTT DoCoMo. But NTT DoCoMo is doing a very good job. For the time being, one company believes that they are responsible and has asked their manufactures

to pay some fees for recycling, but so far CIAJ has not accepted this because they see benefits in exploring the valuable metals in the cellular phones. (Sunada, Yuusuke, July 31 2000)

For every model that Sony Ericsson designs and produces, they use the LCA and DfE. Within the company there are a lot of information about environmental issues and they have access to Sony Corporation's environmental information. (Sunada, Yuusuke, July 31 2000)

### 5.3 Operators

The dominant mobile telephone network operator in Japan is NTT DoCoMo with 41 million subscribers and 58% of the market share (figure 12). In addition to NTT DoCoMo there are two more actors, KDDI who have two brands, AU (12,4 million) and Tu-Ka (3,9 million) and J-Phone (12,4 million) who is merged with Vodafone.

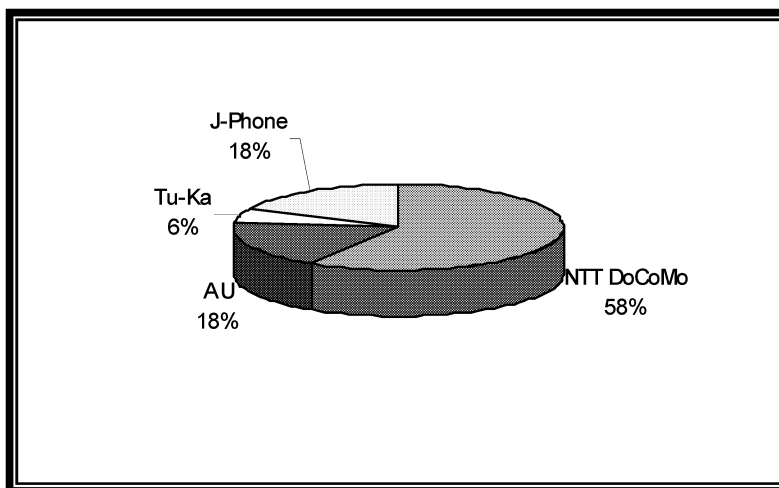


Figure 12. Subscribers April 2002, Source: TCA, 2002

The cellular phone industry began in 1979 with a car phone service. In 1987 NTT DoCoMo started a mobile phone service and the following year, 1988, Nippon Idou Tsushin Corp started their network in Japan. In 1989, Cellular Group started their service where they rented mobile phones for 23000 yen per month. In 1993 selling mobile phones was allowed and 1994 J-Phone entered the market. (Ishida, Iwao, September 13 2002)

#### 5.3.1 Case study: J-Phone

##### Intro

J-Phone was established 1994 under the name of Digital Phone Group. The company was then further developed to J-Phone East, J-Phone West, J-Phone Central and J-Phone Communication (stakeholder). In November 1 2001 J-Phone was merged with Vodafone Group. Vodafone is a relatively new company that has grown dramatically during the last years and have today more than 220 million subscribers in 28 countries.

J-Phone's environmental work is just starting as a result of the merge with the Vodafone Group. The firm bases their Corporate Social Responsibility program upon three pillars; the social-, environmental- and economic aspect. The company shall involve the other departments in the CSR issues. J-Phone has a CSR committee, which includes all the company's departments around Japan. From this committee the company receive ideas on what actions that should be taken concerning environmental issues. By establishing the committee and basic system the firm hopes to be innovative and proactive on dealing with environmental problems.

*Environmental management*

J-Phone has not a system or tool to couple their environmental activities to their business activities. The Vodafone Group does not have such a system either, but is developing a management system that also will be implemented at J-Phone during 2003. Their main task within the environmental field is now to focus on the collection of handsets and then check the figures on base stations and thereafter decrease the energy use of these base stations.

*Incentives*

J-Phone's main incentive is to work with environmental issues in accordance to the Vodafone Corporate Social Responsibility's (CSR) policies. It contains the basic priority items divided into three sectors; 1) Environment, 2) Economy and 3) Employment/Training/Health and Safety. (Vodafone Corporate Social Responsibility Report 2001-02)

Sasaki (2002) says it is fundamental, not only for cellular phone operators, but for any company to always keep in mind the environment, and all activities must be environmental friendly. J-Phone does not feel any demand from the market nor from former employees. Sasaki continues with: "it is kind an ordinary situation for us to try to think environmental as clean as possible..." J-Phone will also start thinking about decreasing the energy consumption, saving energy, and cutting the cost and increasing the efficiency. So far, however, the Vodafone top priorities are CSR activities and in first hand ISO14001.

Telecommunication Career Association (TCA) and J-Phone took action to collect handsets voluntarily because the two companies shared a common concern about the government establishing and starting a new End of Life Treatment law. In other words, once the government has decided to make a law to collect handsets, it will cause considerable extra costs to the operators. The government discusses this topic with the operators together with TCA in order to first try to find a voluntary solution, as a first step. Taking this electric appliance industry for example, J-Phone has no idea if the government still want to go ahead with the regulation. As of today, J-Phone makes a report to TCA who then gives it to the government and there have not been any strong pressure or criticism from the public about the attitude or action from the operators in the area of collecting the handsets.

NTT DoCoMo has been working very positively and aggressively and has now an own solid environmental management system within the ISO14001 system certified. J-Phone can imagine that NTT DoCoMo has already a solid environmental management system and it has already positively outsourced to companies who are collecting used handsets. J-Phone has also promoted their customers to take back their old phones. (Takata, Noriko, August 2 2000)

Before 1994 the cellular phone was sold only on rental basis. Since then operators have been able to sell phones and the rental ratio has decreased dramatically, mainly due to decreased prices of handsets. There are no incentives for subscribers to use handsets on a rental basis. Today there has not been any discussion about a deposit system in the cellular phone industry, but it may come in the future.

*Environmental work*

J-Phone has many shops in Japan, approximately 12000, and at every shop there are yellow coloured boxes. The purpose of these boxes is to collect used batteries, phones and chargers, when customers want to change the model of their cellular phone. After collecting batteries, phones and chargers, J-Phone has outsourced to small truck firms, who are collecting the items at J-Phone's shops and transports them to warehouses. Then they let these firms divide it into 3 groups (Handsets, batteries and chargers), and then transport these to recycling firms for further processing. J-Phone has to pay for this service but since the phones have some valuable metals they get some money back from the recycling firms. (Sasaki, Hideaki, August 15 2002) J-Phone has in total collected 95 ton of cellular phones (including batteries, excluding chargers) in the fiscal year 2001. That is about 10% of the total amount of recycled cellular phones in Japan and J-Phones market share is 17%. J-Phone has had some problems with their retailers who also have been working with recycling companies, or they know some recycling companies through their information source. This has resulted in used handsets, which are consisting of some valuable metals, being sold directly to the recycling companies. Hence, even if J-Phone tries to collect their handsets, some retailers will sell the phones directly to the recycling firms. This means that J-Phone cannot be sure about how many handsets the company collects since some of the handsets are sold to the recycling companies without J-Phones knowledge.

But in the case of J-Phone they have to strengthen their activities. The over all attendances of collected figures have been slowing down, but NTT DoCoMo has kept their appearance and J-Phone has not. J-Phone can imagine that KDDI has not achieved its figures as well either. Of course there is a fact that the market is slowing down, but J-Phone surely has to make up a much more our management system together with their business partners. But J-Phone has one reason why the quantity also has decreased in addition to this original figure; the market is slowing down. (Sasaki, Hideaki, August 15 2002)

Another service J-Phone provides is for example if customers drop the phone in the water, J-Phone changes parts and replace them with old parts from old handsets, so the service is cheap for the customers. (Matsuyama, Noriko, August 15 2002) According to its green procurement J-Phone is going to raise questions about green procurement guidelines, but since J-Phone does not has ISO14001 yet they cannot do that. Today they do not have any green procurement but says they will strengthen their activities. Some suppliers have ISO14001 so they have their own environmental activities, and design the phones in an environmental friendly way. J-Phone's designers might be discussing some issues but that is not a request from J-Phone's part. Regarding the batteries J-Phone is responsible for putting a label on the battery to show what kind of battery it is. Also they should inform where to leave the already used batteries. (Sasaki, Hideaki, August 15 2002)

Japanese handsets have during the last years improved in quality and higher specifications/performance. With these handsets J-Phone can also surprise their subscriber who can get more sophisticated services. The market price on handsets has increased and J-Phone is going to sell their handsets at a higher market price. In the initial stage, when there were no subscribers, J-Phone intentionally tried to sell at a low price. But considering J-Phone's profitability and their effort to strengthen the company's "basics", J-Phone has finally been trying to sell their handsets at a higher price. The customers today get new handsets with new and more services and with a

higher price, whether they like it or not. J-Phone has no other way to higher cost or money compare with two-three years ago. It means that even though they like to (a customer) to change the original handset. The customer might be thinking not to give the old handset to the operators but to a family member or friend. Then people who got old handsets might go back to J-Phone and change numbers. It means that J-Phone has lost their chance to collect original handsets in that system. SIM-card (Subscriber Identity Module) will be introduced in next generation in J-Phone's case.

### 5.3.2 Case study: NTT DoCoMo

#### *Intro*

NTT DoCoMo is an operator in Japan but did not want to display their name in this study. The operator is the largest service provider in the cellular phone industry in Japan. It has been selling handsets since 1994 and before that it had a rental service of portable phones.

#### *Environmental management*

NTT DoCoMo has a MAGIC and DREAM vision and is described in figure 13.

<b>Mobile Multimedia</b>	<b>Dynamics</b>
<b>Anytime, Anywhere, Anyone</b>	<b>Relationship</b>
<b>Global Mobility Support</b>	<b>Ecology</b>
<b>Integrated Wireless Solution</b>	<b>Action</b>
<b>Customized Personal Service</b>	<b>Multi-view</b>

Figure 13. MAGIC and DREAM, Source: NTT DoCoMo Environmental Protection Activity Report (2002)

NTT DoCoMo has not any specific environmental strategy implemented in its business strategies, but they talk about taking responsibility. The company has a system where they measure the direct and the indirect impacts of its activities on the environment.

NTT DoCoMo has three major environmental issues:

- Green procurement guidelines, which aims to increase the demand on the suppliers. The development of Green procurement guidelines has been divided into three steps. The first step was to inform the suppliers about the green procurement and to collect reports from them, addressing how they worked with environmental issues. The second step was to evaluate the suppliers' attitude and designation of technical specifications. The last step was to make a complete implementation.
- Research and development, NTT DoCoMo has continuously joint venture with the manufacturing companies to develop new features and more environmental friendly cellular phones.
- 7 concepts regarding their buildings:
  1. Increase the lifespan of buildings
  2. Reduce the use of halogen and fluorocarbons
  3. Reduce and gradually eliminate harmful materials
  4. Save energy and resources through more efficient use
  5. Protect the global environment
  6. Facilitate recycling
  7. Reduce waste

*Incentives*

NTT DoCoMo's main driving forces are market-based. The firm says that the society demands companies to take their responsibility, not specific customers. According to a survey done by Nikkei (Japanese economic newspaper) less than 10 % of the consumers really care whether the product is "green" or not. At the same time there exist regulation that also push them to work for the environment. NTT DoCoMo's environmental work is mainly internal. The President of NTT DoCoMo has been a major force for the environmental activities and he understands the importance of environmental issues and has been working to make NTT DoCoMo a greener company. The company has a hypothesis that the resources will decrease and the society has to be more aware about how they use the resources and how to take care of them.

Regarding other more environmental friendly business cases of providing the same service the company says that there is no demand from the market on this issue. The consumers want to own their cellular phone. A deposit system where the customers have to pay an extra amount of money when they purchase the cellular phone could work but it has to be regulated, making all operators implementing this at the same time.

*Environmental work*

NTT DoCoMo started recycle batteries in October 1993. Today the company also recycles their cellular phones and chargers. These activities are outsourced to companies within the NTT DoCoMo Group and to external companies as well. This is expensive for NTT DoCoMo to collect and recycle these phones. But the company thinks that people start to look more and on what the companies do for the society and the firm feel it has to do this. NTT DoCoMo collects phones from all the operators and pays also for the cost to recycle them.

**5.4 *Manufacture and operator industry associations***

The operators and manufactures are members in TCA (Telecommunication Career Association) respectively CIAJ (Communication and Information network Association of Japan). They work very close together and these organisations handle the contact with the government.

Their role is to manage the communication between the government and their members. If the government wants to know the opinion of a certain topic the association ask its members and then collect the answers and gives this to the government. They do not receive any feedback either from the government nor the members. (Endou, Akira, August 22 2002)

CIAJ have constructed a committee that is working with reuse and reduce materials. This committee is working together with TCA that works with recycling. This is a project called the 3R-project (Reuse, Reduce and Recycle). There is a recycling network with 26 companies comprising manufacturing companies and operators within the cellular phone industry. (Ikegami, Takeo, August 22 2002) There is no financial aid for recycling the cellular phones. Before the network was initiated in April 2001, companies recycled by their own.

There is no pressure under law; they started by themselves. Companies usually produce other products and recycle them; therefore it has been natural to recycle the cellular phone. Before 1997 the companies worked individually. The best policy would according to Mr Endou be by voluntary measures.

The reasons why the manufacturing companies work with recycling issues are because they think it is important for the image and they are therefore putting a lot of effort into this right now. The operators think that the cost of recycle is low right now. There is a trade off between the cost of environmental issues and environmental investment.

The associations do not have any policies of their own since their task is to be the communicative link between the government and its companies. The green procurement is not a law, just a guideline, but it is not very popular among the companies.

There are no official measures to evaluate the companies' environmental work. But if the environmental efforts are considered to be too small from the government view, they will develop a regulation.

They do not have to reach a consensus in all questions at the meetings. Every company can do as they want, but there are some major questions that they have to reach consensus about. (Marketing issues/guidelines etc)

## **5.5 Government**

The most important institutions of the government regarding this issue are the Ministry of Environment, former Environmental agency, CJC (Clean Center Japan), METI and the Japanese Ministry of Public Management, Home Affairs, Posts and Telecommunications.

### **5.5.1 Case study: METI**

METI (Ministry of Export, Trade and Industry) does not have any regulatory measures for example law enforcement. METI does not communicate directly with the manufactures and operators but through the industry organisation and the industry organisation also gather each company's opinion and feedback to the ministry as a collected issue. This is political sound and political effective when decided by METI. (Nagase, Masamitu, July 26 2002)

The government in general does not support specific one-company solutions but there are semi-governmental banks for small and medium sized companies and they can ask the banks to borrow money for investment for plants and manufacturing technologies. Japanese government first collect information through industry organisation rather than contacts direct to each company because governmental goal is to maximize the public interest or public utility. In that point of view it is better to collect information from the industry organisation to get a collected picture. There is a company association of communication devices industries including wireless and wired with all the mobile phone companies. There are another association for the operators. The CIAJ and TCA voluntary agree to recycle cellular phones devices. In general, industry associations follow guidelines showed by the government. In formal terms there is a committee consisting of authorities, manufacturing industry and operators and so-called talented people to jointly make up guidelines. But in fact METI write down the draft of guidelines and simple authorize it. (Informally, best and greatest people recommend the government to make this guideline and then the organisation will follow the guideline but deep you could write is up to you but in fact the governmental officials usually write draft.) Within that guideline there are two sections, one for the manufacturing companies and one for the operators.

There are different policy goals and sometimes there are conflicting relations, for example if you will make an environmental friendly product (e.g. less toxic) but at the same time you need to use more energy. So the government have to balance the issue. Since there are many issues to follow there are not only one best environmental policy. And also there is a kind of a multi variable equation, which is very difficult to follow. The government is hence trying to listen to as many people as they can and then tries to implement the policy. Cellular phones are not included within the environmental law, because the issue is not that large. When the law is going to be drafted the manufactures and the operators jointly try to develop a recycling system so that's why the cellular phones are not included. There are no plans to implement a recycling regulation since the system works good today. Currently the voluntary process is doing well so METI do not think there is a need to implement a new regulation. METI expects them to produce better measures. (Nagase, Masamitu, July 26 2002)

In April 2001 the Home Appliances Recycling Law was fully enforced. This law obligates home appliance manufacturers to recycle TVs, refrigerators, air conditioners, and laundry machines and to make efforts to attain target-remanufacturing rate ranging from 50% to 60%. The enforcement of the law forced manufactures to form two large groups, one of which includes Matsushita and Toshiba, and the other includes Hitachi, Sanyo, Sharp, Mitsubishi and Sony. Each group has established its own recycling plants, waste-collecting centres, and other necessary facilities and also set recycling chargers. (Fujimoto, Jun, July 25 2002)

Thanks to the manufactures' preparation to the Home Appliances Recycling Law, the law has caused no significant problem when enforced. Manufactures see their collection system and recycling systems functioning well. Manufactures are especially glad to see their 37 recycling plants located in various areas in Japan handling more home appliances than expected. Another good news is that the number of illegally dumped appliances did not increase so much as anticipated. Although the number did increase at the beginning of the enforcement year in comparison with the previous year, now gradually levelling off as time passes. Currently, this number accounts for as low as less than 1% of the total number of waste appliances. (Nagase, Masamitu, July 26 2002)

Clean Japan Centre (CJC) is by fifty percent owned by METI and fifty percent by Japan Chamber of Commerce. Their tasks are to assist METI with environmental question within the area of recycling and to help to create a recycling-oriented society. They think the cellular phone case is very important since it is very easy to just throw away the phones in the nature. CJC and METI started to investigate the case of cellular phones back in 1999 and are right now working on a proposition how to solve this problem. (Takeshita, Kazuhiko, June 28 2002)

## 6 Activities for recycling cellular phones

*The activities for recycling cellular phones are one environmental activity that the companies now are doing. Within this chapter a presentation over the current situation over the collection work will be done. The chapter ends with a presentation over statistic data regarding the amount collected cellular phones, batteries and chargers.*

### 6.1 Collection situation

Today the opportunity to collect unnecessary cellular phones is mainly when customer brings their old cellular phones when they visit shops for model change or cancellation. Operator-own shops (e.g. DoCoMo shops, J-Phone shop etc.) and cellular phone shops (where the mobile phone of various brand (operators) are sold) are offering services to copy the memory of address book, but it is increasing that customer expect to keep old cellular phones for the case like trouble and breaking down of new cellular phones. Because ownership belongs to the customers, it is difficult to force the collection of old cellular phones when they come in and change model or cancel their subscription. The collection flow is shown below in figure 14, where the arrows show the flow of cellular phones. The number of direct shop is quite small. However some manufacturer of cellular phones own the retail shop where only their cellular phones are sold. The example is Pana-shop of Panasonic PHS.

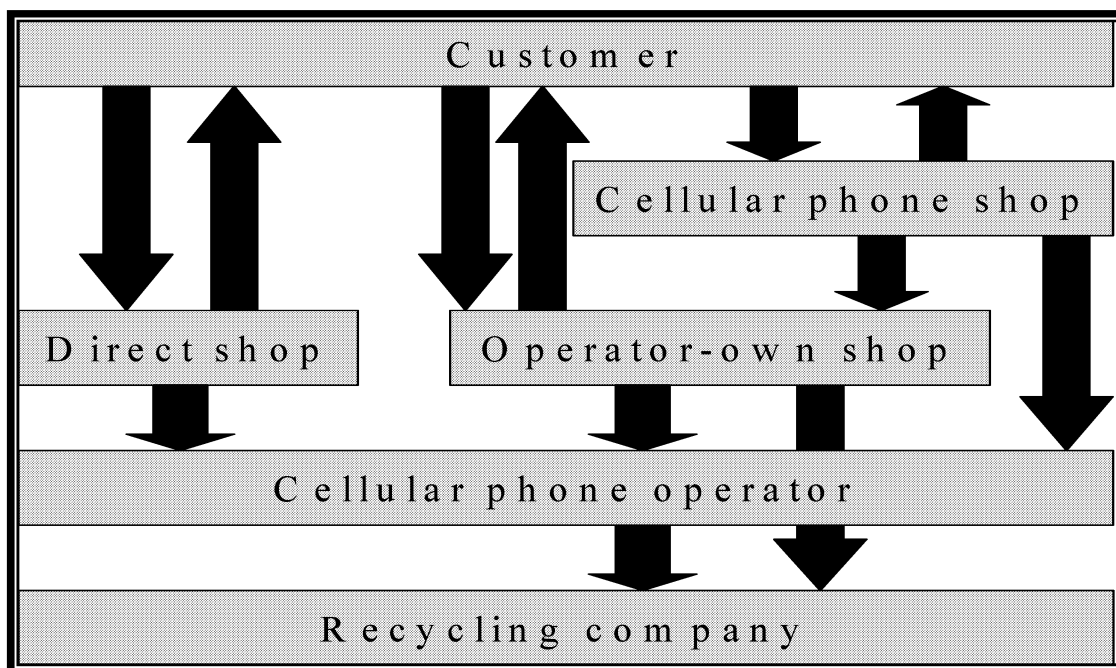


Figure 14. Collection flow, Source: Zanma, 2002

Recently there has been an increasing tendency that the customers want to keep their old cellular phones when they change or cancel a subscription. This is not only because the cellular phones are so small that the customers want to keep it as a toy or insurance if the new mobile phone get out of order, but also because they would like to use it in order to check their friends phone numbers that is stored in the phone. Considering the current situation of use, it can be said that the amount of customers that discard cellular phones by themselves is decreasing. According to a study made by CIAJ in June 2000 54% of

customers who changed model or cancelled their subscription kept their old phones in their house. (TCA and CIAJ Annual Report 2000)

When the cellular phone service started the cellular phones were rented to the customers by the operators, but after 1994 when the system where the customer buy their own cellular phone was implemented the number of subscribers has increased more and more as the price for the handsets has become lower. Today new models are introduced to the market more often and the customers change phones long time before the old one stops working. The old cellular phones that becomes unnecessary when a customer change model would be discarded as incombustible garbage unless the operators take action. Each operator is tackling with the collection and recycle of cellular phones in order to establish the recycle-based system as an environmental activity and also conduction the proactive collection when customer visit shops for model change or cancellation.

The generally cost of collection consist of “commission fee for shop” and “transportation fee to recycling company”. However the scheme for collection depends on each operator and some operators stores the cellular phones in warehouse first. There they are divided into three groups (cellular phones, batteries and chargers) and the transported to the recycling company. In this case the cost consist of commission fee, and fee for transportation and warehouse. Because collected cellular phones can be sold to recycling companies as the valuable, charge for selling is paid. Generally the cost for commission fee and transportation exceed the charge paid by the recycling company. But as today the operators do not charge the customers for collection and recycling. The cellular phone also have some value, PhD student Tsutomu Uryo told that from one ton of disposed cellular phones 150 gr. gold is possible to be extracted, compared with one ton of rocks where only 2-80 gr. gold can be extracted.

## 6.2 Statistics over recycled phones

The industry association TCA has together with the industry association CIAJ collected data from the operators and manufactures regarding the amount collected cellular phones, batteries and chargers as figure 15 show. In 1998 the amount of collected cellular phones was 1180000 kg, in 2001 it was only 798724 kg, which is equal to 13107173 cellular phones. See Appendix *Collected data* for more detailed data regarding the collection of cellular phones, batteries and chargers.

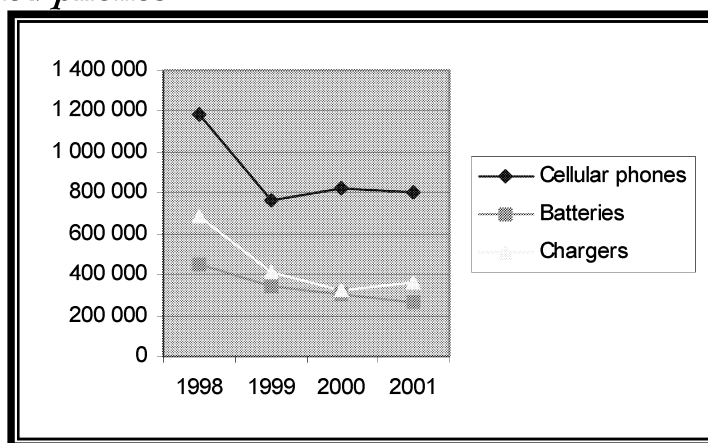


Figure 15. Collected data 1998-2001 (kg), Source: CIAJ/TCA report 2000 and 2002

The reason for the initial high amount is the accumulated amount of cellular phones that were kept in houses before the recycling activities started.

The TCA has developed a recycling ratio, defined in figure 16, that depends on the amount recycled cellular phones, batteries, chargers, the domestic shipment and the amount new subscribers. This is a better tool for measuring the efforts to collect the

cellular phones. Since the ratio will decrease if the same amount cellular phones are collected at the same time the domestic shipment increase.

$$\text{Recycle Ratio} = \frac{\text{Collected cellular phones}}{\text{Domestic Shipment} - \text{New Subscribers}}$$

Figure 16. Recycle Ratio formula, Source: CIAJ/TCA report 2002

The ratios, regarding the cellular phones, batteries and chargers, for the last four years is shown in figure 17 below.

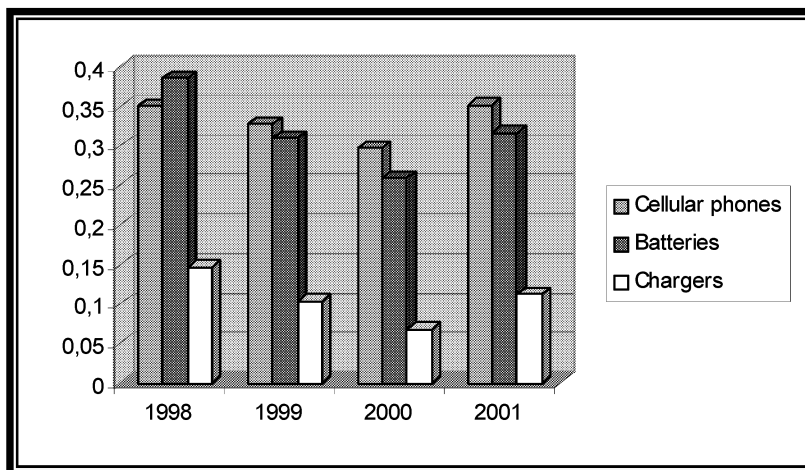


Figure 17. Recycle ratio 1998-2001, Source: CIAJ/TCA report 2000 and 2002

## 7 Analysis

*This master's thesis purpose is to find out how Japanese actors within the cellular phone industry view the environmental strategies related to the business logic and the differences in environmental strategies between the actors. In order to achieve this, the focus has been on the development of the recycling system regarding the cellular phones. The purpose of this chapter is to interpret the findings with help of the chosen literature. The chapter is divided into four subparts policies, management, strategies and the collection of cellular phones.*

### 7.1 Policies

Japan has the highest average annual GNP growth in the world after World War II. But at the same time they have a crucial environmental problem, the space left to put waste in landfill will only last until 2008. This gives Japan necessary incentives to work with a sustainable society. But at the same time their economy is based on mass consumption and mass production. This means that there is a strong connection between the economy and the environment in Japan. Also diffuse emissions are high in Japan, since the customers own their things and do not have any incentive to recycle them instead of just throwing them in the nature. In order to deal with this, Dobers (1997) calls for an expansion of focus from the supply to demand side of the market. As diffuse environmental effects are caused by a large number of actors, a large number of actors have to cooperate to reduce them. It has been shown that most of the companies are using green procurement guidelines and is trying to put demands on their suppliers. Also through the industry association there are a general idea that everybody has to take their responsibility. But regarding the customers there have not been much efforts taking to increase the customers consciousness of environmental issues. The government is now trying to establish a recycling society but as of today there is not a green demand from the customers.

Direct communication between policymakers and companies is rare. Instead there are Industry Associations which main purpose is to act as communicator between the governmental bodies and the companies illustrated in figure 18. In Japan there are two main Industry Associations within the cellular phone industry, CIAJ and TCA. They work very close and also have some projects together. One example of a project is the 3R-project that involves the aspects of reuse, reduce and recycle. This project was invented by the government as a first step to handle the increasing amount of cellular phones in Japan.

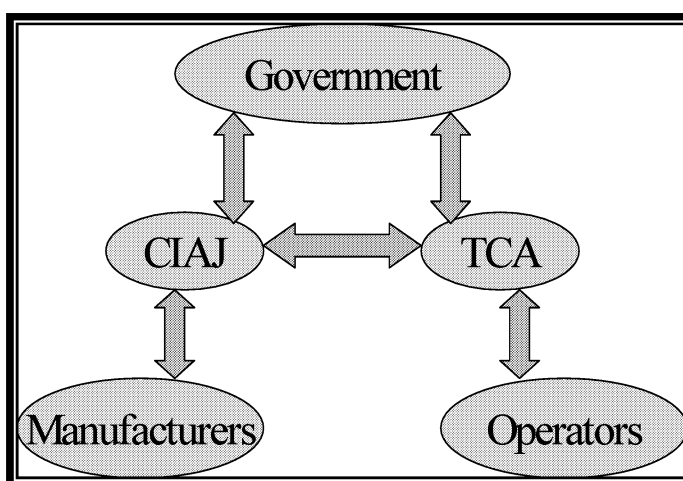


Figure 18. Communication in the cellular phone industry

According to Strannegård (1997, 2000) politicians are often reactive and follow rather than direct environmental development. This enables them to handle contradictory demands that change over time. In Japan's case there has been shown that they rather are trying to catch up with international activities than trying to work proactive. (Yamamoto and Ryoichi, June 26 2002)

Japans institutional framework does provide stakeholders participation when developing new regulations as well as technological assistance to the companies through CJC. At the same time they are trying to catch up to international standards through an international harmonization. This is essential to effect pollution prevention (Ashford, 1993).

## 7.2 Environmental Management

Manufacturing companies' main incentive to work with environmental issues is mainly an international demand from other markets. From the manufacturing perspective, the environmental management is primary based on external demands. The big customers are becoming more and more environmentally consciousness. The manufacturing companies' are more innovative regarding coupling business and environmental activities. Even if the green demand from the Japanese market is not so strong today, except from the big customers there is a demand from other markets that the companies has to take into consideration.

From the operators' perspective, the environmental management is primary based on internal demands. They are eager to decrease the energy consumption and by that means get more eco-efficient. The operators' main driving force is governmental based because of the proposed taxes.

Regarding Porter and van der Linde's four improvements (figure 19) one has been very difficult to study. This is the pro-activity regarding the relationship with the policymakers. This is because the communication normally goes through the industry associations. The companies do not see any incentives to work closer to the policymakers since they feel that the industry associations are good. In creating a bias in advantage of innovation-based solutions the companies has starting trace their own discharges, scrap and emissions. But regarding their customers discharges they still have not started to think about this. Since it is the operators that are responsible to collect and recycle the cellular phones and not the manufacturing companies there is no close connection between the production process and the recycling process. Therefore there

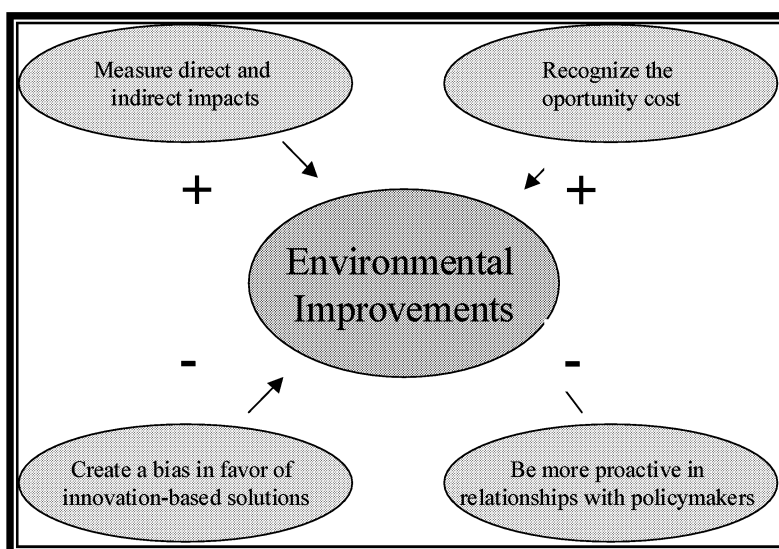


Figure 19. Analyse using Porter and van der Linde's four improvements of environment. The +/- shows how the actors manage to take necessary actions.

are no incentives to create a bias in advantage of innovation-based solutions. To measure the indirect and direct impacts of the environment the companies have different ways of doing this. One-way has been to see at all the inputs and outputs of the company. This makes it easy to identify what kind of activities that is most harmful to the environment. Another way is to carry out environmental accounting. This means to determine the cost of environmental conservation measures implemented during the year under review and calculate the reduction in environmental impact compared with the preceding year. According to interviews made with the companies, the companies work very hard to recognize opportunity costs and to be more eco-efficient. Especially the operators that see the Kyoto-protocol as a threat since this will result in high environmental taxes. They see the energy consumption as a problem. They believe that the energy consumption will only increase because people will use the IT more than today. The opportunity cost is the cost they have to pay for the energy consumption. By decreasing this, mainly by making the base-stations more effective, they can cut cost.

### 7.3 Strategies

Regarding the environmental strategies there are two main perspectives to look at, whether the actors are market or government oriented (see figure 20). To be able to make this evaluation, the perspectives have been divided in reactive and proactive. It is clear that the manufacturing companies are more market oriented and try to pick up new trends than the operators. This is interesting since it is the operators that have contact with the market and not the manufacturing companies. The reason is that the manufacturing companies have a product portfolio that includes a variety of different

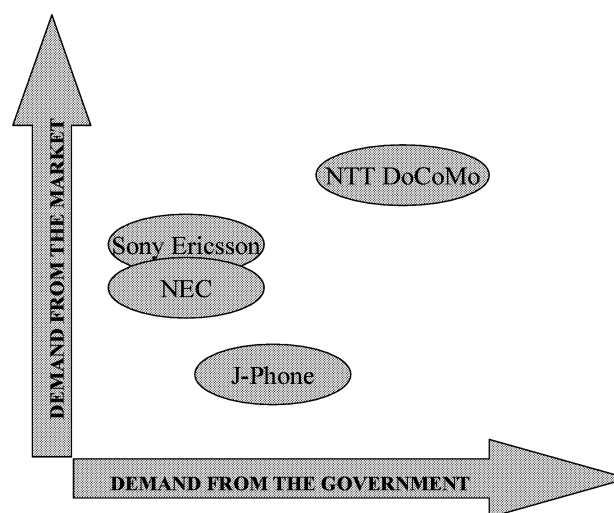


Figure 20. Analyse of the environmental strategies explained in section 3.3.2

consumer products and they are traditionally customized to have a close relationship with the market. But they are not very proactive since they do not think there is a developed green demand from the market. The trend is however changing to become a more green market but the progress is very slow. The main reason why they work with these issues today are because they are international companies and have activities all round the world. Since the green demand is higher abroad they have to take the environmental issues into consideration.

In terms of the operators they work more in a governmental oriented way. But this varies a lot from operator to operator. NTT DoCoMo has been working with environmental issues for a very long time and is the main actor in the cellular phone industry. On the other side J-Phone has just started their environmental activities and has still not established any environmental management system. Their incentive to work with environmental issues is internal and comes from Vodafone, with whom they merged last year. J-Phone is a reactive company today and is just following the agreements made with the industry association TCA. On the other hand NTT DoCoMo is working hard with

environmental issues and is putting pressure on their suppliers through the Green Procurement Guidelines.

#### ***7.4 Recycling cellular phones***

As shown in chapter 6.2 the implementation of the battery recycling law in April 2001 did not have a great impact of the amount of collected batteries measured in kilos or amount. But the recycle ratio increased which show that there was actually an improvement after the implementation of the law. This is explained by the decrease in domestic production, which result in an increase in the recycle ratio. This means that the effectiveness of collecting phones was increased. One reason is because one big operator had various campaigns during this time to increase the amount of recycled batteries. A comparison between the amount batteries and cellular phone collected shows that there is not much difference between these two after the implementation of the battery recycling law in the beginning of the fiscal year 2001.

J-Phone managed to collect 95000 kg of cellular phones and batteries during the fiscal year 2001. They have 1/3 of the size of NTT DoCoMo's market share. (18% compared to 58%) But they only collected 1/10 of cellular phones and batteries compared with the amount of NTT DoCoMo. (J-Phone collected 1100000 cellular phones and batteries<sup>3</sup>, NTT DoCoMo collected 10,000,000 cellular phones and batteries.)

In comparison to Sweden, which collects approximately 43255 kg of cellular phones (Kinnman, 2002), Japan collects 20 times more. But Japan has about 70 million subscribers to Sweden that have 7 millions.

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<sup>3</sup> This was calculated by dividing a average weight of a cellular phone and battery collected in 2001 with the weight they collected.

## 8 Conclusions

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*The conclusion of this thesis is that the environmental strategies are related to the business logic in different way depending on company. The reason is because they have different networks and different types of interest in working with environment.*

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The purpose of this study is to find out how Japanese actors within the cellular phone industry view the environmental strategies related to the business logic and the differences in environmental strategies between the actors.

There is a great variety between the operators about their environmental work and it is difficult to say anything in general. NTT DoCoMo has been working hard with environmental strategies for a long time, driven by their CEO, who is eager to develop the company into a green company. Another aspect is the operator NTT DoCoMo's vision that the society has to take its responsibility as well as the companies'. Everyone has to put efforts to make the environment better including both companies and customers. NTT DoCoMo has been proactive, implementing environmental management system and putting pressure on its suppliers. Other operators, however, have been more reactive not working much with environmental issues other than merely following the industry associations' guidelines. J-Phone has just started with its environmental work due to a recent merger with Vodafone, putting pressure on its Japanese subsidiary.

The manufacturing companies that have been studied are working on the international arena and the environmental strategies has been formed to suit a global market. However, the Japanese market for green product is not very important today. The green market in Japan is rather limited and is today mainly concentrated to big governmental customers. This means that the local green demand is not small. Instead, the manufacturing companies that today are moving from being national to being more global also feel environmental legislative pressures from other markets, especially from the European market. Since the manufacturing companies have business also in Europe they have to adapt the environmental view of the European Union.

The incentives for operators to collect cellular phones, batteries and chargers are higher than for the manufacturing companies. This is because the manufacturing companies do not have the distribution network as the operators have. This network is essential when setting up a collection network. Since the operators already have the network they do not have to make big investments and have high costs to collect the phones, as would be the case for the manufacturers. The recycling firms today receive subsidies from the government and this creates a new market where the operators get competition from the retailers who also collect cellular phones. This competition decreases the needs for smaller operators to invest in a collection network that the big operators already has today for distribution. This makes it possible for the operators to compete under equal conditions.

Other possibilities to increase the incentives to collect the cellular phones are a rental system where the operators let the customers rent a cellular phone to its customers. This is something that the industry does not believe in since it is important for the Japanese to

own their things. Another possibility is to implement a deposit system where the customers has to make a deposit when the purchase the cellular phone and then receive it when they return the cellular phone. This needs to be a regulation since it will be impossible for an operator to implement this on their own. In Europe the cellular phones contains a SIM-card that makes it very easy to change cellular phone with each other. This is not a good system since it will not favour the collection rate.

The industry associations in Japan enable communication between the government and companies. This mean that all data will go through them and they have a very good opportunity to collect valuable information e.g. collection and recycling data. This gives all actors a good picture of the result of their efforts and helps them to improve the activities.

The government has been reactive and is now trying to catch up on the proactive international actors. This is unfortunately odd since Japan has a crucial environmental problem, due to the Japanese economy being dependent on mass consumption and not supports a recycling society. They are working hard but the time is also running out and the government have to put in more effort to inform the citizens about the problems they are facing.

The environmental consciousness in Japan is still in its cradle and the companies know the correct political answers to the questions, but they are still not acting in that direction. This has to change since the environmental problems in Japan are getting worse.

### ***8.1 Future research topics***

This study has focused on the cellular phone industry and the environmental activities regarding the End of Life Treatment. The End of Life Treatment is a crucial issue here in Japan and within a few years there has to be changes regarding the last stage of the product life cycle. To make a similar study in a couple of years would tell whether Japan has manage to handle the increasing amount of garbage.

But there are other industries in Japan that also would be very interesting to study, like the automobile industry where there have been discussions about an implementation of a regulation addressing that cars have to be recycled.

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Erik Edman

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## Appendix

### *Collected data*

<b>Fiscal Year 2001</b>		Collected	Domestic Production-Net Increase	Domestic Production-Net Increase	Ratio
Cellular phones	Amount	13107173	45279194	8033400	37245794 35.19%
	Weight (kg)	798724	2759220		2269682
Batteries	Amount	11788051	45279194		37245794 31.65%
	Weight (kg)	264459	1015816		835591
Chargers	Amount	4230521	45279194		37245794 11.36%
	Weight (kg)	361187	3865778		3179915
<b>Fiscal Year 2000</b>		Collected	Domestic Production-Net Increase	Domestic Production-Net Increase	Ratio
Cellular phones	Amount	13614712	55764014	9936500	45809514 29.72%
	Weight (kg)	818704	3185495		2587976
Batteries	Amount	11847091	55746014		45809514 25.86%
	Weight (kg)	303501	1357085		1102530
Chargers	Amount	3127532	55746014		45809514 6.83%
	Weight (kg)	327897	5553847		4512083
<b>Fiscal Year 1999</b>		Collected		Domestic Production-Net Increase	Ratio
Cellular phones	Weight (kg)	765000		9610900	2337000 32.7%
Batteries	Weight (kg)	344000			1109000 31.0%
Chargers	Weight (kg)	409000			3934000 10.4%
<b>Fiscal Year 1998</b>		Collected		Domestic Production-Net Increase	Ratio
Cellular phones	Weight (kg)	1180000		10005000	3362000 35.1%
Batteries	Weight (kg)	447000			1157000 38.6%
Chargers	Weight (kg)	683000			4657000 14.7%

## **Questions**

### **Operators**

**What are the main driving forces for X<sup>4</sup>'s environmental work (internal or external, marked-based or governmental)?**

1. Is the driving force for X's environmental work marked-based?
2. Is the driving force for X's environmental work based on regulations from the government?
3. Is the driving force for X's environmental work internal?
4. Is the driving force for X's environmental work external?

**Does X have any system to couple the environmental issues with the business issues to make it easier for the decision makers?**

5. Is the connection between the environmental issues and business issues strong in X?
6. Does X's overall business-strategies involve environmental issues?
7. List the tools you are using to couple the environment issues with the business issues.
8. Does X have system to couple the environmental issues with the business issues to make it easier for the decision makers?
9. Is X's environmental budget based on the revenue?
10. Does X measure direct and indirect impacts of their activities?
11. Do you try to find opportunity costs?

**How does X handle the recycling law regarding batteries today?**

12. Is it because getting a better brand name?
13. Does X outsource the collection of batteries?
14. Does X outsource the recycling of batteries?
15. Does the collection and recycling of batteries cost any money for X?

**How is X working with recycling cellular phones today?**

16. Does X outsource the collection of cellular phones?
17. Does X outsource the recycling of cellular phones?
18. Does X collect used phones from other operators?
19. Does X get any money from the recycling?
20. Is X working with other actors in the cellular phone industry to recycle the phones?

**In what way is X trying to make the phones more environmentally friendly and easier to recycle?**

21. List the activities that X is doing to make the phones more environmentally friendly and easier to recycle?
22. Do you consider X to be a pro-active company regarding environmental issues?

**Is there other, more environmentally friendly, ways to offer the service of making phone calls to the customers (for example by rental systems or deposit systems)?**

23. Would it be possible to use a rental system to provide the same service as today?
24. Would it be possible to implement a deposit system to the cellular phones?

**What do you consider the largest future environmental challenges for X?**

25. Are the recycling issues the largest environmental challenge for X?
26. Is the environmental consciousness of the employees at X the largest environmental challenge for X?
27. Is the Green Procurement issue the largest environmental challenge for X?
28. Is the energy saving issue the largest environmental challenge for X?
29. Is the design for environment the largest environmental challenge for X?

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<sup>4</sup> X are the operators J-Phone and NTT DoCoMo.

## **Manufactures**

### **What are the main driving forces for X<sup>5</sup>'s environmental work (internal or external, marked-based or governmental)?**

1. Is the driving force for X's environmental work marked-based?
2. Is the driving force for X's environmental work based on regulations from the government?
3. Is the driving force for X's environmental work internal?
4. Is the driving force for X's environmental work external?

### **Does X have any system to couple the environmental issues with the business issues to make it easier for the decision makers?**

5. Is the connection between the environmental issues and business issues strong in X?
6. Does X's overall business-strategies involve environmental issues?
7. List the tools you are using to couple the environment issues with the business issues.
8. Does X have system to couple the environmental issues with the business issues to make it easier for the decision makers?
9. Is X's environmental budget based on the revenue?
10. Does X measure direct and indirect impacts of their activities?
11. Do you try to find opportunity costs?

### **How does X handle the recycling law regarding batteries today?**

12. Is it because getting a better brand name?
13. Does X outsource the collection of batteries?
14. Does X outsource the recycling of batteries?
15. Does the collection and recycling of batteries cost any money for X?

### **How is X working with recycling cellular phones today?**

16. Does X outsource the collection of cellular phones?
17. Does X outsource the recycling of cellular phones?
18. Does X collect used phones from other operators?
19. Does X get any money from the recycling?
20. Is X working with other actors in the cellular phone industry to recycle the phones?

### **In what way is X trying to make the phones more environmentally friendly and easier to recycle?**

21. List the activities that X is doing to make the phones more environmentally friendly and easier to recycle?
22. Do you consider X to be a pro-active company regarding environmental issues?

### **Is there other, more environmentally friendly, ways to offer the service of making phone calls to the customers (for example by rental systems or deposit systems)?**

23. Would it be possible to use a rental system to provide the same service as today?
24. Would it be possible to implement a deposit system to the cellular phones?

### **What do you consider the largest future environmental challenges for X?**

25. Are the recycling issues the largest environmental challenge for X?
26. Is the environmental consciousness of the employees at X the largest environmental challenge for X?
27. Is the Green Procurement issue the largest environmental challenge for X?
28. Is the energy saving issue the largest environmental challenge for X?
29. Is the design for environment the largest environmental challenge for X?

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<sup>5</sup> X are the companies SonyEricsson and NEC.

## **Government**

1. What products are recycled today? In what way are they being collected and recycled?
2. Does the environmental policies influence the companies operations a lot or little?
3. Do you give any feedback or support to the companies regarding their environmental activities? How are you trying to develop a relationship with the companies, NGO's and other stakeholders on environmental issues?
4. How are you trying to develop the relationship with the companies?
5. What is the aim of the environmental policies?
6. The Commission of the European Communities has developed "Integrated Product Policy" to help to strengthen the competitiveness of European industries. Is Japan using the same concept or is Japan trying to do something else?
7. What kind of incentives does the companies have to invest in environmental issues today?
8. What would be an ideal environmental policy?
9. What do you consider the largest future environmental challenge for Japan and for the cellular-phone industry?

## **Associations**

1. Are you giving any feedback or support to the companies regarding their environmental work? Do you get any kind of feedback or support regarding your environmental activities from the government, regulators and other authorities?
2. Does environmental policies influence the companies' operations minor or major? What actor/actors are pushing more than others for environmental issues? What kind of incentives does companies have to work with environmental issues today?
3. What would be an ideal environmental policy regarding recycling products (regulation or voluntary measures)?
4. What are the main driving forces for your environmental work (internal or external, market-based or governmental)? Does different companies (cellular phone-manufactures) have different views on how to gain value out of their environmental work?
5. How were the measures regarding the recycling law of batteries prepared? Was it difficult to get a consensus between all the companies?
6. In what way are you trying to make the phones more environmentally friendly and how are you preparing for recycling the cellular-phones?
7. What do you consider the largest future environmental challenges for the cellular phone industry?



