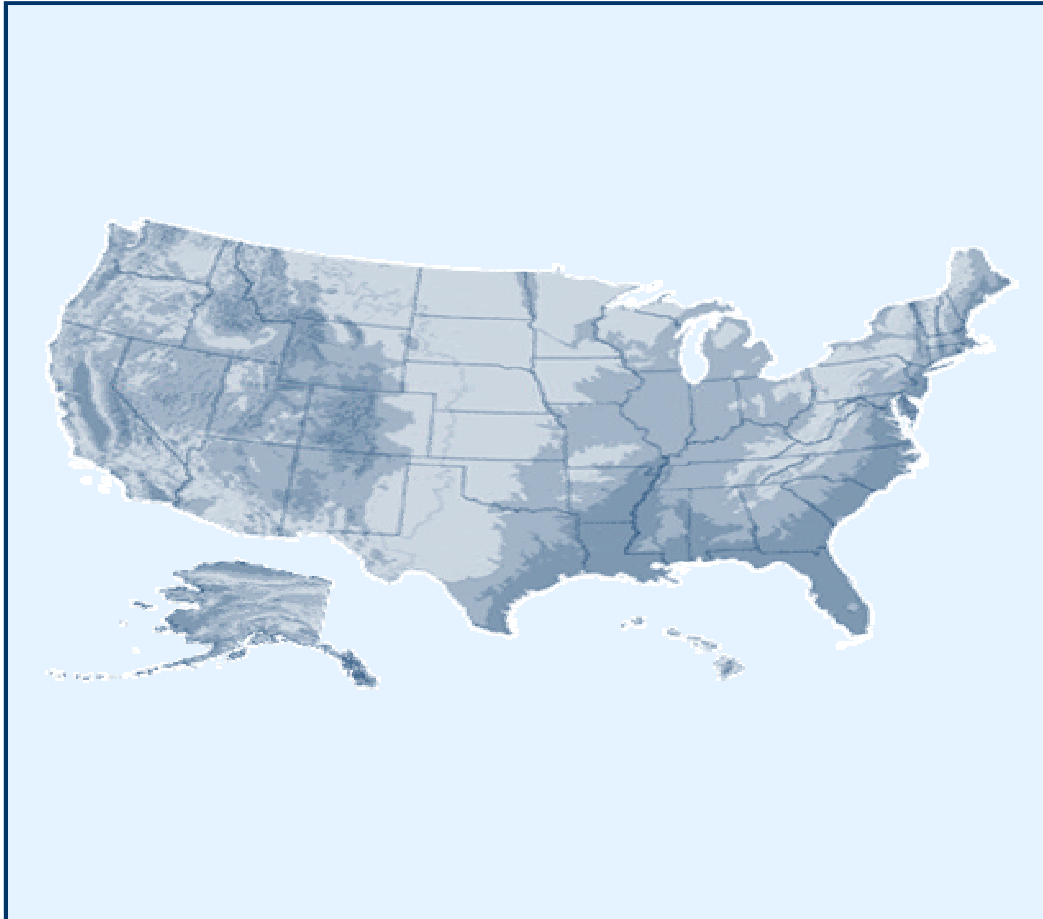


Managing Waste Electronics in the USA: A Preliminary Analysis



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The BRASS Centre:

In 2001, Cardiff University won £3.1 million in research funds from the Economic and Social Research Council to develop a Research Centre for Business Relationships, Accountability, Sustainability and Society (BRASS). The BRASS Centre is a joint venture between the University's schools of Business, City and Regional Planning and Law, bringing together the three Schools' existing research expertise on issues of sustainability, business ethics, company law, corporate reporting and business communication.

The Centre started work in October 2001 under the leadership of Professor Ken Peattie of the Business School, Professor Terry Marsden of the Department of City and Regional Planning and Professor Bob Lee of the Law School. The funding of the Centre covers an initial five-year period, but this should just mark the beginning of BRASS's contribution to creating more sustainable and responsible businesses locally, nationally and globally.

The Electronics Project at BRASS

One of the flagship initiatives of the BRASS Centre is a long-term research project investigating issues of sustainability in the global electronics industry. The central objectives of this project are:

- To identify key sustainability challenges facing the electronics industry;
- To develop an understanding of the variety of strategies adopted by stakeholders in response to these challenges;
- To understand the implications of these different approaches in terms of the sustainability performance of the industry;
- To identify how these strategies differ within and between stakeholder groups, and from place to place;
- To identify the key factors that influence this difference;
- To investigate how a knowledge of these influencing factors can be used to facilitate learning between stakeholder groups and across geographical boundaries.

The first stage of project fieldwork was carried out in the United States during October and November 2003. This preliminary report outlines the main findings in advance of a full report to be published later in the year. The next stage of fieldwork is scheduled for late 2004 and early 2005 in several European countries, followed by a visit to Asia later in 2005. A final project report will be published in 2006.

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Summary

In October and November 2003, a team of researchers from the BRASS Centre visited the United States to undertake fieldwork as part of an ongoing research project investigating the electronic waste issue. Around thirty interviews were carried out with a wide range of stakeholders involved in addressing the issues of e-waste in the US. The research was designed to identify the key challenges facing stakeholders, and to analyse the impact of their behaviour and actions on economic, environmental, social and ethical sustainability. This preliminary report provides a brief outline of the results of this research and offers some initial policy and industry focused recommendations, aimed at enabling a more effective and efficient response to the variety of problems associated with electrical and electronic wastes. It will be followed up by a more detailed final report later this year, as well as by a range of academic and stakeholder targeted papers.



Structure of the Report

Section 1 of the report begins by providing a background to the variety of sustainability problems associated with electronic waste, and how these problems, as well as the strategies adopted to address them, vary across the world. The remainder of Section 1 outlines the conceptual basis and methodological approach of the research project. This information is likely to be of use to those readers interested in gaining a deeper understanding of the rationale behind our work. However, readers with a more general interest in e-waste management in the US might wish to skip straight to Section 2.

Section 2 provides an overview of the range of factors that have been identified as important to an understanding of the e-waste problem and responses to it, in the US and elsewhere. It presents some initial findings of the US research and outlines those aspects that will be investigated in more detail in the final US report.

Section 3 outlines some of the particular challenges facing the US in tackling the problems associated with managing waste electronics, such as, the appropriate management of material flows, the range of sustainability problems associated with the export of e-waste overseas and the development of new business models.

Section 4 offers some initial recommendations to stakeholders and policy-makers based on the conclusions of the US fieldwork. It also explains the next steps for the research project in a little more detail.

Finally, **Appendix 1** details some useful websites and a bibliography, and **Appendix 2** contains a glossary of the terms used in the report.

Section 1: Introduction & Overview

This section discusses the variety of sustainability problems associated with electronic waste, and how these problems, as well as the strategies adopted to address them, vary across the world. The approach to understanding the e-waste challenge is described, along with an explanation of the US situation and an outline of the research strategy. The contents of Section 1 are as follows;

- Background to the E-waste Problem
- Global & Cultural Differences
- Understanding the E-waste Challenge
- The US Situation
- Getting the Data - Research Strategy

This section is likely to be of use to those readers interested in gaining a deeper understanding of the rationale behind our work. However, readers with a more general interest in e-waste management in the US might wish to skip straight to Section 2.

Section 1 - Introduction & Overview

Background to the E-waste Problem

The global consumption of electrical and electronic products is rapidly increasing. Amongst other things, the pace of innovation and technological change in the industry means that manufacturers are able to offer greater functionality to users at either the same or reduced prices. This often means that, in order to keep pace with the latest technology and trends, consumers are motivated to purchase new products at regular, and ever shorter, intervals. In addition, steady increases in average disposable incomes across many developed and developing countries mean that electrical and electronic products become less of a 'luxury' than they were previously. Moreover, the continuing expansion of global logistics and distribution systems makes it easier for consumers to purchase these products.

This increase in the consumption of products has many benefits. For example, the broader availability of household appliances means that many people need to devote less time to labour intensive domestic work. Greater access to information and communication technologies (ICTs) helps to overcome the so called 'digital divide.' However, there are also a range of problems associated with this rising tide of product usage. In particular, the increase in consumption is inevitably accompanied by an increase in the amount of waste generated when products reach the end of their life. Depending on the way in which the waste is managed, this can result in any one of an array of economic, social and environmental implications. For instance, when e-waste is disposed of at landfill sites, apart from putting pressure on available capacity, there is a risk that hazardous materials contained in used products might leach into surrounding groundwater and land. Landfill disposal also means that potentially useful resources contained in e-waste are lost from the materials cycle.

Recycling or reuse offers a potential solution to many of the problems associated with the management of e-waste. However, if inappropriately managed, it can also contribute to a range of negative consequences. For example, unless recycling activities are carried out to acceptable standards, workers can be exposed to the hazardous materials contained in e-waste. These materials, including Lead, Mercury and Cadmium have a range of potentially damaging effects on human health.

Other problems associated with the growth in e-waste include the export of wastes from industrialised to economically less developed countries, the use of disadvantaged labour groups within the e-waste reprocessing or recycling industry, the impacts of the distribution of products for reuse and the economic effects of spatial and industry change at a national, regional and local level.

Global & Cultural Differences

The exact nature of the problems that arise as a result of the growth in e-waste differs from place to place. Similarly, responses to the problems posed by this growth vary at national, regional and local levels. From a global perspective, it is possible to identify a range of different strategies that have been adopted across different locations. Many countries, states and regions have established some form of legislation to address the mounting e-waste challenge. For example, some have implemented measures that impose financial or physical responsibility for the management of waste electronics on one or more stakeholder group. Other strategies have focused on an improvement in the dialogue process within and between the variety of stakeholder groups with an interest in, or responsibility for, tackling the many issues faced. At the local level too, there are many examples of alternative approaches to the collection, transport and treatment of e-waste.

Each of the strategies adopted at these different spatial levels have a positive or negative influence on the economic, social and environmental or, taken together, the *sustainability* impacts associated with e-waste. In this context, it is important to understand the key determinants of success or failure that might shape these outcomes. In other words, what factors might influence the nature and extent of the problems caused by the rise in e-waste, and whether or not a given course of action is able to effectively tackle these problems in a given location? Awareness of these factors, and how they might differ from place to place, is especially important if decision-makers hope to learn lessons from successful strategies elsewhere and apply them in their own jurisdiction.

Understanding the E-waste Challenge

In order to help answer these questions, this research project developed a model of the factors that might influence the nature and extent of the e-waste problem and determine the likely success or failure of strategies aimed at tackling it. The model groups these factors according to three overarching influences, or *framework conditions*: political-institutional, cognitive-informational and economic-technological. Given the nature of the subject, it might also be helpful to think of these conditions as 'operating system', 'software' and 'hardware' as shown in Table 1.

FRAMEWORK CONDITIONS		
Political-Institutional <i>'Operating System'</i>	Cognitive-Informational <i>'Software'</i>	Economic-Technological <i>'Hardware'</i>
<ul style="list-style-type: none"> • Political culture • Legislative and regulatory system • Conditions of participation 	<ul style="list-style-type: none"> • Communication – information and awareness raising • Stakeholder relationships • Knowledge formation 	<ul style="list-style-type: none"> • Economics and financing • Design and technology • Infrastructure

Table 1 : *Framework conditions influencing e-waste management*

These framework conditions, and the range of influencing factors that relate to each, are explained in more detail below:

Political-Institutional Conditions - 'Operating System'

This framework condition relates to the institutional and legal structure that exists in a given country or region, as well as to the prevailing political culture that underpins it. It encompasses elements such as the current and emerging legislation relating to the management of e-waste, and the conditions and norms governing participation in the legislative process by relevant stakeholder groups.

An increasing number of countries and regions are establishing legislation designed to address the problems of e-waste. For example, in the European Union (EU), the Waste Electrical and Electronic Equipment (WEEE) Directive aims to increase the proportion of e-waste that is separately collected and recycled, and to improve the environmental performance of all those involved throughout the life-cycle of electrical and electronic equipment (EEE). In Japan, the problem of waste electronics and appliances has been addressed by the Home Appliances Recycling Law and the Law for Promotion of Effective Utilisation of Recyclable Resources.

The exact nature of each piece of legislation, in terms of elements such as the scope of products covered and the range of instruments used, varies from place to place. In addition, the values and attitudes that inform the legislation will vary depending on location. For example, the political culture in some countries or regions might mean that extensive market intervention is regarded as a viable and desirable policy alternative whereas legislation in other areas might be more heavily influenced by a value system that promotes deregulation.

Cognitive-Informational Conditions - 'Software'

This framework condition relates to the way in which knowledge about environmental problems associated with e-waste is created, as well as how it is applied and communicated. For example, in some countries or regions environmental NGOs have a prominent role in alerting society to the sustainability impacts associated with waste electronics, whereas in other locations their involvement is less pronounced. In terms of the way in which knowledge about the e-waste problem is applied, the patterns of dialogue and relationships that evolve between various stakeholder groups has an important influence on the types of solution that might emerge. For example, in the US, a number of formal dialogue processes have emerged that seek to engage a wide variety of relevant stakeholders in the design and development of appropriate responses to the challenge of e-waste. However, many other countries have adopted a less inclusive and formalised approach. Finally, the communication of knowledge to the general public, as consumers of EEE, regarding the e-waste problem, and their potential role in helping to address it, is also an important determinant of the potential success or failure of response strategies.

Economic-Technological Conditions - ‘Hardware’

This framework condition relates to the economic, technological and infrastructural factors that have an influence on the emergence and the management of the e-waste problem. In terms of economic factors this relates, amongst other things, to the effect of financial pressures on the behaviour of stakeholders involved in the life-cycle of EEE, and the impact of these pressures on the way in which e-waste is managed. It also relates to the way in which economic instruments are employed to influence the behaviour of stakeholders. Technological factors include the extent to which it is recognised that the design of products influences their end-of-life management and how far this recognition informs possible solutions, including legislation. Other technological factors include the relative ability of the domestic manufacturing and supply base to adapt to emerging environmental requirements and restrictions on the content of products. A final key factor is the availability, or otherwise, of an adequate reuse and recycling infrastructure for the management of e-waste.

The US Situation

Having described the range of framework conditions and factors that might influence the nature of the e-waste problem, and responses to it, the challenge now is to understand more about their impact in particular locations. The US is no exception to the growing problem of e-wastes. A wide range of federal projects have been established to address particular aspects of the problem. Many of these are mirrored by regulatory approaches and associated programmes in a number of US states. One of the main issues facing the US is the challenge of establishing effective governance structures to deal with the waste electronics issue. The political structure of the US makes it difficult to develop national scale programmes, since the power invested in state legislatures enables states to make decisions and implement policies that relate to their own political, economic and environmental agendas. There have been, however, some significant regulatory developments and multi stakeholder dialogues in the US.

With reference to the framework condition model, Table 2 summarises some of the emergent problems and responses that our research has found to be of especial relevance to the e-waste situation in the US.

Emergent Problems	Emergent Responses
<ul style="list-style-type: none"> • Export issues • Environmental impact of CRT disposal • Conflicting visions of appropriate e-waste strategies • Regional differences in infrastructure provision 	<ul style="list-style-type: none"> • Export restrictions and prior registration • Landfill bans and advanced disposal fees • Multi-stakeholder dialogues/support for process • Alternative business models and product take-back systems

Table 2 : *Problems and responses in e-waste management in the US*

This table only provides a snapshot of some of the challenges currently facing key stakeholders and decision-makers. However, what is clear is that a range of problems and related response strategies have emerged, that are specific to the US situation. Section 2 of the report describes these in more detail, and also begins to investigate the extent to which they are influenced by the framework conditions presented in Table 1, an investigation that will continue in the forthcoming final report.

Getting the Data - Research Strategy

A range of stakeholders were identified that related to each of the framework conditions outlined in Table 1. For example, representatives with responsibility for e-waste management at each level of governance, including federal, state and local levels and the range of associated regulatory agencies, were identified as appropriate to an investigation of the legal and regulatory framework in the US. Fieldwork was concentrated in three states; California, Oregon and Massachusetts. However, every effort was made to ensure that the majority of the findings would be applicable to the US as a whole.

The research strategy aimed to gain the views from each of these identified stakeholders on a wide variety of topics relating to the emergent problems and responses. They were interviewed using a combination of face-to-face and telephone semi-structured interviews. Where relevant, the interviews were supported by regular secondary documentation and materials searches.

Section 2 - The Influence of Framework Conditions on E-waste Management in the US

Section 1 outlined some of the key factors that influence the management of e-waste across geographical and cultural boundaries. Section 2 extends this analysis to investigate how these 'framework conditions' specifically influence the nature of the e-waste problem, and responses to it, in the US. In the following pages, each of the conditions are dealt with individually, as outlined below.

Political-Institutional - 'Operating System'

- Political Culture
- Regulatory System
- Conditions of Participation

Cognitive-Informational - 'Software'

- Multi-stakeholder Dialogue
- Communications - Information & Awareness Raising
- Knowledge Formation

Economic-Technological - 'Hardware'

- Economics and Financing
- Design and Technology
- Infrastructure

In each case, the nature of the framework condition is outlined in some more detail. Following this, some initial findings are presented, relating to its influence in the US. Finally, an indication is given of some of the key points relating to the framework condition that will be discussed in more detail in the forthcoming final report.

Political Culture

As elsewhere in the world, the political culture of the USA has a major influence on its approach to environmental protection. At all levels of governance, from federal to state to local, the cultural factors that underpin political life have a significant influence on the importance attached to e-waste as an issue, as well as on the types of strategies devised to respond to it. The following characteristics all have an influence on E-waste management in the USA to a greater or lesser extent, depending on locality.

- The USA is a liberal, capitalist economy based on the belief that the most efficient way of allocating resources efficiently and equitably, is by relying on market forces. Consequently, there is a largely deregulatory approach to public policy, where the interests of business are often given precedence over other interests seeking to intervene in the market. This situation is reinforced by the existence of a well-organised business lobby that continues to foster linkages with key staff at both federal and state levels.
- The current political climate in the USA is not conducive to environmental regulation or constraints, and there is very little political will at the federal level to act on environmental concerns. In addition, at the federal level and in many states, there is a general aversion to the use of fiscal instruments as a means of realising environmental goals, especially where they might be perceived as having a negative impact on business interests.
- Scientific evidence and risk assessment form the basis of many political decisions. Little importance is attached to the notion of adopting more precautionary approaches to the design of environmental policy.
- Since the federal government can mandate or give states freedom in how they enact federal legislation, states often have a certain amount of flexibility in regulatory matters. In addition, states can also choose to introduce their own regulations, resulting in a patchwork of legislative approaches and systems across the US. Many states have developed unique characteristics, indeed certain states and regions are viewed as being more progressive and proactive than others in terms of, for example, environmental protection.
- Lobbyists often have a significant influence on state approaches to e-waste management. However, the nature and extent of this influence will vary depending on location. For example, environmental NGOs have a strong presence and exert a key influence in California but this is not the case in some other states.

"... the mood of the congress right now...the mood is not to adopt anything that sounds like a tax."

"It's not uncommon for the state to step in when a number of local governments have done something and said OK, we need something uniform state wide."

In summary, there are many factors that need to be considered within the overarching theme of political culture, all of which have an important impact on the development of approaches to e-waste management. The unique structure of the United States means that the political culture may vary at federal and state levels as well as between states. Amongst other things, this means that more priority is attached to the e-waste issue at some governance levels than others. In addition, such differences might influence the ability of jurisdictions to tackle the problems associated with waste electronics effectively. These issues and others will be discussed in more detail in the final report.

Regulatory System

In an effort to address some of the wide-ranging economic, social and environmental impacts of the electronics industry, many countries around the world have established various forms of legislation and regulation. Amongst other things, these regulations seek to establish physical and financial systems for the management of waste electronics, improve the environmental performance of actors involved throughout the product life cycle and address some of the negative environmental impacts associated with product design. The United States is no exception. This section of the final report will trace the patterns of regulatory development across two states of the US, namely California and Massachusetts and will examine the variety of approaches and instruments adopted in both of these states.

“They may say something else, but there are things happening that are causing the manufacturers to pay more attention here, and I think the state legislation, or the threat of legislation, and multiple programmes around the country, will get the industry to look for federal legislation.”

In California, the main approach of Senate Bill 20 (and more recently Senate Bill 50) has been to introduce an advance disposal fee on products containing CRT's and flat panel screens to cover the cost of collecting, transporting and treating them at the end of their life. In addition, it imposes a variety

of conditions to regulate the export of such waste products overseas. Amongst other things, it also adopts a range of restrictions to limit the inclusion of a number of hazardous substances in these products from the design stage onwards. In Massachusetts, the main thrust of the approach to managing e-waste was based on a five point process involving deregulation, the imposition of a landfill ban on identified products, the establishment of a statewide vendor, the provision of grants and market development.

“In banning small items, it'd be difficult to prove it's not in the trash. Is somebody at a transfer station, when stuff is piling out the back of a packer truck, going to go 'Wait! There's a walkman in there!'”

As well as investigating these particular legislative and regulatory approaches in more detail, the final report will also explore a number of other key issues relating to the future dynamic of regulatory development in each of these states, as well as at a national level. For example, analysis will focus on the perspectives of key stakeholders on the likelihood of regulations being established at federal level, as opposed to continued activity at individual state level. Our initial research has indicated that opinions are divided on this issue. Some stakeholders expressed a hope that some form of federal initiative would be developed while others were convinced that progress would continue to be made on a state by state basis. It is generally felt by many manufacturers that a national system is desirable. However, it also emerged that a number of factors, such as a lack of political will at the federal level and problems of administrative complexity might act as a barriers to the establishment of a national system.

In terms of the dynamic of legislative development, our research also discovered that there are a variety of perspectives on the likelihood and possible nature of any future changes to existing legislation, particularly in relation to the broadening of the scope of electronic products covered. This section of the final report will analyse these in more detail. In addition, it will discuss the range of stakeholder opinions on the likely success of existing regulations and instruments in meeting the objectives that they set out to achieve, as well as outlining some of the suggestions made concerning potential improvements.

“The only way there's going to be federal legislation is if the manufacturers go to the Republicans at Congress and say - 'Help us, we need legislation.'”

Conditions of Participation

The conditions and norms that govern participation in the legislative process by relevant stakeholder groups is an important factor that might significantly influence the complexion of the resultant legislation. For example, if policy-makers exclude key stakeholder groups from decision-making processes, while allowing others to participate, it is possible that legislation will be biased against the excluded group. As well as being non-inclusive, it is also possible that such an approach might lead to inefficient outcomes, particularly if excluded stakeholder groups are less able to communicate relevant knowledge or information. However, on the other hand, there might also be problems associated with a legislative process that involves all stakeholder groups, regardless of their relevance to the issue being addressed. Such a process might mean that legislators avoid making difficult decisions relating to contentious issues and, in trying to cater for the views of all groups, produce over-complicated legislation that lacks the coherency to effectively tackle key problems.

Another way in which the conditions of participation in legislative processes affect the development of legislation is the stage at which stakeholders become involved. In this respect, there is a distinction between those stakeholders that participate in the design of legislation and those that participate solely in its implementation.

Our initial research has revealed that, in California, the formal approach to e-waste legislation was that a Bill was written and put into print before it became available to all stakeholders as part of a public consultation process. However, there was also an informal process, whereby a small group of key stakeholders influenced the early design of legislation through direct communication with policy-makers. In Massachusetts, the legislative process seems to have been driven by regulators, with a smaller role for other stakeholders.

This section of the final report will investigate the nature and extent of the participation of stakeholders in legislative processes in more detail. In doing so, the following points will be highlighted:

- An overview of some of the key conditions and norms governing participation in processes leading to e-waste legislation in California and Massachusetts;
- The role and attitude of legislators in managing the process and ensuring a fair and balanced approach to designing and implementing legislation;
- The experiences of key stakeholders involved in the process of designing and delivering e-waste legislation;
- The opinions of stakeholders regarding how inclusive current legislative processes are, particularly in terms of the specific challenges or barriers to participation that they face.

"At the implementation stage, once it's clear the law's going to happen, so now it's 'no more posturing', it's time to get to work. Then I think it makes sense to bring stakeholders in."

"I'm thinking that communication is not enough. They did ask us for input, they held the seminars for everyone to ask a question and they answer you, but the thing is, it's just not enough. We don't really have a clear direction to go in."

Multi-stakeholder Dialogue

Across the USA, a wide range of stakeholders are concerned with the management of the environmental impacts associated with electronics products. In an effort to facilitate communication within and between each of these diverse groups, several multi-stakeholder dialogue processes have been established at both regional and national levels. For example, on the West coast, the Western Electronics Product Stewardship Initiative (WEPSI) was a project for stakeholders within the States of US EPA Region 10 (Oregon, Washington, Idaho and Alaska), carried out in coordination with partners in US EPA Region 9 (California, Nevada, Arizona and Hawaii). At the national level, the National Electronics Product Stewardship Initiative (NEPSI), sought to provide a platform for a structured dialogue process between stakeholders, partly in the hope that they would agree a consensus opinion that might lead to some form of federal legislation.

"This kind of process makes sense after legislation's passed, not before."

"I think the NEPSI process has been an inclusive process that has really brought some value or expertise to the table that might not have been there otherwise."

Our research has shown that opinion is divided on the merits of such processes. While some stakeholders welcomed them as an effective means of enabling all parties to come to an underlying understanding of all the relevant issues, others expressed frustration at the amount of progress made in terms of concrete outputs. Stakeholders also offered some more detailed perspectives on aspects such as the importance of understanding the effect that power differences between participants might have on outcomes and the difficulties faced by some organisations in attending meetings due to limited time or financial resources.

This section of the final report will therefore investigate the real and perceived success of such initiatives in meeting the objectives that they set out to achieve. It will also provide further insight into the following:

- General opinions of stakeholders on aspects such as the capacity of multi-stakeholder dialogue processes to facilitate a consensual approach to addressing the range of sustainability issues associated with electronics industry;
- More specific comments made by stakeholders actively involved in such dialogue processes;
- Perspectives on the usefulness of such exercises in terms of achieving tangible and intangible results;
- Opinions on the potential role of multi-stakeholder dialogue processes in providing an impetus for the development of state or federal legislation.

"There's no way to hold people's feet to the fire and I think that's why it's been, you know, a failure."

"I tend to think those stakeholder processes are of limited value, partly because they often operate on a consensus basis and public policy is not a consensus oriented business."

As well as the formal multi-stakeholder dialogues that have been developed to address the e-waste problem in the US, a variety of informal relationships also exist between the many stakeholders in the e-waste network, see overleaf.

These informal stakeholder relationships tend to develop in an organic and sometimes *ad hoc* fashion, and often depend on the initiative of individuals or small groups of people to establish initial contacts or links with individuals in other stakeholder groups. Many of the most productive relationships seem to have developed as a result of initiatives established by agencies or organisations with some form of representative function, for example, at state government level, within the regulatory framework or at the level of trade associations. Relationships are also influenced by the perceptions that stakeholders have of one another. These perceptions not only colour interactions between stakeholder groups, but also between parts of one stakeholder group, for example, regional offices of federal or national agencies. Although many of the relationships that develop occur outside the formal or managed multi-stakeholder dialogues, they are equally as important in determining the successful development and implementation of policies and strategies for e-waste management in the US. The issues that arise from these relationships provide some indication of the problems and challenges facing policy makers, industry, regulators and others in achieving a more sustainable approach to addressing electronics waste in the future. Some of these issues are briefly outlined below.

- People working in local government, at the county or city level, often experience low levels of interaction with industry, NGOs and the EPA. Their main relationships are often with state agencies. In addition, in states where the number of counties or municipalities is high, the levels of local government representation in networks to discuss issues such as the management of e-waste is sometimes lower.
- Differences in the approach to developing relationships with other stakeholders between one region of the US and another in, for example, such nationwide agencies as the EPA, can greatly influence the way in which stakeholder relationships develop and grow, as well as the impact they have on the effective implementation of programmes designed to address e-waste.
- Some EPA – state relationships are characterised by a high level of co-operation and partnership in developing responses to e-waste issues. However, others often reveal a more distant and sometimes more conflictual relationship.
- There are signs that a new dynamic is emerging between some reprocessors and OEMs. In some cases, the need to enhance environmentally focused design to facilitate recycling and reprocessing appears to encourage greater levels of dialogue between these two groups.
- In many cases regulators, state government officials or NGOs do not attach the same degree of importance to the development of relationships with reprocessors as they do to those with OEMs. It appears that while some groups correctly perceive the involvement of manufacturers as being key to most e-waste issues, they fail to fully appreciate the central role that reprocessors and recyclers play in the management of waste.
- Some reprocessors and recyclers appear to have strong relationships with people in OEMs at the staff level, rather than at the strategic or company policy level, which might be a somewhat different model than that experienced in the OEMs themselves.
- Some formal programmes are established as a result of networks or relationships that have existed for many years. They are often formed as a means of more effectively disseminating information to other stakeholder groups.
- The relationships between many stakeholder groups and social businesses tend to be *ad hoc*, and generally rather tenuous. In most cases they seem to be based on supplier to recycler type interactions. The more established and dynamic relationships are often found when social businesses have made their own efforts to achieve greater levels of interaction.

“People are engaged in working on the problem...everybody’s got something to contribute...some people have been able to do it academically, some people legally, some people hands on, whether it’s been legislation or actual ‘roll up your shirt sleeves’ and work or whether it’s been somebody taking a look from outside and publishing the information in such a way that it reaches more people.”

The importance of the formal and informal relationships between stakeholder groups cannot be overemphasised. Relationships between key individuals within companies, government departments, NGOs or any other group can often be responsible for stimulating and maintaining effective responses to the management of e-waste issues. The pattern of relationships is, however, extremely complex and fluid, partly due to the movement of individuals from one job to another, and to the highly complex nature of the wide range of stakeholder groups involved in the electronics sector.

Consumer awareness raising and communication is key to the success of many e-waste recycling programmes. It is important that people are informed about the problems associated with the management of e-waste, and the variety of available disposal options, in order to make choices about how to discard their

"I have never seen any advertisement of any sort, TV, print media, about what you should do with your electronic waste or what electronic waste is"

used products in a responsible way. There are currently a number of communication channels utilised in the USA, including community organisations and premises, libraries and educational establishments, retailers, local government websites and direct household leafleting. The types of communication strategy adopted differ from place to place, and experience varying degrees of success. Some of the important issues relating to the communication of information relating to e-waste management strategies are outlined below.

- Although it is recognised that people need to be told about the problem of e-waste, and how they can dispose of it in an appropriate manner, there are often difficulties associated with doing so. This is partly because e-waste is classified and dealt with in different ways throughout the country (see page 17, *Infrastructure*). It is therefore difficult to apply uniform communication and information strategies at a national state level.

- Similarly, at state level, the presence and design of e-waste recycling schemes often varies across counties, cities and towns of residence. This lack of consistency in the type of scheme offered means it is difficult to use widespread communication channels such as radio or TV to disseminate information.

- Limitations in infrastructure capacity, (see page 17, *Infrastructure*), mean that there can often be a reluctance to carry out widespread education and information campaigns. This is because it is possible that the infrastructure would not be able to cope with the likely increase in the number of waste items returned.

- Information needs to be communicated in a clear, easily understandable format that is accessible by all sectors of society. However, in many cases this does not appear to be happening. This may be due in part to the diversity and patchwork of infrastructure in place to deal with e-waste and the relative immaturity of systems.

- The internet is a communication outlet that is relatively cheap and well utilised. However, it is vital that websites are regularly updated to avoid consumers becoming confused by out of date information. It is also important to ensure that internet facilities are readily available to all sections of society, especially if they are the only means of accessing information on disposal routes.

- There appears to be a general lack of information available to consumers on the issue of e-recycling. In addition, consumers are not consulted in the development of policy. For example, throughout the development of SB20 in California, consumers were neither informed of nor consulted on proposals.

- A number of interviewees reported that they frequently receive phone calls from people asking about disposal options for CRTs. It is clear that consumers need to know what the situation is regarding CRTs and information must be effectively communicated regarding the fact that in certain states CRTs have been designated a universal or hazardous waste and so should be treated appropriately when they are being disposed of.

'Your average consumer I think isn't even aware of the fact that it can't get thrown out and as soon as they are educated on that I think they will be conscientious and they will do something about it'

Awareness raising and communication is key to the success of any recycling scheme, but many consumers in the US are currently confused about their roles and responsibilities in terms of e-waste management. All aspects of communication, including consultation processes, types of information to be provided, possible routes of information provision and the most appropriate agents for disseminating information will be subject to more comprehensive analysis and commentary in the upcoming full report.

Knowledge Formation

The way in which knowledge about the problems associated with e-waste is created and applied has an important influence on the responses that are adopted. In the most basic sense, if a society is not aware of the economic, social and environmental impacts associated with waste electronics, it is unlikely to be motivated to devise any form of corrective action. Furthermore, perceptions of the nature of the problem will vary between stakeholder groups. For instance, some stakeholder groups will only be concerned with issues of particular importance to them, whereas others might have a broader awareness of the complex and inter-related nature of the e-waste problem. In this sense, those stakeholder groups that can most effectively articulate their own views and concerns are often better placed to influence any responses that might be adopted.

In California, our research has revealed that knowledge of the e-waste problem largely arose as a result of the actions of several key environmental NGOs. In particular, one organisation addressed a question to regulators concerning the appropriate waste classification of CRTs, that led to a ban on their disposal at landfill sites. Another organisation significantly raised awareness of the negative impacts associated with the export of waste electronics for treatment overseas. Finally, a coalition of environmental NGO, waste haulage and municipality interests led to growing pressure for the establishment of an adequate financing mechanism for the collection and treatment of e-waste. In Massachusetts there was less evidence of the involvement of environmental NGOs in raising awareness of the sustainability impacts of electronic products, with most of the knowledge concerning these issues instead emerging from state regulators.

Perceptions of the nature of the problems and challenges posed by waste electronics also vary across geographical boundaries. For example, in some countries or regions, the main challenge is perceived to be how best to appropriately manage the impacts of the waste that arises. This tends to lead to responses primarily aimed at the financing of waste collection and treatment systems. However, other regions perceive that the problems associated with e-waste occur as a result of activities throughout the life-cycle of products and respond by introducing legislation aimed at improving aspects such as product design and manufacturing processes as well as at addressing waste management issues.

“Environmental groups are not alone in this issue, they are very closely aligned with the waste hauler companies ... and with local governments.”

It is therefore clear that the prevailing perception of the sustainability problems associated with waste electronics, particularly amongst policy actors, has a major influence over whether a response based on prevention or one based on risk management is adopted in a given place.

Our research has found that much of the current and emerging e-waste legislation in the US is underpinned by a risk management approach to policy. Legislation tends to focus on how best to manage waste once it has occurred, as opposed to adopting a preventative approach. While there are indications that some thought has been given to the importance of factors such as product design (e.g. through the adoption of restrictions on hazardous substances in SB20), no legislation has adopted a comprehensive or systematic approach to addressing the sustainability impacts of electronic products throughout their entire life cycle.

“The coalition was a very effective counter to the lobbying of the electronics industry.”

This section of the report will investigate in more detail the influence of these various processes of knowledge formation in the US. In particular, it will analyse how responses to the e-waste problem have been shaped by the attitudes and perceptions of key stakeholders.

It is important to understand the role that economic factors can play in determining the likely success or failure of initiatives and regulations established to meet the sustainability challenge in the electronics industry. For example, decisions concerning the type of financing system that is adopted to implement

“States should just reimburse cities based on some survey, and if they want the Cadillac service then let them charge their citizens more.”

the stated aims of regulations often have far reaching implications for the variety of stakeholders involved.

In addition, knowledge of the economic pressures facing these actors is vital to policy-makers and others in deciding the most appropriate way to distribute funds for activities such as waste collection, transport and treatment. Furthermore, the way in which financial responsibility is allocated is of key importance in mechanisms that incentivise manufacturers to design products that are, for example, easier and therefore cheaper, to disassemble at the end of their life.

This section investigates the influence that such economic considerations have in shaping the interests and concerns of stakeholders. For example in California, although the majority of stakeholders interviewed agreed that the financing mechanism employed in SB20 represents a positive step, many questioned whether the advanced disposal fee was set at a sufficiently high level to fund the management of electronic waste in the state. Opinions were also divided on the most appropriate means of distributing the money that is collected. In addition, research shed a great deal of light on the particular financial pressures faced by key participants in the e-waste infrastructure such as not-for-profit organisations, local governments and reprocessors. As well as addressing these subjects in greater detail, this part of the report will also provide an in-depth analysis of issues such as:

- The best means of ensuring appropriate financing mechanisms for the management of legacy and orphan electronic waste.
- The need to ensure enough funding to meet the costs of collection, transport, storage and reprocessing of e-waste.
- The effect of regulations on inter-state sale, purchasing and disposal activity.
- The importance of ensuring an equitable, transparent and accountable system to collect, administer and distribute any funds raised.
- The effect of regulations on local government charging schemes.
- Environmentally friendly and sustainable purchasing by public bodies.

“SB20 was a good start, certainly much better than what we had previously but, you know, the \$10 advance disposal fee I think’s just kind of a drop in the bucket. It certainly doesn’t come close to approaching full cost recovery.”

Design & Technology

The way in which electronic products are designed and manufactured is a major factor in their overall sustainability impact. Hazardous materials like Mercury or Lead, found in many electronic items, can have a detrimental effect on the environment and human health. Design choices made early in the life-cycle of a product also have far reaching implications for how it is managed at the end of its life. For example, the choice of materials used in a product is important for recyclers and reprocessors, because the inclusion of materials that cannot command reasonable prices on the secondary materials market affects the profitability, and therefore viability, of their operations.

“My concern is the tying of people’s hands in terms of flexibility to innovate and to develop new products.”

These issues have led policy-makers to seek ways of influencing the impact of design choices. For example, in the European Union the RoHS Directive restricts the use of a range of hazardous substances in electronic devices, restrictions also imposed in California by SB20. Other instruments, like financing mechanisms, might also act as incentives for manufacturers to undertake design improvements.

This section will analyse the broad range of issues associated with the sustainability impacts of product design, as well as how they are addressed at federal and state level. In general, our research shows that the major manufacturers tend to adopt strategies whereby a single product design is marketed globally, meeting the most stringent standards, suggesting that design standards and restrictions, such as those seen in SB20, have an important role to play in influencing movement towards more environmentally benign electronic products. However, opinions are divided on the effect that other instruments, particularly financing mechanisms, might have on design choices. This section will pay particular attention to the comments made by key stakeholders on these points, as well as analysing their perspectives on:

- The importance of ensuring that the RoHS component of SB20 remains closely aligned with the associated European legislation to ensure an international level playing field.
- The potential difficulties faced by manufacturers and component suppliers in responding to the design challenges posed by regulations or other pressures.

“You should be rewarded for good design changes, SB20 doesn’t do that.”

- The possible effects of regulations and financing mechanisms in terms of providing incentives to introduce sustainability design improvements.
 - Perspectives on the potential of design for environment initiatives to improve sustainability performance in the electronics industry.
- The possible effects that licensing arrangements might have on the expansion of product upgrade or reuse activity.

“Manufacturers really don’t want to be told how to design their products.”

Infrastructure

There are a number of different systems for managing e-waste in the USA, primarily consisting of a mixture of business, charity and local government initiatives. The type of infrastructure therefore varies depending on location, since individual companies, charities, states, counties, cities and towns each adopt different approaches. Infrastructure is more developed in some states than in others, but tends to concentrate on the management and safe disposal of CRTs or large white goods. Examples of CRT disposal systems in place include:

- Local government waste disposal sites / transfer stations where for a fee users can deposit unwanted CRTs for recycling or disposal;
- Free disposal days at transfer stations where consumers can take items and dispose of them at no cost;
- Bulky item collection services offered by local governments, which include provision for electrical items;
- Schemes whereby householders are permitted to dispose of one CRT with their general refuse within a designated time frame, for example, one per month;
- Collection events held in conjunction with local government, businesses, and charities etc, where consumers can dispose of designated items free of charge;
- Sticker schemes where householders can approach the local government and request removal of equipment. Upon payment householders receive labels to attached to the item (s), which are then left out for collection at an arranged time;
- Charitable donations of those items such as IT equipment, which are quite new and in good working order;
- Clean up campaigns arranged by local governments, for example over a 4 week period. Although

"You have a bunch of computer monitors in peoples closets right now because of their perceived value but they can't throw them away and unless you're in a certain city you are not allowed to put them out in the street for pickup, and so there's nothing just happening to those right now".

"...it's less expensive for us to ship glass or waste glass to reprocess in Singapore than it would be to ship it to the east coast of the US where the only glass plants we have are".

these campaigns are not often specifically aimed at electrical products these items are often put out;

- Some large manufacturing companies provide a national recycling service where customers can pay a fee and mail back unwanted computer equipment for treatment.

There are many positive, and at times innovative, aspects to the provision of infrastructure for CRT disposal. The US-EPA and others continue to carry out a variety of pilot schemes in order to explore and assess different infrastructure options, for example, *Plug into E-Cycling*, the *Federal Electronics Challenge* and the *EPEAT Programme*. However, a number of issues are apparent in the USA, centred on equitability, integration, efficiency and spatial aspects of the services on offer, which can in turn have a number of implications for the ultimate destination of CRTs. For example, depending on location, residents may or may not have to pay for the collection of CRTs. In some cases, the cost of responsible disposal can mean that people opt to store items or dump them instead. Recycling events can be very time consuming and expensive to organise and can be thwarted by unforeseen circumstances. In addition, because collection events always attract non specified items there can be unexpected costs. Finally, there are few places where collected CRTs can actually be processed which leads to a whole host of other issues (see for example, page 21, *Export Issues*).

The points above provide a glimpse of the different models and approaches to CRT management in the United States and raise a number of the issues. These will be detailed and further explored once more in depth analysis has been carried out.



Section 3 - Other E-Waste Issues in the US

The previous section has outlined those issues that specifically relate to the influence of the framework conditions explained in Section 1. However, there are also several other issues relating to the management of waste electronics in the USA. These are issues that do not directly relate to any *one* of the identified framework conditions but are instead affected by a range of them. In the following pages, each of these issues are dealt with individually, as outlined below:

- Material flows
- Export issues
- Business models

As before, these pages provide a brief introduction to the issue, and an overview of some of the main points relating to the US situation. In each case, the points raised will be investigated in more detail in the forthcoming final report.

Material Flows

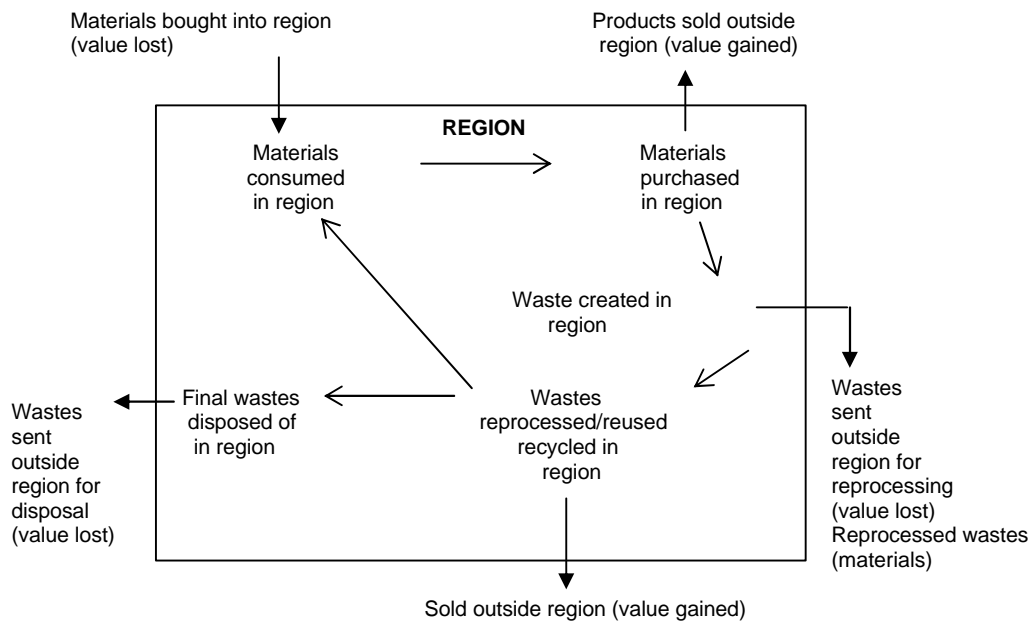
At the heart of the e-waste problem lies the flow and management of materials. One of the key issues is the persistent view, held by many stakeholders, that used-materials constitute a waste as opposed to a resource. Until a change in perception occurs across the whole range of stakeholders, it will be difficult to achieve the efficient redirection of materials out of the waste stream and into a resource recovery stream. Another major issue is the lack of knowledge about the nature of the flow of materials. Whilst there are a number of data sets, software programmes, tracking systems and other tools that exist to quantify specific material flows across certain locations, these are not linked, and may not even be compatible. There is, therefore, no single mechanism that can track e-waste materials across the US, or even outside the US in terms of incoming and outgoing flows and trends. The sometimes limited value of materials in waste form often means it is difficult to manage them sustainably. In addition, some materials, such as plastics, are not well integrated into reverse logistics, recycling and reprocessing systems. These issues, and a number of others, combine to make material flows a poorly understood component of the e-waste system. However, they are issues that need to be addressed if a full understanding of the sustainability impacts of policy and business decisions is to be achieved. The points below outline some of the key findings of our research.

- Materials do not always flow uninterrupted from end use back into the resources stream. They often get stopped at points of blockage, which might be the storage of old equipment in consumers' basements, lofts or rented lockups, or might be at a commercial or social business facility where managers are waiting for material commodity prices to rise before sending them for recycling or reprocessing.
- Key materials identified in e-waste streams are precious metals such as gold and silver, as well as aluminium, copper, base metals, CRT glass, and other materials. Many products consist mostly of plastics of a large variety of types and grades. In many cases these plastics have little or no value. However, bulk recycling or reprocessing of some types of plastic is sometimes economically feasible.
- Intermittent flows in materials mean it is difficult for businesses to plan materials acquisition in an effort to use resources as secondary materials for new product manufacture. This is a problem that characterises markets for recyclates globally.
- Only a limited number of components or materials are usable or economically viable to extract from electronic products. Most reprocessors will extract particular pods of components, such as CD drives from computers, precious metals from, for example, circuit boards, and base metals from CPUs. CRT glass has a value for recycling as well.
- Material is often shipped out of state in the US, because the distribution of material reprocessors tends towards regionalisation or clustering. Some states are therefore gaining value from other state's waste materials. There does not appear to be a full appreciation of the implications of this 'leakage' of valuable materials. Figure 1 shows how any region, whether a state, a wider region, or even a country, may both gain and lose from the inflow, throughflow and outflow of materials. To retain value and reduce in-region and pver boundary wastage should be the aim of regions seeking to maximise economic value from material management.
- Substantial quantities of materials are exported to China and SE Asia countries. There are a range of sustainability issues associated with this, as the section on *Export* (page 22) shows. However, it also results in the removal of materials from the US, constituting the loss of a material resource, that might be, with infrastructure support, retained.
- E-waste material flows are increasing. All reprocessors and recyclers interviewed identified substantial increases in the amount of material they were handling year on year, and the value of the materials they were dealing with.

- An understanding of material flows should not just be applied to the e-waste end of the supply chain. The purchase of materials, in the form of new products, is the 'tap' that supplies the flow of resources to the consumption point of the system. Changes in purchasing behaviour are seen as key by a number of stakeholders in achieving a more sustainable approach to effective e-waste material flow management.

The potential opportunities from the more effective and efficient management of material flows and resource recovery is acknowledged by only a relatively small number of stakeholders as a key driver in improving the sustainability of e-waste management in the US. Unsurprisingly, these stakeholders tend mainly to be those engaged in obtaining value from such an approach, namely companies in the reprocessing or recycling business. Overall, however, there appears to be a lack of comprehension of the flow of material through different product life cycle stages, such as through supply chains and reverse flows into resource recovery systems. Changing purchasing behaviour, while acknowledged as a necessary component of strategies to achieve reductions in waste, through design or material substitution, still does not seem to be integrated into an overall model of the complete chain in the minds of many stakeholder groups. While many stakeholders point to the difficulty of reprocessing and recycling within states, regions, or in the US itself, few fully appreciate the economic mass balance in terms of negative and positive material value gains and losses.

Figure 1 : Regional Economic Material Exchanges



Export Issues

Recent years have witnessed a growing concern over the economic, social, environmental and ethical implications of the export of waste electronic products from the US to overseas countries. In particular, much attention has been paid to the ongoing transport of large quantities of e-waste from California to some parts of China. A report published jointly by the Basel Action Network and the Silicon Valley Toxics Coalition highlighted the environmental degradation and threats to human health that occurred as a result of the rudimentary dismantling and reprocessing activities carried out in settlements in and around the town of Guiyu in Guangdong province. As a result of this research and the ongoing lobbying activity of environmental NGO's, the Californian legislature laid down in SB20 a series of rules to regulate the export of 'covered electronic waste.'

"California cannot unilaterally enact treaty restrictions and other kinds of things that are the domain of the federal governments and the international community."

This section of the final report will investigate how the growing trend of exporting e-waste overseas was compounded by a variety of inter-related economic and technological factors. For example, some stakeholders pointed out that the lack of an adequate CRT infrastructure in the US, coupled with the relatively high costs of domestic transportation, encouraged the overseas shipping of e-waste. This section will investigate these assertions, it will also analyse the perspectives of stakeholders and incorporate a broader analysis of:

- How this complex set of underlying dynamics emerged.
- How a growing awareness of the export problem mobilised stakeholders to articulate their concerns.
- The extent to which the export provisions laid down in SB20 are likely to alleviate the variety of sustainability problems associated with the transport and treatment of e-waste overseas.
- The best way to ensure that the export provisions are properly enforced.
- The implications of the export provisions for the domestic e-waste transportation and treatment infrastructure.

"The transport costs have just been so high, and that's why we've been seeing the majority of equipment going in sea boxes and going to Asia, especially on the West coast."

"There are a number of recyclers who have signed pledges not to export, and those are the more expensive recyclers."

The relative complexity of supply chains, and the variety of alternatives for the management of wastes, are key determinants governing the sustainability performance of electronic waste systems in the US. E-waste management, including refurbishment, re-use, recycling and reprocessing is carried out by a wide range of commercial and not-for-profit organisations. The variety of business models used provide opportunities for improving sustainability, but also present problems in terms of complexity and lack of transparency for consumers and other stakeholders. There are a number of interesting partnerships or collaborations between manufacturers and waste processors in the commercial sector, as well some examples of further interactions between waste processors and not-for-profit organisations. A number of issues centre around the efficiency and sustainability of the various business models used.

- Large scale reprocessors dominate the market due mainly to economies of scale. Smaller, locally based reprocessors do exist, and could grow and offer services that truly reflect the proximity principle by treating waste generated in their own locality. These businesses need support from waste generators, local government, state government and federal agencies.
- Commercial reprocessors and recyclers do not always have a good level of communication with manufacturers. Problems encountered with the management of hazardous waste, or inefficiencies in the reprocessing system, can sometimes be resolved, amongst other things, through better product design or material substitution. In order to achieve this, better working relationships need to be forged throughout product supply chains as well as between manufacturers and reprocessors.

"... as we move into an institutionalisation of this, and contracts on a national basis, that some of the smaller companies and the social purposes may get squeezed out. That the companies, particularly if the manufacturers are taking a stronger role, in a third-party organisation, that they're going to be looking at efficiencies. They don't see these other benefits in the same comprehensive light as government is used to."

- There are some examples of interactive or organic collaboration between manufacturers and reprocessors/recyclers. When a manufacturer takes the lead in driving the reprocessing/recycling of its waste products forward, the result can be a more coherent and efficient partnership. However, this requires a well developed, transparent relationship, built on trust and communication.
- Social businesses are generally underused as a component of the e-waste infrastructure. Most social businesses operate on a not-for-profit business model and collect waste electronics from their locality, often refurbishing them and returning them back to the

local community at low or no cost, providing employment and/or training in the process.

- While many social businesses have been established to deal with e-waste, they are offered little ongoing support and may struggle to survive for any length of time unless they utilise business models that increasingly engage with the commercial or value gaining aspects of their operation. There are a few examples of social businesses that have managed to increase this level of engagement whilst remaining true to their original social principles. Many of those that have appear to be expanding rapidly.
- There is unease and a range of conflicting opinions about the use of prison labour in dealing with e-waste. The practice is vilified by some, but regarded as an activity with social and environmental benefits by others.

There appears to be relatively little discussion about the role of different businesses models in dealing with e-waste in the US, and the ways in which a co-ordinated strategy may help to develop a mixture of businesses geared to responding to the e-waste problems, whilst fulfilling a range of economic, environmental and social objectives. One of the main problems is scale. A wide range of business models exist across the US, from small-scale operations to much larger initiatives. However, although some models are referred to in some compendia, there is no comprehensive up to date understanding of all types of business model relating to the management of e-waste. A general lack of awareness seems to exist between different stakeholder groups about the roles and functions of the different business models. Industry actors identify easily with commercial responses in the form of profit based reprocessing businesses, but have much less understanding of how not-for-profits or social businesses may fit into the mix. Social businesses might offer a value added approach to e-waste management as they contribute not only to environmental sustainability, but also to social sustainability and local economic sustainability. More work is required to understand the benefits and drawbacks of each model combined with a clearer and more co-ordinated structural approach to the application of different models in different contexts.



Section 4 — Recommendations & What Comes Next?

Section 1 of this report outlined some of the key factors that influence the management of e-waste across geographical and cultural boundaries. Section 2 extended this to investigate how these 'framework conditions' specifically influence the nature of the e-waste problem, and responses to it, in the US. Section 3 went on to look at some of the other issues associated with e-waste. Section 4 concludes the report by putting forward a selection of initial recommendations. A brief outline of the next stages of work and reports that can be expected from the electronics project research group at BRASS is then provided.

Recommendations and What Comes Next?

Recommendations

- Currently the scope of products covered by regulations, agreements and recycling programmes is very limited. It is therefore recommended that the scope be broadened to cover a wider range of products, as is already the case in many other parts of the world. On a positive note, this already appears to be happening to some extent in certain states with, for example, the recent Cell Phone Recycling Act of 2004 introduced in California.
- A more co-ordinated, inclusive and flexible approach to considering the different business models that could be applied to managing e-waste would be beneficial. For example, an integrated approach to the employment of manufacturer, local government, recycler, reprocessor and social business models, coupled with the development of existing systems, would aid efficiency and help to ensure the long term sustainability of operators within the e-waste management field.
- More needs to be done to promote the fact that materials in e-waste are also resources, and so should not just be thrown into landfill sites. There is a tendency to focus on the detrimental effect of disposing of CRTs in landfill sites. The fact that many e-waste materials are valuable, and that throwing them away constitutes a waste of resources, is often neglected.
- When drafting legislation it may help to have a greater strategic awareness of the broad sustainability impacts. For example, the CRT landfill ban in California contributed towards an increase in the quantities of e-waste exported for recycling, a trend that was not anticipated by policy-makers. A more planned approach to the design and delivery of policy and legislation would allow legislators to better identify the likely effects of implementation and to devise measures to control them.
- It is recommended that there should be a more comprehensive, national approach to education and communication about the issues associated with e-waste and the disposal options available to consumers. It is appreciated that the variety of different programmes in existence from state to state, and within states, makes the planning and provision of a uniform federal strategy more difficult. It is therefore suggested that an innovative approach to awareness raising, that enables a robust message to be communicated at the national level but is flexible enough to be tailored to local or regional conditions, is adopted.
- Greater consumer involvement and consultation when considering e-waste management programmes should be encouraged. More also needs to be done to overcome consumer inertia and attitudes regarding how they choose, use and dispose of EEE.
- More needs to be done to encourage the sustainable design and use of products. Variable financing mechanisms could be used to incentivise this, for example by rewarding those manufacturers that improve product design through lower advance disposal fees on their products.
- Greater interaction needs to be fostered between different specialist areas in industry. For example, better communication between product designers and marketers would help to ensure that mixed messages about products are not given, and that advances in one area do not compromise or contradict those in another. In addition, the facilitation of enhanced co-operation between product designers and materials reprocessors should help contribute towards the better management of e-waste. For example, joint strategies could be adopted to devise means of making it easier, and therefore more economically feasible, to dismantle electronic products at the end of their life.

What Comes Next?

This report presents the initial findings of the electronics research group and will be followed up by a more in depth full report towards the end of 2004. Over the next 18 months, the research programme will continue, and fieldwork will be carried out in Europe and South East Asia. Each of these fieldwork stages will be followed by a presentation of initial findings and then reports containing more in depth analyses. The project will culminate in a book which will synthesise research findings and theoretical development.

Appendix 1 - Useful Websites & Selected Bibliography

Useful Websites

- Apple <http://www.apple.com/>
- Californians Against Waste <http://www.cawrecycles.org/>
- California Integrated Waste Management Board <http://www.ciwmb.ca.gov/>
- Computer Takeback Campaign <http://www.computertakeback.com>
- Dell <http://www.dell.com/>
- Electronic Industries Alliance <http://www.eia.org/> In particular, the Consumer Education Initiative (CEI) is a program developed by the Environmental Issues Council of the Electronic Industries Alliance (EIA) - <http://www.eiae.org/>
- EPEAT <http://www.Epeat.net>
- Epson <http://www.epson.com/>
- Free Geek <http://www.freegeek.org/>
- Goodwill Industries International Inc <http://www.goodwill.org>
- HP <http://www.hp.com/>
- Intel <http://www.intel.com/>
- National Caucus of Environmental Legislators <http://www.ncel.net>
- National Electronics Product Stewardship Initiative <http://www.nepsi.org>
- Northeast Recycling Council <http://www.nerc.org>
- Northeast Waste Management Officials' Association <http://www.newmoa.org/>
- Product Stewardship Institute <http://www.productstewardshipinstitute.org/>
- Raymond Communications <http://www.raymond.com/>
- Silicon Valley Toxics Coalition <http://www.svtc.org/>
- Sony <http://www.sony.com/>
- UK Government Department of Trade and Industry <http://www.dti.gov.uk/sustainability/weee/index.htm>
- U.S. Environmental Protection Agency <http://www.epa.gov>
- Western Electronic Product Stewardship Initiative <http://www.wepsi>

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Appendix 2 - Glossary

BRASS	The ESRC Centre for Business Relationships, Accountability, Sustainability and Society, Cardiff, Wales
CRTs	Cathode ray tubes – these form an integral part of TV and computer screens
EPEAT	Electronic Products Environmental Assessment Tool Project
E-waste	Electronic and electrical waste
Multi-stakeholder dialogue	Multi-stakeholder dialogues enable direct interactions and opportunities for groups to share their concerns, experiences and proposals in specific areas and discuss them in detail. Such exchanges help to promote meaningful participation among major groups
NEPSI	National Electronics Product Stewardship Initiative
NGO s	Non governmental organisations
OEMs	Original Equipment Manufacturers
RoHs	CEC (2003a) Directive 2002/95/EC of the European Parliament and of the Council of 27 January, 2003 on the restriction of the use of certain hazardous substances in electrical and electronic equipment Published in OJ L 37/19, 13.2.2003. Brussels: Commission of the European Communities.
SB20	Senate Bill 20 – The Electronic Waste Recycling Act of 2003
US EPA	The United States Environmental Protection Agency
WEEE Directive	CEC (2002b) Directive 2002/96/EC of the European Parliament and of the Council of 27 January, 2003 on waste electrical and electronic equipment (WEEE). Published in OJ L 37/24, 13.2.2003. Brussels: Commission of the European Communities.
WEPSI	Western Electronics Product Stewardship Initiative

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