

SECTION II B: Stimulating Eco-efficiency in Asia and the Pacific: The Role of Public Policy



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The Role of Public Policy in Providing Sustainable Consumption
Choices: The Resource-Saving Society and Green Growth



SECTION II

Part B

STIMULATING ECO-EFFICIENCY IN ASIA AND THE PACIFIC: The Role of Public Policy

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Summary

Many trends in the Asia-Pacific region, as elsewhere in the world, are environmentally unsustainable. This paper discusses and gives examples of how public policies and citizen actions can reduce the environmental impacts of production, consumption and infrastructure provision.

Current trends suggest that the Asia-Pacific (AP) region is reproducing the 'Western' model of development, with high environmental impacts. Such trends if continued will result in resource constraints and serious environmental degradation in the region and beyond, which will be exacerbated if the region succeeds in its economic aim of becoming a global production centre. The systematic pursuit of a model of 'green economic growth', involving pollution control and the encouragement of eco-efficiency, will be required if these effects are to be avoided. Achieving such growth will require harnessing market dynamics through environmental and economic policies in order to drive eco-innovation.

Eco-innovation will be required in all areas of production and consumption, and in infrastructure provision, driven by imaginative packages of different kinds of environmental policies. These will need to focus especially on reducing the resource use and environmental impacts of consumer behaviour, especially in the particularly problematic areas of home energy use, food provision, personal transport and tourism.

Infrastructure is key to reducing long-term environmental impacts. If not supported by appropriate infrastructure, individual behaviour change to reduce environmental impacts is unlikely to take place. This is especially true of transport infrastructure. Western levels of car dependency in the AP region will hasten and intensify constraints on global oil supplies and cause immense environmental damage.

Individuals need the support of civil society, in the form of citizen groups and local government, as well as of infrastructure, in order to affirm both the legitimacy and value of environmentally sustainable lifestyles. A new emphasis on environmentally conserving traditional values may help to increase environmental awareness in society.

Many people in low-income societies need to substantially increase their use of natural resources of all kinds to fulfil their potential, but need to find ways of doing this that minimise environmental pressures. People with already high incomes need to make substantial reductions in the environmental burden of their consumption patterns if economic and social development are to become environmentally sustainable.

INTRODUCTION

Economic activity is associated with resource flows related to the extraction, production, consumption/use, and disposal of materials and products. In the production phase, those materials that are not embodied in the end product or put to some other use are emitted to the environment, constituting a waste of resource and, perhaps, causing pollution. In material terms, therefore, economic production consists of inputs to production, desired outputs (the products) and undesired outputs (emissions to the environment). The consumption/use phase of the activity may then also be associated with a flow of materials (and especially energy), before the product comes to the end of its useful life, and becomes waste materials, which may then be recycled into new products, or disposed of.

Many current environmental problems are rooted in the size of the material flows (including those embodied in fossil fuels) through the economy, suggesting that the dematerialisation of production, and less resource use in consumption, are needed to reduce environmental impacts. It has been suggested that global use of nature can be halved whilst still doubling wealth, through improvements in eco-efficiency or resource productivity by a factor of four (von Weizsäcker *et al.*, 1998). These types of improvements are therefore seen by many as key to achieving sustainable development.

As noted in the companion paper in this study, the concept of eco-efficiency was introduced to describe a broad management objective to decouple economic activity from natural resource use and pollution (Schmidheiny, 1992) and, for production activities, has been defined as relating to “activities that create economic value while continuously reducing ecological impact and the use of natural resources” [DeSimone and Popoff 1997, p.xix]. This paper is concerned with the public policies that may be used to stimulate improvements in eco-efficiency.

One of the main purposes, and results, of locating environmental policy in a broader framework of sustainable development was to ensure that environmental policy was conceived of and evaluated in ways that took economic and social, as well as environmental, outcomes into account. One result has been that environmental policy has become transformed into policy for sustainable development more generally and encompasses a wide range of measures and instruments that go well beyond the regulations and impact assessments that characterised the first years in which environmental policy was taken seriously.

Table 1.1 presents a matrix of environmental policy agendas, conceived in a context of sustainable development that is broadly typical of a country in the European Union. The first row relates to statutory policy frameworks, from international treaties, through national legislation to the powers that are devolved to lower tiers of government. The second row relates to sustainable development strategies, which have now been very widely prepared at all levels of government and in the private sector. The third row indicates the importance of measurement, through indicators of all the various dimensions of sustainable development, and the fourth row the importance of benchmarking, by which is meant being aware of what ‘average’ or ‘best practice’ performance is in certain areas, and national/local/corporate positioning in relation to this. The fifth and sixth rows encompass target-setting and planning. With sustainable development, as with any other strategy, it is important to have a clear idea of directions, goals and plans to achieve them. Finally, the policy system needs a capacity for learning and evaluation, through research and analysis, in order to improve the outcomes it can achieve.

A number of principles have now become fairly widely accepted as underlying environmental policy. Most important among these

are probably:

- **Polluter pays principle:** This holds that polluters, rather than governments, should pay the clean-up costs of pollution, and the costs of pollution or pollution-prevention should be internalised into the cost structures and prices of the relevant economic activities, so that polluters (producers and consumers) have incentives to reduce pollution.
- **Pollution prevention principle:** This principle embodies the widespread experience that it is usually cheaper to prevent pollution than to pay to clean it up after the event.
- **Precautionary principle:** This principle has been subject to many different interpretations and much controversy (see O’Riordan & Cameron for some discussion), but it essentially seeks to give guidance on policy and action in situations which involve a risk (even a very small risk) of very large negative outcomes, especially where they are irreversible, and on where the burden of proof in such situation should lie. The principle suggests that actions which might bring about such situations should not be undertaken.
- **Life-cycle impact assessment:** This is not really a principle, rather guidance as to the appropriate approach to the assessment of policies, projects and programmes which have an impact on the environment. As its name suggests, this approach seeks to take account of the full life-cycle impacts of the situation under assessment.

With regard to the policy instruments available to national governments, it is now well understood that policies to promote environmental improvement in the context of sustainable development may be grouped under four generic headings (see, for example, Jordan, 2003):

- Market-based (also called economic) instruments (see EEA, 2006, for a recent review of European experience, as discussed further below).
- Regulatory instruments, which seek to define legal standards in relation to environmental performance, pressures or outcomes (such standards may bring about innovation, Kemp, 1997).
- Voluntary (also called negotiated) agreements between governments and producing organisations (see ten Brink, 2002, for a comprehensive discussion)
- Information-based instruments (the main example of which given by Jordan et al. 2003 is eco-labels, but there are others), which may be mandatory or voluntary.

It is increasingly common to seek to deploy these instruments in so-called ‘policy packages’, which combine them in order to enhance their overall effectiveness across the three dimensions of sustainable development.

One particularly important set of policies for eco-efficiency has come to be grouped under the heading of “sustainable consumption and production”, and these are now explored in more detail.

Table 1.1 National environmental policy agendas in a context of sustainable development

Policy activity	Public					Private	
	Global	European	National	Regional	Local	Sector	Company
Treaties Legislation	Global/ Multilateral Environmental Agreements	Directives/ Regulations	Legislation/ National policy in- struments	Regional gov- ernment/ De- velopment Agencies	Municipal authori- ties		
Sustain- able De- velopment	Comparison of national SDSs	EU SDS/ 6EAP/ Thematic strate- gies	Sustainable develop- ment strat-	Regional SDS	Local sustain- ability	Sectoral sustainability strategy	Corporate sustainability/ CSR strategy
Measure- ment Indicators	Resource accounting methodolo- gies/ indica-	Resource ac- counting meth- odologies/ indi- cators	Resource accounting methodolo- gies/ indica-	Regional and local sustain- ability indica- tors		Corporate sustainability reporting	
Bench- marking	Benchmark- ing	Benchmarking				Benchmarking	Benchmarki ng
Target- setting		Indicative tar- gets/obligations	Identifica- tion of envi- ronmental limits Policy tar- gets	Eco- industries/ Industrial symbiosis		Meeting sectoral targets (e.g. recycling)	Environ- mental Man- agement System and related tar- gets
Planning			Economic planning	Freight traffic planning	Municipal planning		Corporate plans
Research and analysis		EU research programmes	Modelling policy im- pacts Sec- toral analy- sis/ priori- tisation	Modelling policy impacts	Modelling policy impacts		Corporate research

Focusing on Sustainable Consumption and Production

The Sustainable Consumption and Production (SCP) movement was initiated in Agenda 21 from the Rio Earth Summit, with the acknowledgement that “the major cause of the continued deterioration of the global environment is the unsustainable patterns of consumption and production, particularly in industrialised countries, which is a matter of grave concern, aggravating poverty and imbalances” (UN, 1992: 4.3).

Therefore, policies were called for that help

- “To promote patterns of consumption and production that reduce environmental stress and will meet the basic needs of humanity;
- To develop a better understanding of the role of consumption and how to bring about more sustainable consumption patterns” (UN, 1992: 4.7).

This was re-enforced at the World Summit for Sustainable Development (WSSD) with new global commitments on SCP.

Case study: the UK experience with SCP

The UK government has been actively promoting/carrying out SCP policies since the middle of the 1990s. The SCP agenda featured prominently in the UK Government's sustainable development strategy *A Better Quality of Life* (DETR, 1999). After the World Summit on Sustainable Development (WSSD) in Johannesburg, the government established its SCP policy framework *Changing Patterns* (DEFRA, 2003). In this document the government laid out its SCP framework to “deliver continuous economic and social progress that respects the limits of the Earth's ecosystems, and meets the needs and aspirations of everyone for a better *quality of life* now and for future generations to come” (DEFRA, 2003, p.6). The objectives of the framework were intended to be accomplished by:

- “Decoupling economic growth and environmental degradation.
- Focusing policy on the most important environmental impacts associated with the use of particular resources, rather than on the total level of resource use.
- Increasing the productivity of material and energy use, as part of the broader Government commitment to increase the productivity of the nation.
- Encouraging and enabling active and informed individual and corporate consumers who practice more sustainable consumption” (DEFRA, 2003, p.6).

Two interlinked themes, which are essential if the above objectives are to be achieved, recur throughout the framework. *First*, all lifecycle impacts of resource use need to be taken into account. *Second*, (and connected to the first) the impacts of domestic

consumption patterns on the rest of the world need to be considered, when SCP policies are devised.

The rather general guidelines and principles laid out in the 'Changing Patterns' SCP framework were taken forward in the revised Sustainable Development Strategy (DEFRA, 2005). Chapter 3, called 'One Planet Economy,' provided what might be called a national action plan for SCP, with the actions clustered in seven key areas identified to accelerate the shift towards a more sustainable system of consumption and production. At the heart of all actions is the overriding objective to de-couple economic growth and resource utilisation and to detoxify economic processes/economy/society. Hence, SCP as understood by the UK government is about breaking the links between economic growth and environmental degradation as well as reducing the environmental impact per unit of physical flow. This requires a major shift towards new processes, products and services with lower environmental impacts and therefore a general re-thinking of how we produce and consume. Hence, action needs to be induced in three major areas:

- “better **products and services**, which reduce the environmental impacts from the use of energy, resources, or hazardous substances,
- cleaner, more efficient **production** processes (doing more with less), which strengthen competitiveness, and
- shifts in **consumption** towards goods and services with lower impacts” (DEFRA, 2005, p.44).

It was further perceived that the whole spectrum of stakeholder groups in the UK needed to be involved in this challenge and make their contribution, including

- Individuals, who need to become more aware of their roles as responsible citizens and resource consumers
- Businesses, who need to develop new eco-innovative business models
- Government itself, not least through its own purchasing power.

One important contribution from the scientific community was seen to be the provision of a sound and robust evidence base and a useful set of analytical tools to inform decision makers in the best and most reliable way possible. Such an evidence base needs to provide organised and comprehensive information about the usage of natural resources by human activities and the arising environmental impacts caused during the process of resource utilisation in a lifecycle perspective, from extraction to disposal. A lifecycle perspective also requires taking into account the environmental impact caused abroad by domestic consumption of imports. All this is perceived as vital to the success and delivery of the overall SCP programme.

Sustainable Consumption and Production (SCP) has developed into the over-riding priority area to tackle environmental degradation within the Government's Sustainable Development Strategy (DEFRA, 2005). Behind this promotion of the concept stands the insight that the production and consumption of goods and services in the UK (as in all other industrialised countries and many developing countries as well) are far too resource intensive. This results in a variety of environmental problems at home as well as abroad, such as global warming, deforestation, biodiversity loss, soil erosion or desertification, which adversely affects human well-being today and will do so even more in the future. The aspiration of SCP policies, therefore, is to foster lifestyles that are much less dependent on natural resources. This implies that goods and services need to be both produced more efficiently and

consumed differently.

The European and national SCP agendas can be broken further down and associated with important policy initiatives that have emerged from it. These initiatives can be related to seven key policy areas as shown in Table 1.2.

These seven areas can be related to policy more directly in the form of Table 1.1, as shown in Table 1.3. Important at the European level is Integrated Product Policy, with its associated concepts Product Stewardship and Producer Responsibility, which have resulted in a number of Directives relating to end-of-life-products, including packaging, end-of-life vehicles (ELV) and waste electric and electronic equipment (WEEE). At the national level 'market transformation' has been important, whereby environmentally superior products displace inferior products in environmentally sensitive markets. Examples of a number of the policy approaches listed in Table 1.3 are given in later sections of this paper, some in the form of case studies.

Table 1.2: Key areas in the UK Government's Sustainable Consumption and Production Strategy

Products	Strengthening UK and international measures to improve the environmental performance of products and services, including improved product design
Production	Improve resource efficiency and reduce waste and harmful emissions across business sectors
Consumption	Influence consumption patterns, including proposals for new advice for consumers
Procurement	Sustainable procurement in the public sector, to make the UK a leader within the EU by 2009
Innovation	Support for innovation to bring through new products, materials and services
Sustainable	Increase transparency, corporate responsibility and skill in business and other or-
Waste	Increased emphasis on reducing waste at source and making use of it as a resource

Table 1.3: Sustainable Consumption and Production (SCP) policy agendas

	Public					Private	
	Global (Rio, WSS D)	European	UK/DA National	Regional	Local	Sector	Company
Production			Decoupling/green growth/eco-efficiency/resource productivity	Regional (RDA-led) focus on resource efficiency –			Identification of waste/inefficiency
Sustainable business	Global Compact		Corporate reporting guidelines/regulations				CSR/Corporate reporting
Products		Integrated product policy, inc. product stewardship, producer responsibility (e.g. WEEE, ELV Directives)	Market transformation				Product design
Innovation			Green 'challenge' funds	Innovation and industrial collaboration focused on future-proofing regional economies / green products / green chemistry etc			Eco-innovation
Procurement			Green public procurement		Green public procurement		
Consumption			Information provision, economic instruments	Regional spatial strategies			
Waste			Waste management planning	Waste management planning			

1. PROVIDING INFRASTRUCTURE

Infrastructure consists of the often long-lived basic economic assets that permit the functioning of some of the most important systems in a modern society: the transport and energy systems; the water supply and wastewater management systems; the solid waste management system; the telecommunications system. It also includes buildings of all kinds. Frischmann (2005, p.923-4) classifies infrastructure into transportation systems, communication systems, governance systems (e.g. court systems) and basic public services and facilities (in which he includes schools, in addition to those mentioned above).

Infrastructure is of fundamental importance to economic development; physical infrastructure is of fundamental importance to the environmental impact of that development. That is, it is fundamental to whether sustainable development is achieved.

Sustainable infrastructure engineering has been defined as “the design of new infrastructure, and the re-design, rehabilitation, re-use or optimization of existing infrastructure, which is consistent with the principles of urban sustainability and global sustainable development”, and this definition is intended to encompass

- “infrastructure renewal
- long-term economic analysis of infrastructure, e.g. life-cycle analysis, ecological footprinting
- modeling of land use and transportation for assessment of policies on emissions, energy use and reduced infrastructure costs.
- the protection of existing infrastructure from environmental degradation, e.g. preservation of historical masonry buildings
- material selection for sustainability - quality, durability and energy conservation
- making better use of so-called ‘waste’ water and materials
- the redesign of infrastructure in light of global climate change
- the remediation of environmentally damaged soils and water” (University of Toronto 2005)

Four Principles of Sustainable Infrastructure are articulated:

- minimizing the use of non-renewable resources
- minimizing impacts on the natural environment
- protecting biodiversity
- using renewable resources in a sustainable manner

and it should be clear from the previous list that these principles should be applied to infrastructure across its lifetime (i.e. to include

use and decommissioning) as well as its initial construction.

There is no 'right' way of mobilising the very large investment finance that is required to build, and maintain, infrastructure. In some countries it is financed by the state. In some countries it is largely left to the private sector, with or without government oversight, sometimes through an appointed regulator. In some countries it is provided through a mix of public-private partnership. Examples of all these models can be found in the world today, and countries over time have changed from one model to another. Menckhoff & Zegras (1999) provide an overview of experiences in granting concessions to the private sector to provide urban infrastructure.

However, there are some principles that seem generally to apply to the provision and maintenance of infrastructure, if it is to contribute to sustainable development:

1. If it is intended that the infrastructure should provide (or not impact negatively) public goods (e.g. clean air, low carbon dioxide emissions, universal access to basic services), as well as private benefits, then government will either have to regulate to achieve this, or the public sector will need to contribute investment. Markets will not provide these public goods by themselves.
2. Frischmann (2005, p.925) makes the point that, despite the variety of public-private mix, "the government's position as provider, coordinator, or regulator of traditional infrastructure provision remains intact in most communities." He also argues persuasively that "managing traditional infrastructure in an openly accessible manner makes economic sense" (ibid., p.926), although by this he does not mean that use of infrastructure should be unregulated or free of charge. One of the key conclusions of the Menckhoff & Zegras (1999, p.34) review is that "Concessions should desirably occur within the context of a clear transport policy, institutional, legal and regulatory framework, and overall strategy for the sector.", further emphasising the importance of the public sector role in any public-private partnership.
3. It is very difficult for much physical infrastructure to be maintained in the absence of realistic user fees for the services that it provides. These fees must provide for the maintenance and replacement of the infrastructure over time, even if the infrastructure was put in place through public sector funding (i.e. from taxpayers) or as part of an aid and development programme (of course no private sector funding will be provided unless the investors can see how their investment is to be made economically viable). Countries are littered with, for example, energy and water infrastructure in a poor state of repair, which is not delivering the quantity and quality of services required, or soon will not do so, because of failure to collect revenues for its use, so that it cannot be maintained.

Because infrastructure is often long lived, decisions made about infrastructure can influence, or even determine, the development path of a society for decades. One of the reasons for this is that the nature of the infrastructure will greatly influence the choices that are open to individual consumers. For example, the balance struck in a society between road and rail infrastructure in the development of a transport system will be of fundamental importance to the extent of car dependency in the society in the future, with profound implications for air emissions (and therefore urban air quality), carbon dioxide emissions, the use of healthier modes of short-distance travel, such as cycling and walking, impacts on the landscape and the 'liveability' of urban areas.

here follow a number of case studies relating to the sustainable provision of infrastructure in transport, water and waste.

Sustainable transport infrastructure

Case Study: The Busways of Curitiba

(sources: Cox 2003, Friberg 2000)

Curitiba is a Brazilian city with a metropolitan population of 2.5-3 million people. Despite having the second highest car-per-capita ratio in Brazil, it gives road space priority to buses, and has developed what is probably the most sophisticated busway system in the world. The origins of the system lie in the master-planning process developed in 1974, and setting out a road hierarchy and land control system, which has guided city growth since then. By 1982 five main 'structural corridors' were completed, each with two central bus lanes dedicated to express buses, and with inter-district and feeder lines., and with zoning laws to structure the growth of the city. These laws ensured that high density residential areas could only be sited along the main bus corridors, and it is estimated that there are some 400 condominium blocks of 20+-stories along these routes. The system is run by a state-owned company, Urbanizao de Curitiba, which maintains the infrastructure and regulates the private companies which own the buses, the largest of which are bi-articulated vehicles which hold 270 passengers. All buses have to be replaced every ten years, which ensure that their emissions profile is continually improved. The system is completely financed by bus fares, without any public subsidy. The estimated current cost of busways is USD 3m/km, compared with USD 8-12m/km for a tram system, and around USD 50-10m/km for a subway. The Curitiba Integrated Transport System covering the metropolitan area has about 900km of routes which carry about 1.9m passengers per day, with 75% percent of commuters using the system on weekdays. As a result the city's fuel consumption is 30% lower than eight comparable Brazilian cities. Curitiba has matched its emphasis on public transport with the provision of pedestrian networks and cycle paths, and lots of green space, in the city, facilitating human contact, recreational activities and general 'liveability'.

Sustainable Water Infrastructure

Infrastructure for water includes provision for safe water supply, for wastewater management and disposal, and for managing rainfall run-off, including stormwater, so as to avoid flooding. The challenge facing the human population in respect of water is hard to over-state, but is set out in sober terms in the 2nd UN World Water Development Report (WWAP 2006), published in March 2006. Here some ideas on sustainable water infrastructure are given in the form of a case study from the Water Environment Federation, a not-for-profit network including water quality professionals from 76 Member Associations in 30 countries, who work toward the WEF vision of preservation and enhancement of the global water environment (see www.wef.org). The case study illustrates that one of the world's richest countries, the USA, still faces significant challenges in terms of assuring clean, safe water and waste water management for all its population. The WEF approach set out in the Case Study is applicable in some form to all countries, whatever their level of development.

Case Study: Sustainable Infrastructure for Clean and Safe Water in the USA

Source: WEF 2005

Even in the United States, water pollution still persists. According to EPA's 1998 Water Quality Inventory Report to Congress, 44% of assessed estuaries and 35% of assessed rivers and streams have impaired water quality due to a variety of sources, including

inadequately treated wastewater. Infrastructure problems associated with aging pipes, out-dated systems, and inadequate capacity to meet growing population demands are requiring many communities to make huge investments in upgrades to their water and wastewater infrastructure systems. According to the EPA, the costs associated with these upgrades range from a low of \$485 billion to a high of \$896 billion over the next twenty years. These amounts are beyond the capacity of some municipalities to shoulder alone. If this challenge is not met, EPA estimates that by 2016 water pollution levels could be similar to levels observed in the mid-1970s.

The Water Environment Federation supports a three-pronged approach to solve the infrastructure challenge facing water and wastewater utilities: First, utilities must be well managed and appropriately funded to ensure long-term sustainability of collection, treatment and distribution systems; second, there must be a significant and continuing federal investment commitment; and, third, the general public and business community must play a larger role in ensuring that utilities continue to effectively serve their communities.

Utilities must be well managed locally to ensure long-term sustainability of collection, treatment and distribution systems. Specifically, WEF supports:

- Strong professional staff that are viewed as advocates for clean and safe water in the community and on the state and federal level. In addition, utilities must have employee development and training programs that ensure utility staff possess the skills needed to manage, operate and maintain the utility using best practices;
- Full cost-of-service pricing systems that encourage local communities to establish rates that reflect, to the maximum extent practicable, the system's true life-cycle costs, including debt service, and that can support long-term management needs;
- Sustainable management approaches, including asset management and environmental management systems, that proactively ensure long term viability of each component of the system while simultaneously ensuring compliance with local, state and federal environmental regulations;
- A culture of constant innovation and research into new technologies and management approaches that support best management practices, including conservation, efficiency and reuse; and a system to ensure transparency and public participation so the utility remains accountable to ratepayers and the general public.

There must be a significant and continuing federal investment. WEF recognizes that even if local utilities do all the above and are managing their systems using best practices, federal assistance in financing infrastructure costs will continue to be essential for many communities. Specifically, WEF supports:

- State Revolving Fund Programs (SRF) with a significant increase in appropriations to more closely reflect financing needs that exist;
- Improved administration of SRFs, that streamlines the application process, provides increased flexibility to States to determine, with public input, project eligibility and environmental compliance standards, and encourage innovative partnerships that bring diverse stakeholders together for more effective broad-based solutions; and reduces paperwork burdens on communities;
- Flexible forms of financing, made available by states on the basis of need, to assist communities that do not have the rate base to support conventional or SRF loan financing costs. These include extended loan terms, loan forgiveness programs and grants. Communities in need often include low-income communities and small communities or those facing costly environmental challenges. More comprehensive affordability criteria should be developed for states to use in allocating

SRF financing;

- A dedicated revenue source for the SRF could ensure that federal investment in water infrastructure is consistent and no longer solely depends on annual discretionary appropriations. Any dedicated SRF revenue source identified should be broad-based, related to clean and safe water, and should not impose a national tax on local water and wastewater ratepayers.
- In addition to increased funding, assuring infrastructure sustainability will require increased federal support for State-administered clean water programs, including support for watershed based approaches; support for technical assistance to small communities; increased investment for research and development of treatment and infrastructure technologies and management strategies that improve the life-cycle of wastewater treatment systems; and support for the development of a national program to educate the public about the benefits and economic importance of water and wastewater infrastructure.

The general public and the business community need to play a larger role in ensuring clean and safe water, through strategies that encourage greater participation by the public and the business community in maintaining the healthy operation of community water and wastewater treatment facilities. All parts of society must be involved in the long term environmental stewardship of water resources by:

- Entering into partnerships and cooperative relationships with the business community to develop innovative, cost-effective solutions to infrastructure sustainability. Public-private partnership decisions should be made locally based on what local officials determine is most appropriate for preserving and enhancing the water environment;
- Elected officials and non-governmental organizations, including public health organizations, advocacy groups, business associations and other civic organizations, playing a leadership role in highlighting the importance of water infrastructure and continued investment in it;
- A continued commitment to continue public outreach among all stakeholders to increase their support for investment in infrastructure for clean, safe water.

No single solution addresses the full range of clean water infrastructure and related challenges. All levels of government and the private sector must share responsibility for effective, efficient, and fair solutions to protecting a country's waters.

Sustainable waste management infrastructure

As countries develop according to the conventional model, they generate increasing amounts of solid waste, the safe management of which also requires significant investments in infrastructure. The Case Studies that follow, on experiences in Argentina and China, illustrate the problems, and some of the solutions, related to waste management in a developing country context. Both make clear that the sustainable provision of infrastructure depends as much on good legislation and regulatory capacity as on the financing and construction of physical structures.

Case Study: *US\$40 million World Bank waste management loan to Argentina*

Source: RRF 01/03/06

About 60 per cent of Argentina's solid waste is disposed in open dumps without sanitary controls. The economic crisis of 2001-2002 worsened solid waste management practices and the lowest socio-economic groups are disproportionately affected by poor service. In particular, the economic crisis forced many families to enter the informal recycling and separation business, which peaked at about 30,000 families in 2002.

The National Urban Solid Waste Management Project seeks to improve public health and quality of life by developing environmentally and financially sustainable systems for urban solid waste management in the country. A \$40 million loan to the Project from the World Bank seeks to support the development of sustainable systems for urban solid waste management in Argentina.

The project has been designed to address both the evident health effects related to poor final disposal practices and to support improvements at the *environmental* level (through the inclusion of recycling, composting and minimization policies); *economic* level (through the regionalization of final disposal facilities and improvement of cost recovery policies); *social* level (through the inclusion in the overall solution of socially displaced groups like informal waste-pickers); *technical* level (through the inclusion of strategic planning as tool to improve overall solid waste management practices); and *regulatory* level (requiring as part of project preparation the elaboration of a legal framework).

In particular the project will:

- Finance the construction of new environmentally and economically sustainable landfills (as well as the closure of existing open dumps), and of infrastructure and equipment for separation and recycling activities.
- Implement a series of initiatives to ease the transition for waste pickers working at the dumpsites being closed or rehabilitated by this project, and strengthen national and local capacity to assess and manage complex social issues around the implementation of these initiatives.
- Strengthen the institutional capacity of the Secretariat of Environment and Sustainable Development, and other agencies involved in the sector, by establishing cutting-edge technical and financial models for solid waste management, and improving the local legal and regulatory frameworks.

The \$40 million fixed-spread loan is repayable in 11 years, including a 6.5-year grace period. The total project cost is \$54.38 million, including counterpart financing from local sources and the borrowing country.

Case Study: China acts on waste

Source: RRF 06.03.06

In 2004 in China, 1.20 billion tons of industrial solid wastes were generated across the country, 20.0% up against the previous year while the discharge of industrial solid wastes was 17.92 million tons, down by 7.7% compared with that of 2003. The amount of industrial solid wastes under integrated reuse totaled 680 million tons, resulting in an integrated utilization rate of 55.7%, which was on a par with that of the previous year. The amount of hazardous wastes generated was 9.63 million tons.

China's State Environmental Protection Administration (SEPA) has issued information describing action taken to address the large flux of materials, including:

Development of Relevant Laws, Regulations and Standards: on Prevention and Control of Pollution by Solid Wastes (law took effect on April 1, 2005); Management of Operation License of Hazard Wastes (regulation went into effect on July 1, 2004); various Technical Requirements for Facilities for Centralized Incineration and Disposal of Medical Wastes, for Facilities for Centralized Incineration and Disposal of Hazardous Wastes, for the Construction of Facilities for Safe Landfill and Disposal of Hazardous Wastes (in 2004).

Control of Waste Imports: SEPA also required all provincial environmental protection bureaus to prepare and submit a feasibility study report on the establishment of solid wastes management centre. It also strengthened the environmental management of imported wastes (in 2004) and improved the management list for imported wastes. In 2004 SEPA approved the import of a total of 23.42 million tons of restricted wastes as raw materials, 63% up compared with that of the previous year. The actual import of wastes totaled 10.53 million tons, up by 17.9% against 2003. Wastes approved to be used for raw materials under automatic permission amounted to 57.82 million tons and the actual import amount was 22.55 million tons.

Implementation of International Conventions: China ratified in 2004 both The Stockholm Convention on Persistent Organic Pollutants and The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.

2. MANAGING CONSUMER DEMAND

Consumption makes an important contribution to human welfare. Certain kinds of consumption are also a major cause of environmental degradation. The purpose of managing consumer demand for sustainable development is to allow consumer welfare to increase while controlling environmental impacts.

In high-income countries, environmental problems can be caused by the sheer scale of consumption, even if that consumption is relatively eco-efficient. In fast growing economies the problem may be that the growing scale of consumption outpaces the development of institutions either to control its environmental impacts, or to direct the patterns of consumptions into forms that are sustainable in the long term. Both these phenomena are apparent in the Asia-Pacific region today.

The policies to manage the environmental impacts of consumer demand will vary greatly between countries, and include a wide range of instruments adapted in many detailed ways to suit the local or national context. The classification of four types of instruments set out in section 1 (relevant to consumers are regulation; economic instruments; information-based instruments) is nevertheless generally valid. This section presents some more detailed discussion and examples of use of these instruments, through a number of specific case studies.

Use of economic instruments in the European Union

Many countries in the European Union, from both old and new Member States, have now made use of economic, or market-based, instruments for environmental protection. EEA (2006, p.13) lists such instruments as "emissions trading, environmental taxes and

charges, deposit-refund systems, subsidies (including the removal of environmentally-harmful subsidies), green purchasing, and liability and compensation". Table 3.1 shows that a very wide range of environmental taxes has been implemented in European countries, including taxes on air pollution, transport, water effluents, waste, noise, many different products, and raw materials.

**Table 3.1: Numbers of countries in EU-25 (plus Iceland and Norway)
with environmental taxes as specified**

Air/Energy		Products	
CO ₂	11	Tyres	8
SO ₂	12	Beverage containers	7
NO _x	9	Packaging	11
Fuels	27	Plastic bags	4
Syn. Fuels	8	Pesticides	5
Transport		CFCs	6
Car sales and use	23	Batteries	9
Diff. annual car tax	4	Light bulbs	4
Annual circulation tax	10	PVC/phthalates	2
Water		Lubrication oil	7
Water effluents	20	Fertilisers	3
Waste		Paper, board	5
Waste/waste-end tax	17	Solvents	2
Dangerous waste	4	Resources	
Noise		Raw materials	9

Source: EEA 2006, pp.26-27

In a number of EU countries (for example Denmark, Finland, Germany, Netherlands, Sweden and UK) the implementation of environmental taxes has taken the form of Environmental Tax Reform (ETR). ETR seeks explicitly to use the revenues from environmental taxes to reduce the tax burden on beneficial economic activities, such as investment or employment, i.e. it seeks to shift the tax burden from 'goods' to 'bads'. Taxes on energy account for over three quarters of revenues from environmental taxes.

Figure 3.1 plots three indices on the same scale:

- Energy taxes/final energy consumption (top curve), which increased by 15-20% between 1996 and 2001;
- Final energy consumption/GDP (bottom curve), which decreased by about the same amount over the same period (indicating the likely effectiveness of the energy tax increase in reducing the energy intensity of economic activity);
- The implicit tax on labour (middle curve), which declined slightly over the period shown.

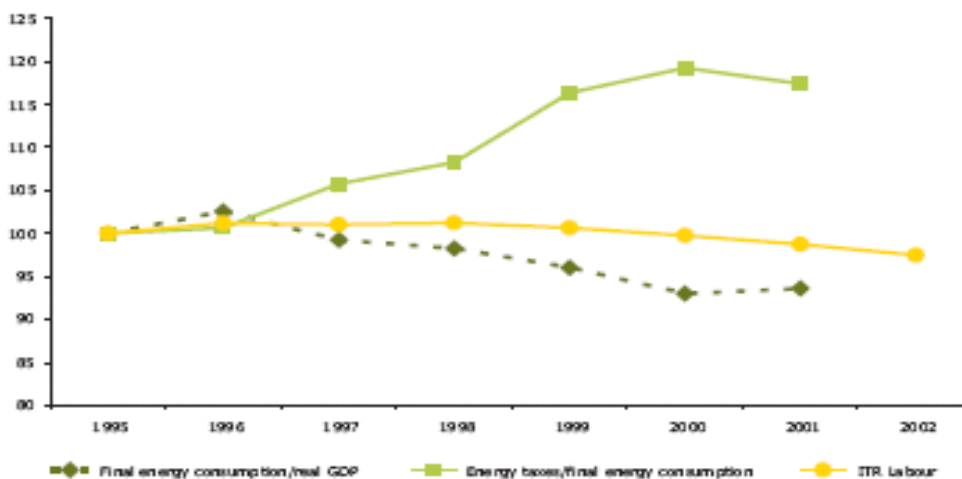


Figure 3.1: Evolution of energy intensity (bottom), implicit tax rate on energy (top) and on labour (middle) in EU-15, 1995-2002 (Source: Eurostat, as cited in EEA 2006, p.30)

In sum Figure 3.1 shows that there has been some ETR in EU-15, with energy taxes substituting to some extent for labour taxes, and reducing energy intensity (and, almost certainly, the environmental impacts from energy). This indicates progress in respect of both environmental sustainability and fiscal structure.

Case Study: Tackling congestion

Traffic congestion is a major problem in practically every city in the world, causing increased pollution from vehicles and inflicting high economic costs, as essential business and other activities are impeded. Despite this, relatively few cities have sought to tackle the problem through the obvious economic instrument – congestion charging. Two of the most successful examples of this policy are Singapore and London.

Singapore operates both road toll charges and congestion charging. A manual road charging system was introduced in the 1970s, but electronic road pricing, and congestion charging in the Central Area, has operated since 1998. For Singapore residents charging is effected through a Cash Card, which can be bought/topped up at retail outlets, banks, petrol stations and automatic machines, and is fixed to the vehicle windscreen. Different charges for different roads at different times are automatically deducted from the Cash Card as the vehicle passes under gantries. On introduction of the system there was an immediate reduction of 24,700 cars during peak periods, and a 22% increase in traffic speed. Traffic in the zone during charging period decreased by 13% from 270,000 to 235,100 vehicles, with a reduced number of solo drivers and a shift in trips from peak to non-peak periods.

Source: <http://www.transalt.org/campaigns/sensible/congestion.html#s>

A congestion charge was introduced in central London in February 2003. The main aim of the scheme was to reduce traffic congestion in and around the 22 km² charging zone. Revenues are used to improve transport in London more generally. Vehicles entering central London, or those parked on the capital's streets, on weekdays during the day, were initially subject to a GBP 5 daily charge, which can be paid electronically, and this increased to GBP 8 in July 2005. Certain vehicles, e.g. taxis, motorcycles, buses and low-emission vehicles, are exempt, while some users, e.g. residents and the disabled, are eligible for discounts. A recent review of the charging system found that congestion within the charging zone has reduced by 30% and that the volume of traffic has reduced by 15%. Bus services in the zone have improved. The evidence suggests that the charge has had little direct negative impact on business, but has had benefits in terms of environmental amenity and reduced traffic emissions. There is currently a consultation on whether the scheme should be extended to cover more or less double the area of the existing charging zone (source: EEA 2006, p.28).

Using Regulation and Information to Drive Energy Efficiency

Studies routinely show that increasing the energy efficiency of both consumption and production is one of the most cost-effective ways of reducing both local and global pollution from energy use, and, of course, of using fewer energy resources to deliver economic output than would otherwise be necessary. However, it is also the case that, left to itself and for reasons that are now quite well understood, market decisions alone are slow to take up the available energy efficiency potential.

One response is to seek to increase the uptake of energy efficiency through regulation. One example from the UK is that building regulations were changed such that from April 2005 energy-efficient condensing boilers would need to be installed as the norm. Figure 3.2 shows that before 2005 the market uptake of condensing boilers was relatively small, despite their cost-effectiveness over their whole life, because of their greater initial cost. However, since the regulation has taken effect, condensing boilers have increased their sales to over 80% of the market.

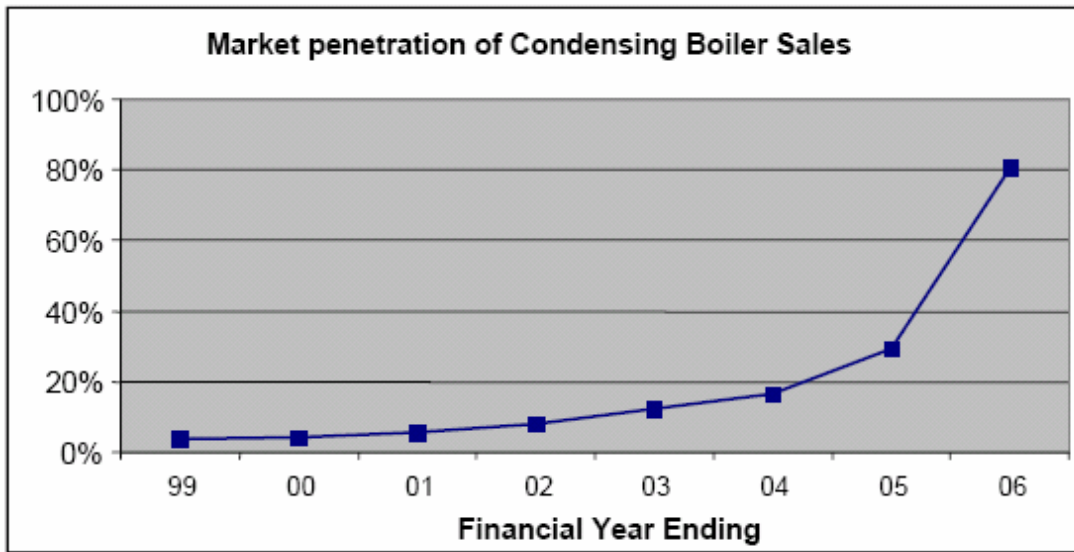


Figure 3.2: Penetration of condensing boilers as a percentage of the total boiler market from 1998/9 to the end of 2005 (source: Lees 2006, p.37)

In addition to implementing such regulations, over more than ten years the UK has pioneered a way of seeking to drive the market for energy efficiency, by requiring energy suppliers to make investments in energy efficiency goods and technologies such that they save a specified amount of energy over a certain period (six countries in the EU now have some kind of energy efficiency obligation, but the UK's scheme is the largest). The early schemes were called Energy Efficiency Standards of Performance (EESOP), and the most recent scheme Energy Efficiency Commitment (EEC). Figures 3.3 and 3.4 shows that the level of savings required under EEC have been dramatically increased over the EESOP requirements. The most recent evaluation of EEC showed that electricity was saved at an average cost of 1.3p/kWh, compared to a (2004) retail price of 6.7p/kWh, and gas for heating and cooking was saved at a cost of 0.5p/kWh, compared to a (2004) retail price of 1.7p/kWh (Lees 2006, p.7), so that EEC has delivered large consumer, as well as environmental, benefits.

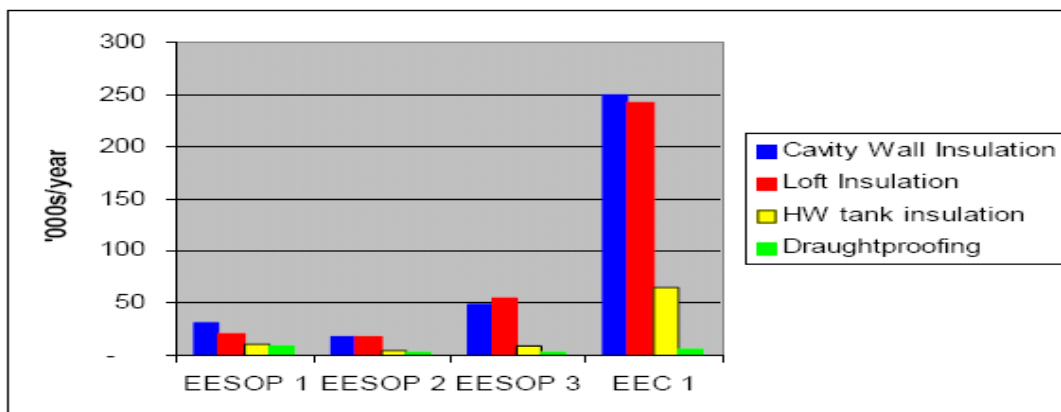
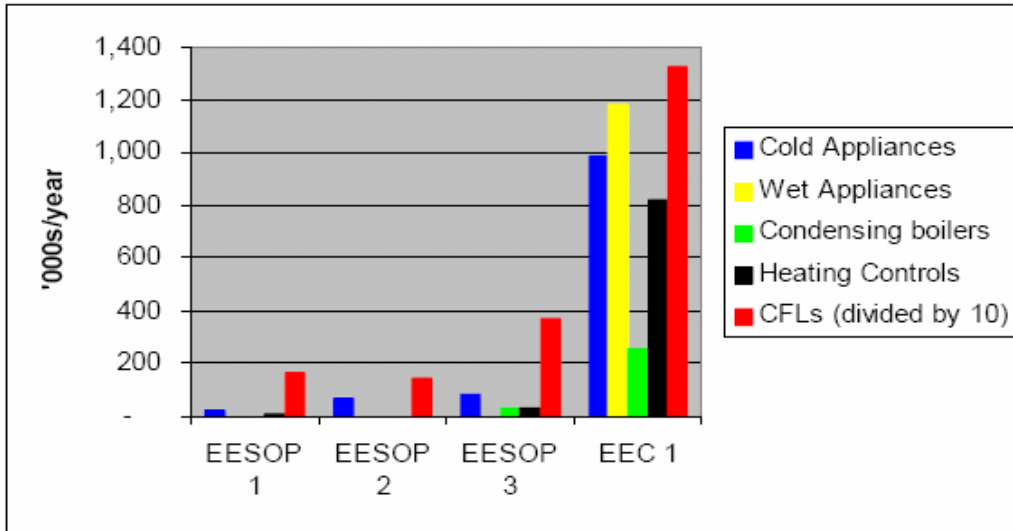
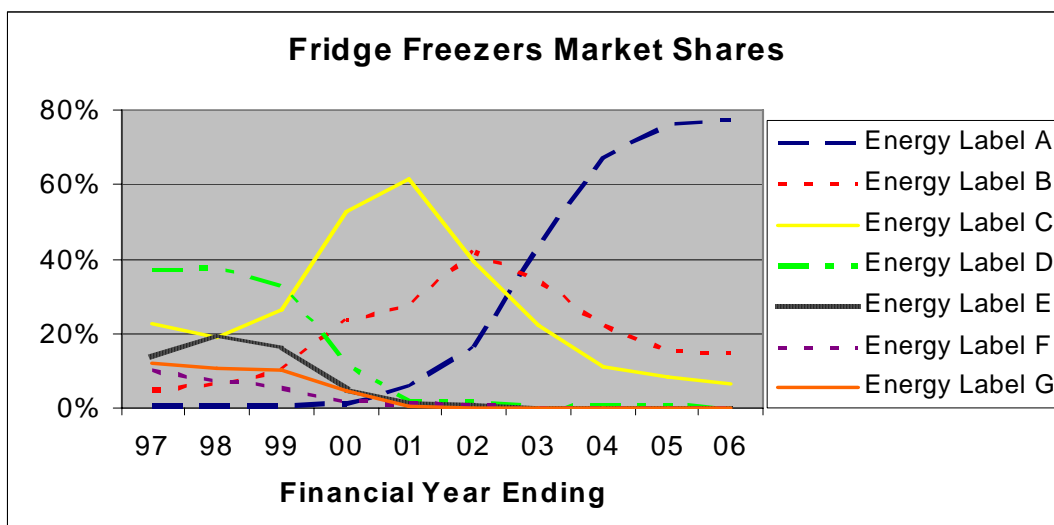


Figure 3.3: Average number of insulation installations per year supported by energy suppliers in the first 4 phases of the GB Energy Efficiency Obligations.



The move towards condensing boilers is an example of what has come to be called 'market transformation', and this has been apparent also in other areas driven by EEC. Figure 3.5 shows how the market shares of the most energy-efficient fridge freezers, wet appliances (e.g. washing machines) and dishwashers have evolved since the EEC was introduced in 2002.

Figure 3.4: Average number of appliance installations per year supported by energy suppliers in the first 4 phases of the GB Energy Efficiency Obligations.



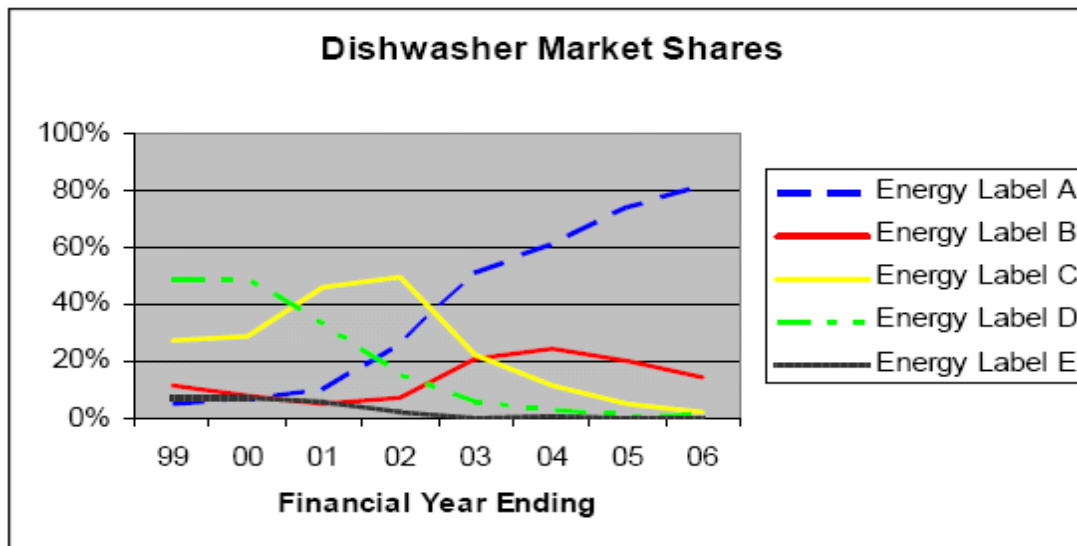
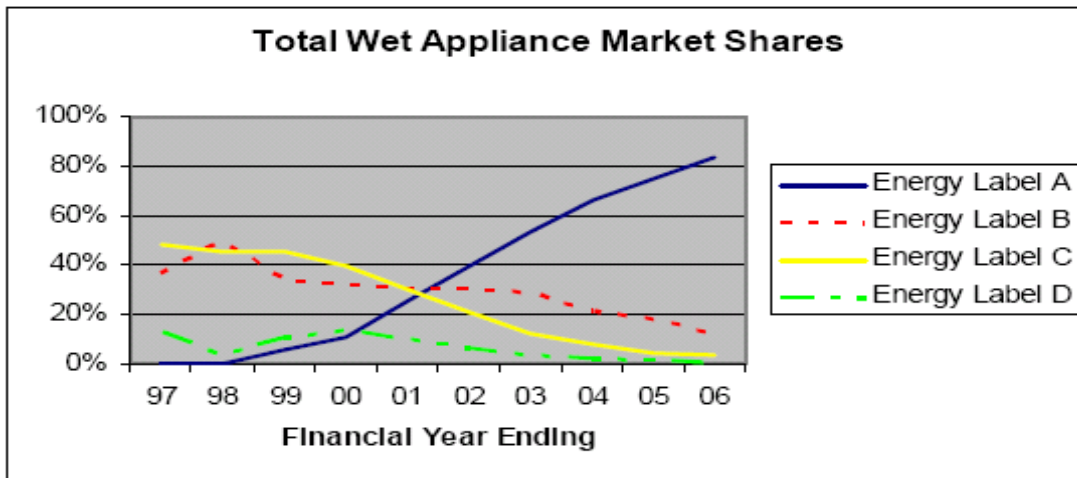


Figure 3.5: Development of the fridge freezer (top), total wet appliance (middle) and dishwasher appliance (bottom) markets by energy rating to end September 2005

It is important to note that this kind of market transformation is the result of a number of actors coming together, rather than just a function of the EEC obligations. These factors are (Lees 2006, p.34):

- EU energy labelling
- EU Minimum Performance Standards
- Marketing campaigns by the Government and its agencies, like the Energy Saving Trust
- Consumer advice from the Energy Efficiency Advice Centres

- Media coverage on climate change
- Retail staff training and point of sale material from the Energy Saving Trust
- Energy Efficiency Recommended branding and advertising
- EESOP and EEC funding for incentives for consumers to purchase the energy-efficient models
- Uplift factor (and extra incentive) in EEC1 to encourage market transformation

Similarly the increased uptake of condensing boilers would not have been possible (and their installation would not have been made mandatory) without prior work of information and training to ensure that installers in sufficient numbers were both aware of the technology and capable of installing it. So often it is a combination (or 'package') of complementary policies that is required for real effectiveness.

There now follow a number of shorter case studies from different countries which further exemplify some of the points which have already been made.

Case Study: *China introduces consumption taxes for environmental protection*

Source: China Daily 23/03/06; RRF 22/03/06; RRF 22/02/06)

China's current Five-Year Plan (2006-10) lays great stress on energy conservation and sustainable development. From April 2006 some consumption taxes increased in a bid to help the environment and narrow the gap between rich and poor. Taxes on yachts, luxury watches, golf clubs, large-engine cars, chopsticks and wooden floor panels are rising by 5-20%.

Oil consumption by automobiles has been increasing rapidly as a result of fast-growing vehicle sales. China is the world's No 3 vehicle market after the United States and Japan. According to the State Council Development and Research Centre, automobiles are expected to consume 138 million tons of oil a year by 2010, accounting for 43 per cent of the nation's total consumption, with the proportion rising to almost three-fifths by 2020 (in 2000, the figure was one-third). The Research Centre predicted that China's annual vehicle demand would reach 9.4 million units by 2010 and 18.9 million units by 2020, up from 5.7 million units last year.

From April 1st 2006 consumption taxes on passenger vehicles with engine capacity larger than 2 litres rose to a maximum of 20% from 8%. At the same time, levies on cars with engine capacity between 1 and 1.5 litres was cut to 3 per cent from 5 per cent. The changes are apparently to curb people from buying gasoline guzzlers, such as sport utility vehicles (SUVs) and large sedans, and conserve oil. The new tax policy is expected to encourage people to buy economy cars. The government also announced that consumption tax would be levied on oil products in a move to regulate and reduce energy usage.

Partly in anticipation of the tax move, Tianjin FAW Xiali Automobile, an affiliate of China's top vehicle maker First Automotive Works Corp, announced in 2006 that it would launch nine new models in the following five years to be a leader in China's economy car market. The company aims to double its sales to 400,000 vehicles by 2010 from 2005. The new tax policy drove down shares of manufacturers of SUVs and large sedans. In one day, shares of Hong Kong-listed Great Wall Motor, China's biggest SUV producer, tumbled 3.8 per cent.

China also produces about 45 billion pairs of chopsticks a year, consuming millions of birch, poplar and bamboo trees. Now the Chinese government is introducing a 5% tax on disposable wooden chopsticks. The disposable splints of wood, usually between eight and 10 inches long, have long been a target for Chinese environmentalists. School children have written to the Chinese prime minister asking for a ban on disposable wooden chopsticks, while students have persuaded some college cafeterias to replace them with spoons. In recent years, the government has actually encouraged their use, in a bid to reduce the spread of infectious illnesses by sharing eating utensils.

The Hong Kong Special Administrative Region (HKSAR) government also has plans to introduce environmental taxes, and tax reductions, to encourage pro-environment behaviour, (LegCo). Citing the polluter pays principle, the secretary of the environment, transport and works will introduce a bill to the Legislative Council (LegCo) later in the year to provide a legal framework for producer responsibility schemes. The products to be regulated under the schemes will include tyres and plastic bags. The Environment, Transport and Works Bureau will levy a fee on tyres and require the industry to be responsible for their recovery and recycling. With regard to plastic bags, the HKSAR authorities are intending to introduce legislation prohibiting their free distribution and to levy a tax to deter their use. On the tax reduction side, it is proposed that electric vehicles will be exempt from first registration tax for a further three years, with a possible tax reduction for hybrid vehicles in the future.

Case Study: *Shanghai targets food waste*

Source: Xinhua News Agency, as reported by RRF 27/02/06)

Chinese officials have urged a clampdown on food waste in restaurants as wining and dining in Shanghai alone leaves up to 1,100 tons of food a day. A recent survey revealed that 81% of Chinese diners cannot finish all their food and 28% never take their leftovers home, the report said. The survey also found that men aged between 30 and 40 are the most extravagant at dinner tables, apparently ordering excessively and not taking away the leftovers. Though no official statistics are available, mainland Chinese are probably wasting 60 bln yuan (USD1 = 8.05 yuan) a year at hotels and restaurants. In Shanghai, the 1,100 tons of food waste a day at the city's hotels and restaurants not only reflects badly on efforts at eradicating poverty, but has also become an environmental problem. This has led the government to kick off a 'green' campaign urging restaurants to persuade customers not to over order and to take their leftovers home in environmentally-friendly containers.

Case Study: South Korea raises price of rubbish bags by 40%

Source: The Korea Times reported in RRF 16/01/06)

Korean households and businesses are required to purchase and use specific garbage bags issued by their respective municipal governments when disposing waste. They also need to separate recyclable items from conventional waste that are put into the garbage bags and buried in landfills. Local governments set their own prices for garbage bags whose colors and designs are different from one municipality to another. The bags issued by a certain municipal government cannot be used in other cities and provinces.

Now the government of South Korea has decided to raise the prices of plastic garbage bags by some 40 percent over the next three years to encourage businesses and households to generate less waste. South Korea has saved a total of 7.7 trillion won on waste disposal costs, and earned 311 billion won from recycling various items, over the past decade when the government introduced the current volume-rate garbage disposal system. Korea's daily per-capita waste generation has decreased 23 percent to 1.03 kilograms in 2004 from 1.33 kilograms in 1994, while the amount of recycling rose 175 percent. The per-capita figure is less than the average of Organization for Economic Cooperation and Development (OECD) member nations which is 1.56 kilograms of waste per person.

Apparently a substantial number of households, particularly in rural areas, still illegally incinerate and dump garbage to avoid paying for the garbage bags. It plans to improve the current reward system for those who report illegal activities regarding waste disposal, and encourage municipal governments to computerize garbage collection and disposal procedures.

Case Study: European consumption outpaces efficiency improvements and damages environments elsewhere

Source: EEA 2005

Despite a policy focus on sustainable consumption dating at least from the Johannesburg World Summit on Sustainable Development (WSSD) in 2002, the growth of European consumption in key environmentally damaging areas is both outpacing improvements in efficiency and therefore resulting in increased environmental damage overall, and causing environmental damage outside Europe, because of the increased sourcing of food and raw materials abroad.

These were the key conclusions of a report by the European Environment Agency on household consumption and the environment (EEA 2005), which looked in detail at consumption trends and patterns in four important and growing areas of consumer spending (which were also the focus of SCR 2006):

- *Food and drink*, the consumption of which accounts for about one third of total household environmental impact, mainly from food production and processing in Europe and other parts of the world. Food packaging waste (more than two thirds of all packaging waste) also continues to grow.
- *Housing*, including the household use of energy and water and generation of waste. Homes are becoming larger and more luxurious, with more electric appliances of all kinds, and more people are buying second homes. Energy use in homes for

both space heating (which accounts for 70%) and appliances continues to grow.

- *Personal travel and mobility*, greenhouse gas emissions from which increased by 20% over 1994-2004, because, although cars generally became more energy efficient, this was outweighed by the growth in transport demand and the increased use of heavy and relatively fuel-inefficient cars.
- *Tourism*, which is growing by 3.8% per year, which is both driving high rates of increase of environmentally damaging air travel and resulting in the consumption of large amounts of energy, water and natural space, especially in more luxurious destinations.

Of course, for many consumers these trends are perceived as benefits: "Many Europeans live in better, more convenient and larger houses than previously. They have access to a greater quantity and variety of food from all over the world. They can buy large cars, travel to foreign countries, and the large majority of Europeans have unprecedented access to health, social and educational services", contributing to an average 8-year increase in life expectancy since 1960 (EEA 2005, p.18).

Despite this, there is academic research that questions whether these benefits have actually resulted in an overall increase in quality of life (Offer 2006). Certainly the EEA report makes clear that consumption patterns are both driven and constrained by a "complex mixture of institutional, social and psychological factors" (EEA 2005, p.21), which leads to seemingly irrational consumer behaviour such as that described in the next brief case study, but also to the possibility that consumer values may evolve and change, perhaps under the influence of traditional values (as explored in Section 5) to be less environmentally damaging.

Case Study: UK - women "buy clothes they never wear"

Source: RRF 7/01/06

Last year, women in Britain spent more than £7 billion buying clothes, shoes and accessories they will never wear, according to a survey of 2,518 men and women in December 2005.

Women have 14 items of clothing, on average, lurking in the back of their wardrobes that they have not worn in the last year, the survey by home insurer Churchill found. Each unwanted item cost an average £21.82, which meant the country's 24 million women spent £7.3 billion last year on clothes they did not wear, the insurer said. Nearly two-thirds of women (62 percent) said they bought their fashion follies in the sales, the same proportion as bought clothes a size too small in the hopes of dieting to fit their latest finds. The survey found that women were spending an average £305 a year on clothes they would never wear, or £12,810 in a working lifetime.

While women had the greater number of wardrobe follies, men were found to have on average nine items of clothing unworn at the back of their closets. Women were more likely to make purchases of shoes that would never be worn, while men unworn clothes were most often shirts.

3. PROMOTING PRODUCER INNOVATION

For most products a sizeable proportion of their environmental impact is generated during the use phase. While patterns of use can affect this impact, much of it is a function of the design of the product, and consumers are only able to reduce the impact to a limited extent. This is obviously especially true of, for example, the energy efficiency of buildings and energy using appliances, and of the ease with which products can be recycled.

The previous section has already discussed how 'market transformation programmes', driven largely by consumer labelling, can stimulate producer innovation in the manufacture and design of products, in order to reduce their impacts in use. This section explores how other public policies, such as producer responsibility legislation, can both achieve the same results in terms of 'eco-design', and increase the proportion of materials that is reused or recycled following the end of life of the products in which they are embodied, i.e. how producer innovation can also contribute to transforming wastes into productive resources.

Producer Responsibility: Shifting the Emphasis from Goods to Services

Concern with waste in the European Union dates from 1975, with the introduction of the Framework Directive on Waste (75/442/EEC) in 1975. This was amended in 1991 (Directive 91/156/EEC) to require Member States to "take measures to restrict the production of waste particularly by promoting clean technologies and products which can be recycled and re-used ; to encourage the recycling of waste and re-use of waste as raw materials ; to adopt specific rules for re-usable waste". In particular, in what reads in retrospect like a comprehensive strategy to promote eco-efficiency, Article 3 stipulates that Member States shall take appropriate measures to encourage "the prevention or reduction of waste production and its harmfulness, in particular by the development of clean technologies more sparing in their use of natural resources and also the technical development and marketing of products designed so as to make no contribution or to make the smallest possible contribution, by the nature of their manufacture, use or final disposal, to increasing the amount or harmfulness of waste and pollution hazards". They should also encourage the "recovery of waste by means of recycling, reuse or reclamation or any other process with a view to extracting secondary raw materials, or the use of waste as a source of energy". (cited in Gervais 2002).

Also in 1991, as part of its Fourth Environmental Action Programme, the European Commission established a Priority Waste Streams (PWS) programme, whereby action plans for particular types of waste were applied, applying the objectives and principles of sustainable development, preventive and precautionary action and shared responsibility. The initial PWS identified were packaging of all kinds, used tyres, end-of-life vehicles, healthcare waste, construction and demolition waste and waste from electrical and electronic equipment. Devising strategies to deal with these wastes led directly to the concept of producer responsibility.

Producer responsibility legislation requires industry and commerce involved in the manufacture, distribution and sale of goods to take greater responsibility for the disposal and/or recovery of those goods at the end of their useful life. With 'extended producer responsibility' (EPR) producers are required to be "financially or physically responsible for their products after their useful life" (Hanisch 2000). Taken to its logical conclusion, this would mean that when a product is sold, the ownership of the materials, and the responsibility for their collection and disposal at the end of the product's life, remains with the producer, while the purchase by the consumer is actually of the services provided by the product during its life (or until the consumer sells on the product) rather than the product itself.

As implemented in various countries, particularly the European Union, “EPR requires that producers either take back spent products and manage them through reuse, recycling, or remanufacturing, or delegate this responsibility to a third party, a so-called producer responsibility organization (PRO), which is paid by the producer for spent-product management.” In the United States, EPR is normally implemented through voluntary agreements. It is anticipated that EPR will encourage producers to design their products in such a way that involves less material use and greater use of recycling. Experience in Germany indicates that this has already happened for cars, office machines and cameras. Asian countries such as Japan, Taiwan, and Korea, and some South American countries, including Brazil and Peru, are also adopting EPR programs. Although a variety of EPR systems are in operation, there are underlying commonalities. All are strategically focused on the post-consumer phase of products and imply that producers have physical and/or financial responsibility for product waste management. All approaches also set target quotas for waste reduction and recycling.

“EPR began in Germany in 1991 with the German Packaging Ordinance. The country was then facing a severe landfill shortage, with packaging waste amounting to a significant percentage—30% by weight and 50% by volume—of the nation’s total municipal waste stream.” (Hanisch 2000) The Ordinance made industry responsible for handling its packaging waste, requiring producers of all kinds of packaged products to take back their packaging either individually or join the Duales System Deutschland (DSD), an industry packaging waste management organization. “For a fee, DSD licenses its green dot label to producers, who then are allowed to print it on their packaging—the green dot on packaging waste lets consumers know that they can use the DSD collection system. Green dot-labelled plastic, metal, and composites are collected in yellow bins or bags located at households; glass and paper are collected in separate bins or drop-off containers.” (Hanisch 2000)

In 1994, the European Commission developed a packaging waste directive as part of its PWS programme and to achieve some harmonization among packaging waste reduction strategies in different countries. The EU Packaging Directive (94/62/EC) aimed at, and succeeded in, reducing packaging waste generation by 50% throughout Europe by 2001, and achieving recycling of at least 25% of all packaging materials combined, including a minimum of 15% for each type of material specified in the directive. In 1999, the Landfill Directive (99/31/EC) banned the landfilling of tyres from 2006; the End-of-Life Vehicles (ELV) Directive (2000/53/EC) followed in 2000, and the Waste Electrical and Electronic Equipment (WEEE) Directive (2002/96/EC) in 2002, both stipulating take-back requirements and minimum recycling rates for their respective products.

The ELV and WEEE Directives, in particular, have not proved easy to implement. The experience of the UK with the WEEE Directive, the implementation of which has been substantially delayed, is not atypical and is instructive of the kinds of problems which can arise. This is followed by an account of how the implementation of the Directive is being approached in Romania, a candidate country for accession to the EU.

Case Study: UK - Government reports on WEEE review

Source: RRF 3/4/06

On 14 December 2005 Malcolm Wicks, Minister for Energy, announced a review of the implementation of the Waste Electrical and Electronic Equipment Directive in the UK was announced by the UK Government in December 2005, with the purpose of engaging in dialogue with stakeholders before proceeding with formal consultation on the draft regulations.

The Review concluded that UK implementation of the WEEE Directive should have the following main features:

- Approved compliance schemes for retailers, which will establish networks of Designated Collection Facilities (DCFs);
- Obligatory registration for producers, which may be either direct or through an approved compliance scheme;
- A system for calculating producers' obligations under the Directive;
- A quasi-market mechanism for allocating WEEE from DCFs to producer schemes;
- A code of practice covering the collection of WEEE from DCFs;
- A network of Authorised Treatment Facilities, which will process WEEE and provide evidence of this to producers;
- Protocols to enable producers to demonstrate achievement of recycling targets in a cost effective way;
- A voluntary approach for producers to show the cost of handling historical WEEE.

Copies of the report of the review are available at: http://www.dti.gov.uk/sustainability/weee/WEEE_policy_review_conclusions.pdf

Case Study: *Romania implements producer responsibility for WEEE*

Source: RRF 20/01/06

All producers and importers of electric and electronic equipment have been required to register with the National Agency for Environment Protection (ANPM) by the end of April in order to comply with the settlements regarding the waste coming from WEEE sectors. Each producer will get a registration number that will be communicated to the stores where their equipment is sold. Without this serial number these producer will be forbidden to sell their products.

ANPM will give fines between EUR2,700 and 5,400 to the companies that do not comply with these requirements. The producers that do not register will be excluded from the market and the ones that comply will pay for the management of the waste coming from the electric and electronic equipment. Depending on the market share owned, each producer will start paying these taxes by the end of 2006.

For the management of waste the producers can join organizations or they can act individually. Presently only two groups have stated their intention of creating such organizations; one being a home appliances and TV set producer and the other being active in the IT sector. Producers can form several types of organizations to keep down the costs of waste management process.

The individual management of waste is likely to prove more expensive because the waste volume is smaller and the recycling costs are larger. The management costs for this type of waste will be present as the 'visible tax' that will be annexed to the price of a product, so the buyer will know the price of the purchased product and cost of its recycling.

As noted above, the producer responsibility is also well established in Asia. The following case study explores its application in Hong Kong.

Case Study: *Hong Kong explores producer responsibility and integrated*

waste management options

Source: RRF 22/02/06

In the eleven years to 2000, more than HK\$10.2 billion was invested in new waste management facilities in Hong Kong. These comprise three new sanitary landfills with leachate and gas collection; seven refuse transfer stations and refuse transfer facilities for the outlying islands; a chemical waste treatment centre; and a livestock waste composting plant. On the other hand, the amount of solid waste has been rising as a result of the continuous growth in population and economic activities. In 1999, the total amount of municipal solid waste (MSW) (which comprises domestic, commercial and industrial waste) generated was 5.2 million tonnes, representing a 45% increase over 1989. The amount of construction and demolition materials (which comprise soft inert materials, hard inert materials and non-inert waste) generated was 13.5 million tonnes, representing a 100% increase over 1989.

Product Responsibility Schemes (PRS): Under PRS in Hong Kong, manufacturers, importers, retailers and consumers of goods are required to take responsibility for the collection and disposal of end-of-life products. As a first step, the Administration has conducted a Regulatory Impact Assessment (RIA) of PRS on tyres and rechargeable batteries. In April 2002, a voluntary PRS programme was launched to recover mobile phone rechargeable batteries. Since then, 8.6 tonnes of batteries have been collected for recycling. The scheme was expanded in April 2005 to include other types of rechargeable batteries and to include more members of the trade. Following public consultation the Administration aims to implement the PRS on waste tyres by late 2006, with implementation of PRS for electrical and electronic equipment and for beverage containers envisaged for the future.

Integrated waste management facilities (IWMF) in HK: In late April 2002, the Administration invited local and overseas suppliers and facility operators to propose waste treatment technologies for the development of IWMF in Hong Kong. Six main technology types, namely composting, anaerobic digestion, incineration, gasification, a combination of mechanical and biological treatment as well combustion of fuel derived from waste for the production of cement, were identified. Based on these technologies, eight strategy options have been shortlisted, some of which comprise more than one technology, that appear to be suitable for Hong Kong:

- Option 1 – Incineration with energy recovery
- Option 2 – Gasification
- Option 3 – Close-coupled gasification-combustion
- Option 4 – Material Recovery and combustion of refuse derived fuel for cement production
- Option 5 – Mechanical-Biological Treatment (MBT)
- Option 6 – Composting and Incineration
- Option 7 – Anaerobic Digestion and Incineration
- Option 8 – MBT and Gasification

IWMF should adopt a multi-technology approach so that the most suitable technology could be applied to deal with different waste streams of MSW. The approach will be built upon and complement the existing efforts to promote waste reduction and recovery.

Waste will be reduced as far as practicable through various measures such as economic incentives and community education. It is hoped that 50% recovery rate can be achieved by 2014. Through the separation of MSW at source, recyclable materials will be recovered for recycling. Biodegradable materials will be separately collected for biological treatment. The remaining mixed MSW may then be treated by both MBT and one of the thermal technologies.

Under the influence of the producer responsibility, or some other concept, many producers are now innovating to reduce both the amount of waste they generate and the way in which remaining waste is managed. There follow a number of brief case studies which describe some of these experiences from different countries, the first three from Japan.

Case Study: *Sekisui House in Japan achieves zero waste at new construction sites*

Source: RRF 24/01/06

Sekisui House, a leading Japanese home builder, achieved zero waste at its new home construction sites in July 2005. They did this by also serving as an officially designated cross-regional recycler of industrial waste, granted by the Ministry of the Environment in September 2004, the first such designation for the construction industry. The designation was granted as an exceptional measure under the Waste Management and Public Cleansing Law, under which companies like Sekisui can collect and recycle their end-of-life products on a nationwide basis without applying to individual prefectures for approval.

At each construction site, waste is sorted into 27 categories and carried to the company's recycling center by delivery trucks returning from the site. These resources are further broken down into about 60 categories at the recycling center.

Sekisui House already achieved zero waste at all of its six factories in May 2002. Utilizing their existing recycling routes, the company has since successfully established a new system for construction waste. Some items are entrusted to outside recyclers depending on the type of material; iron, aluminum and concrete are recycled for use as building materials, and resin is recycled into pellets. Sawdust and degraded resin are processed at the company's own facilities and recycled into roof battens and interior materials.

Such efforts by Sekisui House have also helped reduce waste generation at construction sites. The average amount of waste from a construction site was reduced from about 2,900 kilograms in 2000 to about 1,800 kilograms in July 2005. Costs reduced through zero waste reached 39 million yen (about U.S.\$350,000) in July 2005 alone. The company expects costs to be reduced by about 250 million yen (about U.S.\$2.2 million) in the second half of its fiscal year ending in January 2006.

Case Study: *Food waste recycling using 'eco-money' starts shopping arcade in Kanagawa*

Source: RRF 23/11/05)

A recycling project for food waste using 'eco-money', a community currency, started in 2005 in Nakacho Main Street Arcade in Atsugi, Kanagawa Prefecture. Under this project, household food waste is collected and composted for local farmers to produce organic vegetables. The project is one of the "*Pilot Projects for Building a Sound Material Society*" approved by the Japanese Ministry of the Environment. The Association for the Promotion of Nakacho Main Street Arcade, the project's organiser, issues the eco-money when people bring household food waste to the 'Eco Station', a drop-off site in the arcade.

Each kilogram of the waste is rewarded with ten points of eco-money, which can later be used as 10 yen (about nine US cents) for purchases in the arcade. The collected waste is dried and composted before being distributed to the farmers in the city to grow organic vegetables.

By selecting organic vegetables grown locally with the local compost and providing them to people using the local currency, the association aims to establish a sound cycle of local produce for local consumption, while also revitalizing the shopping arcade.

Case Study: *Kyoto City starts project to create hydrogen from food waste and used cooking oil*

Source: RRF 23/02/06

Kyoto City has launched a research project to produce hydrogen for fuel cells from food waste and used cooking oil for the first time in Japan. This is a joint research project with Kyoto University, the Ministry of the Environment, and the Biogas Study Group.

The city built a biogas technology research plant in June 1999 in collaboration with the Biogas Study Group which then consisted of six plant manufacturers and Osaka Gas Co., and developed a technology to produce biogas, mainly composed of methane, by fermentation of industrial food waste. Using this plant, the city plans to produce biogas from household food waste and glycerin, a by-product generated in the process of making biodiesel fuel at the city's waste oil recycling facility. The city also intends to develop a technology with Kyoto University to convert biogas into hydrogen gas.

The aims of the research project are to put the conversion technology to practical use by 2010, and to generate electricity with fuel cells using the hydrogen at a biogas plant, which is scheduled to be built and start operation in fiscal 2013 at the second factory of the South Clean Center.

Case Study: *Finding twin solutions – biodegradable alternatives and recycling – to styrofoam 'white pollution' in China*

Source: RRF 23/01/06

Starting in the early 1980s, cheap, sanitary and food-preserving containers made of styrofoam, a major type of foam plastics, became widely used among Chinese people on trains and in the fast food industry. Many were discarded into the environment, resulting in white disposable tableware littered everywhere, many piling up along the railways and floating in the rivers. Eventually, people started to become concerned more about the so-called 'white pollution'. In 1991, experts from the packaging industry gathered for the first time to discuss strategies to alleviate the pollution.

First the State Environmental Protection Administration advocated recycling when dealing with plastic waste, but because styrofoam was hard to collect and took up a lot space, and some companies began to produce biodegradable single-use tableware, the government decided to ban its production and use.

However, the ban proved difficult to enforce and the production of Styrofoam continued to increase, while firms producing the more expensive biodegradable alternatives experienced economic difficulties. In Shanghai the emphasis switched to recycling and reprocessing Styrofoam, taxing its producers in order to subsidize garbage collectors, the reprocessing factory, the waste management department and garbage transport. Now in Shanghai, a comprehensive network has been established to collect more than 70% of styrofoam tableware for reprocessing elsewhere. The plastics from used containers can produce plastic granules,

which are used as raw materials for hard plastic products like rulers, buttons and cups.

Case Study: C&A mines buildings for resources instead of the Earth.

Source: RRF 13/02/06

C&A Floorcoverings (C&A) has recycled more than 100,000,000 pounds of reclaimed vinyl and vinyl-backed carpet, since it introduced the *Infinity Initiative* 10 years ago.

Housed at Tandus' Center for Environmental Innovation, C&A's recycling programme recycles any post-consumer vinyl-backed carpet, regardless of original manufacturer, into 100% recycled content backing for new ER3(R) floor-coverings. Containing a minimum of 25% post-consumer carpet, the remaining 75% of the ER3 backing system consists of post-industrial waste generated during carpet manufacturing and industrial waste from the automotive industry.

Because old vinyl-backed carpet and vinyl waste is the only feedstock for its ER3 backings, C&A instituted FLOORE, a "buy-back" programme offering customers financial incentives to return and recycle their old vinyl-backed carpet. The company's sustainable warranty guarantees to customers that all carpet returned will be recycled in its entirety and that no portion will be landfilled, incinerated (including waste-to-energy) or disposed of in any other way.

Also made at the Center for Environmental Innovation, and using the same process and equipment as the ER3 backing, C&A's *ethos* backing is created from the PVB film reclaimed from laminated safety glass after its useful life. Manufacturers have recycled the glass for years, but few had delved into additional uses for recovered PVB. Overall, C&A products made with *ethos* contain 30-62% recycled content, with a minimum of 30% post-consumer content.

Case Study: Coconut waste in the Philippines is turned into a useful resource

Source: RRF 02/02/06)

The husk of the coconut fruit, the most ubiquitous plant in the Philippines, has been turned a tough but biodegradable netting that anchors the soil on sloping land as well as river banks, protecting against erosion while encouraging the growth of vegetation. The product, called 'coconet', has been adopted in infrastructure projects all over the Southeast Asian archipelago, as well as in China and Sri Lanka.

In the coconut-growing regions of the Philippine, the dried coconut meat, or 'copra', was the only part of the tall plant that had recognised economic value - the raw material for vegetable oil, soap, animal feed and industrial processes. The discarded husks were the largest waste product of the regions, with an estimated 75% of 12 billion coconut husks a year thrown away. Former agriculture college dean Justino Arboleda found a way to mill the husks, convert them to fibres, which the women of the village could spin into a tough thread which in turn is woven into the netting. The net could then be laid onto sloping land, especially the kind left behind in road construction.

Using his life savings and money borrowed from relatives, Arboleda in 1995 set up a company with an initial capital outlay of less than \$4,000. A factory was set up in Bicol, to make use of the excess labour in the area. The company is now worth about \$2.3

million, with around \$1.5 million in sales last year. The company subcontracts the thread and net-weaving to local farming families, giving them an extra daily income of 150 to 200 pesos (R17 to R23) a day. The product not only holds the soil down against erosion. It absorbs water, preventing soil runoff from rains while serving as a fertile bed for plant growth. It can also be installed manually unlike alternatives which often require heavy equipment. The product is now used to shore up the exposed earth in dam and highway projects in the Philippines, preventing landslides in hillside housing projects and covering garbage used as landfill.

Arboleda recently sealed an agreement with China to study how coconet could be used in slowing desertification. In addition, he has found a way to use the dust produced when coconut husks are made into fibres. He turns it into 'coco-peat': a fertile, porous soil-like material which can be used as a growing medium for plants and can be shaped like bricks, pots or posts, for ornamental vegetation.

Case Study: *Boots and Coca-Cola Enterprises join trial to close the plastic packaging recycling loop*

Source: RRF 4/11/05)

The rPET project seeks to boost the use of recycled PET (rPET) in the UK packaging industry. Funded by WRAP (the UK Waste & Resources Action Programme), the rPET project has already seen Marks & Spencer working in conjunction with Closed Loop London to introduce post-use recycled plastic in the packaging for its 'Food to Go' range. Now, products from the two other partners in the trial - Boots and Coca-Cola Enterprises Ltd (CCE) - are available to consumers throughout the UK.

The CCE trials involve 500ml 'diet Coke' bottles as well as various other CCE products. It is the first time that CCE has trialled mechanically recycled plastic in its bottles in Great Britain. CCE is testing different types of recycled PET (including flake and pellet) at 25 per cent inclusion rate and around 1,000 tonnes of rPET will be used in total during the trial. All recycled materials have passed CCE's stringent testing requirements and been fully approved by The Coca-Cola Company, and are now in production. It is estimated that over 150 million 500ml bottles will be manufactured during the course of the trial.

The products being trialled by Boots are also now on sale in stores. The company's high profile 'Ingredients' range is being packaged in bottles with a 30 per cent rPET content, providing an opportunity to research the use of rPET in a non-food sector. The project will assess the viability of using rPET in terms of efficient manufacture, product quality and consumer acceptance.

Case Study: *Plastic waste used to create road construction material in India*

Source: RRF 26/09/05

R.Vasudevan, the professor of chemistry at the Thiagarajar College of Engineering in Madurai, has discovered a novel method of re-using plastic waste to construct road surfaces that remain in their prime form for twice as long as normal tar roads, which are vulnerable to India's hot and extremely humid climate, where a combination of temperatures which frequently exceed 50°C and torrential rains leaves most of the roads with large potholes.

Plastic carry-bags and disposable cups are collected from garbage dumps across Madurai. When mixed with hot bitumen, the main ingredient of road-construction, the plastics melt to form an oily coat over the aggregate, and the mixture is laid on the road surface like a normal tar road. These 'plastic roads' remain stable even at 55°C, and the plastic enables the roads to withstand the rain much more than normal roads. The binding property of plastic also makes the road last longer besides giving added strength to

withstand more loads. Madurai's municipal authorities have already given the go-ahead to the novel method of construction and work has begun to use the bitumen-plastic mixture on some sections of the city's roads.

4. THE ROLE OF TRADITIONAL LIFESTYLES AND CULTURAL VALUES IN ECO-EFFICIENT CONSUMPTION

Globalisation and rapid economic development are leading to unsustainable patterns of consumption. At the same time they are also leading to the loss of traditional lifestyles and cultural values that promote sustainable consumption, such as frugality and the constrained use of natural resources. Many of these traditional value systems are highly relevant to modern societies and particularly the promotion of eco-efficient consumption. An important requirement for the creation of sustainable consumption patterns will be to identify, preserve and promote existing values and practices, in both the north and the south that contribute to sustainability.

There are indications that interest is growing in using traditional attitudes towards nature and society to promote eco-efficient consumption. For example, the Japanese government called on countries in Asia and the Pacific to 'rediscover those elements in their traditional way of life suited to conserving the environment' and launched the Eco-Asia initiative to promote just this (EcoAsia 1998; Robins 1998). Traditional lifestyles and cultural values can be used to promote sustainable consumption through a number of practices, such as the adoption of more frugal lifestyles, sustainable agriculture, industrial practices that are based on local knowledge and sound stewardship of natural resources.

For policy-makers the challenge for the integration of traditional value systems and sustainable consumption is how to develop hybrid cultures that combine economic development, improved quality of life and traditional value systems. In developed countries the creation of a hybrid culture will require the regeneration of traditional values, which are largely forgotten. In developing countries the role of traditional value systems will need to be re-evaluated in the face of increasing consumption (Robins, 1999). This section provides details and case studies of some traditional value systems that promote eco-efficient consumption.

Sustainable use of natural resources

Where livelihoods are dependent on natural resources, communities and local groups develop institutional arrangements for their use and management. Successful common property institutions are those that last over a long period of time, constrain users to safeguard the resources and produce equitable outcomes. Research into common property institutions has informed how policy makers think about resource management and there are many examples of governments pursuing initiatives that devolve some of the control over resources to local users.

Sashi, Indonesia: An indigenous group in the Molluca Islands of Indonesia that are dependent on fishing for their livelihoods have a traditional custom known as 'Sashi'. For centuries, every year fisherman are forbidden to go fishing during a certain period of the year. This enables fish stocks to be regenerated and without this tradition fish stocks would become depleted (EcoAsia, 2006).

Ban Banh, Viet Nam: Deforestation has been a major issue in the Lai Chau Province of Viet Nam. One of the reasons contributing to this problem was weak institutional management created when the state managed the forest between the 1960s and 1980s. The state management replaced the traditional practices of the Thai community (an ethnic minority group), which had promoted the

traditional management of the forest, using indigenous knowledge and customary laws. In 1989 a government land reform allocated forest and agricultural land to individual households for long term use. The Thai community in Ban Banh organised themselves to manage the forest as common property by reviving and adapting their traditional management practices. Since then, the Lai Chau Province's Department of Forest Protection has developed guidelines, based on the Ban Banh model, for application across the whole province. Between 2000 and 2003, 1,785 communities had adopted the Ban Banh model of common property management (APEIS 2004).

Sustainable agriculture

For hundred of years traditional agricultural systems have involved the sustainable management of environmental resources, such as biodiversity, water and land. In the 20th century these traditional systems, and the livelihoods that depend on them, were affected by the modern, export-oriented system of agriculture. More recently, there has been a growing movement towards sustainable agriculture, which emphasises the importance of integrating economic viability with environmental health and social benefits. Increasingly researchers are looking towards traditional agricultural systems not only as reserves of genetic diversity, but also as important resources to improve nutrition, food security and incomes for the rural poor in developing countries.

Self- sufficient production in Sri Lanka: In Sinhalese and Tamil villages all the commodities necessary for daily life, such as cereals, vegetables and spices used to be produced within the territory of the village. For example, a pond in the village would be used to cultivate fish, and orchards were planted around the village. The production and material balance was restricted by the carrying capacity of their territory and the entire production system was organised so as to minimise impacts on the local environment. This traditional lifestyle has in recent years been affected by the western agricultural system and in the 1980s a policy was adopted that limited production of export commodities only to the individually specialised traditional goods of the village (EcoAsia 1998).

Neglected and underutilised crops: Of more than 7,000 crop species that are cultivated today, only 30 or so have been intensively and widely used. Neglected crops are those grown primarily in their centres of origin by traditional farmers, for example the Andean grain quinoa (*Chenopodium quinoa*). Underutilised crops are those that have fallen into disuse for a number of agronomic, cultural and economic reasons, such as millet in southern India. There is growing interest in these neglected crops as they have the potential to contribute to food security and improve nutrition, increase incomes of the rural poor and contribute to ecosystem stability. Despite these advantages, small farmers growing crops outside the mainstream find it difficult to enter international markets. The biggest challenge for their wider use is the creation of a global marketing system. Better policy and legal frameworks are required that support the small scale production of neglected crops in areas that are not particularly fit to grow major crops (IPGRI 2006).

Frugality

Frugality and an emphasis on meeting perceived real needs rather than induced desires are characteristics of many cultural value systems. Frugality is considered not only to be good for the individual, as the control of material desires constitutes the basis of moral self-discipline, but also for society by increasing social stability. The goal in the adoption of a more frugal lifestyle is to develop a balance between consumption and frugality in such a way that benefits economic development whilst promoting the development of both the individual and society (Zhongzhi 2001).

'Mottainai Furoshiki', Japan: The average household in Japan creates around 12.5 tonnes of waste a year and consumes the same amount of natural resources. The Japanese Minister of the Environment, Yuriko Koike, recently launched the 'Mottainai Furoshiki' as a symbol of Japanese culture in an effort to encourage individuals to reduce waste. 'Mottainai' means 'too precious to waste' and a 'furoshiki' is a traditional Japanese wrapping cloth, which can be used to carry everything from books to food. The modern-day 'mottainai furoshiki' is made from a fibre manufactured from recycled PET bottles and it is hoped that it will provide an opportunity to reconsider the possibilities of a sound material cycle society (Ministry of the Environment 2006).

Sustainable Design

Case Study: Cave dwellings in China inspire sustainable design

Source: RRF 05/04/06

There are more than 20 million people currently living in traditional cave dwellings in China, especially in the loess plateau along the Yellow River in the northwest part of the country, and people are still building new cave dwellings today. Although basic by modern Western standards, these dwellings provide residents with reliable shelter, making the best use of materials available with a minimum negative impact on the environment.

In 2005, volunteers from the charity Earthwatch helped scientists to conduct field studies of the cave dwellings in Dang Jia Shan, a generations-old mountain village of 30 households. They measured the physical dimensions of the structures, photographed the building materials, recorded temperatures to examine thermal performance, and interviewed villagers about functional design and construction methods. Based on these data, a life cycle analysis was conducted to examine the environmental impact of the cave dwellings.

The research found that almost all the features of traditional cliff cave dwelling coincide with modern sustainable design principles. The cave dwellings reflect a core concept of Chinese culture – being in harmony with nature. They are the result of a people's adaptation to their environment with limited natural and technological resources, enabling the people and their culture to survive in this area for hundreds of years without leaving heavy marks on the environment. Examples of sustainable design features found in the caves include the fact that they are built entirely from materials acquired nearby and using simple hand tools, avoiding the added environmental costs of manufacturing, transport, and heavy machinery. They do not occupy valuable arable land, so are very efficient in their land use. The cliffs face south, and the thermal mass of the solid loess provides solar warmth into the winter and a cooling effect into the summer. The research teams' findings on cave dwelling design will help inform the green design movement, which is central to sustainable development efforts.

New Crafts and Old Habits to Utilise 'Wastes'

Case Study: From waste to fashion bags in India

Source: RRF 06/03/06

Plastic bags are a major problem throughout India, as elsewhere, often ending up polluting the environment, littering streets and

blocking drains. In Delhi the organisation Conserve, set up by the Ahuja couple with their life-savings, employs rag pickers to scour the city's streets and waste dumps for plastic bags. Some women snip at the handles of the bags to make them into sheets; others wash them in water and detergent and hang them on a clothes line. These are then moulded together into single sheets of thick, durable plastic, and stitched into bright, colourful handbags.

Conserve has now become a highly successful enterprise, employing 300 people and with a turnover of around \$150,000. The Ahujas are now trying to convince the Indian Ministry of Culture to recognise what they are doing as a craft, but as yet without much success, because of a perception that a craft has to be at least 500 years old.

Case Study: Japanese women living in Bangkok launch foam recycling initiative

Source: RRF: 13.03.06

Municipalities in Japan make garbage sorting and recycling mandatory. Residents have to buy colour-coded garbage bags for recycling. More importantly, community members closely watch their neighbours. Disobedience means a social sanction. Regulations are less strict in Thailand, and more litter is discarded into the environment. This has caused a group of Japanese housewives in Bangkok to launch in September 2005 a foam garbage recycling campaign to dissuade people from discarding this type of waste into the environment.

The women placed two collection boxes, adapted from animal cages, in front of the Fuji and Villa supermarkets near Sukhumvit Soi 33, the area known as having the biggest Japanese community in Thailand and perhaps Southeast Asia. The campaign in Bangkok got off to a shaky start, with people throwing garbage and even cigarette butts into the box. The 14 panel members took turns cleaning the boxes every two days and circulated leaflets asking people to clean foam packaging before putting it in the container. Gradually non-Japanese people have also come to use the service.

Twice a week, a pick-up truck from P.P. Packaging Co collects foam to be recycled at its factory in Nakhon Pathom. Foam garbage is turned into stationery items such as pencil boxes and rulers. Each week, the factory collects around 400 foam boxes, the amount surges to 700 a week at festival times such as New Year or Chinese New Year.

The women plan to launch a new campaign, this time seeking to provide more raw materials (from food waste) for a garbage compost facility in Sukhumvit.

5. CONCLUSIONS AND RECOMMENDATIONS

The companion paper to this project 'Eco-Efficiency and Resource Productivity: Concepts, Indicators and Trends in Asia-Pacific', indicated that many trends in the Asia-Pacific region, as elsewhere in the world, are environmentally unsustainable. This paper has discussed and given examples of how public policies and citizen actions can reduce the environmental impacts of production, consumption and infrastructure provision.

These conclusions and recommendations derive both from the foregoing discussion, and from discussions at a UNESCAP workshop in Bangkok in April 2006, at which an earlier draft of this paper was presented.

1. The evidence currently suggests that the Asia-Pacific (AP) region is reproducing the 'Western' model of development, with high environmental impacts. If the AP region becomes a global production centre, as seems likely, pollution control and the encouragement of eco-efficiency will have to be more determined if resource constraints and very serious environmental impacts are to be avoided.
2. Systematic improvements in eco-efficiency and green economic growth will only be achieved by finding a new complementarity, and mutual reinforcement, between environmental policy and the market dynamics that drive innovation. While it is true that the market will not deliver green economic growth by itself, it is also true that market-driven innovation will be required to resolve environmental problems in ways that do not constrain economic growth.
3. The challenge for environmental policy, in all regions, is to promote eco-innovation, providing goods and services that people want while reducing environmental impacts. The innovation will be required in all areas of production and consumption, and in infrastructure provision. All four kinds of environmental policy (regulation, economic instruments, voluntary agreements and information provision) will be required to deliver this, but often implemented in new combinations and imaginative ways.
4. It has so far proved easier to reduce the pollution from production activities than to reduce the resource use and environmental impacts of consumer behaviour, especially in the particularly problematic areas of home energy use, food provision, personal transport and tourism. These areas particularly will require government to:
 - Provide information in new and attractive ways (e.g. meters for energy and water),
 - Mandate the design of environmentally sustainable products (e.g. homes, cars, electronic goods)
 - Ensure that price signals steer people towards these products and away from environmentally unsustainable behaviours
 - Set a good example through its own procurement and provision of public goods and services (e.g. in schools and hospitals)
5. Infrastructure is key to reducing long-term environmental impacts. For example, without energy efficient buildings, energy-intensive home living will inevitably increase with economic growth. Even if they are environmentally motivated, people as individuals cannot have environmentally sound lifestyles without appropriate infrastructural support.
6. Transport infrastructure is an especially important area of decision-making. If the AP region becomes as car-dependent as the old industrial countries (among which, in fact, Japan is among the least car dependent in terms of the share of car passenger transport in total transport), which is inevitable unless it invests seriously in rail and bus infrastructure, global oil supplies and prices would soon make such dependence unviable even if there were no considerations to climate change to be taken into account.
7. Individuals also need the support of civil society, both in terms of informal civil society groups and local government, in order to affirm both the legitimacy and value of environmentally sustainable lifestyles, and to bring peer pressure to bear on their opposite. A new emphasis on environmentally conserving traditional values, such as exist in many societies in the AP region in respect of agriculture, building design and the conservation and frugal use of natural resources, may help to foster a growth in social environmental awareness.
8. None of the above should be taken to deny that many people in low-income countries need to substantially *increase* their use of resources of all kinds in order to live decent and fulfilling lives. Enabling them to do this in ways that minimise environmental pressures is one of the main priorities of sustainable development. The other is for people in high-income countries, and for high-income people in low-income countries, to reduce the environmental burden of their consumption patterns, so that poorer people have the environmental space into which their consumption can grow.

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