Towards Sustainable Household Consumption?

TRENDS AND POLICIES IN OECD COUNTRIES

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Vers un monde de consommation durable des ménages ?
TENDANCES ET POLITIQUES DANS LES PAYS DE L'OCDE

FOREWORD

Sustainable consumption has become an important issue in national and international agendas. Changing unsustainable consumption patterns is crucial for achieving the goal of sustainable development. For many years, environmental policies were focused on the production side, mainly through pollution control and eco-efficiency. There was a lack of understanding of the consumption patterns and the drivers behind them, an understanding which is necessary to identify the appropriate role of governments in promoting more sustainable consumption patterns, and for the choice and implementation of different policy instruments.

Is achieving sustainable consumption in OECD societies an insurmountable challenge? Looking ahead to the nature and size of the problem in OECD countries, the challenge appears daunting – even without considering the still greater implications of a global community consuming in the style and on the scale of OECD countries. Ten years after the 1992 Earth Summit what can be said about the progress made in addressing the environmental impacts of household consumption patterns and what are the future priorities for action?

The OECD Environment Directorate has worked actively on sustainable consumption and the environment since late 1994. Over the course of 1999 to 2001, it led a comprehensive exploration of key household consumption patterns and drivers in OECD countries, the related environmental impacts, and policy measures to promote more sustainable patterns. This report provides a synthesis of that three years programme of work.

It describes the nature and magnitude of the challenge ahead to reduce the environmental impacts from current and projected household consumption patterns. The web of driving forces that shape household consumption patterns means that there are many options for influencing consumption patterns, including roles for public policy, market innovation, NGO mobilisation of consumer groups, and voluntary initiatives by consumers themselves. While recognising the close link to progress in sustainable production and waste management practices, the report looks in particular at the specific role of government in promoting more sustainable consumption patterns.

The report shows that the foundations for making greater progress already exist in OECD countries, but that the issue of sustainable consumption still remains on the periphery of policy development. The report identifies many of the barriers to effective policy design and implementation, but also practical steps that can be taken in the short-term to improve the ability of markets to allocate resources, and to strengthen the signals to the private sector and consumers alike to produce and consume in an environmentally sensitive manner. If OECD governments have kept sustainable consumption on their agenda since the 1992. Earth Summit, it is fair to say that much of the past ten years have been spent becoming more familiar with the issue and exploring ways forward without significant action. Projections of environmental trends make it clear that more concrete action, reaching a broader group of OECD consumers, is what is now needed.

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The Synthesis Report

This report has been written and edited by Elaine Geyer-Allély – together with Adriana Zacarías-Farah, Philippe Crist, and Dan Biller and under the supervision of Jean-Philippe Barde. The Report draws upon background papers on *Household Food Consumption* by Harald Payer, Petra Burger and Sylvia Lorek (Austria), Wlodzimierz Sekula (Poland), Ingrid Jedvall (Sweden), Joanne Kauffman and Frédérique Chevrot (US), and Niels Jungbluth and Rolf Frischknecht (ESU-Services, Switzerland); on *Household Energy and Water Consumption and Waste Generation* by Aad Correlje, Judith Klosternmann and Stephan Slingerland (Netherlands), Sylvia Lorek, Sandra Striewski, and Joachim Spangenberg (Germany), and Mireya Vilar, Valeria Guarneros, Kristina Jannerbo, and Mariela Ibanez (Mexico); and on *Participatory Decision-making* by Frans Coenen, Dave Huitema and Johan Woltjer (University of Twente), and on *Policies to Promote Sustainable Consumption* by Bas de Leeuw (on secondment from the Dutch Ministry for Housing, Spatial Planning and Environment). The OECD expresses its appreciation to the governments of Austria, Poland and Sweden and the research team from Mexico for sponsoring their national case studies.

The report was prepared under the supervision of the Environment Policy Committee's Working Party on National Environmental Policies. It is published under the responsibility of the Secretary-General of the OECD.

The OECD Programme on Sustainable Consumption

The OECD 1999-2001 Work Programme on Sustainable Consumption provided new data and analysis to help OECD Member countries reduce the environmental impacts from household consumption patterns. The Programme combined empirical studies of consumption trends in OECD Member countries with conceptual and policy analysis. Programme elements included: development of an economic *conceptual framework* to set out the boundaries of analysis and policy to influence household decisions; *sector case studies* documenting trends, environmental impacts, and policy options in five areas of household consumption; *policy case studies* to deepen analysis of policy instruments that influence household consumption of final goods and services; and refinement of a body of *indicators* to assess progress towards more sustainable consumption patterns. The results of these 8 elements of work are published separately and drawn together in this Synthesis Report.

Publications and reports from the OECD Environment Directorate 1999-2001 Programme on Sustainable Consumption

Towards Sustainable Household Consumption? Trends and Policies in OECD Countries	OECD, 2002
Synthesis Report of the 1999-2001 Programme on Sustainable Consumption	
Conceptual Analysis	
Towards Sustainable Consumption: An Economic Conceptual Framework	ENV/EPOC/WPNEP(2001)12
Sector Case Studies	
Household Food Consumption: Trends, Environmental Impacts and Policy Responses	ENV/EPOC/WPNEP(2001)13
Household Tourism Travel: Trends, Environmental Impacts and Policy Responses	ENV/EPOC/WPNEP(2001)14
Household Energy and Water Consumption and Waste Generation: Trends, Environmental Impacts and Policy Responses	ENV/EPOC/WPNEP(2001)15
Policy Case Studies	
Information and Consumer Decision-making for Sustainable Consumption	ENV/EPOC/WPNEP(2001)16
Participatory Decision-making for Sustainable Consumption	ENV/EPOC/WPNEP(2001)17
Policies to Promote Sustainable Consumption: An Overview	ENV/EPOC/WPNEP(2001)18

TABLE OF CONTENTS

List of Boxes

Chapter 2

Chapter 3

Chapter 4

List of Tables

Chapter 2

Chapter 3

Chapter 4

Annex

List of Figures

Chapter 1

Chapter 2

Chapter 3

Chapter 4

EXECUTIVE SUMMARY

Contents of the Synthesis Report

This Report is about the day-to-day actions of households in OECD countries and how these actions affect the environment. It presents data and trends in five key areas of household consumption: food, tourism travel, energy, water and waste generation. The data shows that environmental impacts from household activities have grown over the last three decades and are expected to intensify over the next twenty years, particularly in the areas of energy, transport and waste.

This Report is also about what OECD governments are doing, or can do, to help households reduce these environmental impacts. It reviews the framework and objectives of policies to promote sustainable consumption, examines the effectiveness of different types of policy instruments (regulatory, economic, social) to influence consumer decision-making, and identifies combination of instruments for promoting more sustainable consumption in the five areas studied. It identifies some of the key challenges to developing policies to influence household consumption patterns, but also areas of opportunity and effective strategies to generate greater action by consumers.

The OECD Programme on Sustainable Consumption

The analysis presented in the book is the synthesis report of the OECD Environment Directorate's 1999-2001 Programme *Towards Sustainable Consumption*. The Programme was designed to provide a comprehensive exploration of key household consumption patterns in OECD countries, related environmental impacts, and policy measures to promote more sustainable patterns. It stimulated a large body of research and discussion in OECD Member countries: 7 countries participated directly in the research while the results of the different programme components were reviewed by OECD government officials working in ministries of the Environment, Consumer Affairs, Finance, and Foreign Affairs, and representatives from the private sector, academic institutions, and environmental and consumer NGOs.

Key data and trends in household consumption (Chapter 2)

Environmental pressures from consumption will intensify

Per capita private consumption has increased steadily in OECD countries over the last two decades, and is expected to continue to follow GDP growth in the period to 2020. Product and technological innovations have reduced the energy and material intensity of many consumer goods. However, the increasing volumes of goods used and discarded, and the *structure* of consumer demand have outweighed many of these gains. Households as a group are not the largest contributor to most environmental pressures, but their impact is significant and will intensify over the next two decades (OECD *Environmental Outlook*, 2001):

- *Energy* – energy use in OECD countries grew by 36% from 1973-1998 and is expected to grow another 35% by 2020 despite efficiency gains. Commercial and residential energy use (approximately 30% of current final energy consumption) is the second most rapidly growing area of global energy use after transport.

- *Transport* – the current total motor vehicle stock in OECD countries of 550 million vehicles (75% of which are personal cars) will grow 32% by 2020, while motor vehicle kilometres are projected to increase 40%. Global air travel is projected to triple in the same period.
- *Waste* – municipal waste is projected to grow by 43% from 1995 to 2020 to approximately 700 million tonnes per year. In 1997, OECD households generated on average 67% of municipal waste loads. Recycling rates have increased, which has slowed the rate of growth of waste destined for final disposal, but have not reduced the total volume of waste generated.
- *Water* – households are relatively low consumers of water and household demand for freshwater has stabilised or declined in 9 OECD countries. But in many others population growth and expanded water use have outweighed the effect of water saving technology and behaviour.
- *Food* – OECD households are consuming more meat, vegetables, fish, processed, imported and organic food than in the past. The most significant environmental impacts from food occur early in the production chain, but households influence these impacts through their choice of diet and demand for food-related services. Household also directly affect the environment through food-related energy consumption and waste generation.

Understanding the trends (Chapter 3)

Current and projected household consumption patterns are influenced by a number of different driving forces. Rising per capita income, demographics (more working women, more single-person households, larger retirement population) and accompanying changes in lifestyles have led to more individualised buying patterns, a shift towards more processed and packaged products, higher levels of appliance ownership, and a wider use of services and recreation. Higher incomes have also increased the number of objects household purchase. Technology, institutions and infrastructure also play an important role in influencing household consumption and behaviour. They create the prevailing conditions faced by households in their everyday life, and can either expand or constrain the product options available to them.

Policy to influence consumption patterns should more carefully consider the different influences on consumer decision-making because they help to determine which influences on consumption may change, how quickly and under what stimulus. This has direct implications for the choice and implementation of different policy instruments.

Policies to promote sustainable consumption (Chapter 4)

It is resource use and environmental pollution that have to be brought to sustainable levels, not the consumption of products and services as such. This means that action is needed to promote a shift in the *structure* of consumption and production (*i.e.* the environmental and resource intensity linked to different goods and services) so as to reduce the environmental impacts of households in the key areas of energy, transport, and waste (*e.g.* moving from products to services). Sustainable consumption can also be associated with absolute reductions in some scale impacts (*e.g.* CO_2 emissions or water consumption in some areas).

The web of driving factors that shape household consumption patterns means that there are many options for influencing consumption patterns. Promoting more sustainable consumption will require a multi-stakeholder approach, including public policy, market innovation, NGO mobilisation of consumer groups, and voluntary initiatives by consumers themselves.

Governments can play a stronger role in promoting sustainable consumption than they currently do. Consumers need a stronger and more consistent set of signals about the sustainability of their consumption patterns. Providing consistent signals requires a clearer set of environmental quality objectives – and how these relate to household activities – than currently exist. It also requires taking a life-cycle approach, so that measures are taken at different points in the product chain to bring material use and environmental pollution within sustainable levels. Governments should give greater

consideration to cross-sector policy integration and the potential environmental impacts of policies in other areas that influence household decisions (land-use, infrastructure investment, macroeconomic policies).

Policy design for sustainable consumption can benefit from previous experience with different instruments to influence consumer decision-making (economic, regulatory, information-based). E*conomic instruments* are generally more cost-efficient (since implementation and enforcement are less demanding) and less intrusive in individual decision-making than regulatory instruments. However, their effectiveness can be moderated where price is not a key decision criteria for the consumer, or by the market structure of certain goods which prevent price signals from being passed on to the consumer.

OECD governments also act directly to influence or constrain household decision-making through *regulatory limitations or standards* on products and their ownership or use. The use of direct regulation on households is relatively rare because it is difficult to implement and enforce and is relatively intrusive. Governments have generally preferred to influence household consumption patterns through imposing or increasing standards or requirements further upstream in the product chain. Consumers will accept regulatory intervention where it maintains or increases the quality of the product or service concerned, or responds to consumer health and safety concerns.

S*ocial instruments* (information-based) influence consumer knowledge and willingness to act in favour of the environment. Information campaigns on energy and water efficiency and waste recycling are widespread, as are eco-labelling schemes in OECD countries. Information-based instruments, however, are hindered by consumer scepticism and confusion generated through the proliferation of environment-relevant messages. There are effective means for overcoming the barriers to information and for using more interactive decision-making mechanisms to promote more sustainable consumption (Section 4.2).

In most cases, reducing environmental impacts from household consumption will require a *combination* of instruments. In some areas (household food and tourism travel), there are few co-ordinated policies intended to reduce environmental impacts from households. However, lessons can be drawn from a longer and broader experience with different instruments and combinations of instruments in the areas of household energy and water and waste generation and recycling (Section 4.3).

Moving forward (Chapter 5)

Consumers in OECD countries are concerned about the environment and how their own actions contribute to environmental quality. Most OECD countries have implemented policies to reduce the environmental impacts from household activities. Some of these policies have resulted in limited changes in behaviour, but overall results appear to be modest. Many of the environmental impacts resulting from household decisions are expected to intensify over the next two decades.

Governments could play a more active role in facilitating household action than they currently do. In particular, they will need to clarify objectives for household action, reinforce existing policies, and improve the co-ordination and consistency of policies in order to help households to develop less material- and pollution-intensive lifestyles.

Five general conditions are required to create a framework for sustainable consumption:

- a price structure for consumer goods and services that internalises environmental costs and benefits;
- a policy and regulatory framework that makes clear the priorities and direction for change;
- the availability of a range of environmentally friendly goods and services;
- technology and infrastructure that include environmental quality criteria in the design and running of transportation networks, housing, waste management, etc; and

- an educational, learning and information environment that motivates and enables consumer action.

Within the context of these five framework conditions, several broad guidelines for policies to promote sustainable consumption can be drawn from OECD analysis. Policies for sustainable consumption should:

- shift the structure of consumption;
- change both the "hardware" and "software" of consumption patterns;
- use a life-cycle approach for determining points of policy intervention;
- privilege upstream intervention;
- apply a combinations of instruments;
- ensure consistent cross-sector policies; and
- promote and support initiatives by private sector and civic organisations.

Some unresolved policy questions

What additional scope for applying economic instruments? Most environmentally related taxes are in fact already paid by households through taxes on the purchase or use of motor vehicles and fuels (petrol and diesel) and because many exemptions and rebates are currently granted to business. It is also true that environmental taxes are still not well targeted and are unpopular. Taxes that would internalise external costs related to production and consumption patterns would, in many instances, be higher than existing ones, particularly for energy and transport. Additional taxes could also be required on other products. This raises questions about the *distributional and social implications* of policies that would raise consumer prices for key goods and services.

Where can governments most effectively target and combine policies to promote sustainable consumption? Depending upon the structural characteristics of the sector concerned policy signals may be imperfectly transmitted up and down product chains. An important step for designing more cost-efficient, environmentally effective, or equitable consumption policies is to better understand how information and price signals are transmitted for different consumer goods, and how these and other drivers affect consumer preferences. Progress is also needed in identifying and implementing effective packages of instruments that give consumers a consistent message about the sustainability of their consumption choices.

What potential exists for using social instruments to promote sustainable consumption? Consumers are the most difficult economic actors for governments to reach. They are a large, dispersed and heterogeneous group and their behaviour in generating negative environmental externalities is varied. Governments also want to avoid excessive intervention in consumer decision-making. As a result, more attention should be given to the scope for different social instruments to promote sustainable consumption, including co-ordinated voluntary consumer initiatives; participatory decision-making for sustainable consumption; and information-based instruments in general.

Chapter 1

INTRODUCTION

This Report is about the day-to-day actions of households in OECD countries and how these actions affect the environment. It presents data and trends in five areas of household consumption: food, tourism travel, and energy and water use and waste generation. The data show that environmental impacts from household activities increased over the last three decades and are expected to intensify over the next twenty years, particularly in the areas of energy, transport and waste.

This Report is also about what OECD governments are doing, or can do, to help households reduce their environmental impacts. It reviews the range of regulatory measures, economic instruments and social instruments that governments are using to influence consumer decision-making and discusses their relative effectiveness in stimulating pro-environmental behaviour on the part of consumers. Through OECD-wide Secretariat research and case studies of consumption patterns in seven OECD countries, the Report identifies some of the key challenges to developing policies to influence household consumption patterns, but also areas of opportunity and effective strategies to generate greater action by consumers.

The information provided in this Report is the result of a two and a half year programme of work in the OECD Environment Directorate that ran from 1999 to 2001. This programme of work stimulated a large body of research and discussion in OECD Member countries: 7 OECD countries participated directly in the research while the results of the different programme components were reviewed by OECD government officials working in ministries of the Environment, Consumer Affairs, Finance, and Foreign Affairs, and representatives of the private sector, academic institutions, and environmental and consumer non-governmental organisations (NGOs). The Report is intended foremost to support OECD policy makers working in the areas of sustainable households or sustainable consumption, but contains useful information for other international organisations, including business and consumer organisations, researchers and NGOs working to raise awareness and to promote more sustainable patterns of consumption.

1.1. Structure of the Synthesis Report

The Synthesis Report contains five chapters. This chapter provides a working definition of "sustainable consumption" and other terminology used in the Report. It explains the role of governments in promoting a reduction of environmental impacts from household consumption patterns. This chapter also briefly describes the OECD's 1999-2001 Programme of Work, its objectives, components and boundaries.

Chapter 2 provides data and analysis of household consumption patterns and related environmental impacts in five areas of household consumption: food, tourism travel, energy, water and waste generation. This chapter is linked to Annex, which reviews the state of development of indicators and methodologies for measuring the environmental impacts from household consumption patterns and trends. It suggests indicator sets for each of the five areas studied.

Chapter 3 explores key driving forces behind consumption patterns. It identifies different conceptual frameworks from microeconomic and socio-economic analyses that can be used to describe consumer decision-making. It then describes the most important factors driving consumption patterns in the five areas studied. Understanding these driving forces helps to determine which influences on

consumption patterns may change, how quickly and under what stimulus. This has direct implications for identifying the role of government in promoting more sustainable consumption patterns and for the choice and implementation of different policy instruments.

Chapter 4 explores government policy options for helping households reduce their environmental impacts. Section 4.1 examines the general objectives and framework for policies to promote sustainable household consumption based on the existence of environmental externalities. Section 4.2 gives an overview of policies that influence household consumption, and the relative effectiveness of different types of instruments (economic, regulatory, social) in shifting consumer choice towards less environmentally damaging products and services. This section also looks in greater depth at the potential of two types of "social instruments" – information and participatory decision-making – for promoting sustainable consumption. Section 4.3 identifies specific policies to reduce environmental impacts in the five areas of household food, tourism travel, energy and water consumption, and waste generation.

Chapter 5 identifies broad framework conditions for moving forward on sustainable consumption. These are the conditions necessary to reduce impacts from household consumption. This chapter also draws out policy guidelines from OECD policy and sector case study analysis and identifies several outstanding issues for policy design and implementation to promote sustainable consumption.

1.2. Working definitions and terminology used in the OECD Programme on Sustainable Consumption

What is Consumption?

In this Report the term "consumption" refers to the consumption of products and services by households. It does not include consumption by the public sector nor intermediate consumption of products and services in the productive sector. The term also refers to a sequence of choices and actions by households including the "selection, purchase, use, maintenance, repair and disposal of any product or service" (Campbell, 1998). It thus extends beyond a classic economic definition of consumption. As in the broader language of welfare economics, "consumption" is also understood to include more than expenditures on marketed products and services. Many goods and services are provided outside markets, through such institutions as the family and the natural environment, and can be "consumed" (OECD, 2000). Because they have no market value, non-marketed goods and services may be over- (biodiversity, marine resources) or under-consumed (*e.g.* green space, clean air).

***Consumption* is:**

- **Household consumption of goods and services.**
- **A series of activities from the selection and use of a product or service through its disposal.**
- **Market expenditure but also consumption of non-marketed goods and services.**

***Sustainable Consumption* is:**

- **The consumption of goods and services that meet basic needs and quality of life without jeopardising the needs of future generations.**
- **Site and problem-specific.**
- **A dynamic concept that indicates the direction and sometimes magnitude of change, and that can evolve over time.**

What is Sustainable Consumption?

The term "sustainable consumption" is defined in parallel to the Brundtland definition for sustainable development as: "the use of goods and services that respond to basic needs and bring a better quality of life, while minimising the use of natural resources, toxic materials and emissions of waste and pollutants over the life-cycle, so as not to jeopardise the needs of future generations" (Norwegian Ministry of Environment, 1994).

This definition remains open to different interpretations. This is appropriate because the assessment of what is sustainable is site- and problem-specific, and depends on social and political decisions on acceptable levels of risk and substitution between natural capital and man-made, human and social capital.* Chapter 4 discusses the implications for policy design of adopting *weak* or *strong* sustainability as the basis for defining sustainable consumption objectives.

Sustainable consumption is also defined as a function of the time within which environmental pressures must be evaluated, which may be a question of a few years or many decades. As a result, sustainable consumption is a dynamic concept that indicates the direction of change desired or required; it can evolve as new information is gathered and political preferences are established. Where ecological limits can be established, sustainable consumption can be linked to specific targets (*e.g.* for CO_2 emissions, water consumption).

Important aspects of the social dimension of sustainability (*e.g.* equity and distributional considerations) have so far not been addressed in the OECD Environment Directorate work on consumption. Thus, the term "sustainable consumption" in this Report refers primarily to *environmentally sustainable consumption*.

1.3. The role of government in promoting sustainable consumption

There are many factors that shape household choices and actions (See Chapter 3) and consequently many options for influencing consumption patterns. Reducing the environmental impacts from household consumption will require a multi-stakeholder approach including public policy, market innovation, NGO mobilisation of consumer groups, and voluntary initiatives by consumers themselves.

Within a multi-stakeholder framework, what is the role of government in promoting sustainable consumption? Environmental impact trends are related in large part to the market's failure to properly reflect the real cost of resource use or pollution linked to household consumption patterns. Wherever the price of energy, road fuels, food, water or waste do not fully reflect associated environmental costs, households have an incentive to "over" consume. Households also cannot always express the value they place on non-marketed goods, such as a clean environment or "safe" food – which means that many such goods may be under-consumed. Where externalities exist or where the public good quality of environmental goods or services makes it impossible to use markets to allocate resources effectively, governments have an important role to play in increasing market effectiveness and providing the framework conditions in which society meets it environmental protection goals.

Household decisions are also influenced by government policy and institutional arrangements in other areas of public planning, including macroeconomic fiscal and monetary policies intended to influence savings or stimulate consumption (*e.g.* of consumer durables, housing, real estate), land-use planning, technology policy, etc. Government failure to define sustainability objectives and to adequately co-ordinate policies across economic sectors can result in negative spill-over effects on the environment.

Consumers are a large, dispersed and heterogeneous group and their behaviour affects the environment in different ways. Consumer interest in environmental issues also varies within and between OECD countries. This means that policies designed to influence household behaviour are likely to be more difficult to design and difficult to implement than policies addressed to industry for example. However, practical experience and analysis are showing that many environmental problems will be difficult to resolve without addressing diffuse sources of pollution and the dynamics created by consumer demand. This means that government policies are needed not only to promote a reduction in the direct environmental impacts of households in key areas (energy, transport, waste) but also to

* Natural capital (KN) includes natural resources and the environment's assimilative capacity; man-made capital (KM) includes machinery and other produced goods; human capital (KH) refers to skills and knowledge embodied by humans; and social capital (KS) characterises the interactions among individuals and institutions (OECD, 2001*a*).

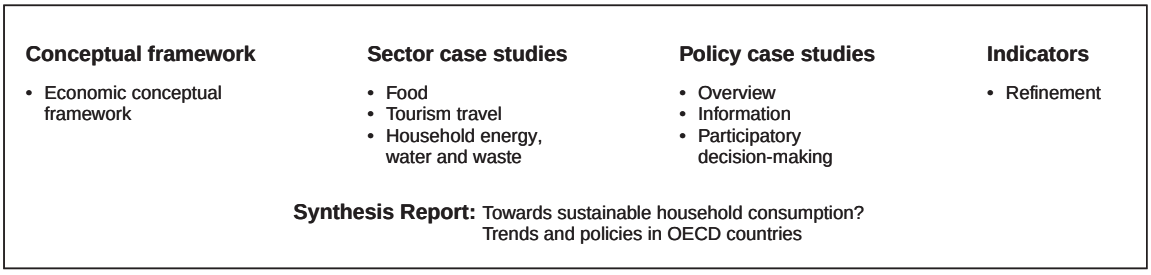
secure greater consumer engagement and support for environmental policies targeted to producers and the public sector.

1.4. The OECD Programme on Sustainable Consumption

The OECD Environment Directorate's 1999-2001 *Programme on Sustainable Consumption* was designed to provide a comprehensive exploration of key household consumption patterns in OECD countries, related environmental impacts, and policy measures to promote more sustainable patterns. The Programme sought to combine conceptual work with empirical studies of real consumption trends in OECD Member countries. This approach had two objectives: to provide a firmer basis for discussion and action in key areas of household impact and to strengthen analytical and policy approaches to addressing consumption patterns. The Programme was composed of 8 projects grouped into 4 streams of work (Figure 1):

- *conceptual framework analysis* to help structure analytical and policy approaches to household consumption patterns.
- *sector case studies* documenting trends, environmental impacts, and policy options in five areas of household decision-making: food, tourism travel, energy, water and waste generation. These are areas where household impacts are comparatively greatest.
- *policy case studies* to deepen analysis of policy instruments that influence household consumption of final goods and services in general, and specifically in the five areas explored in greater detail. This series of studies includes a special focus on "social instruments", including information-based instruments and participatory decision-making mechanisms.
- refinement of a body of *indicators* to assess progress towards more sustainable consumption patterns.

Figure 1. **OECD 1999-2001 Programme on Sustainable Consumption**



Four boundaries limited the focus of the Programme. Analysis centred essentially on:

- *household consumption of goods and services* as opposed to public sector consumption and consumption of intermediate goods in the productive sector. However, links are drawn upstream and downstream in the product cycle in the discussion of the driving forces behind consumption patterns and appropriate policy responses.
- the *environmental impacts* as opposed to social impacts of consumption (*e.g.* the distribution of consumption among different population groups within OECD countries or between OECD and non-OECD countries).
- analysis of consumption patterns and environmental impacts *in* OECD *countries only*. While the Report discusses some global environmental impacts from household consumption (*e.g.* greenhouse gas emissions), it does not cover local environmental impacts in non-OECD

countries of OECD consumption patterns (*e.g.* pollution linked to OECD consumption of food produced outside the OECD region).

- the *role of public policy* in promoting more sustainable consumption, as opposed to action by other stakeholders (*e.g.* the private sector, NGOs).

The Programme stimulated a large body of research and discussion, including OECD Environment Secretariat research and analysis, commissioned papers from external consultants, a multi-stakeholder workshop on *Information and Consumer Decision-making*, and case studies in 7 countries in the areas of household food consumption or energy and water consumption and waste generation. These case studies do not provide a comprehensive review of consumption trends across all OECD countries. However, given that consumption patterns in the five areas studied are generally converging across OECD countries – water use is the interesting exception – the case studies provide a useful first approximation of the direction, rate and magnitude of change. The case studies also demonstrate a useful research approach that could be used in OECD countries to document actual consumption trends, driving factors and environmental impacts and to link these to policy approaches to promote more sustainable consumption.

The results of the different programme components, presented in this book, were reviewed by OECD government officials working in ministries of the Environment, Consumer Affairs, Finance, and Foreign Affairs, representatives from the private sector, academic institutions, and environmental and consumer NGOs, and OECD experts working in the areas of food and agriculture, energy, transport, climate change, waste and public management.

Chapter 2

HOUSEHOLD CONSUMPTION TRENDS AND ENVIRONMENTAL IMPACTS

Most OECD countries have implemented policies to reduce the environmental impacts from household activities. These include encouraging energy conservation or waste recycling, imposing standards to increase the choice of environmentally benign goods in the market, or using taxes or fees to increase the relative prices of products with greater negative environmental impacts. Private sector innovations have also brought sometimes important changes in product design and technology which have helped dampen the environmental impacts of consumption patterns, particularly in the areas of energy and waste. Environmental and consumer NGOs have been instrumental in translating abstract debates about "sustainable consumption" into practical action areas for households.

Many of these initiatives have helped reduce the environmental intensity of consumption patterns. In general, however, overall results so far are modest. Per capita private consumption has increased steadily in OECD countries over the last two decades, and is expected to continue to follow GDP growth in the period to 2020. As a result, although households as a group are not the largest contributor to most environmental pressures, their impact is significant and will intensify over the next two decades (OECD, 2001).

This chapter of the Report describes consumption trends and related environmental impacts in five areas of household consumption: food, tourism travel, energy, water and waste generation. These are areas where household impacts comparatively are the greatest. Secretariat research and analysis were augmented by contributions of national studies in seven OECD countries. The national studies followed a common *terms of reference*, modified as necessary to meet the specificity of the sector under study. Complete background reports for each sector case study are available separately.[1]

Section 2.1 describes trends in household food consumption patterns and direct environmental impacts in the areas of energy consumption, transport, waste generation and greenhouse gas emissions. It also illustrates the links between consumption patterns and upstream impacts in the product life-cycle. Section 2.2 documents trends in household tourism travel and key environmental impacts related to greenhouse gas emissions and air and water pollution. This work completes extensive past work in the OECD on overall patterns of household travel, one of the most important ways in which households affect the environment. Section 2.3 looks at trends and environmental impacts linked to household energy and water consumption and waste generation.

The discussion in this chapter is linked to Annex, which reviews the state of development of indicators and methodologies for measuring the environmental impacts from household consumption patterns in the five areas studied.

2.1. Household Food Consumption

Consumer demand for different food products has changed in important ways over the last thirty years, and with it modes of food production. These changes have important implications for the environment. Although the most significant environmental impacts arise in the food production and processing sectors, households influence trends in these areas through their choice of diet and their demand for food-related services. Households also have direct environmental impacts through the way they purchase, store and prepare their food, and how much organic and packaging waste they generate.

The OECD Sector Case Study on *Household Food Consumption* explored these impacts in four OECD countries: Austria, Poland, Sweden and the United States (OECD, 2001*b*). Section 2.1.1 provides a summary of major consumption trends for food products and services. Section 2.1.2 describes the environmental impacts of these trends.

2.1.1. *What we eat: food consumption trends and projections*

Across OECD countries consumers demand an affordable and diverse food supply that is safe, of high quality and convenient. Despite sometimes significant differences in per capita consumption of major food categories (Table 1) OECD consumers share a rising trend toward higher consumption of meat, cheese, fruits, vegetables and bottled drinks.

Food consumption trends in the four case study countries (Figures 1*a*, *b*, *c*, *d*) mirror general trends in the OECD region, although a few countries (*e.g.* Mexico and Korea) have not reached saturation levels for per capita consumption of individual commodities and/or aggregate food consumption (Alexandratos, 2000). Total calorie intake is increasing in many OECD countries, which – combined with increasingly sedentary lifestyles – is leading in some areas to rising obesity levels. The US Department of Health and Human Services, for example, estimates that 35% of US adults are technically obese, compared to 25% in 1980, despite a generally positive response to nutritional guidelines issued by the government. The nutritional benefits of eating leaner meat and drinking lower fat milk are being compromised by increases in caloric sweets, high fat dairy products, especially cheese added to processed foods, and near record amounts of added fats (*e.g.* salad and cooking oils, baking and frying fats) (Kauffman and Chevrot, 2000). All countries note important increases in bottled beverage consumption, including fruit juices, mineral water, and carbonated soft drinks. In Sweden, household demand for soft drinks and mineral water has increased 230% since 1970. In the US, over the same period, per capita consumption increased by 908% (from comparatively low initial levels) for bottled water and by 61% for carbonated soft drinks.

Projected food demand in 2020 for the OECD region as a whole includes a 7% increase (from 95/97 levels) in per capita consumption of meat, milk and egg products and a 13% increase in vegetable oils, oilseeds and related products (Figure 2). Average total caloric intact will also increase slightly. In Poland, the growth in demand will be highest for poultry meat, fish and fruit. A survey of firms and organisations in the Swedish food sector suggest that further growth is to be expected for processed and pre-prepared foods that are easy, predictable and quick to prepare. Pasta, rice and potato products, for example, will likely increasingly replace potatoes, and tomatoes, cucumber and lettuce will replace beetroots, carrots and swedes. Consumer demand for variety will increase the market for exotic international and regional specialities, while health concerns are expected to strongly increase the demand for organic foods and so-called "functional" or nutrient-fortified foods, and foods prepared or conserved in particular ways.

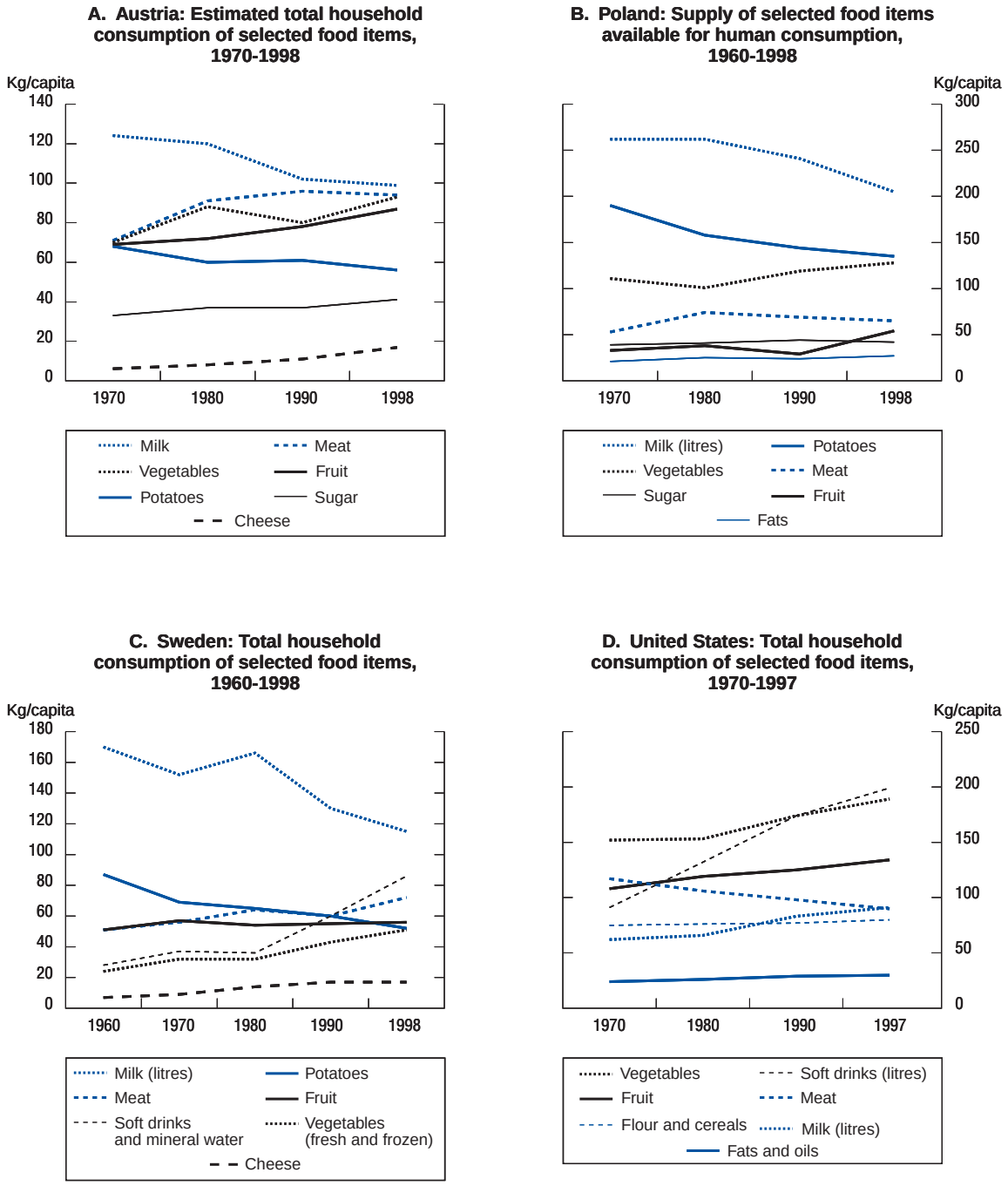
Consumer spending on food has steadily declined as a percentage of total household expenditure in most countries. This has led to sharper competition in the food processing and retail sectors and a tremendous pressure to diversify product offerings. More than 16 000 new food products, including new packaging sizes, flavourings, etc., were put on the US market in 1995, more than double the

Table 1. **Per capita consumption of major food categories (kg/capita/year)**

	Total	Meat	Eggs (no)	Fats and oils	Fruits	Vegetables	Flour/ cereal	Sweeteners
Austria	764	94	n.a.	n.a.	87	94	79	41
Poland	790	86	177	16	54	263	119	42
Sweden	750	72	n.a.	n.a.	56	103	71	n.a.
US	907	89	239	134	134	189	91	70

Note: Data are for 1998 (estimates for Sweden).
Source: Payer *et al.*, 2000; Jedvall, 2000; Sekula, 2000; Kauffman and Chevrot, 2000.

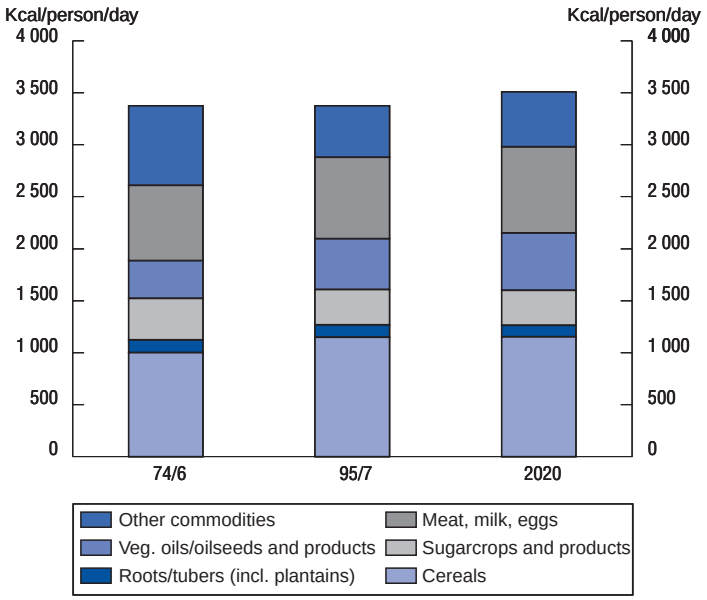
Figure 1*a, b, c, d.* **Household food consumption: Austria, Poland, Sweden and the US**



Source: Payer *et al.*, 2000; Jedvall, 2000; Sekula, 2000; Kauffman and Chevrot, 2000.

8 000 introduced in 1988. In Poland, market liberalisation in the early 1990s increased the range and quality of food products and the share of value-added products. Cross-cultural influences, consumer demand for variety, and declining communication and transportation costs are leading to a "globalisation" of food consumption patterns and a growth in imported food products in all countries.

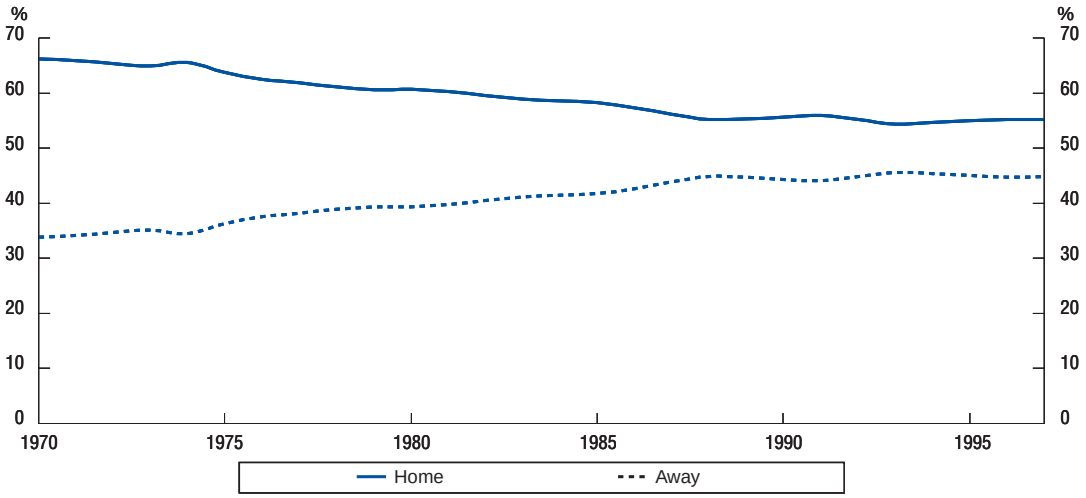
Figure 2. **Apparent food consumption in OECD countries, Kcal/person/day, major commodities: 1974-2020**



Source: Alexandratos, 2000.

A strong component of new consumer product demand is for out-of-home food preparation and consumption. Pressed by time and a waning interest in food preparation, households increasingly demand frozen and chilled foods and pre-cut, pre-prepared meat, fruit and vegetables. These trends are also reflected in the growing percentage of household food expenditures spent on out-of-home food preparation, one of the most dynamic markets within the entire food chain (Figure 3). Demographic and

Figure 3. **US shares for food consumed at home and away from home**



Source: ERS, USDA, 1999 in Kauffman and Chevrot, 2000.

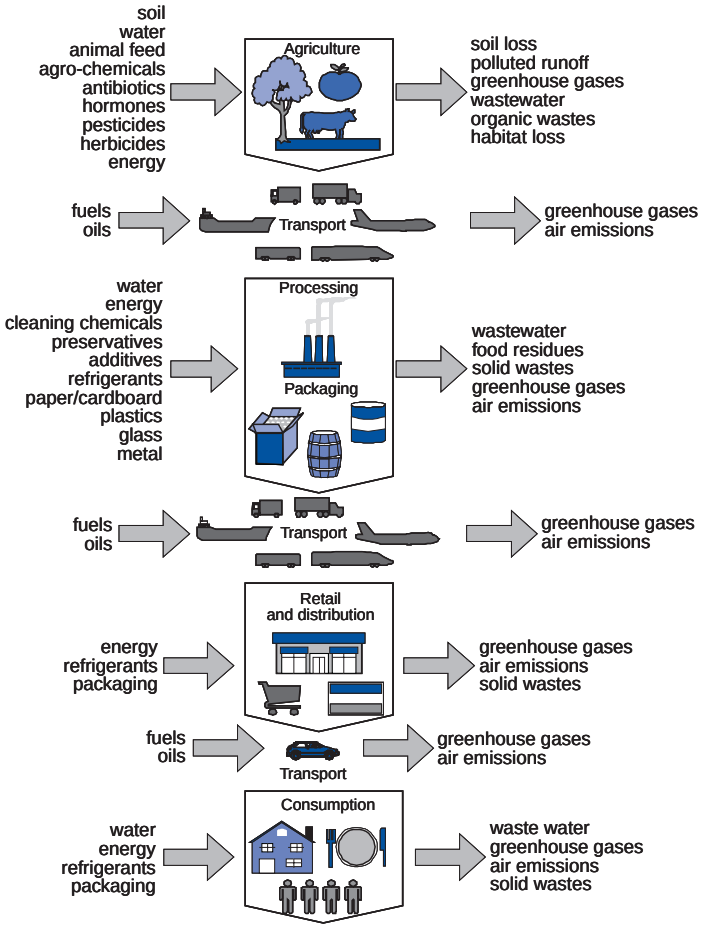
cultural shifts – more households, individualisation of time budgets within households for both parents and children, and a steady decline in sit-down family meals – have expanded the demand for individual portions and packaging.

Food shopping patterns are also changing: consumers shop less often and in increasingly larger food retail stores. A number of new food shopping options are gaining importance, namely petrol service stations, mobile delivery services, bookshops, food slot -machines and electronic commerce. The rate of online-shopping for food has increased remarkably, although not as fast as in other fields of electronic commerce, in part due to the difficulty of satisfying consumer confidence in fresh foods (Payer *et al.*, 2000).

2.1.2. *The environmental impacts of household food choices*

What are the environmental impacts of the changes in food consumption and production patterns? The answer depends on several factors, including where and how food is produced, processed, packaged, preserved, distributed, prepared and disposed of. The most significant environmental impacts are high in the production chain. However, OECD households influence trends in these areas through their choice of diet and their demand for food-related services. The demand for year-round availability of fresh fruits and vegetables, for example, has an impact through energy demand for greenhouse production or long-

Figure 4. **Environmental impacts from the food sector**



Source: Jedvall, 2000.

distance transport either by road or air. The growing demand for meat has contributed to the growth of intensive animal production systems for pig meat and poultry, which are important sources of water pollution. Other impacts result from the food processing and services sectors (Figure 4).

Households also have direct environmental impacts related to how they purchase, store and prepare their food and how much organic and packaging waste they generate. This section describes the results of the national case studies in four areas: energy consumption for food preservation and preparation, transportation impacts from shopping patterns, food and packaging waste generation, and greenhouse gas emissions. It also provides three examples of upstream impacts in the food production and processing sectors linked to changes in household food demand.

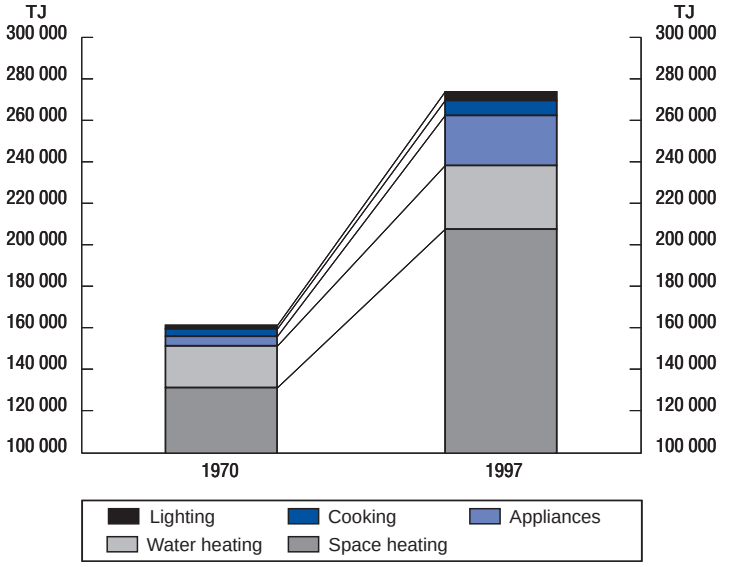
The quantification of environmental impacts from household food consumption is a relatively undeveloped area of public policy research. In many cases, data are hard to find, or are collected at an aggregate level that makes it difficult to link household behaviour with a specific level of impact, and thus to define appropriate policy instruments. The information available from the national case studies varies considerably in depth of analysis and data availability. Several methodologies have been developed and applied to food consumption analysis that can help improve the assessment of environmental impacts. Annex provides a review of some of those methodologies and proposes a set of 14 indicators that could be used to more closely monitor environmental impact trends from household food consumption.

Direct environmental impacts from household food consumption patterns

Energy

Energy is an essential input to household activities related to food, including shopping, storage, preparation, and cleaning. The use of energy for all of these activities constitutes an important, but not the dominant, component of total household energy use. In Austria food-related energy consumption (excluding fuel for transport) accounts for 7% of total energy (Figure 5). In comparison, the US study

Figure 5. **Energy consumption in Austrian households, 1970-1997**



Source: Payer *et al.*, 2000.

estimates energy use for cooking and washing dishes at 10% of all household energy and a Swiss study put food-related energy use at 12% (Ospelt, 1996 in Payer *et al.*, 2000).

Food-related energy consumption is dominated by the use of appliances. The aggregate energy intensity of food-related electrical equipment is determined by two factors: rising efficiency levels and the number and capacity of the appliance stock. Average efficiency should continue to increase. Efficiency improvements have been driven in part by regulatory standards and labelling requirements. In Europe, for instance, refrigerators, freezers, and dishwashers are required to carry energy-efficiency rating labels. However, many other appliances including, ranges, ovens and stovetops are not subject to minimum-efficiency standards, and manufacturers tend to concentrate more on styling and ease of cleaning than energy efficiency. Surveys in both the US and Poland have shown wide variations (*e.g.* 50%) among households in the amount of energy used to cook the same meal. Some of the difference is tied to cooking behaviour but also to the use of less efficient appliances (Sekula, 2000; Kauffman and Chevrot, 2000).

The number and capacity of the appliance stock has also increased. There is a growing convergence in OECD countries in appliance ownership and size towards US levels, although in 1992 US households still owned the most and the biggest appliances (Table 2). These trends explain the rising importance of electric appliances and electricity in general in the household total final demand of energy by end use (See Section 2.3). Higher ownership levels and the increased energy consumption of bigger appliances have overtaken efficiency gains.

Table 2. **Household appliance ownership: 70-90 (units per 100 households)**

		Refrig/Comb. units	Freezers	Microwaves	Dish-washers
US	1973	100	34	n.a.	25
	1997	115	36	85	50
Austria	1970	67	11	0	1
	1998	97	67	45	44
Poland	1973	n.a.	n.a.	n.a.	n.a.
	1998	96	Range: 18-77	Range: 5-32	Range : 1-6
Sweden	1973	97	55	n.a.	11
	1995	114	86	n.a.	47

Source: IEA, 2000; Payer *et al.*, 2000; Sekula, 2000.

An important consideration for household energy use is the growing percentage of foods prepared and/or consumed outside the home, which has an impact on the share of energy use along the production-consumption chain. Net impacts would depend upon efficiency rates, particularly in the processing and retail sectors. At the household level, increased out-of-home dining could lead to a decline in energy for cooking, but a stable or increased demand for energy for food conservation (Table 3).

Table 3. **US – Energy use per year for selected appliances**

Appliance	Time in use	kWh/ year
Microwave oven	2 hours/week	89
Coffee maker	30 minute/day	128
Refrigerator (frost free 16 cubic feet)	24 hours/day	642
Dishwasher (not including hot water)	1 hour/day	432
Refrigerator (frost free 18 cubic feet)	24 hours/day	683
Toaster oven	1 hour/day	73

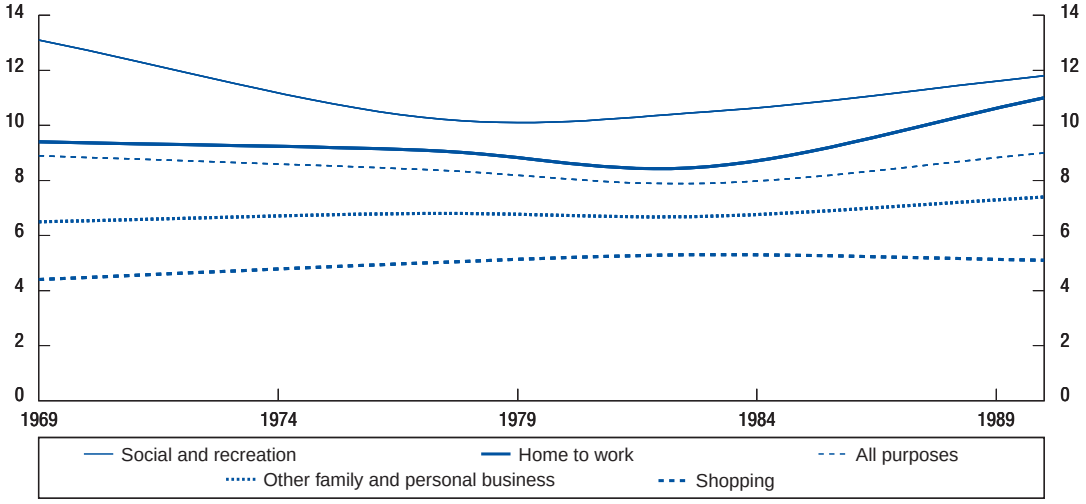
Source: US Department of Energy, 1993 in Kauffman and Chevrot, 2000.

Transport

The direct food-related transport impacts from household food consumption patterns are mainly related to individual passenger-car traffic. Data on the share of food shopping in total household demand for individual car travel is difficult to find because household transport statistics are often not disaggregated by shopping purpose. Estimates for the case study countries include up to 10% of total household transport demand in Austria (Herry and Sammer, 1998 in Payer, 2000) and somewhat less than 4% in Sweden.

The net impact of the evolution of food shopping patterns and the rapid growth of hypermarkets and food shops (often located outside large cities and small towns) on transport energy demand have not been fully evaluated. Evaluating potential environmental impacts would require measuring changes in shopping frequency against average distances travelled. While bigger store formats and larger home refrigerators and freezers have led to a decline in shopping frequency in many countries, trends in shopping distances are not uniform. In the US, for example, shopping distances appear to be declining although the data are not disaggregated by shopping purposes (Figure 6). On the other hand, anecdotal information in Poland shows a 15-fold increase in car ownership over the last 30 years (33-fold in the largest cities), which – tied to the creation of out-of-town hypermarkets – suggests a growing portion of transport miles for household food shopping. In Sweden, one study concluded that for some goods households use almost as much energy in driving their food home as producers do in transporting it to the shops.[2]

Figure 6. **US: Average vehicle trip length (miles)**



Source: Kauffman and Chevrot, 2000.

Waste generation

Food waste. Food losses begin on the farm and continue through the retail chain to the consumer. In the US, more than 43.6 billion kilograms (27% of edible food available for human consumption in 1995) were lost by retailers, the food service industry and consumers (Kantor *et al.* 1997 in Kauffman and Chevrot, 2000). Food service and consumer food loss accounted for nearly all of the waste, with fruits and vegetables (fresh and processed) and fluid milk accounting for 50% of the total. Food waste is

comprised of leftover portions of meals and trimmings from food preparation activities in kitchens, restaurants, fast food chains and cafeterias. At the retail level, food waste results from overstocking, improper stock rotation, and the discard of seasonal foods, etc. Food service and household food losses occur because of over stocking, over preparation, plate waste, cooking losses and misunderstanding of quality defects and label interpretation (*e.g.* "sell by" dates or expiration codes). In Austria, food waste is estimated to be the second largest component of discarded waste after construction waste. According to national material flow accounting[3] total food losses in commercial and household kitchens in Austria are estimated to be 1.9 million tonnes (Table 4). A Swiss study estimated that about 25% of total municipal waste in Switzerland is linked to food consumption patterns (Belz 1994 in Payer, 2000).

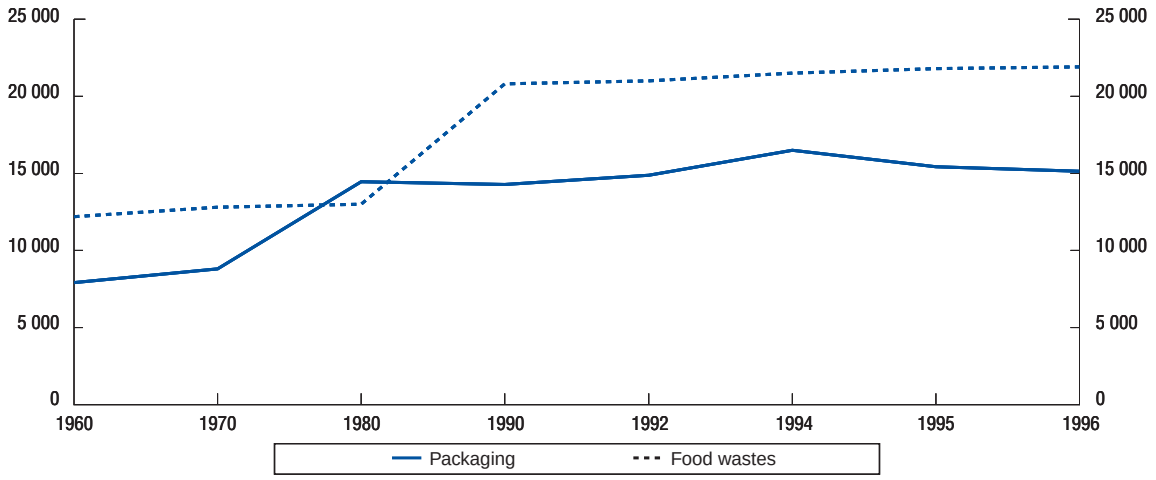
Table 4. **Austria: Average food losses at the household level**

	% of product net weight
Poultry	–55
Veal	–50
Beef	–48
Oils	–46
Butter	–45
Pork	–45
Fruits	–42
Cheese	–18

Source: Erard 1986, Östat 1995, in Payer *et al.*, 2000.

In the US, food waste is the third largest component of generated waste (after yard waste and corrugated boxes). The amount of food waste in the waste stream has increased by 1.2 million tonnes in the last 25 years. It has declined as a percentage of municipal solid waste, but this is due to increased tonnage in paper and other materials – many of them for food packaging (Figure 7). In the US, most of these wastes end up in landfills. Landfilled food waste has a density of 2 000 pounds per cubic yard, other wastes have a much lower density (aluminium cans: 50-74 pounds, plastics: 24-400 pounds;

Figure 7. **US food and packaging wastes, 1960-1996 (1 000 tonnes)**



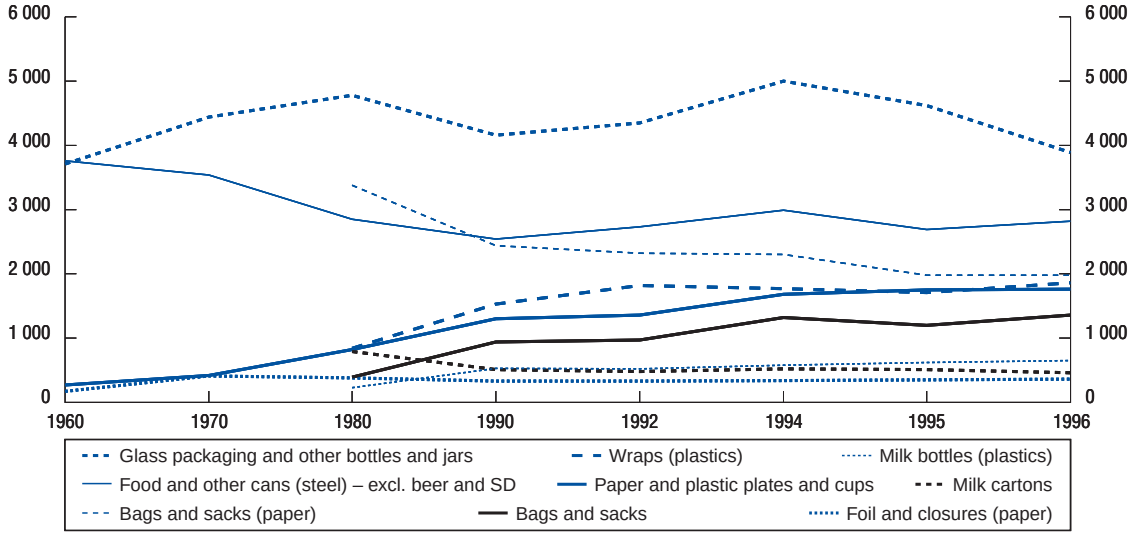
Source: Franklin Associates for the USEPA, 1997 in Kauffman and Chevrot, 2000.

cardboard: 300-1200 pounds). Food waste is also the wettest component of the waste stream with typical moisture content of 70% and an energy conversion value for incineration ranging from 1 500-3 000 BTU per pound compared to the average 4 500-5 000 BTU/pound for municipal solid waste. Organic decomposition results in methane production, which contributes to global warming. Currently, only 4.1% of food waste in the US (compared to 41% for yard waste) are recovered through composting. Some states have set recycling targets for food, including California and some locales in Massachusetts.

In Poland, no surveys have been conducted directly on food waste. However, the National Food and Nutrition Institute has provided a rough estimate based on food data derived from household budget surveys. This estimate combines information on the per cent of waste for individual food items derived from Polish food composition tables and estimates on plate waste in households. The results show that edible food waste in households amounted to over 100 kg per person in 1998 and ranged from approximately 96 kg in urban households to over 108 kg in rural homes (Sekula, 2000).

Packaging waste. The trend toward increased pre-packaged foods and food service packaging has helped reduce food waste from spoilage, transportation and storage. It has also, however, significantly increased the amount and variety of non-organic wastes entering the household waste stream (Figure 8). Recovery rates in the US for inorganic wastes have increased over the past 30 years but vary widely depending on the materials, ranging from 42% for paper and paperboard, 39% for metals, 24% for glass and 5% for plastics. The low recovery rate for plastics is of particular concern given the tremendous increase in consumption of carbonated soft drinks and the progressive substitution of glass and aluminium by plastic soft drink packaging. As a result, even though recycling and composting have increased four-fold since 1990 (bioCycle, 1999 in Kauffman and Chevrot, 2000), wastes from household food consumption are among the least affected by these trends.

Figure 8. **US: The evolution of packaging waste (1 000 tonnes)**



Source: Franklin Associates for the USEPA, 1997 in Kauffman and Chevrot, 2000.

Preliminary estimates in Poland show that total packaging waste amounted to approximately 2.7 million tonnes in 1998 and included some 1.1 million tonnes of paper/cardboard, 427 thousand tonnes of plastic, 124 thousand tonnes of composite cardboard packaging, 165 thousands tonnes of

metal packaging and 870 tonnes of glass packaging (Sekula, 2000). Less than one fourth of this total was subject to recycling. Polish waste analysts estimate that approximately 60% of packaging waste come from food packaging and amounted to 33.9 kilograms per person in 1998. Packaging of meat products, yoghurts and other milk products, margarine, vegetable oils, and mineral waters predominantly contributed to total plastic packaging waste. In view of the increasing consumption of all of these product groups, packaging waste is expected to increase. Fast growing consumption of fruit juices is also driving increases in glass packaging waste. Total packaging waste in Poland is expected to reach approximately 3.4 million tonnes in 2005.

Greenhouse gas emissions

Household greenhouse gas emissions are related to energy consumption for food conservation and preparation, food transport patterns, and choice of diet through upstream impacts on production, processing and distribution patterns. According to one German study, the distribution and consumption of food together account for 42% of all CO_2 emissions connected to the food sector (Enquete-Kommission, 1994 in Payer, 2000) (Table 5). In the US, input-output analysis[4] showed that the combined consumption of meats, fruits, and vegetables contribute most to annual greenhouse gases emissions compared to all other food categories. However the trend in eating away from home (which includes transportation to and from food service establishments) is also a significant contributor to GHG emissions (Union of Concerned Scientists, 1999 in Kauffman and Chevrot, 2000).

Table 5. **Germany: The contribution of the food system to the greenhouse effect**

	Million tonnes of CO_2 equivalent	%
Agriculture	135	52
Processing	15	6
Distribution	35	13
Consumption	75	29
Total	260	100

Source: Enquete-Kommission, 1994 in Payer *et al.*, 2000.

Life-cycle analysis (LCA)[5] has been in Sweden used to compare different foods, their nutrient content, and emissions of GH gases per unit of nutrient (Table 6). Conclusions about the highest or lowest emitting food depend on the functional unit chosen (*e.g.* energy, protein, etc.), the mode of production (conventional, greenhouse, organic) and distance from the point of production to the point of consumption (Carlsson-Kanyama, 1999).

Table 6. **Nutrient content of some foods and the emissions of GHG per unit of nutrient**

	MJ per kg	Protein (grams per kg)	β-carotene (µg per kg)	g CO_2 equivalents per MJ	g CO_2 equivalents per g protein	g CO_2 equivalents per µg β-carotene
Tomatoes	0.83	9	5 730	4 000	370	1
Carrots	1.67	6	68 000	300	83	0
Potatoes	3.10	18	100	56	10	2
Rice	14.90	68	0	430	94	–
Pork	7.20	180	0	850	34	–
Dry peas	12.40	215	150	55	3	5

Source: Carlsson-Kanyama, 1999.

Indirect environmental impacts from household food consumption patterns

Most environmental impacts related to food are linked to upstream production methods. These include impacts on water quality and depletion, greenhouse gas emissions, soil conservation, air pollution, habitat alteration and biodiversity.[6] Households influence these trends, however, through their choice of diet and their demand for food-related services. This section briefly highlights some examples of environmental pressures from the food processing, distribution and retail sectors to illustrate the link between changes in household demand and environmental impacts higher in the food system. This link is important for determining where technological innovations or policy measures will be most effective in reducing environmental impacts linked to consumption patterns.

Energy

Consumer demand for processed and pre-packaged foods has increased energy demand in the food-processing sector. In the US, the food industry is the fourth largest consumer of electricity. A major portion of the fossil fuel consumed is used in the manufacture of steam, which serves for blanching and scalding, cooking, sterilisation and pasteurisation, and evaporation (concentration and dehydration). The meat and poultry industry ranks high in overall energy consumption due its volume of production, but is not especially energy-intensive given the large number of products produced. Frozen fruits and meat operations on the other hand are relatively energy-intensive: the increase of frozen foods in pre-prepared dinners has considerably increased the energy share of the final product. Wet corn milling is the most energy-intensive process per value of shipment: most energy use is associated with evaporation of water from concentrate solution in the production of sweetener and starch. High fructose corn syrup captured most of the market for caloric sweeteners in beverages in the mid-1980s and increased the demand for wet milling.

Energy use in the distribution and retail sectors is associated with warehousing and food refrigeration and fuel use by distribution fleets. More environmentally sound practices are available to retailers (efficiency gains in the supermarket industry; recycling and refrigeration management programs), but many companies have found it difficult to implement these because of lack of time and knowledge of technological alternatives. The trend towards fewer and larger retail outlets with centralised warehousing is aimed at increasing economies of scale, improving logistical efficiency and optimising transport distances, and could also improve energy efficiency. It is important, however, to determine the net effect of these trends compared to greater international distribution of foods (see below), and a possible increase in household travel for food shopping.

Transport

In Austria, the share of food freight is about 10.4% of total annual freight volume measured in tonnes/kilometre. The food freight volume increased by about 10% since the mid-1980s – approximately the same rate as total freight in the same period. However, growth after 1995 when Austria joined the EU is estimated to be considerably higher. A German study has estimated that average food miles per capita since the 1970s have risen by approximately 70% while per capita food consumption levels have remained unchanged (Mildner and Böge, 1996 in Payer, 2000). In Sweden, road transport of food by trucks increased from 3 953 million to 4 684 million ton-km between 1985-1995. Mean haulage distance and mean load weight for food transport also increased.

The modal split of food freight across the case study countries shows a clear dominance of road (truck) traffic at 89% (Sweden), 80% (Poland) and 75% of total food transport (in tonnes/km) in Austria (Table 7). In Austria long distances (approximately 230 kilometres) prevail over short distances (approximately 50 kilometres) on average. Domestic long-distance freight traffic together with transit traffic account for approximately 70% of total food related transport, compared to 20% for short distances. Domestic long-distance freight traffic shows the highest rate of growth. The share of food miles by air transportation appears to be low in Austria.[7] In comparison, although most food freight in

Table 7. **Food miles in Austria, 1984 to 1995, annual freight traffic in million tonnes/km**

	1984	1988	1993
Traffic medium (modal split):			
Road	1 984.3	2 006.0	2 039.3
Rail	532.5	697.5	571.7
Waterway	25.4	52.2	158.6
Total	2 542.3	2 755.6	2 769.6
Transport distances:			
Domestic long-distance freight traffic	796.1	929.6	893.7
Domestic short-distance freight traffic	542.1	527.1	576.8
Import	240.7	248.8	252.7
Export	136.2	200.1	172.2
Transit	827.3	850.1	874.2
Total	2 542.3	2 755.6	2 769.6

Source: Payer *et al.*, 2000.

the US is also transported by road, the share of food freight carried by airplanes grew from 21% to 29% (exports) and from 12% to 21% (imports) between 1980 and 1993 (Eno Transportation Foundation, 1994 in Kauffman and Chevrot, 2000).

The environmental impacts of transportation patterns differ by mode. Airfreight is the most energy-intensive, followed by trucks. The rapid growth of transport distances is closely connected with the centralisation of production sites, the reduction of small stores in favour of big supermarkets, hypermarkets and shopping centres, and the rising internationalisation of nutrition habits. Changes to food conservation techniques (*e.g.* closed cooling chains), packaging systems, and an increasing demand for large storage plants also have implications for transportation options. The demand for frozen and chilled foods, for example, has increased the need for flexible and quality-controlled transportation refrigerated trucks. Total environmental impacts from food transportation patterns will depend on the net effect of these trends and the potential for more efficient distribution patterns from centralised distribution and storage patterns. Low price/cost margins in food production and marketing give firms strong incentives to seek cost savings from new technology and energy efficiency. Transport to and between shops can be reduced considerably if different suppliers co-ordinate and use delivery vehicles more effectively ("grouped traffic"). There are several examples in Sweden, Denmark and the UK where grouped traffic has been introduced with profitable results (Jedvall, 2000).

Air and water pollution

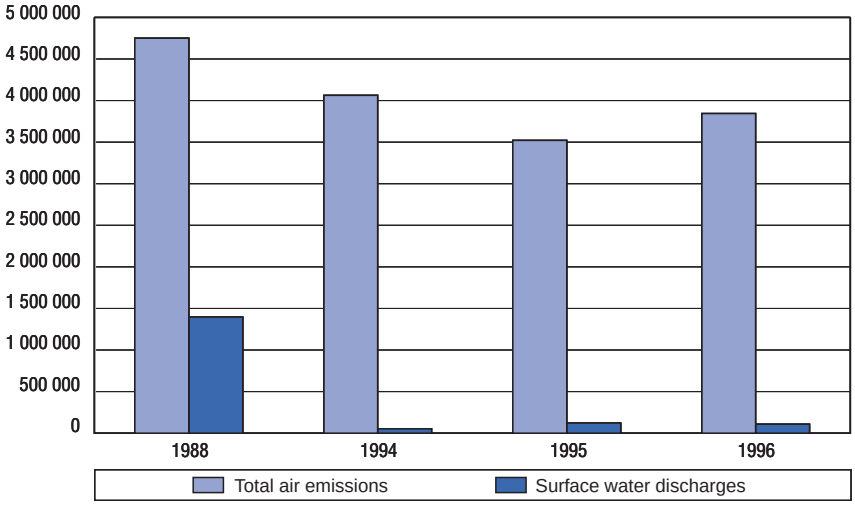
Food processors cure, wash, fumigate, acidify, pasteurise, freeze, dehydrate, esterify, or apply other physical, chemical or mechanical techniques to preserve foods from microbes, enzymes, chemical deterioration or mechanical damage. In the US, according to the Toxic Release Inventory (TRI) the food industry released 85 million pounds of pollutant in 1993. While this represents only 1.2% of total emissions, food processing is concentrated in a few states where the environmental impacts may be more intense. Chemicals released from the food processing industry that may have environmental impacts include ammonia, phosphoric acid, sulphuric acid, chlorine, hydrochloric acid, nitric acid, copper compounds and zinc compounds (Multimedia Environmental Compliance Guide for Food Processors, US EPA, 1999 in Kauffman and Chevrot, 2000). Two of the top 15 chemicals for total on- and off-site are OSHA carcinogens: atrazine and acetaldehyde. Atrazine is an herbicide used primarily by raw cane sugar producers and processors. Acetaldehyde is a common food flavouring added to milk products, baked goods, fruit juices, candy and soft drinks. It is used to produce vinegar and yeast and to preserve fruit and fish.

The two industrial groups with the largest release of toxic substances in the US were soybean oil mills and frozen and canned food processors, accounting for more than 50.7% of the on- and off-site

releases and 56.5% of total production-related waste reported in the food and beverage sector (EPA, TRI, 1996 in Kauffman and Chevrot, 2000). The food processing industry has made progress in reducing its emissions to the environment (Figure 9) and in on-site recycling of waste although TRI data also shows an increase in total production-related waste which suggests a potential for source reduction.

Figure 9. **US – Air and water pollution from the food sector, 1988-1996**

Thousand tons



Source: Kauffman and Chevrot, 2000.

Wastewater at food processing facilities is generated during food preparation, processing and cleaning processes. Surface water discharges from food processing in the US increased 39% from 6.5 million pounds in 1995 to nearly 9 million pounds in 1996. Nitrate compounds mainly from meat processing facilities represented the largest discharges to surface water at 94% of total releases. Other regulated pollutants include biochemical oxygen demand (BOD), chemical oxygen demand (COD), total suspended solids, oil and grease, total Kjedhal nitrogen, high or low pH, ammonia nitrogen, and phosphorous.

Box 1. Summary: Trends and environmental impacts from household food consumption

Determinants of environmental impact

- Production methods
- Transport distance and mode
- Efficiency and scale of energy use
- Packaging intensity and waste prevention and management practices

Determinants of environmental impact

- Production methods
- Transport distance and mode
- Efficiency and scale of energy use
- Packaging intensity and waste prevention and management practices

Environmental impact

- GHG emissions and air pollution linked to energy for production, transport, conservation and preparation
- Packaging and organic waste

2.2. Household Tourism Travel

Household travel is one of the most significant ways in which households contribute to environmental pressures. Individual private car use and air travel will increase to 2020, contributing strongly to growing emissions of greenhouse gases (OECD, 2001). Household travel also contributes to local air and water pollution, noise exposure, and land alteration for roads and transport infrastructure.

While trends in overall household transport demand and related environmental impacts have been explored in depth (see Box 2), the environmental impacts of travel to and from tourism destinations have received less attention to date. Once heralded as a "smokeless" industry, the tourism sector has moved in recent years to reduce negative environmental and social impacts flowing from tourism activities. Nearly all of these efforts, however, have been targeted at reducing the *on-site* impacts of tourism activity (*e.g.* energy and water consumption, waste generation, land use, impacts on biodiversity). The OECD *Sector Case Study on Household Tourism Travel* was intended to help fill these gaps in existing analysis and policy development by identifying important trends in household tourism travel, related environmental impacts, and options for reducing those impacts.

Tourism-related travel represents a relatively important source of transport energy use and CO_2 emissions. While not as large a contributor as other forms of transport it is projected to grow, especially longer distance air travel. This means that environmental pressures from the households will likely increase in coming years. Section 2.2.1 reviews the results of OECD Secretariat research and analysis of international and national data on tourism travel. Section 2.2.2 identifies the environmental impacts of these trends.

Box 2. Household travel in OECD countries

The demand for all forms of transport has risen in OECD countries. Household travel meets the need for three kinds of mobility: commuting and other work-related travel, family and civic excursions (shopping, school, medical visits, etc) and social and recreational trips.

Car ownership in particular has increased steadily since 1970. Daily car use has grown substantially while road distances traveled by car have nearly doubled. Private vehicle stock and kilometers traveled are projected to increase substantially in OECD countries by 2020. Significant gains have been made in car fuel efficiency in all OECD countries, but greater car use and preferences for heavier, more powerful, and more comfortable cars have offset these improvements. Moreover the frequency of trips has risen while the number of persons per car has dropped. Among the different types of vehicles, cars collectively emit the greatest amount of carbon monoxide (CO), volatile organic components (VOCs), and carbon dioxide (CO_2). Emissions of lead, nitrogen oxides (NO_x), CO and VOC have been reduced, but CO_2 emissions from motor vehicles in OECD countries are projected to increase by approximately 45% from 1995 to 2020.

The share of rail travel in passenger transport has declined in recent decades in all OECD countries except the US. While total passenger travel by rail has experienced a growth of 10% over the past fifteen years, it accounts for only 6% of passenger travel. In contrast, air travel has grown tremendously over the past 30 years as a result of economic growth, higher disposable incomes and increased leisure time on the demand side, and falling airline tariffs and technical change on the supply side. Passenger traffic has expanded at an average rate of 9% annually since 1960. Compared to road transport, air travel represents a relatively small, but rapidly growing, source of environmental impacts.

Source: OECD *Environmental Outlook* (OECD, 2001). For additional information and publications on Transport and the Environment, consult the OECD Website *www.oecd.org/env*.

2.2.1. *Tourism Trends*

International and national data on tourist movements show that tourism-related travel[8] is growing across OECD countries. A broad survey of existing data indicates that business travel accounts for less

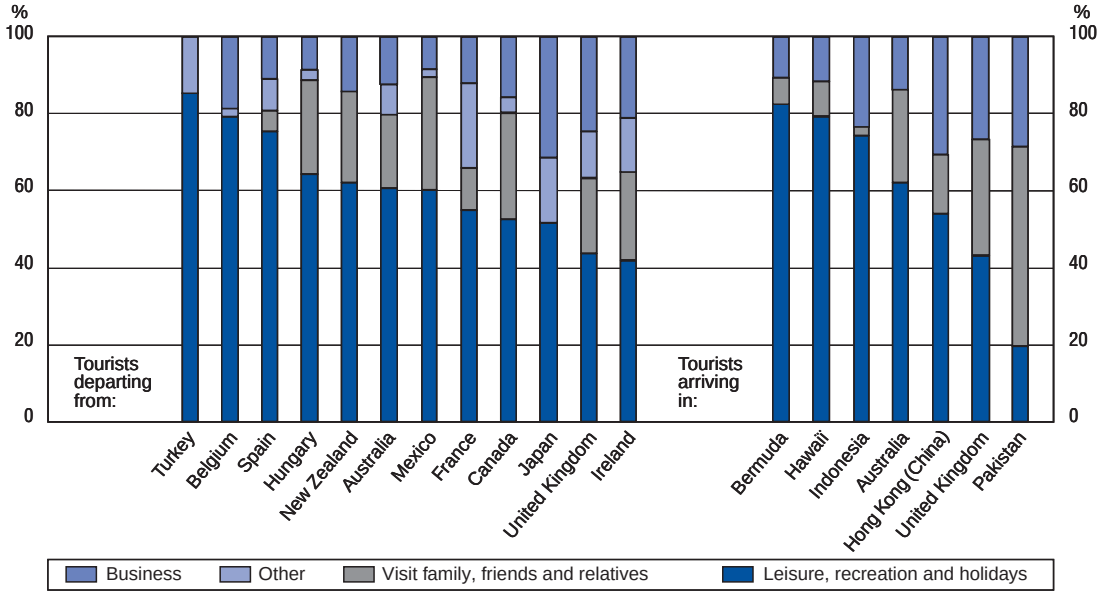
than half of all international tourism trips (Figure 10). Within Europe, holiday travel accounts for 64% of all international travel by Europeans compared to only 14% for business travel (Potier, 1999). In 1991 in Germany, holiday travel accounted for 62% of the total number of kilometres travelled, business travel for 30% and visits to family and friends for 7% (Meurs, 1999). In the United States visits to family and friends and holiday travel accounted for 50% on a trips basis and 61% as measured in kilometres travelled compared to approximately 38% and 27% respectively for business travel (US Department of Transport, 1995).

Tourism generates approximately 12% of world GNP, employs 100 million workers (Vellas, 1995) and makes up one of the most significant trade flows involving such diverse goods and services as airplanes, food and drink, and hotel management services. The tremendous growth of the tourism sector since the 1950s has been stimulated by the decrease in working hours, the rise in number of days of paid leave, and an overall increase in wealth and disposable income, particularly in OECD countries. Tourism activity within the OECD accounts for more than two thirds of all global tourism expenditures (74% in 1996) and over half of all tourism receipts (63% in 1996) (WTO, 1999*b*; OECD, 1997).These shares have been declining in relative terms as many non-OECD countries attract more international tourism.

Patterns of vacation travel are changing. Many households make shorter, more frequent tourism trips although the long (over two-week) holiday is still the norm in many countries, especially within Europe. In 1997, 36% of European holiday makers left for more than two weeks at a time, 21% for two weeks and 19% for one week (Eurobarometer, 1998). In contrast, legislation and cultural factors result in less annual leave in the United States and Japan. Decreases in annual working hours are thought to have contributed to more frequent trips around the week-end. These trips tend to be shorter than annual vacation trips but can involve considerable travel distances.

Most tourism trips take place within the country of origin. Exact figures vary from source to source but tend to confirm that domestic tourism accounts for 80% (Vellas, 1995) to 90% (WTO, 1998) of all tourism trips. In 1995, the WTO estimates that total domestic tourism arrivals numbered about 5.6 billion compared to 567 million international tourist arrivals (WTO, 1996). Domestic tourism can be broadly characterised in the following manner:

Figure 10. **International tourism by purpose: selected generating and receiving countries**



Source: WTO, 1999*b*; OECD, 1997.

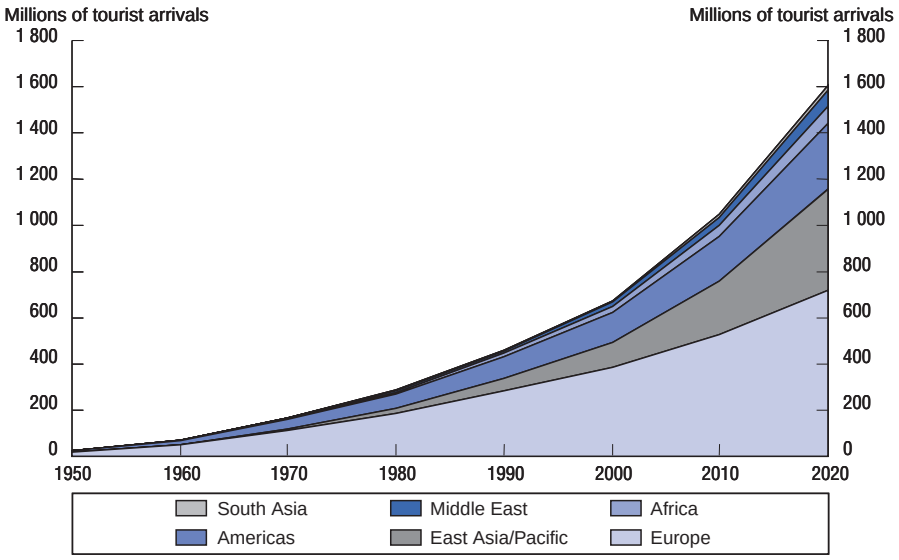
- domestic tourism trips are typically shorter in duration, cover less distance and are principally taken by car. (There are exceptions, however, for example in the Benelux countries where even short car trips can have foreign destinations, and in the United States and Canada, where aviation accounts for a relatively high share of domestic tourism travel because of the distances covered).
- large countries such as Canada and the United States tend to have large shares of domestic tourism, smaller countries have smaller shares.
- within Europe, northern countries have smaller shares of domestic tourism, southern countries have relatively larger shares.
- generally, domestic tourism displays a much flatter growth rate than international tourism.

There are exceptions of course, in particular when circumstances dissuade international travel. The WTO predicts that domestic tourism travel will stabilise within much of the OECD before 2020.

Both the WTO and the OECD compile comprehensive data on international tourism flows. These data give a fairly good understanding of the characteristics and trends in international tourism travel. However, they can hide important environmental impacts because they do not readily allow for a calculation of travel distances and mode use. In addition, problems arise for comparing trends for large and small countries. A large proportion of a small country's trips will be accounted for in international tourism statistics where longer trips in larger countries are considered "domestic" since no border has been crossed. The trends discussed below relate only to *international* tourism activity as measured by the WTO.

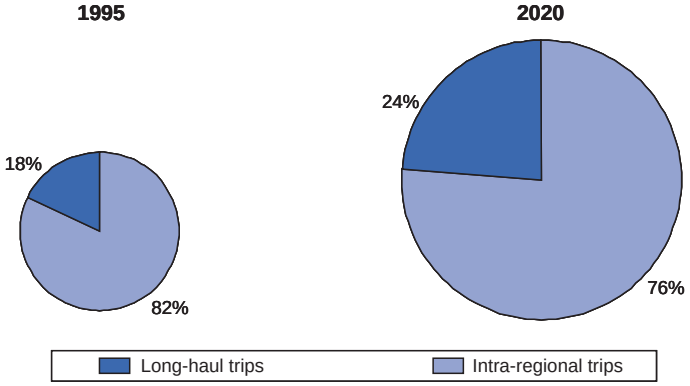
International tourism has grown at an annual average rate of 7.1% since the 1950's (Figure 11) and is projected to grow at an annual average rate of 4.3% through the year 2020. Past growth has primarily concerned Europe and, to a lesser extent, the Americas (in particular North America). Growth rates in these regions are projected to decline relative to tourism in the East Asia/Pacific region. The WTO predicts that in 2020, tourism arrivals world-wide will be triple their 1995 levels. One characteristic of this growth is that long-haul tourism travel (travel that takes place between world regions) will grow at a faster rate than intra-regional travel (Figure 12) and in 2020 will be as large as nearly 70% of *all* tourism travel in 1995. Inter-regional (mostly intercontinental) travel involves great distances of air travel where environmental impacts tend to be highest. The growth in long-haul travel will principally

Figure 11. **Past and projected inbound tourism by region**



Source: WTO, 1998.

Figure 12. **International tourist arrivals worldwide:**
Long-haul *vs.* intra-regional trips 1995-2020 (million tourist arrivals)



	million tourist arrivals	index
Long haul trips	101.34	100
Intra-regional trips	461.66	100

	million tourist arrivals	index
Long haul trips	384.48	379
Intra-regional trips	1 217.52	264

Source: WTO, 1998.

concern Europe and the Americas; the WTO predicts that the bulk of first-time Asia/Pacific tourism travellers will initially travel within the region.

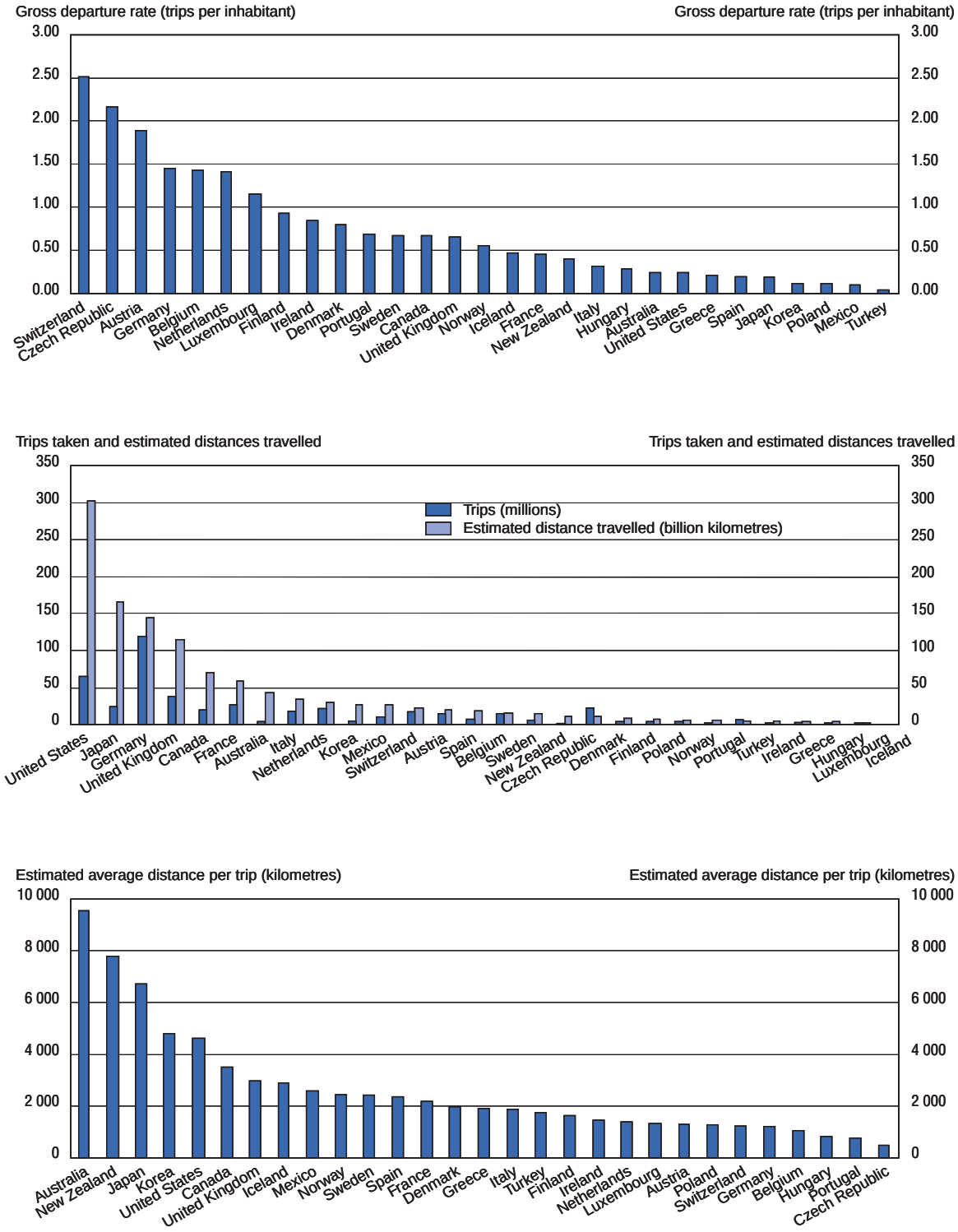
Figure 13 provides an overview of OECD international tourism activity in 1996 as measured by OECD tourists' destination choices. Most countries still have relatively small international departure rates, which suggests important growth potential for international travel. On the other hand, international tourism travel concerns a relatively small number of people in many OECD countries (especially considering that the gross departure rate masks individuals taking multiple international trips). Two elements stand out from a comparison of international trips taken and estimated distances travelled. The first is that the five countries with the highest estimated travel distances account for more than two-thirds (67%) of all OECD international tourism travel distances. The second is that there is considerable variability between countries in the number of trips taken and overall distances travelled. Many countries with high average lengths (*e.g.*Australia, New Zealand and Korea) contribute relatively little to the absolute volume of travel whereas some countries with relatively low international departure rates contribute in a much higher proportion to the total volume of international tourism travel (*e.g.*United States and Japan).

Domestic and international tourism are more linked than previously thought. Countries with strong domestic tourism markets are generally also attractive international tourism destinations. Furthermore, countries with developed domestic tourism infrastructure and services tend to experience a higher degree of international travel substitution under the influence of external factors (*e.g.* relative growth in real income, price differences between nations, political developments, etc.).

2.2.2. *The environmental impacts from tourism-related travel by mode*

Travel to and from tourism destinations and within tourism destinations contributes to a number of environmental impacts. These impacts principally concern climate change and air, water and noise pollution. They also affect to a lesser extent biodiversity, natural resources and visual amenities, although these impacts can be acute locally (Table 8). Travel represents the most important source of energy use and greenhouse gas emissions in the tourism sector.

Figure 13. **OECD international tourism 1996**



1. Calculations are based on WTO 1999 Yearbook of Tourism Statistics, calculated according to destination. Because of WTO data variability preference was given to Tourist arrivals, then Visitor arrivals and Arrivals in all forms of accommodation. Distance calculations are based on great circle distances between the geographic centres of origin and destination countries, which may lead to distortions. Distance calculations reflect the *magnitude and scale* of travel distances, not the exact number of kilometres travelled.

Source: WTO 1999.

Table 8. **Environmental impacts from tourism and tourism transport**

Category of impact	Type of impact	Impact from transport
Biodiversity: Floral and faunal species composition	Disruption of breeding habits	+
	Killing of animals through hunting	
	Killing of animals in order to supply goods for the souvenir trade	
	Inward or outward migration of animals	+
	Destruction of vegetation through the gathering of wood or plants	
	Change in extent and/or nature of vegetation cover through clearance or planting to accommodate tourism-related facilities and transport infrastructure	++
	Creation of a wildlife reserve/sanctuary or habitat restoration	
	Creation of monetary value and incentives for the preservation of natural amenities	
Pollution	Water pollution through discharges of sewage, spillages of oil/petrol	+
	Waste generation	+
	Air pollution from vehicle emissions, combustion of fuels for heating and lighting	+++
	Acid and nitrogen deposition in sensitive ecosystems and water bodies.	++
	Noise pollution from tourist transportation and activities	++
Erosion	Compaction of soils causing increasing surface run-off and erosion	
	Change in risk of occurrence of land slips or slides	
	Change in risk of avalanche occurrence	
	Damage to geological features (*e.g.* caves, tors, etc.)	
	Damage to river and stream banks, damage to dunes and beaches	
Natural resources	Depletion of ground and surface water supplies	
	Depletion of fossil fuels to generate energy for tourist travel and activities	++
	Change in risk of occurrence of fire	
	Depletion of mineral resources for building materials	
	Over-exploitation of biological resources (*e.g.* overfishing)	
	Change in hydrological patterns	
	Change on land used for primary production	
	Increase in land take for tourist developments and transport infrastructure	+
Visual impact	Facilities (*e.g.* buildings, chairlift, car park roads)	++
	Litter	
	Sewage, algae blooms	
	Smog	++
Climate change	Radiative forcing impact from emission of greenhouse gases and water vapour at high altitudes from air transport to and from tourism destinations	+++
	Greenhouse gas emissions from ground and maritime sources	++
	Greenhouse gas emissions from energy production for tourism activities	
	Change in carbon sequestration potential due to tourism related land-use change	

Source: Modified from Green and Hunter, 1995.

The scope and scale of environmental impacts from tourism travel depends on the volume of travel for different modes, the specific environmental characteristics of these modes and the environment within which travel takes place (*e.g.* urban areas, sensitive ecosystems, etc). Although sufficient data is available to evaluate general environmental impacts from transport, relatively little international data exists on the *specific* impacts of domestic and international *tourism* travel. Despite this limitation, it is possible to estimate these impacts by comparing international data on tourism movements and mode shares with more detailed national data.

Road Transport

Road transport is a major source of air and water pollution, greenhouse gas emissions, noise levels and land-take. Although motor vehicles, and cars in particular, have greatly improved their per vehicle and per passenger kilometre environmental performance, these gains have been somewhat offset by

increases in overall volumes of travel. Future growth in road transport volumes could even reverse current downward trends in absolute emissions of NO_x and VOCs (both damaging in their own right and when combined as ozone).

Road transport dominates tourism travel when measured by number of trips and to a lesser extent by kilometres travelled, although tourism-related road travel accounts for a fairly small share of overall intra- and inter-urban road transport activity. That share increases over long-distance (over ~100 kilometres) road transport. The relative contribution of tourism road travel to overall environmental impacts from passenger road transport is furthered tempered by the high average vehicle occupancy for tourism trips and efficient operating conditions (*e.g.* a relatively low share of energy-intensive and polluting stop-and-go traffic). High load factors in coach travel make this a relatively environmentally benign form of travel, at least for its intercity component (OECD, 2001*c*).

Local impacts can be minimal for diffuse patterns of tourism (*e.g.* in the case of much rural tourism), but acute for certain forms of seasonal and concentrated tourism flows. In these cases large flows of tourist vehicles can overwhelm existing transport infrastructure, increase damaging emissions and cause levels of traffic congestion more typically associated with large urban areas. These impacts are oftentimes strongly felt in urban, sea-side and mountain areas although they can manifest themselves at certain constrained nodes of road networks during peak travel periods. Impacts from tourism-related road transport differ from those caused by local traffic only in their scale and concentration in time. One particular exception is coach travel, which has no local equivalent and contributes to considerable environmental and congestion problems at high volume tourism destinations such as historic city centres. Over time the accumulated impact of tourism-related transport emissions can be significant (*e.g.* accumulated acid/nitrogen deposition; ozone damage in sensitive ecosystems). Impacts related to the construction or modification of transport infrastructure, while not uniquely caused by tourism travel – they serve local inhabitants as well – can be important insofar as new infrastructure is created or old infrastructure is re-sized with the specific intent to handle seasonal tourism flows.

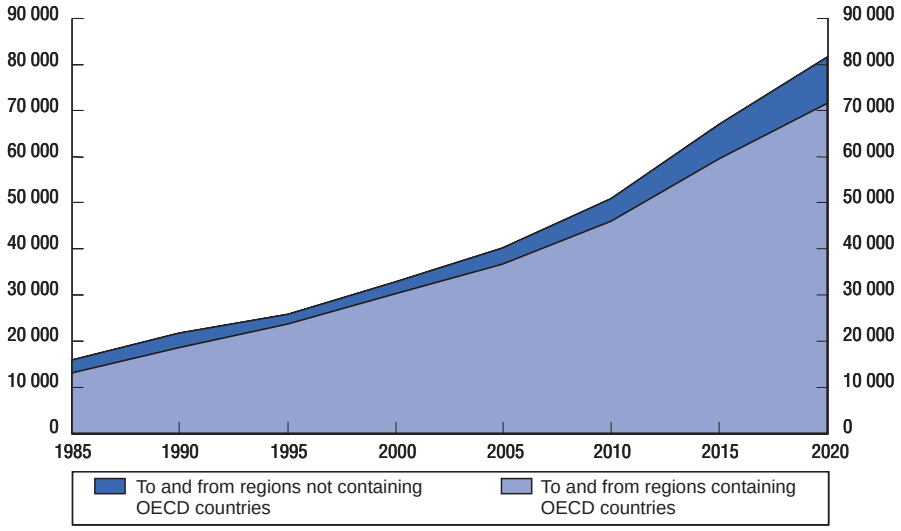
Household tourism travel can also indirectly influence environmental impacts from non-tourism road transport activity by influencing household decisions on what type of vehicle to buy. In many OECD countries, increases in the operating efficiency of automobile engines have been offset by increasing vehicle weights and sizes (IEA, 1999). One purchasing criteria households commonly cite is to have a car large enough for family vacation trips, even if this means a larger car than required for day-to-day use (US DOE, 1998).

Air Transport

Compared to the road transport sector, aviation represents a relatively small, but rapidly growing, source of global environmental impacts. Because of improved engine performance, increased load factors, technical and operating efficiency improvements and changes in fleet composition, air travel has become nearly as efficient as typical automobile use on a per-kilometre basis. As a result, environmental impacts will increasingly be a function of the overall distances travelled (for CO_2 emissions), emission concentrations (NO_x at and around airports) and at what altitude emissions occur (*e.g.* for water vapour, fine particles, NO_x), rather than the specific impacts per kilometre travelled. At the same time, past efficiency gains are not expected to continue into the future and the projected annual average future efficiency gains of 1-1.3% will not be sufficient to offset future growth (Figure 14) and significant rises in energy use and CO_2 emissions. Future improvements in aircraft performance will also be made more difficult because there are trade-offs between reducing either CO_2 or NO_x emissions (IPCC, 1999).

Absolute levels of CO_2 emissions from air transport are important – roughly comparable to carbon emissions for certain OECD countries (Figure 15). Overall, CO_2 emissions from aviation represented approximately 2.4% of global fossil fuel emissions in 1992 or 12.4% of carbon emissions from transport activity. According to different transport scenarios, aviation's share of carbon emissions may increase over the next two decades by 3% to more than 7% of all fossil fuel carbon emissions (IPCC, 1999).

Figure 14. **Growth in global aviation, 1985-2020**

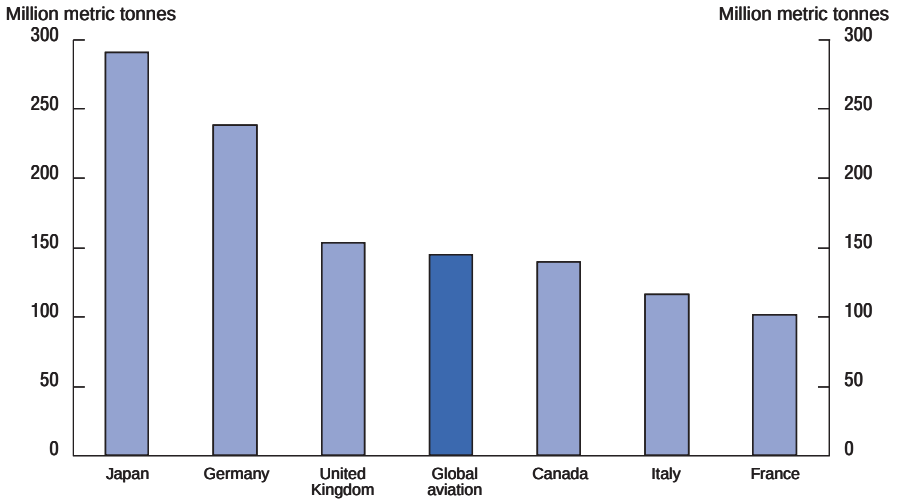


Source: Boeing, 1999.

Greater long-haul tourism travel will be responsible for a significant portion of this growth, much of which will be from traffic to and from OECD regions.

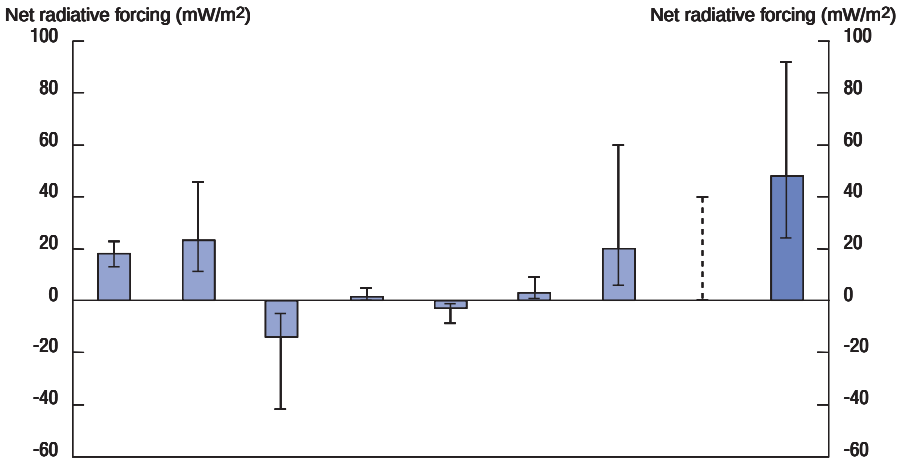
The current best scientific understanding of the greenhouse effects of aircraft engine emissions in the atmosphere is illustrated in Figure 16, which shows the roles certain compounds and emissions play in contributing to (*e.g.* CO_2) or attenuating (*e.g.* direct sulphate emissions) atmospheric warming (IPCC, 1999). NO_x emissions can both contribute to warming (through the creation of ozone) and decrease it (by breaking down methane – a highly potent greenhouse gas). On balance the IPCC has concluded that

Figure 15. **Total CO_2 emissions from selected countries compared to the global aviation**



Source: US GAO, 1999.

Figure 16. **Radiative forcing from aviation emissions**



Emissions/ Pollutant	CO_2	NO_x (as NO_2)	NO_x (as NO_2)	H_2O	SO_x (as SO_2)	Soot	Mix of SO_2, Soot and H_2O	Mix of SO_2, Soot and H_2O	Total w/out cirrus
Greenhouse relevant medium	CO_2	O_3	CH_4	H_2O	SO_4	Black carton aerosol	Contrails	Cirrus clouds	
Level of scientific understanding	goal	poor	poor	poor	fair	fair	fair	very poor	

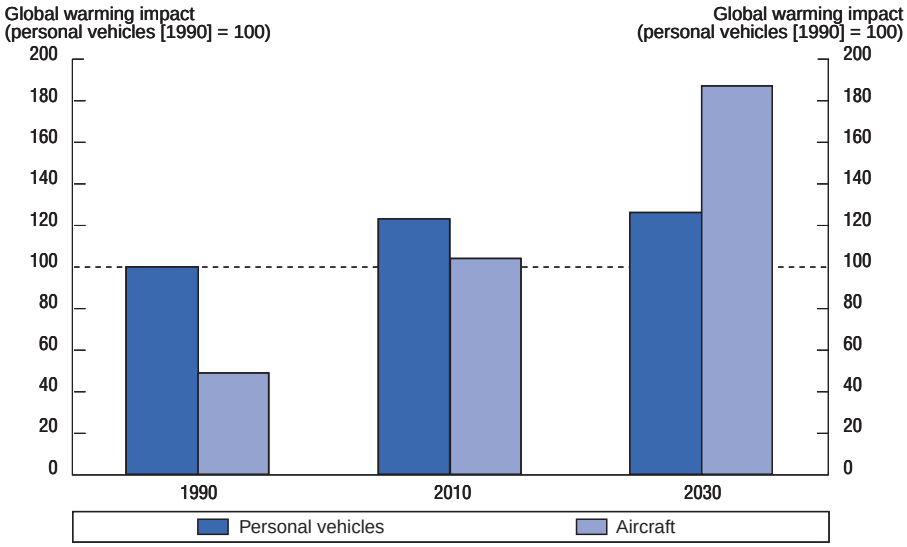
Source: IPCC, 1999.

the overall global warming impact from aircraft emissions amounts to *two to four* times the global warming impact from aviation CO_2 emissions alone (IPCC, 1999).

Based on these findings and projected aviation and motor vehicle growth rates, the global contribution of aircraft to global warming will surpass the global warming impact of cars by 2030 despite aviation's comparatively low emissions of CO_2 alone (Figure 17). Our understanding of the radiative forcing impact of aircraft emissions is still evolving, but recent findings tend to support a higher forcing impact than estimated before. Furthermore, the radiative forcing impact is dependent on a number of factors including flight altitude and routing. Many shorter distance flights take place at lower altitudes, which tends to reduce the warming impact from NO_x, and to the extent that these flights avoid passing through humid air layers, the impact from contrail formation. Reducing the volume of these types of flights (for which alternatives are more readily available), would not have the same impact on radiative forcing as reducing difficult-to-replace long-haul flights. Efforts to reduce the non-CO_2 emissions from aviation could also lead to increased CO_2 emissions.

Landing and take-off cycles and the ground movement of aircraft and related ground support equipment (which tend to be heavy emitters of NO_x and particulate matter) can also contribute to local air pollution in and around airports. These emissions are further compounded by the use of kerosene-burning auxiliary power units that generate electricity and conditioned air for aircraft while taxiing and parked at the gate. Total ground emissions from aircraft and their support represent a relatively small share of overall urban air pollution. However, in some areas with high levels of background pollution or in sensitive areas (*e.g.* mountain valleys) airport emissions are a source of concern. Significant progress has been made by upgrading ground support equipment and through the provision of centralised electricity and conditioned air systems (US EPA, 1995). Noise pollution also represents a problem for areas surrounding airports although important noise reductions have been achieved by gradually phasing out older aircraft. However, a recent report by a commission of the European Parliament has

Figure 17. **Global warming impact of transport modes worldwide: 1990-2030**



Source: CST, 2000; IPCC, 1999; OECD, 1995.

concluded that these measures will not be sufficient to resolve the noise problem for people living under flight paths near airports.

Maritime Transport

As a transport mode, maritime passenger transport is relatively energy efficient and low-polluting both in absolute terms and on a per passenger kilometre basis. However, certain environmental impacts associated with cruise ship vacations stand out when examining complete vacation packages. In particular, since the means of transport is also the place of accommodation, impacts otherwise considered to be relevant to tourism destinations only (*e.g.* solid waste and wastewater disposal in sensitive marine environments) must be considered. Furthermore, cruise vacations are often jointly packaged with air travel to and from the point of embarkation. The climate, pollution and energy use impacts of this component of the vacation package dwarf the environmental impacts produced once the ship is underway.

Box 3. **Summary: Trends and environmental impacts from household tourism travel**

Trends at the household level

- Growing demand for tourism travel
- More frequent departures
- Most tourism within country of origin, but growing long-haul travel

Determinants of environmental impact

- Volume
- Distance
- Mode (road, air, maritime)
- Characteristics of environment (urban, sensitive ecosystem

Environmental impact

- GHG emissions
- Air, water and noise pollution
- Impacts on biodiversity, natural resources, visual amenities

2.3. Household Energy and Water Consumption and Waste Generation

Household energy and water consumption and waste generation are important areas of household activity for the environment. The OECD *Sector Case Study on Household Energy and Water Consumption and Waste Generation* investigated trends in OECD countries, and specifically in Germany, Mexico and the Netherlands. Section 2.3.1 presents trends and environmental impacts for *energy*. The analysis shows that household energy demand continues to grow, although at a slower rate than in the past, but despite efficiency gains for many household energy end uses. In contrast, Section 2.3.2 shows that household *water* consumption has stabilised or declined in a number of OECD countries. These trends suggest a strong potential for households in other OECD countries (and particularly those with high per capita water consumption levels) to reduce their use levels. Households are not the principal source of water pollution, but do influence quality through wastewater releases and run-off of lawn chemicals. Section 2.3.3 shows that the generation of household waste continues to grow and is projected to increase further to 2020, making waste a priority concern.

2.3.1. *Household Energy Consumption*

Commercial and residential energy uses account for between 15% and 30% of final energy consumption and are the second fastest growing area of demand after transport. Household demand for energy has grown, driven by greater use of electrical goods, more home floor space per capita, and higher levels of cooling and heating comfort. Electricity demand in particular is projected to increase substantially in all OECD regions, with the highest relative changes (approximately a 200% increase) expected in Central and Eastern Europe (OECD, 2001). Air pollution and human induced climate change are the most pressing environmental problems arising from energy generation and use.

Household Energy Consumption Trends

Energy use in OECD countries grew by 36% from 1973 to 1998 and is expected to grow by a further 35% by 2020. The OECD regions' share of energy consumption in the world total is projected to fall from 35% in 1995 to 32% in 2020. Compared with recent trends in energy demand, these figures represent a decline in the energy intensity of the economy both for OECD regions and world-wide, indicating that some decoupling of energy use from economic activity is taking place.[9] However, per capita energy use is expected to continue to increase to 2020, and energy related CO_2 emissions in 2010 will be still significantly higher than required to meet commitments under the Kyoto Protocol (IEA, 2000*b*).

In Germany, households consumed 30% of total final energy consumption during the 1990s. Total household energy consumption increased 9.4% from 1991 to 1998 (Lorek *et al.*, 2001). In the Netherlands households consume 20% of total final energy compared to 17% in Mexico, where household electricity demand increased 6% during the 1990s (Secretaría de Energía, 2000).

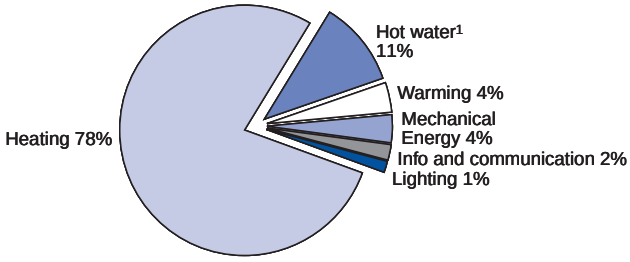
Total primary energy supply (TPES),[10] per capita consumption, and efficiency rates vary significantly among OECD countries (Table 9). TPES per capita, for instance, is much higher in Germany

Table 9. **Key energy indicators in 1998**

	Germany	Netherlands	Mexico	USA	OECD
Population (million)	82	16	96	269	1 101
GDP (billion 1990 US dollar)	1 834	349	334	7 044	20 656
Total primary energy supply (Mtoe)	345	74	148	2 182	5 097
TPES/population (toe per capita)	4	4.7	1.6	8.1	4.6
TPES/GDP (toe per 000 US dollar)	0.18	0.21	0.44	0.31	0.25
Electricity consumption/population (kWh per capita)	6 482	6 310	1 644	13 388	7 751
Electricity consumption/GDP (kWh per US dollar)	0.28	0.28	0.47	0.51	0.38

Source: IEA, Energy Efficiency Indicators, internal database, 1998.

Figure 18. **Household energy use in Germany**

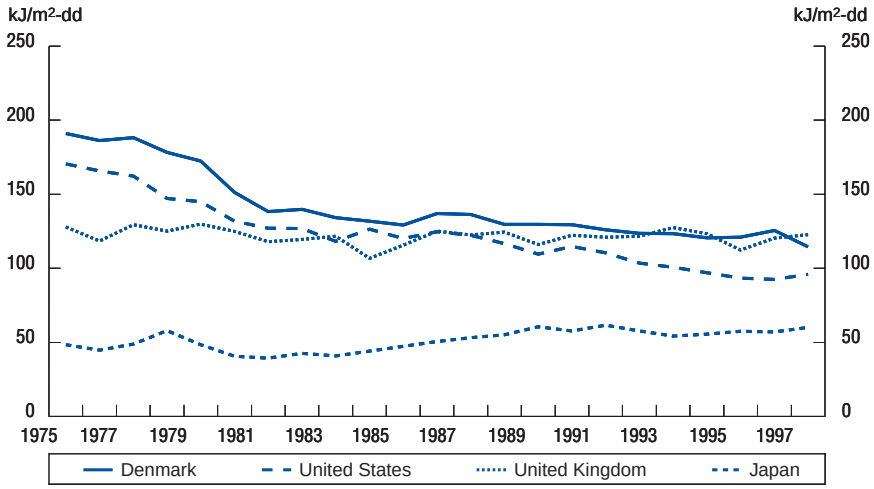


Source: Vereinigung Deutscher Elektrizitätswerke, Frankfurt; AK Nutzenenergiebilanzen (1998). Hot water includes hot water for washing machines, dishwasher; engine under mechanical energy. And warming refers to cooking, ironing, tumbling, etc.

and the Netherlands than in Mexico, but so is energy efficiency. Differences are significant in the USA, where electricity consumption is 13 388 kWh per capita and electricity consumption/unit GDP is 0.51 (Table 9). In per capita terms, Mexico's energy use and pollutant emissions are low compared to most OECD countries. Notwithstanding, energy intensity (energy use per unit of GDP) is increasing in Mexico at the same time that it is decreasing for the OECD as a whole (OECD, 1998).

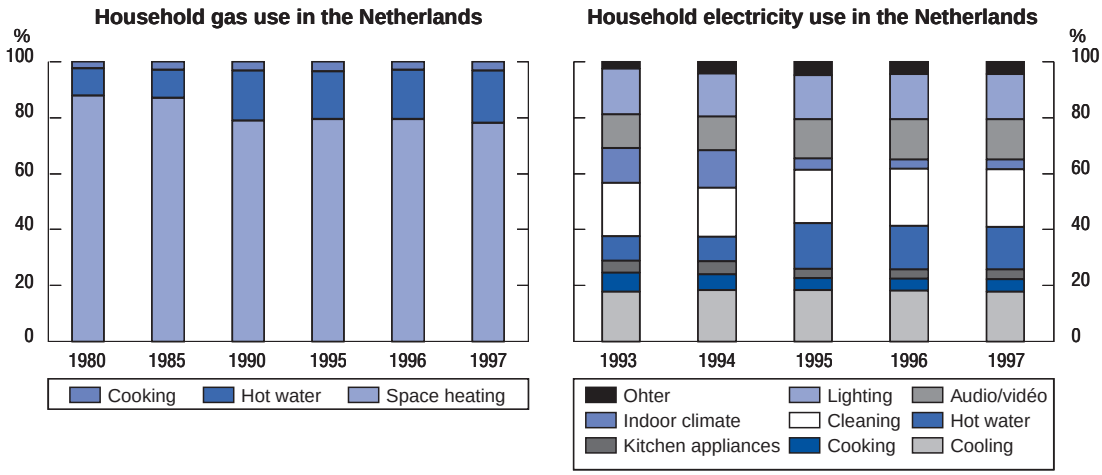
Households use most energy for space heating, followed by water heating, and small amounts for lighting and cooking. In Germany, for instance, nearly 80% of household energy is used for heating (Figure 18). Many countries have made progress in increasing energy efficiency and reducing household energy use for heating (Figure 19). In the Netherlands, natural gas has been used since the 1960s for cooking, hot water supply, and central heating (Figure 20*a*). From the 1980s onwards, natural gas consumption per household began to fall in absolute terms, as a consequence of the introduction of more efficient boilers and improved insulation of houses. Energy consumption in new houses in the Netherlands is now about 40% of that in a home built in the 1960s. On the other hand, in the Netherlands (Figure 20*b*), as in other OECD countries, the use of electricity for lighting and to power an

Figure 19. **Space heat intensity (adjusted to similar climate)**



Source: IEA, 1998.

Figures 20*a* and 20*b*. **The Netherlands**



Source: ECN, 1998.

increasing number of appliances has been growing. Although the appliances marketed in OECD countries in general have become substantially more energy efficient in recent years, this has not been enough to offset the effects of greater ownership and more frequent use (OECD, 2001).

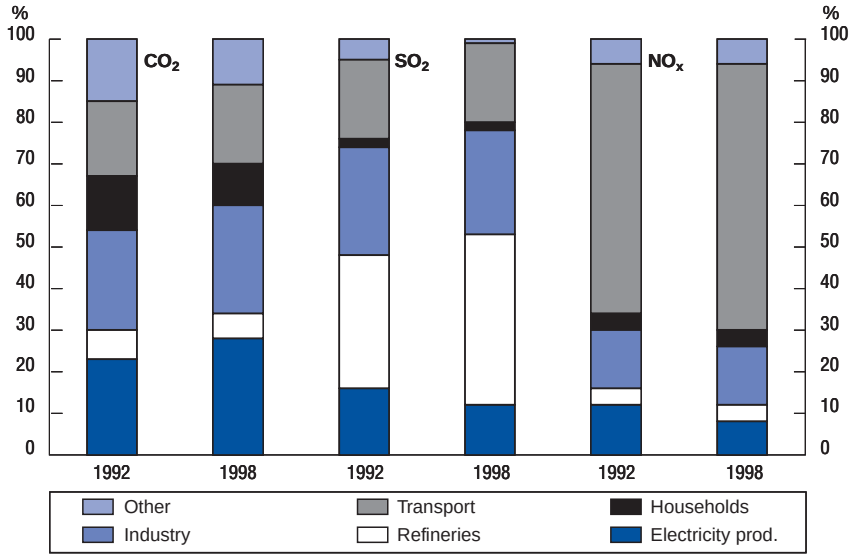
The Environmental Impacts of Household Energy Consumption

Air pollution and human induced climate change are the most pressing environmental problems arising from energy generation and use. Fuel combustion is the major source of air pollution across OECD regions, with subsequent impacts on human health and well-being and on ecosystems. Regional and global impacts on ecosystems include acid rain through SO_x and NO_x emissions, and climate change through increased atmospheric concentrations of greenhouse gases. In many OECD countries relative emissions of SO_x and NO_x from industry and electricity production have been stable or declining since the 1980s. This has been the case in the Netherlands, for example, over the past ten years (Figure 21). In contrast, the relative share from households has increased because it is comparatively more difficult to reduce household emissions. The share of NO_x, emitted by households is relatively small. CO_2 emissions fell in the Netherlands as a result of increased efficiency in gas heating. Across the OECD region, however, energy-related SO_x and CO_2 emissions are expected to increase by 26% and 33% respectively to 2020. This represents a slower rate of growth than in the past (OECD, 2001).

Electricity generation also contributes to water pollution. Many OECD countries increasingly use freshwater resources for cooling purposes in electricity production: over 50% of freshwater abstractions in at least eight OECD countries are used for cooling in electrical power generation (OECD, 1999*c*). While water used for cooling is generally returned to the source, it often has a higher temperature than when it was abstracted. Thermal pollution of waterways can lead to oxygen depletion in freshwater ecosystems, and for that reason is regulated in most OECD countries, usually through siting permits. Pollution of water and soil from energy use also occurs directly through leaking oil tanks and indirectly through acidic deposition caused by NO_x and SO_x emissions. This has led to severe effects on lakes and rivers and on forests in some regions, with damage to freshwater fish, other fauna, and habitats (OECD, 2001).

Nuclear energy produces waste that carries unique risks in relation to its transport and disposal. Nuclear waste can remain highly radioactive for thousand of years. There is also a threat of accidental releases of radioactive material from nuclear power generation facilities. While many OECD countries

Figure 21. **Netherlands: Direct emissions from energy use by sector 1992 and 1999 (shares)**



Source: Correljé *et al.*, 2001.

have agreed that isolation of nuclear waste in stable geological structures is currently the most appropriate option, implementation of this policy has been slow for political reasons.[11] In addition, there is no consensus on whether waste disposed in such a manner should be retrievable – in case another method of storage is subsequently preferred – or irretrievable, so as to minimise the risk that the storage facility could be used as an illegal source of nuclear materials (OECD, 2001).

2.3.2. *Household Water Consumption*

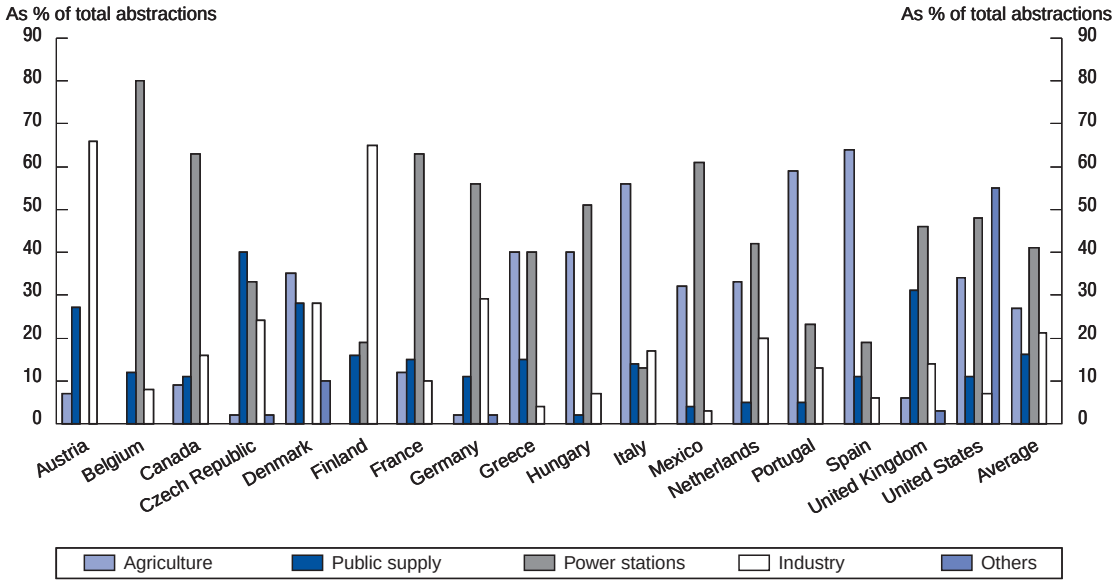
OECD countries are the world's largest users of water, consuming three times more than an average person in East Asia, Latin America, Africa or India. In the OECD area, total freshwater abstractions have risen by over 4% since 1980, and are expected to rise another 12% to 2020. Technological improvements, but also to some extent behaviour change on the part of consumer, have led to some decoupling of water consumption from economic growth. However, while per capita water abstractions have been declining in many OECD countries, population growth has resulted in an increase in total water abstractions. Only nine OECD countries – primarily in Europe – reduced total water abstractions between 1980 and 1997 (OECD, 2001). Water consumption patterns affect the environment in two ways, through extraction and depletion, and pollution of ground and surface waters.

Household Water Consumption Trends

OECD households on average consume only 8% of total freshwater withdrawals, compared to 65% for industry (44% for power generation and 21% for other industry) and at least 30% for agriculture (OECD, 1999*d*). Relative sector shares vary among countries (Figure 22).[12]

Few data exist on household water consumption. Household consumption is usually estimated through the "public water supply", which refers to water supplied by water networks and includes other users such as restaurants and small business. Households are the largest consumers of public water supplies. Per capita levels vary considerably among OECD countries, ranging from 100 to 300 litres per capita per day (OECD, 1999*d*). Households in Germany, the Netherlands, and Mexico are on the lower end of this range (Table 10). Public water supply in Germany, of which household consumption accounts

Figure 22. **Total water abstractions by sector in selected OECD countries**



Source: OECD, 1999*d*.

for 80%, decreased by 15% from 145 litres/day in 1991 to 128 litres/day in 1996 and has since stabilised (Figure 23). Similarly, after a tremendous increase between 1950 and 1999, household water consumption in the Netherlands decreased from 131 litres/day in 1989 to 128 litres/day in 1998 (Figure 24). This decrease has occurred despite increasing per capita income and population growth due to water saving policies (see Section 3.2.3) (Vewin, 1998).

In Mexico regional water scarcities and inadequate distribution of potable water are areas of concern: although 18 million additional people have been connected to the public water supply system since 1990, 13% of the population (5% of urban households and 35% of rural households) are still without piped water. Mexican households consume 12.6% of the total water supply, compared to industry (4.7%) and agriculture (82.7%). Per capita water use in Mexico increased from 121 litres/day to 135 litres/day in 1999, driven by population growth, the increasing numbers of households connected to the water network, and economic growth (see Section 3.2.3).[13]

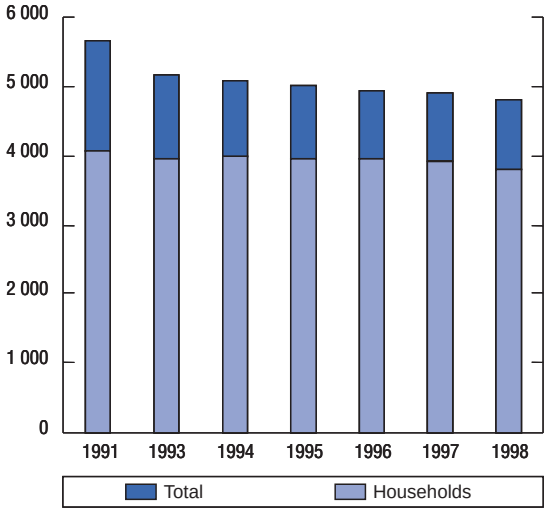
Households use most water for bathing and showering, toilet flushing, and washing clothes. Average European household consumption is about 150 litres, of which approximately 33% is for

Table 10. **Summary of household water consumption indicators in Germany, the Netherlands and Mexico**

Indicator	Germany	Netherlands	Mexico
Share of water abstraction of total water available	22.5%		17%
Of which:			
Surface	66%	33%	33%
Groundwater	33%	66%	66%
Household water consumption as share of total water consumption	13%	28% (OECD, 1997)	12%
Household water consumption per capita (litres)	128	127 (1999)	135 (1999)
Water loss through leakage	9%	4.9%.	40%
Population connected to water treatment plants	92%	98%	23.8%*

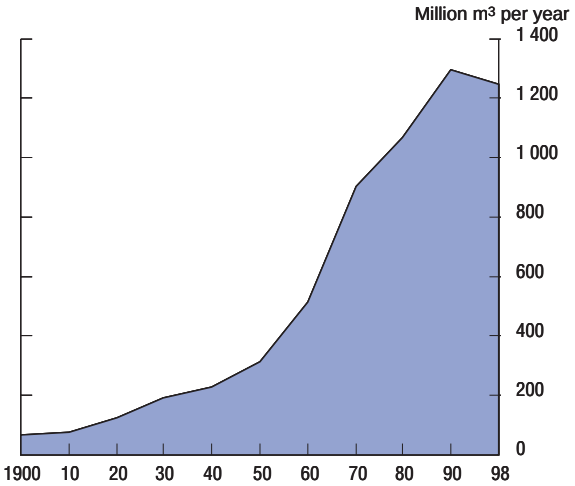
* Includes urban areas only.
Source: Lorek *et al.* (2001), Correljé *et al.* (2001), Vilar *et al.* (2001).

Figure 23. **Germany: Public water supplies 1991-1998**



Source: Germany Federal Statistics Office.

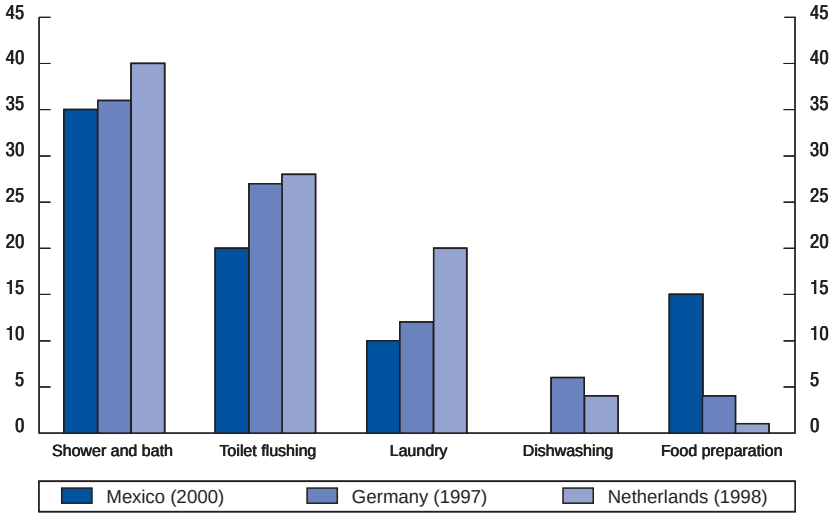
Figure 24. **Netherlands: Total public water supply**



Source: Waterleidingstatistiek 1998, Vewin.

personal hygiene, 33% for clothes and dish washing, 20-30% for flushing toilets and only 5% for drinking and cooking (European Environment Agency, 2001). These figures are similar in the three case study countries (Figure 25). Currently all household water uses draw on potable water supplies. Pressures to reduce water supply costs are motivating some countries to examine options to supply lower quality water for flushing and gardening.[14]

Figure 25. **Household water use (litres/day)**



Note: In Mexico, the cluster of food includes not only drinking water, but also water for washing dishes and other activities related to cooking.
Source: IMTA, 2000; FAGGWI, 1997; NIPO 1999.

The Environmental Impacts of Household Water Consumption

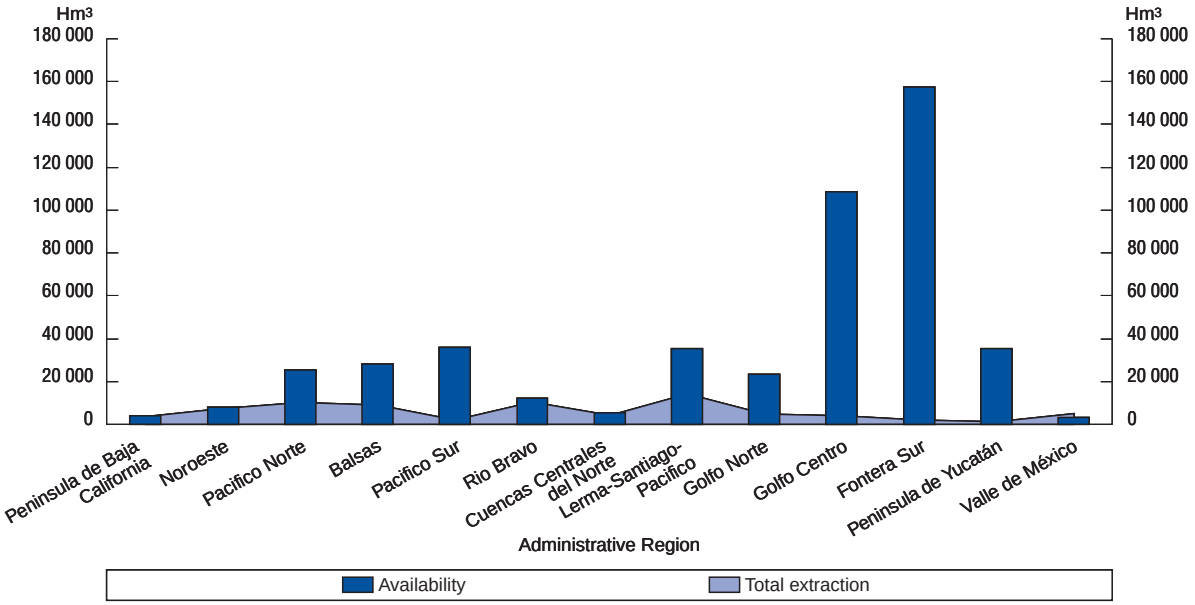
There are two main environmental impacts of water consumption: water abstraction and depletion and water pollution. Although most OECD countries do not face water scarcity problems, there exist extensive arid or semi-arid areas where development is restricted by water supply. Urban and rural communities are also increasingly competing with other water users, while many cities in OECD countries are facing rising costs to supply water of drinking quality and sanitation facilities to urban residents. Water pollution is a more generalised problem despite major efforts in OECD countries to clean up many of the worst polluted water bodies over the last few decades.

Water Abstraction and depletion

The pressure on water resources is different in each country since freshwater is distributed unevenly within and among countries as are the relative pressures on these resources. Most OECD countries currently abstract less than 50% of their annually available water resources. Germany, for example, exploits only 23% of its available water resources (of which 33% comes from ground water, and 66% from surface water) (German Federal Statistics Office, 2000 in Lorek *et al.*, 2001). In contrast, while only 17% of total available water resources are abstracted at the national level in Mexico, 15% of water resources supplying 50% of national water consumption, are over-exploited. Other regions (*e.g.* Mexico City) present a water deficit (CNA, 2001) (Figure 26).

Overdrawing groundwater sources can result in significant environmental effects, including the subsidence of the land above aquifers, the lowering of water tables and desiccation, and the intrusion of seawater where aquifers are sited near coastal zones, contaminating the freshwater resources with salt and causing salinisation of coastal lands (UNEP, 2000). In the higher areas of the Netherlands, for example, the groundwater level fell on average from 0.10 to 0.4 meter below the soil surface between 1950 and 1990 (Milieubalans 1999, RIVM). This has caused damage to 600 000 hectares of water-dependent nature. In the Netherlands, the drainage of agricultural land accounts for 60% of desiccation problems, groundwater extractions by industry and water companies for 30%, and other changes in the hydrological system (*e.g.* increase of built/paved area) for 10% (Correljé *et al.*, 2001).

Figure 26. **Regional comparison of water extraction and water availability in Mexico**



Source: CNA, 2001.

Water Pollution

Water quality can be affected by direct pollution to water bodies and through the concentration of mineral and salt content caused by excessive water abstraction. Industry, followed by agriculture, is the primary polluter of water resources. The contribution of households is comparatively small, and concerns essentially the effects of wastewater releases on the oxygen availability in aquatic ecosystems (known as biochemical oxygen demand or BOD), contamination by household products (including phosphate detergents, oil and grease), and run-off from lawn and garden chemicals. Phosphates are no longer a serious concern in most OECD countries, following policies and product changes to eliminate phosphate detergents over the last two last decades.

Household water pollution has been reduced over the years primarily by connecting more households to basic sewage treatment facilities and better treatment of wastewater. The total share of the population connected to public wastewater treatment plants in OECD countries rose from 51% in 1980 to almost 60% in the mid-1990s, although connection levels vary from under 10% to a high of almost 100% (OECD, 1997). Despite these improvements, BOD levels in household sewage releases are still projected to increase to 2020.

In Germany, 92% of the population are connected to the public sewage system and 87% of household sewage passes through purification plants with mechanical, biological, and tertiary (advanced) treatment. In the Netherlands about 98% of the population is connected to the sanitation network. In contrast, only 23.8% of the urban population is connected to the sanitation system in Mexico. The remaining wastewater goes back to rivers without any treatment, making water quality one of Mexico's most pressing environmental problems. 90% of the water pollution comes from industrial activities; household wastewater represents only 9.5% of water pollution (Roemer, 1997 in Vilar *et al.*, 2001).

Households could contribute to reducing water consumption and pollution. When the combined consumption of households is lower, the sanitation network and purifying installations can be smaller and more efficient (Correljé *et al.*, 2001). Solid and chemical pollution could also be reduced by using solid waste channels as much as possible, by choosing biodegradable soaps, shampoos and detergents, and avoiding pouring oils and chemicals down the drain. Product modifications (low-phosphate detergents, pre-dosed soap tablets) are expected to continue to improve water quality in some countries (RIVM, 2000).

2.3.3. *Household Waste Generation*

Decoupling municipal waste generation from economic growth represents an environmental priority for the next two decades in many OECD countries (OECD, 2001). In the future, both municipal and industrial waste are expected to show high growth rates. While many measures have been taken to improve waste management systems, major efforts are still needed to reduce the volume of waste generated in the first place. Waste can represent an inefficient use of material and energy resources and can be a source of environmental pollution where inappropriately managed. Most OECD governments have been shifting waste strategies from simple collection and disposal to a "waste hierarchy" with a primary emphasis on preventing waste generation. Although landfill is still the most widely used method of waste disposal, household participation in waste recycling schemes are at their highest levels ever in many countries. In other countries, however, municipal waste management has not changed in any significant way: recycling systems are poor, and there is a lack of economic capital to improve the infrastructure and technology for more environmentally friendly waste management.

Household Waste Generation Trends

Data on household waste are generally difficult to compare or aggregate because definitions and surveying methods vary considerably across countries and over time. Household waste generation is part of municipal solid waste, but it is often not possible to clearly separate waste generated by households from that produced by other actors, such as small businesses or services. Nevertheless, in a

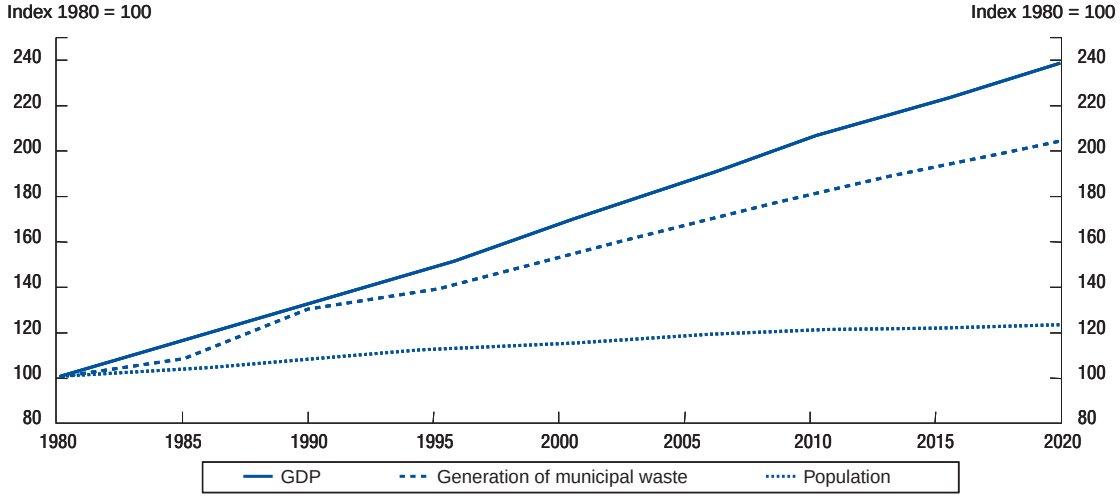
majority of OECD countries, household waste is the major component of municipal waste: households generated on average 67% of municipal waste loads in 1997 (range: 41-96%) (OECD, 1999*c*).

Although higher recycling levels means that the growth rate of waste going to final disposal has fallen, total and per capita household waste generation levels in OECD countries continue to increase along with economic growth. Since 1980, municipal waste generated has increased approximately 40% in absolute terms and 22% on a per capita basis. In 1997, OECD countries produced 540 million tonnes of municipal waste annually, corresponding to about 500 kg per person. The average annual growth rate of municipal waste increased 1.8% between 1980 and 1985 and 3.6% between 1985 and 1990 but slowed to 1% between 1990 and 1997 (Stutz *et al.*, 2001). However, these trends should be interpreted with caution because they may also reflect changes in data quality and coverage. Recent projections estimate that municipal waste generation in OECD countries will grow by about 43% by 2020, amounting to 770 million tonnes or 640 kg per capita (Figure 27) (OECD, 2001). In the EU, household waste is projected to increase 22% from 1995 to 2010, with increases in paper and cardboard waste by between 44%-62% and glass waste by between 24%-53% (OECD, 2001).

In Germany, Mexico and the Netherlands the total volume of waste at both national and municipal level is increasing. Municipal waste accounts for around 12% to 15% of total annual waste in these countries, compared to an OECD average of 14%: inferior to OECD averages for industrial waste (25%), and agriculture and forestry waste (21%), but equivalent to mining (14%) and construction (14%) waste (OECD, 2001).[15] In the future, both municipal and industrial waste are expected to show high growth rates, while waste generation from the agricultural and mining sectors is expected to grow at a slower rate to 2020.

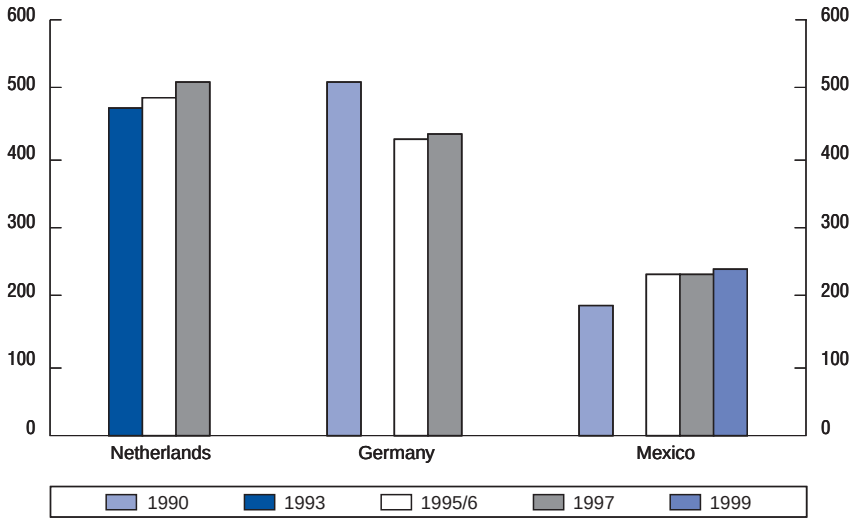
Per capita levels are also increasing. Household waste generation per capita increased 9.5% in the Netherlands between 1993 and 1998, and 26% in Mexico between 1990 and 1999 (Figure 28). Per capita generation appears to have decreased 8.6% (from 508 kg/capita in 1990 to 435 kg/capita 1997) in Germany between 1990 and 1997 (Lorek *et al.*, 2001), although it is difficult to estimate per capita levels because waste statistics changed in 1994. For example, other data show an increase from 429 kg/per capita in 1996 to 435 kg/per capita in 1999 (Federal Statistical Office Germany, 2000). Although it is difficult to obtain comparable data for the OECD region, average household waste generation per capita

Figure 27. **Municipal waste generation, GDP and population in OECD countries, 1980-2020**



Source: OECD 2001.

Figure 28. **Household waste generation per capita (kg/per capita/year)**

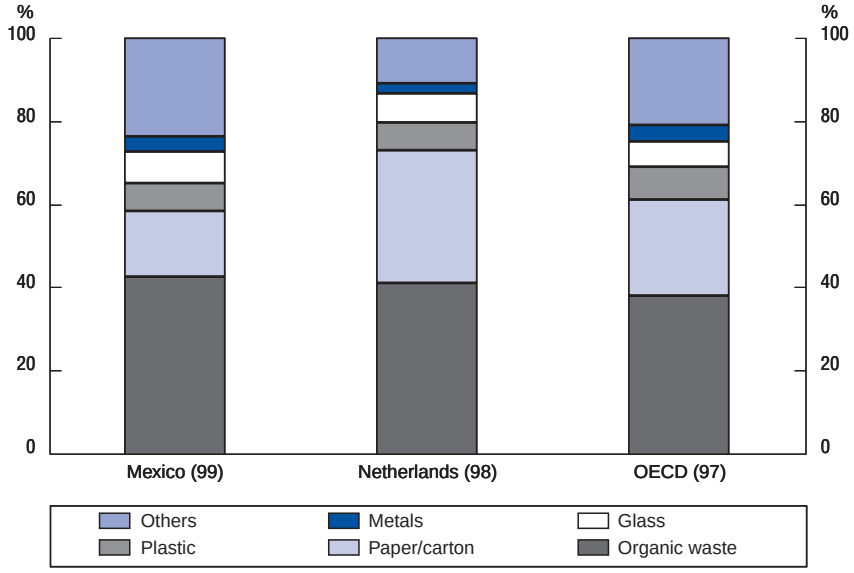


Source: Netherlands: RIVM 1993-98; Germany: German Federal Statistical Office 2000; Mexico: INEGI, 2000.

appears to have grown 29% between 1980 and 2000, and is projected to grow by another 30% by the year 2020 to 640 kg/capita (OECD, 2001; Stutz *et al.*, 2001).

The composition of municipal waste has changed significantly over time. The primary components are garden and food residue (38%) and paper and paperboard (23%), followed by plastic (8%), metals (4%), and in smaller shares, textiles and bulk waste (durable goods, renovation waste, furniture, electrical appliances, containers) (OECD, 1999*c*) (Figure 29). There is a clear trend toward increased

Figure 29. **Municipal waste composition**



Source: Mexico: Sancho y Cervera, 1999; Netherlands: RIVM, 1998; OECD, 1999*c*.

packaging waste, including from pre-packaged foods and food service packaging (see Section 2.1.2 for a discussion of food-related household waste.) In Mexico, for example, the volume of disposable products and packaging, especially plastic, paper and glass increased by approximately 5%, 3% and 1% respectively from 1991 to 1997, while organic waste decreased by approximately 8% (Table 11). In Germany, the *Dual System Germany* initiative succeeded in reducing the total amount of packaging used for transportation and handling (the impact on sales packaging is not yet clear) from 1991 to 1996. Since 1996 the rate of waste reduction has slowed, however, paper, organic and metal waste generation is again on the rise.

Given current trends, and without major efforts and policies to change them, it is expected that packaging waste will continue to increase. Although recycling rates have increased considerably, this is a relative increase due in part to the rapid expansion in consumption. For example, recycling rates in the EU for paper and cardboard will need to rise by 100% by the year 2010 – an increase of more than 2 million tonnes per year – if the amount of waste paper and cardboard disposed of is to remain stable (Fischer, 1999). Similarly, for the volume of glass going to landfill to remain stable at 1996 levels (6.2 million tonnes), glass recycling will have to increase by between 10 and 14 million tonnes (35%-90%) to account for increased consumption (Fischer (1999).

Table 11. **Evolution of household waste sub-products in Mexico 1991-1997**

(%)

Waste sub-products	1991	1997	% change
Organic waste (food and garden)	52	45	–8
Paper/carton	14	17	+3
Glass	6	7	+1
Plastics	46	9	+5
Metals	3	4	+1
Textiles	1.5	2	+1
Others	19	16	–3
TOTAL	100	100	

Source: Sancho and Rosiles (1999).

The Environmental Impacts of Household Waste Generation and Management

Waste represents a potential loss of both material and energy resources. It is also a source of pollution and land degradation when inappropriately managed. The environmental impacts of waste generation are diverse and vary according to the volume and type of material (organic, plastic, paper, metal, etc) generated, but particularly the kind of waste management systems used. Waste separation and recovery, and better technologies for landfill and incineration plants, reduce the environmental impacts of waste. But even these waste management process entail certain environmental impacts, including land use, air and water pollution and greenhouse gas emissions. As a result, reducing the impacts of household waste generation requires minimising waste, increasing waste recycling and recovery (*e.g.* incineration with energy recovery), and disposing of any remaining waste in an environmentally safe manner. This is in fact the approach of the "waste hierarchy" that has been fostered by the EU and that is being implemented rapidly, especially in Scandinavia, Austria, the Netherlands, and Germany.

The comparative evaluation of environmental impacts of individual waste management processes is difficult. Experts have not agreed on a common methodology: the definition and scope of the subsequent steps of analysis differ from country to country, and from institute to institute. As a result, the discussion below identifies only the general environmental impacts related to waste generation and treatment.

Air pollution and Greenhouse Gas Emissions

The environmental impacts of waste generation on air pollution and greenhouse gas emissions depends on the type and quantity of waste and the waste management technology used. Waste *incineration* causes emissions into the air. The main air pollutants released through incineration are acidic gases, polycyclic aromatic hydrocarbons, dioxins and furans, dust and heavy metals (OECD, 2001).

Waste treatment in incineration plants can reduce waste mass up to 70% and waste volume up to 90%. There is a clear trend in OECD countries towards the construction of incinerators with energy recovery systems, which could contribute to reduce some negative environmental impacts such as methane. In the EU, emissions from incinerators were reduced after 1990 through the closing of many small incinerators, the introduction of cleaning systems, and higher temperature incineration (which reduces the release of toxins, such as dioxins and furans). However, despite these benefits, waste incineration is criticised because of outstanding environmental risks caused by flue gases (dust, carbonate, NO_x, SO_x and dioxins), solid residues (fly ash, flue gas gypsum, slags and ashes containing heavy metals, chlorides and fluorides), restricted acceptance and utilisation of solid residues, and high investment and treatment costs resulting in high waste treatment fees for inhabitants (Lorek *et al.*, 2001).

Landfills and waste dumps often contribute to greenhouse gas (GHG) emissions. Waste-derived GHG emissions comprised 2% of total GHG emissions in OECD regions in 1998. Waste management practices accounted for 34% of methane emissions (mainly from landfills) in 1998. Waste derived methane emissions in OECD regions are expected to increase by 20% from 1995 to 2020 (OECD, 2001). In non-OECD countries, where waste generation is expected to double with land filling the main disposal method, waste-derived methane emissions are projected to increase by about 140% over the same period. These emissions can be mitigated either by avoiding land filling of organic matter or by collecting and utilising the gas at the landfill sites. The EU, and some other OECD countries have already introduced, or plan to issue, general bans on land filling organic waste (see Section 4.3.3). Efforts have also been made to establish gas collection facilities at existing and new landfill sites (OECD, 2001).

Soil and Water Pollution

Another environmental and health problem related to waste treatment is soil contamination, which often leads to the pollution of ground and surface waters. *Waste dumping* (direct disposal on or into the

Box 4. Summary: Trends and environmental impacts from household energy and water consumption and waste generation

Trends at the household level

- Growing demand for energy and water services tied to larger homes, and more energy and water appliances
- Growing share of electricity in household energy consumption
- Growing waste generation and recycling
- Diversification of the waste stream

Determinants of environmental impact

- Scale of energy and water use
- Energy and water efficiency rates
- Fuel source for heating and electricity generation
- Availability and quality of water resources
- Volume and composition of waste and method of waste disposal
- Recycling rates and waste prevention

Environmental impact

- GHG emissions, air and water pollution linked to the generation and use of energy
- Water depletion and pollution
- GHG emissions, air, water and soil pollution from inappropriate waste management

land) and *landfills* without adequate environmental safeguards can leach toxic substances and nutrients. The extent of these problems varies according to the type of waste, the construction, and the hydro-geological conditions of the landfill sites: unprotected waste dumps are the poorest waste management option in terms of water, land and air pollution, and the loss of energy and resources.

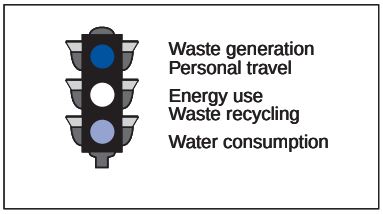
2.4. Conclusions on the environmental impacts of household consumption patterns

The national case studies and Secretariat analysis outlined in this Chapter demonstrate the link between day-to-day household decisions and environmental impacts. This analysis was supported by the results of the OECD *Environmental Outlook*, which examined past environmental impacts across different sectors in OECD countries and assessed environmental conditions and pressures to 2020 based on expected economic growth.

Priority will need to be given in coming years to addressing household travel, waste generation and energy demand. The OECD analysis has identified municipal waste generation and personal travel as priority areas where environmental impacts from households are expected to increase, followed by energy use and waste recycling, for which projections are more moderate. Only trends in water consumption show a decoupling of economic growth from consumption patterns, but this in only nine countries (Box 5).

Household travel is one of the most significant ways in which households contribute to environmental pressures. Individual private car use and air travel will increase to 2020, contributing strongly to growing emissions of greenhouse gases (OECD, 2001). Household travel also contributes to local air and water pollution, noise exposure, and land alteration for roads and transport infrastructure. Travel to and from tourism destinations and within tourism destinations contributes to these impacts with potentially locally acute impacts on biodiversity, natural resources and visual impacts. Tourism-related travel represents a relatively important source of transport energy use and CO_2 emissions, although not as large as other forms of travel. Current trends in tourism travel point to a rise in the

Box 5. **Household environmental impacts to 2020: OECD traffic light**



The Outlook used a system of "traffic lights" to signal key findings. A "green light" (light blue) signals pressures that are decreasing or environment conditions for which the outlook to 2020 is positive. It is also used to signal societal responses that have proved to help alleviate the problems identified. A "yellow light" (white) signals areas of uncertainty or potential problems. Finally, a "red light" (dark blue) signals pressures on the environment or environmental conditions for which recent trends have been negative and are expected to continue to be so to 2020, or for which recent trends have been more stable, but are expected to worsen (OECD, 2001).

Source: OECD *Environmental Outlook*, 2001.

number of departures, a greater use of air travel and an increasing preference for far-off destinations. The environmental impacts from tourism travel currently range from moderate, concerning climate change, to locally acute, concerning more classic vehicle pollutants. However, projected growth in tourism -related travel – especially longer distance travel by air – will increase household environmental impacts. Travel by air places more of a burden on the environment than does any other mode – principally because of the distances travelled and the amount of mid- to upper-level emissions of climate-affecting compounds. Tourism-related travel represents the most important source of energy use and greenhouse gas emissions from the sector.

Municipal waste generation continues to grow in OECD countries despite a significant expansion in waste recycling. Packaging and organic waste are priority areas of concern. Waste represents a potential loss of material and energy resources and can be a source of greenhouse gas emissions, air and water pollution, and soil contamination where inappropriately managed. Total and per capita household waste generation levels in OECD countries are increasing along with economic growth. The rate of increase has slowed, but household waste is growing faster than other waste sectors. Waste separation and recovery, and better technologies for landfill and incineration plants, reduce the environmental impacts of waste. But even these waste management process entail certain environmental impacts, including land use, air and water pollution and greenhouse gas emissions. As a result, reducing the impacts of household waste generation requires minimising waste, increasing waste recycling and recovery (*e.g.* incineration with energy recovery), and disposing of any remaining waste in an environmentally safe manner.

Despite significant gains in the efficiency of many household appliances and other measures to reduce the energy-intensity of space heating, household energy demand continues to rise, although more slowly than in the past. Household energy use for non-transport purposes affects the environment primarily through the burning of fossil fuels either directly or in the generation of electricity. Air pollution and human induced climate change are the most pressing environmental problems arising from energy generation and use. The environmental impacts of increased household energy consumption will depend on future approaches to residential and space heating and energy efficiency improvements achieved via building standards, product modification or changes in household behaviour. As emissions are a consequence of the choice of technologies and fuel use in the power sector, households often do not have much influence over emissions, except by deciding to reduce their energy consumption. Emerging options to invest in "green" power or to contribute to decisions on home energy supply systems could moderately increase consumer leverage to influence the environmental impacts from their energy consumption patterns.

The importance of addressing household water consumption trends varies across OECD countries. Water consumption is the one area where trends in some OECD countries are showing a clear decoupling of economic growth and consumption. The majority of OECD countries do not suffer from water scarcity, although an increasing number of countries are experiencing temporary or regional shortages. The costs of public water supply and treatment are also increasing. In more arid OECD countries, or countries with irregular regional water supply, water consumption is a growing problem.

Compared to other areas of household consumption, food consumption patterns in general are a less pressing problem. The impacts from households are also small compared to those from food producers, processors and retailers. Nevertheless food consumption patterns contribute to household environmental impacts in virtually every other area of household consumption, including energy use for transportation, preparation, conservation, water use, and waste generation. Changes in consumer demand, such as the spectacular increase in demand for bottled soft drinks and water, also have direct impacts on food production and processing and waste streams. The net impact of trends towards greater out-of-home food preparation and consumption are not clear but are likely to lead to either a stabilisation or slight increase in household energy demand. Similarly, disaggregated data on shopping purpose and distance are needed to determine actual trends and net environmental impact of household transport patterns. Greater distances between points of food production and households suggest a growing environmental impact from food transport, but net environmental impacts will

depend on transport mode (air, road, ship) and efficiency gains in the organisation of transport at the retail level. Organic (primarily food) and packaging waste are priority areas of concern for municipal waste management due to rising volumes of waste and the low percentage of food-related waste streams that are currently composted or recycled.

OECD countries have begun to address some of the environmental impacts from household consumption trends, but trends and projections show that further progress is needed. Before looking at how government policy can promote more sustainable consumption patterns, the following chapter explores the influences that have shaped consumption patterns in the past and that are expected to continue to drive consumption trends in the future.

NOTES

1. See: Household Food Consumption Patterns, OECD General Distribution Document ENV/EPOC/WPNEP(2001)13/FINAL; Household Tourism Travel, OECD General Distribution Document ENV/EPOC/WPNEP(2001)14/FINAL; Household Energy and Water Consumption and Waste Generation, OECD General Distribution Document ENV/EPOC/WPNEP(2001)15/FINAL. These reports are available on the OECD website: *www.oecd.org/env/consumption*.
2. The example given is the energy used to make a journey by car (fuel consumption is assumed to be one litre per 10 kilometres) to and from a shopping centre 5 kilometres away. This is the equivalent to the energy used to transport 5-10 kg of apples from New Zealand to Sweden by ship (Jedvall, 2000).
3. See Annex for a description of Material Flow Analysis.
4. See Annex for a description of Input-Output models.
5. See Annex for a description of Life-cycle Analysis.
6. For information on OECD projects and publications on Agriculture and the Environment see the websites of the OECD Directorate for Food, Agriculture and Fisheries [*www.oecd.org/agr*] and the OECD Environment Directorate [*www.oecd.org/env*].
7. In terms of absolute tonnage freight transportation by air accounts for only 0.0002% of total freight traffic. Since the mid-90s freight export via the Vienna airport, by far the biggest airfreight destination in Austria, has remained constant (ÖSTAT in Payer, 2000).
8. The World Tourism Organisation (WTO) defines tourism as "the activities of persons travelling to and staying in places outside of their usual environment for not more than one consecutive year for leisure, business and other purposes" (WTO, 1997).
9. World energy intensity – the primary energy demand per unit of real GDP – is expected to decline between 1997 and 2020 by 1.1% a year, equal to the historical rate since 1971 (IEA, 2000).
10. Total Primary Energy Supply (TPES) is the energy content of different energy sources as they are offered by nature before they are transformed for use. TPES is made up of domestic production plus imports and minus exports, international marine bunkers, and stock changes.
11. The first high-level nuclear waste storage installation is not expected before 2010.
12. Percentages are also not always directly comparable because countries use different methodologies for measuring and reporting water statistics.
13. A recent study by the Mexican Institute of Water Technology, estimates that an average metropolitan citizen consumes 164 litres of water per day (CESPEDES, 2000). These consumption patterns are closer to the patterns in the Netherlands; Mexico City has higher economic growth than many other regions in Mexico.
14. See Water Consumption and Sustainable Water Resources Management, OECD 1998.
15. Averages disguise national differences. In 1997 in Germany, for example, the relevant percentages are approximately: residential (12%), "production" (16%), agriculture and forestry (21%), mining (15%) and construction waste (57%) and in 1999 in the Netherlands: consumers (14%), others (7%), agriculture (3%), industry (37%), services/government (8%), and construction (30%) (OECD, 2001*d*).

Chapter 3

DRIVING FORCES BEHIND HOUSEHOLD CONSUMPTION

What are the key influences and driving forces behind current and projected household consumption patterns? What leads consumers to make pro-environmental consumption choices? There is a rich body of theoretical and empirical work on consumer preference formation and consumer decision-making that helps explain why consumption patterns have developed as they have, and how they will likely evolve in the future. Understanding these driving forces is important to determining which consumer preferences may change, how quickly and under what stimulus. This has direct implications for identifying the role of government in promoting more sustainable consumption patterns and for the choice and implementation of different policy instruments.

This chapter presents data and analysis on driving forces behind household consumption patterns. It draws from several areas of the 1999-2001 programme, including the conceptual framework analysis, the sector case studies and the policy case study on Information and Consumer Decision-making. Section 3.1 briefly reviews different approaches to conceptualising driving forces and consumer decision-making. Section 3.2 describes key driving forces identified in each of the five areas studied. Section 3.3 draws some general conclusions, including on the insights the analysis of driving forces can provide for the design and implementation of policies to influence consumer decision-making.

3.1. Conceptual frameworks for describing the driving forces of consumption

Consumer decision-making is a complex process affected by different and sometimes competing criteria, including self-interested motives (price, quality, individual taste, lifestyle) as well as socially-rooted motives (culture, self-identity, social context, environmental and social concerns) (Moisander, 1997). The complexity of consumer decision-making and behaviour is perhaps best reflected in the wealth of disciplines that have something to say about it. Theories of consumer behaviour are offered in marketing studies (psychology of decision-making), microeconomics (individual preferences and maximisation of utility), philosophy (why people consume), anthropology (consumption as a cultural expression and social identity), sociology (life-stage, social status, cultural meanings of consumption; sociology of technology), and ethics (individual values, social and environmental responsibilities in consumption behaviour). Each of these fields explain important motives for consumption.

This section briefly reviews four different conceptual frameworks that were drawn upon for different elements of the 1999-2001 programme: an *Economic Conceptual Framework* and three models which can be roughly classed as socio-economic frameworks: *Socially Contingent Consumption*, Systems of Provisions Model of Consumption, and *the Needs-Opportunities-Abilities Model of Consumer Behaviour*. The latter, is then used in Section 3.2 to describe key driving forces in the five areas of household consumption studied. The objective of this discussion is not to suggest that one conceptual framework is more powerful than another. Valuable insights into consumer decision-making can be drawn from each.

3.1.1. *An economic conceptual framework of consumer decision-making*

The study of consumption and its change over time has been one of the pillars of macro- and microeconomics.[1] As one of the key variables determining individual welfare and quality of life, consumption has dominated much of the microeconomic debate dating back to John Stuart Mills and the classical economists of the 18th and 19th centuries. As one of the fundamental components of the

gross national product (GNP) and gross domestic product (GDP), the main variables for measuring economic growth, consumer expenditure and the nature of the consumption function have directed much of the macroeconomic debate of the 20th century, at least related to the demand side of the economy. Throughout this time, substantial progress has been made in understanding both the micro- and macroeconomic determinants of consumption, resulting in more accurate policy instruments. At the same time, environmental and sustainability considerations have added new dimensions to the analysis, particularly concerning consumer decision-making related to public goods and externalities.[2]

Macroeconomics focuses on aggregate consumption and consumer propensities to spend or save. As statistical information on consumer behaviour became available in the middle of the 20th century, it became clear that at least in the short-term people tend to spend a decreasing percentage of their income on consumption (although their absolute levels of consumption may still rise). People also tend to protect their consumption patterns as income falls by not cutting consumption proportionally to income.[3] Overall, this means that the marginal propensity to consume (MPC) is less than the average propensity to consume (APC), but in the long-run the data show that they are equal as indicated by the work of Simon Kuznets.

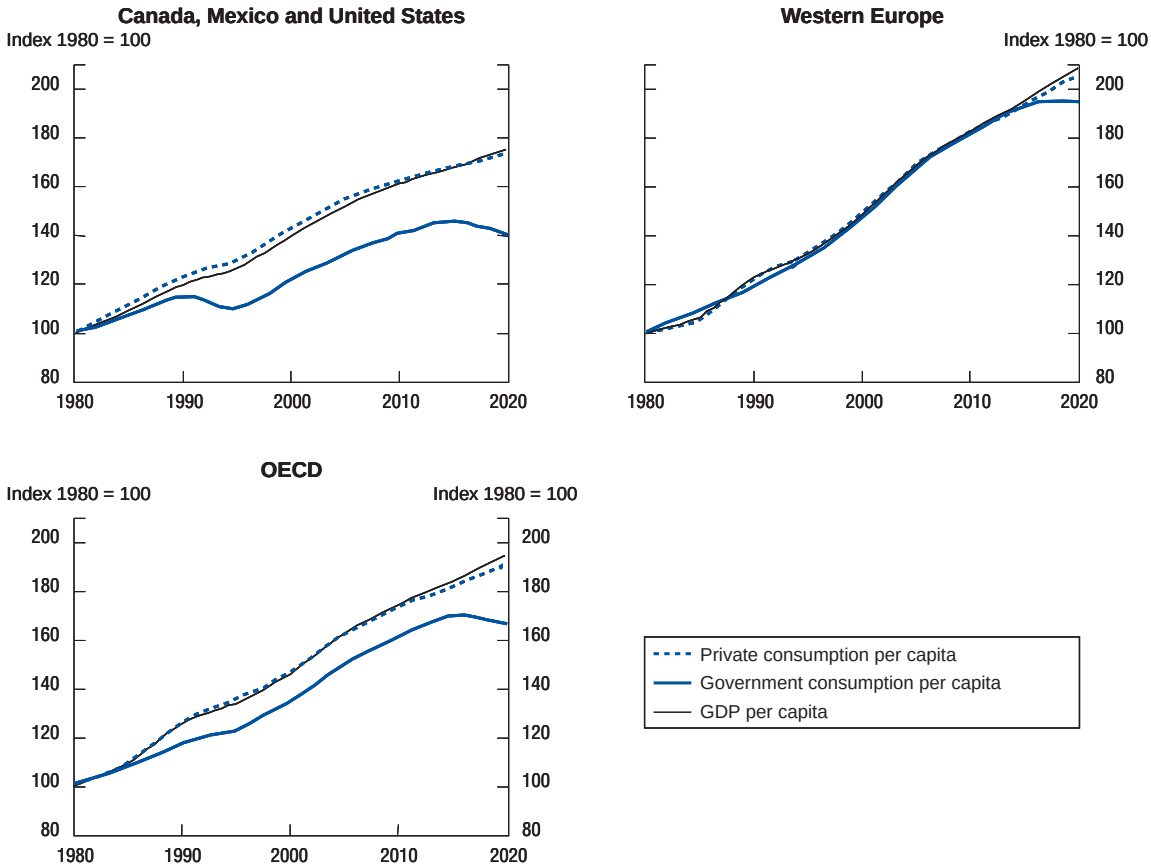
Wealth effects also influence consumption, though this relationship is not fully understood. A persistent increase in the wealth stock is often perceived as an increase in permanent income, thereby allowing households to spend more on consumption. The actual size of the wealth effect is subject to debate. Some studies indicate that a US$1 increase in the wealth of the median household leads to a five cents increase in its annual consumption. Other studies argue that the wealth effect on yearly consumption can be as low as one cent. Yet, even with the lowest estimates the wealth effect would translate into a US$96 billion increase in consumer spending in 2000 compared to 1989 (The Economist, 4 March 2000). The workings of the wealth effect on consumption are also unclear. For example, the speed of the effect is uncertain: while in theory it should be instantaneous, consumption is a matter of habit and habits are slow to change. The effect may also be asymmetric: for example, falls in share prices may decrease consumption by more than rising prices increase it. Nonetheless, stock market wealth effects for the United States are statistically significant with an impact on consumption in the range of 4 to 7% (Boone *et al.*, 1998). The effect is likely to be less in other G-7 countries due to smaller and less equal stock distribution and financial regulations.

Income is a central component of conceptual frameworks of consumer decision-making. Net disposable income per capita expanded rapidly in OECD countries in the 20th century, doubling and even tripling in several countries between 1985 and 1997/8 alone (OECD, 2000*a*), and is projected to continue to rise to 2020 (OECD, 2001). At the same time, consumers in OECD countries enjoy a steadily expanding range of low-priced, mass-produced goods and access to a progressively more global marketplace. The share of total private expenditure[4] in GDP has been almost constant at 60% in Western Europe and Japan over the last twenty-five years, although this share varies significantly among OECD countries (range: 46% to 74%). Private consumption per capita has increased along with income, rising by approximately 40% from US$8 000 per capita in 1980 to US$11 000 per capita in 1998, and is projected to increase with growth in GDP in OECD countries to 2020 (Figure 1).

Microeconomics focuses on the qualitative aspects of consumption: in other words, within aggregate consumption, how the consumption of different goods and services, marketed and non-marketed, interact with one another. This is important for the design of policies that foster more environmentally benign forms of consumption or for the use of the different forms of capital discussed in Section 1.1 in a more environmentally efficient manner.

A key concept in microeconomic theories of consumption is *consumer preference formation*. Many economic models consider consumer preferences to be consistent, stable over time and immune to external influences. More recently, this standard economic analysis has been extended to incorporate the effects of experiences and social forces by incorporating into the notion of individual well-being the concepts of personal capital (relevant past consumption and other personal experiences that affect current and future well-being) and social capital (the influence of previous actions by others in one's social network) (Becker, 1998). These concepts are dynamic: future levels of human capital will depend

Figure 1. **Private and government consumption per capita, 1980-2020**



Source: OECD, 2001.

in part on the amount a consumer invests today; future social capital will depend in part on the effects of choices made by others. They have strong links to sociological and anthropological theories of consumption as a social phenomena ("keeping up with the Jones'") and as an important component of personal status.

The extended notion of well-being including both personal and social capital allows for the fact that preferences are *endogenous* to the growth process. This means that preferences both influence economic outcomes and are in turn influenced by the economy: "initial stocks of personal and social capital, along with technologies and government policies, do help determine economic outcomes. But the economy also changes taste and preferences by changing personal and social capital" (Becker, 1998). This interaction affects the consumption of marketed and non-marketed and durable and non-durable goods and services, and influences not only basic daily decisions but also lifetime actions. The interaction also makes it difficult to separate preferences from the *opportunities* provided consumers by external agents (see below).

Another key concept in microeconomic theory is the rationality of consumer preferences. When analysing consumer choices, most economists depart from the assumption that individuals behave rationally, following a number of well-defined axioms, in search of well-being. This allows for stylised models based on the concept of utility, which is a functional form representing preferences. A growing school of behaviourists, however, draws on psychology to redefine "rationality" in a way that explains

seemingly irrational behaviour (*e.g.* holding beliefs that contradict evidence, being susceptible to outside suggestions regardless of the information available, and taking bigger gambles to maintain rather than to acquire a certain status-quo). Further, psychology indicates that people tend to "compartmentalise" when making decisions rather than to look at the bigger picture as suggested by the utility approach. They may also be subject to "cognitive imperfections" (*e.g.* over-confidence when assessing likely outcomes, attributing cause and effect where this is absent, having hindsight and memory biases, etc.). These modifications to the classical understanding of "rationality" bring economic theories of consumer behaviour closer to other sociological theories of consumer decision-making.

Whichever way preferences are formed, microeconomics also helps highlight the importance of the relationship between goods and services and the elasticity of consumer demand for different goods and services. Elasticity is a measure of the sensitivity of demand to changes in the price of a good and/or its substitutes, or to changes in income. People make trade-offs as they make their daily consumption decisions and future consumption plans. Knowing the strength of consumer preferences and their willingness and ability to change their consumption patterns is a critical element of policy development to promote sustainable consumption.

3.1.2. *Socio-economic frameworks of consumer decision-making*

Socially contingent consumption

There are other theories of consumer behaviour that follow broadly economic theories of consumer behaviour, but develop the *social contingency* of consumption in more depth (*i.e.* the personal and social capital components of welfare). These theories argue that the motivational base and behavioural dimensions of pro-environmental consumption are more complex than individual consumers' personal motives and attitudes as determinants of environmental choices.[5] From this perspective, "green consumerism" is not a continuum from "less green to more green", nor is it uniquely individualistic. Instead, individual reasoning is typically based on multiple and contradictory goals and motives, and is influenced by other people's opinions and behaviours. Combined with the evolving nature of some information on the environment, this means that consumers have divergent views on what is pro-environmental behaviour, and thus myriad ways for acting "green". This divergence makes it difficult to design policy measures that can influence all consumers equally.

From a social contingency view of consumption, consumer decision-making includes a *strategic dimension*. Unlike preferences for marketed goods and services, people's preferences for environmental quality cannot always be revealed by looking at their purchasing behaviour: in most cases, the environment is "consumed" without being paid for. Moreover, environmental quality can be produced only through co-operation among actors in society. This creates a strategic situation where consumers must decide whether to "co-operate" in favour of the common good or to act as *free riders*, benefiting from changes made by others without making those changes themselves.

Primary motives for pro-environmental behaviour may also diverge among consumers due to disagreements or confusion about the basic objectives and strategies of environmentally responsible consumption, the criteria for what constitutes an environmentally sound product or service, and the relevant areas of environmental concern. Selective behaviour too may vary widely because consumers may not know all the environmentally relevant behaviours, choose not to engage in all of the relevant behaviours for convenience reasons, or lack the opportunity or ability to do so. The sets of behaviours consumer choose may also vary in terms of the extent to which each environmentally relevant act is performed. Some consumers, for example, may be unwilling or unable to use public transportation, but engage in other energy saving behaviours extensively, thus trying to compensate for their environmentally harmful commuting behaviour. The lack of transparency of some environmental claims in the market, and the important gaps in the delivery of information on many environmental problems, means it is often unclear to the consumer what is the environmentally correct thing to do.

Consumers are assumed to have two competing sets of preferences when making decisions about collective goods: "personal" preferences (what consumers consider best for themselves personally) and "social" preferences (what they consider to be best for society). For example, when a consumer decides whether to commute to work with her own car or by public transportation, she weighs the personal utility (personal comfort and convenience) of using her own car against the social utility (less pollution and crowding) of using public transportation. Consumers make use of two types of information in these decision situations: they know their own commuting preferences, but in order to form a social utility function, they also need social information about the consequences of behaviour for the collective good (Table 1).

Table 1. **Differences between choices of private *vs.* public or common goods**

Private goods	Public or common goods
• Preferences are revealed by market choices • Choices are based mainly on: – Product information – Social and cultural background (*e.g.* identification or distinction) – Feelings of making authentic, unique choices that contribute to one's self-identity	• Preferences are hidden, and free-riding is possible • Choices are based mainly on – Strategic information on how others will behave – Commitment to accepted social norms and values – Information on how one's co-operative action contributes to the common good – Feelings of being a good citizen, contributing to the common good.

Source: Liisa Uusitalo, OECD 2001*e*.

If the consumer feels that she has already contributed more than other actors to the collective good, personal preferences will be given more weight, while in the opposite case social preferences dominate. The "fair share" argument, while utilitarian and not by itself a satisfactory explanation for socially committed behaviour, emphasises the need to consider environmentally sound consumption not as one activity at a time, but as a *pattern of behaviours*. When calculating whether she has already given a fair share to the collective good, the consumer may thus trade off between various kinds of activities. If we accept that the weighing of private against collective utility takes place at least sometimes in the minds of consumers, this whole pattern of behaviours (or lifestyle) becomes important. From this perspective, the majority of consumers act in some respect in an environmentally friendly way, while in other respects they may act ignorantly or as deliberate free riders (Uusitalo, OECD 2001*e*).

This view of the motivations of consumer decision-making suggests several roles for government, including:

- using the tools and instruments at their disposal to influence individual pay-offs in environmental choice situations;
- filling information gaps, including on the social context of environmental decision-making; and
- promoting and supporting social dialogue on desired environmental quality objectives and the means for achieving them.

Systems of provisions model of consumption

The *systems of provision* framework for understanding consumption patterns stresses the importance of exploring the mechanisms that shape everyday practices related to goods and services and the extent to which they can be seen to support or impede sustainable consumption. In this framework, household consumption is not just the sum of individual behavioural patterns, each consciously motivated and evaluated by the actor. Instead, household consumption is a whole set of behavioural practices that are common to other households (*e.g.* bathing, washing, travelling, gardening). They are

social practices carried out by applying sets of rules and shared norms. They are also connected to production and distribution systems (technological and infrastructure networks) that enable certain lifestyles and that connect consumers to one another (Chappells *et al.*, 2000).

The systems of provision framework views consumption as an active process, with actors seeking certain lifestyles, and constructing their identity by selective consumption and practices. The "systems of provision" is defined as the chain that unites particular systems of production with particular systems of consumption, focusing on the dynamics of the different actors (producers, distributors, retailers as well as consumers). Consumers are defined as *co-actors* who interact, shape and are shaped by the way in which systems of production are designed (Spaargaren and van Vliet, 1999). In this light, it becomes clear that by the way governments design and transform energy, transport, water and waste systems they can either enable or obstruct household behaviour towards sustainable consumption.

If water, energy and food consumption and waste collection can be seen as a set of social practices of households rather than as separate and individual behaviour, it is unrealistic to assume that targeting policy instruments and measures uniquely to consumers will prevent or reduce the environmental impacts of household consumption (*e.g.* the ineffectiveness of environmental education alone to influence patterns). It is equally unrealistic, however, to lean on strategies which aim at only a technological restructuring of the collective social-material system without working with household practices. Policies and strategies directed to both levels, and especially to the interrelation between consumers and collective systems of provision, are more promising (Chappells *et al.*, 2000). This will require that governments design integrated policy approaches for sustainable consumption.

The N*eeds-*O*pportunities-A*bilities *model of consumer behaviour*

Another useful conceptual framework for describing and understanding the motivations behind household consumption patterns is the Needs, Opportunities and Abilities (NOA) model developed by Vlek *et al.* (Gatersleben and Vlek, in Noorman and Uiterkamp 1998).[6] The NOA model was inspired by the Motivation-Opportunities-Abilities (MOA) model of consumer behaviour (Robben and Poiesz, 1992; Ölander and Thøgerson, 1994). To be able to better predict intentional consumer behaviour Ölander and Thøgerson extended the Fishbein-Ajzen theory of reasoned action (Fishbein and Ajzen, 1975) to include opportunity and ability components (for a full description see Gatersleben and Vlek, in Noorman and Uiterkamp, 1998).

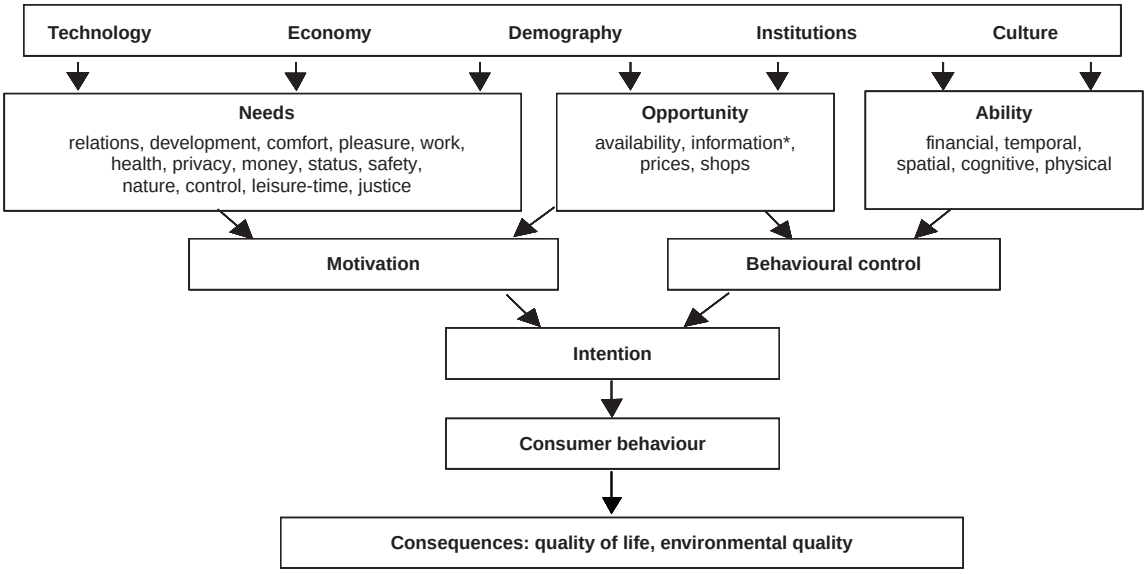
The NOA model is intended to diagnose the specific forces underlying consumer behaviour at both the macro-level of society as a whole and at the micro-level of the household (Figure 2). In the NOA model, consumer motivation to act in a specific way results from certain consumer needs and opportunities and abilities to fulfil those needs. It is presumed that people buy goods not for their own sake but for what those goods can do for them. N*eeds* refer to the set of objectives that individuals pursue to maintain or improve their "quality of life" or well-being (Box 1). Gatersleben and Vlek use 15 indicators of well-being or quality of life that they consider reasonably representative of aspects that are important to individuals in Western consumer societies.

O*pportunities and abilities* determine the degree of behavioural control people have. In order for a certain kind of consumer behaviour to emerge, people need to have both the motivation and the behavioural control to do so. O*pportunities* are seen as a set of external facilitating conditions, such as the objective availability of goods, materials and services, their accessibility, the relevant information that is available and prices. A*bilities* are the set of internal capacities of an individual or household to procure goods and services. They include financial (*e.g.* income, credit options), temporal (*e.g.* more time to take holidays), spatial (space in the home to store goods and distance to relevant shops and services), cognitive and physical means and skills (health, fitness, possession of licenses and permits).

The NOA model is embedded in a societal context by the addition of five general macro-level forces, which inevitably influence the individual behaviour concepts. The societal context is divided into five kinds of driving forces: technology, economy, demography, institutions, and culture. Technology and economic developments have increased opportunities because more services and

Figure 2. **The Needs-Opportunity-Ability model of consumer behaviour**

Needs and opportunities together constitute the motivation to buy or do something, while opportunities and abilities together constitute the behavioural control needed to be able to do so. The model builds on the means-end chain theory (Reynolds and Guttman, 1988; van Raaij, 1994) according to which people do not want goods for their own sake, but for what they can do for them. People therefore buy certain goods in order to satisfy their needs, which might be satisfied in another way as well (*e.g.* less energy-consuming).



* In the original model this factor is restricted to advertising but is expanded here to include all information flows on consumption opportunities
Source: Gatersleben and Vlek, in Noorman and Uiterkamp, 1998.

materials are available now than 50 years ago, while due to mass production, people's actual abilities and opportunities have increased because of falling prices. Demographic changes have a multiplier effect as more people, an increasing number of them living on their own, are around to consume them. Consumption and consumption growth have also penetrated into cultural norms and values, in that for many people, their sense of well-being depends to a large extent on their earnings and possessions, and perception of others is influenced by their material possessions.

3.2. Key driving forces behind household consumption patterns

The preceding discussion shows that it is possible to outline and group the driving forces behind current and projected household consumption patterns in a number of ways, none of which captures every influence neatly without overlap or omissions. While the models discussed cannot provide a strong assessment of causality between different drivers and specific consumption patterns, they are very useful in identifying the range of general influences on consumers in any specific area of consumption. They demonstrate the importance of a multidisciplinary perspective in the analysis of household consumption patterns.

This section outlines key driving forces behind household food consumption, tourism travel, water and energy consumption, and waste generation. To facilitate cross-sector comparison the discussion is organised using the NOA conceptual framework of consumer behaviour. The NOA model provides a useful structure for placing the driving forces behind consumption patterns in a dynamic framework and for distinguishing between consumer ability and willingness to change and the relative importance of different macroeconomic influences on consumption.

Box 1. What are consumer needs?

Many theorists have tried to describe what it is that individuals seek in order to maintain or improve their quality of life or welfare. Hareide (1994) described the variables that make life worth living: social relations, health, nature and environment, meaningful work, and material possessions. Allardt (1994) studied the central conditions necessary for human development and existence, which included material conditions, social relations and personal growth. Maslow (1954) formulated a five-level hierarchy: which included physiological needs, safety, a feeling of belonging, self-esteem, and self-actualisation. Rokeach (1979) created a value survey composed of 18 "terminal values" (*e.g.* "a comfortable life", "a world of beauty", "social recognition") and 18 "instrumental values" (personality characteristics such as responsible, independent, loving) to achieve end values. Social indicators are used to measure the level of well-being or happiness of individuals within society (see for example, OECD, 1976), including personal indicators (health, safety, education, labour, leisure time), environmental indicators (physical and social environment, culture), and economic indicators (availability of goods and services, mobility). So far, emphasis has been given to economic indicators of well-being. The GNP, for instance, is still the most important indicator of the level of (economic) well-being of a nation (Excerpt from Gatersleben and Vlek in Noorman and Uiterkamp, 1998).

Meeting needs: from products to services?

One of the newer currents of thinking on the links between consumption, production and environmental impact focuses on the potential for meeting some consumer needs through services rather than ownership of physical goods. Consumers don't actually need a boiler, they need a warm room. Likewise, they don't necessarily need a car, they need mobility. Some private sector companies and governments are looking for ways to meet consumer needs through the provision of services, and in this way not only increase the value to consumer, but also reduce the associated flow of materials and pollution. In the transport area, for example, car sharing initiatives offer car-less consumers the convenience and flexibility generally valued in car ownership plus the possibility to choose a car size that fits their specific needs at different points in time (*e.g.* small cars for weekly shopping; larger vehicles for family holidays). Similarly, some local governments in environmentally sensitive tourist destinations have partnered with the transport and hotel sectors to provide tourists with door-to-door mobility for both people and their baggage, making car-free destination sites possible. There remains an enormous potential for "out-of-the-box" thinking about how to meet consumer needs in less material- and pollution-intensive ways.

3.2.1. *Key driving forces behind household food consumption*

Needs

Nutrition and Health

At the most fundamental level we eat to live. Food is the main source of energy for human metabolism, and healthy diets can reduce the risk for a number of diseases, notably cardio-vascular illnesses and some cancers. In many OECD countries consumers increasingly demand foods perceived as "healthy". In the US and Austria, this trends includes a shift from "taking the bad out" (foods with less salt, less fat, and fewer calories) to looking for food with added benefit, including so-called "functional foods" that meet specific needs, fight disease or promote longevity. In the US, nutritionally enhanced products accounted for 78% of total growth in more than 35 major food categories in recent years. Food safety is another major driver of food choices that has been galvanised by a series of food safety problems, a declining confidence in public and private information sources and a growing suspicion of processed products. In some consumer markets, this has led to increased consumer interest in

freshness, origin and level of processing. Health concerns, rather than environmental protection considerations, have largely driven consumer demand for organically produced food.

Convenience and Variety

Less time for buying, preparing and eating food has made convenience a key consideration in household food choices. One of the most important demographic shifts in this context is the increase of women in the labour force: in 17 OECD countries more than 75% of women between 25 and 44 now work, compared with roughly 40-60% in 1970. The conditions of the work and school day in OECD countries have also changed, with longer distances between home and workplace, continuous "9-5" working hours, and more extra-curricular activities for children. This has led to a splintering of the day into many short blocks of time and an individualisation of time budgets within households. Meal preparation time during the working week has dropped steadily. In US, for example, the time allotted for meal preparation in households where all adult members work outside the home has shrunk from 30 minutes a few years ago to 20 minutes or less today. In the US and Austria, decisions about what to cook are often made only late in the day. These trends have increased consumer demand for food products that are fast to prepare and give predictable results. The food-processing industry has responded to the evolution of lifestyles by developing new products that meet consumer demand for greater convenience (pre-prepared foods, mobile delivery services, home meal replacement, individual portions, etc.). The widespread availability of freezers and microwaves has also allowed households to rely on pre-prepared frozen and chilled foods requiring minimum planning and preparation time.

Opportunities

In OECD countries, consumers benefit from a wide range of food consumption opportunities: food is abundant, relatively inexpensive and generally available year-round. Consumers are informed about their food options through a variety of channels from brand and generic advertising to government education and other information initiatives (media) on nutrition and dietary recommendations.

Food Prices

An abundant supply of food, improvements in transportation and communications, and concentration in the food sector and related economies of scale and smoothed demand, have helped keep food prices relatively low in many OECD countries. Regional and national economic development has also had an impact on food prices. In both Austria and Sweden, for instance, entrance into the EU influenced price levels; in Sweden the price of meat decreased 20% since 1990 with most of the price reduction taking place after 1995 when Sweden became a Member of the EU. In Poland, government subsidies to meat and milk products kept prices for those goods artificially low and allowed more affluent diets for many Polish households during the 1970s and 1980s. After liberalisation of the food market in 1989/1990 consumers faced very rapid increases in food prices not matched by comparative wage increases. As a result, consumers demanded less butter, meat and milk and shifted to less expensive meats such as poultry.

The price of products and their substitutes, along with disposable income, primarily explain the choice of one product over another, and shifts to different groups of food products (*e.g.* to higher value-added products). Price and income alone will not lead consumers to choose a meat-intensive diet over one rich in other sources of protein. Income and prices are among a much richer texture of social practices, cultural beliefs and technological realities that motivate consumer behaviour. Evidence of this is present in the changing demand for beef in the United States, which has declined since the mid-1970s. One reason for this decline is that chicken has become more affordable relative to beef. However, income changes would have contributed little to per capita beef purchases (only a 1% increase) because declining demand is primarily for specific cuts of beef that take more time and effort to prepare (*e.g.* roasts) (Manchester, 1999 in Kauffman and Chevrot, 2000).

Food Supply

The vast majority of households in OECD countries are food secure – they have assured access at all times to enough food to lead an active healthy life. Although there are households with food security problems – nearly 10% of US households (10 million) are food insecure at some point of the year and 21% of Polish households surveyed can afford only the cheapest food available – these problems stem from insufficient disposable income and not gaps in the food supply. Most consumers have a very wide choice of both low- and high-priced food products and services.

Advertising

Food advertising is one avenue through which consumers receive information on different food options. In the US, food manufacturers spent $7 billion on brand advertising in 1997, especially branded processed and packaged foods and soft drinks. The most advertised foods in the US are also the most over-consumed from a nutritional perspective. In comparison, combined education, evaluation, and demonstration initiatives by the US Department of Agriculture in 1997 amounted to $333.3 million – slightly more than half of what is spent annually on advertising carbonated soft drinks. Generic advertising has been used in the US by co-operative efforts among producers of specific food items (California prunes, Wisconsin cheese, beef in general), and by the US government to promote fluid milk consumption. In the US, generic advertising had a positive impact on both cheese and fluid milk sales in the period 1984-1996. Research results are mixed on the impact of generic and brand advertising on beef consumption.

Poland saw a tremendous increase in food advertising in the 1990s. One of the most intensively advertised products was margarine, for which consumer demand has grown steadily. According to a recent Polish study, approximately 67% of consumers surveyed reported that advertising influenced their buying behaviour, with the greatest impact on the purchase of confectionery and beverages. The Austrian case study reports a much lower awareness of food advertising: in a study there 60% (compared to 37% in the EU) reported that they relied on labels as the best way of informing themselves about the characteristics and nutritional content of food. Only 9% reported advertising, 8% brochures and 4% newspapers when asked for other sources of food-relevant information.

Abilities

The ability of a consumer to satisfy needs given the knowledge and accessibility of different food products and services depends on disposable income, education (meaning an ability to interpret different types of product information) and information. Noorman and Uiterkamp also talk about the temporal ability to meet needs: the discussion above notes the impact of a growing squeeze in household time budgets on food purchase and preparation habits. The discussion in this section will focus on per capita disposable income, education and information.

Per capita disposable income

Per capita income has increased steadily across OECD countries. Although the quantity of food has remained relatively stable from year to year, the rise in per capita disposable income and lower food prices have allowed a strong shift to foods with higher value added (*e.g.* pre-prepared). In Austria, greater per capita income, combined with rapidly multiplying food options, has promoted consumer choices driven by specific situations or events rather than by traditional determinants of food choices such as education or profession: both low- and high-income households now purchase luxury food items for special occasions. Income is also an important determinant of out-of-home consumption. In the US, dual-incomes combined with less time for meal preparation have sharply increased the number of meals consumed outside the home. The same effect is seen in Austria where only 18% of consumers with a household net income up to ATS 15 000 (US$9 450) frequently eat out of their homes compared to 47% of people with a household net income over ATS 30 000 (US$18 900).

Education and Information

Consumers in OECD countries are on the whole educated and literate. Moreover, they are exposed to a tremendous flow of information on food from many sources including the government, consumer advocates, food manufactures and retailers and special interest groups. Education levels are important to food choices from both a nutritional and environmental point of view. In Sweden, for example, men with higher education have been shown to eat less sandwich fat and potatoes and more fruit, vegetables, pasta and fish than do women with less education. More highly educated people also tend to be more active information seekers. In contrast, higher education levels do not necessarily translate into practical skills: the Austrian, Swedish and US studies all note a higher reliance on pre-prepared food and predictable dishes (*e.g.* pasta instead of potatoes) linked to a decline in general food preparation skills.

The focus of nutritional information has gradually shifted in OECD countries from nutrient-based recommendations to general guidelines based on food groups. Not surprisingly, nutritional guidelines to date have not included the ecological dimension of food consumption, although rising consumer concern about food production systems may create pressure for guidance on food quality and safety that has ramifications for the environment (*e.g.* comparative studies on produce from organic, integrated, or conventional agriculture). Consumer interest and assimilation of nutritional and other information varies. In Austria, for example, while 80% of consumers believe their level of nutritional knowledge is adequate, studies have shown very low levels of understanding, particularly among disinterested or passive consumer groups.

Consumers in many OECD countries have shown a growing interest in environmental labels on food and labels indicating production methods (*e.g.* organic, GMO) or product origins. 96% of Austrian consumers surveyed, for instance, wanted to find a declaration of origin on food label. The burgeoning number of organic, GMO- and eco-labels, however, have created a dilemma for many consumers. Labels are often unclear and can be misleading.

Macro-level forces

Technology: food production, processing and retail

The agro-food sector has evolved radically over the last fifty years both in production technology (crop protection and nutrition; biotechnology) and in the processing and distribution sectors (advances in conservation methods, packaging materials and improved communications and transportation technology and infrastructure). These advances have succeeded in ensuring not only a stable and ample supply of food, but one that can largely ignore seasonal constraints in order to cater to consumer demands for high quality, convenience and variety at affordable prices. At the retail level, the widespread adoption of product bar coding and electronic checkout scanners means that detailed information can be gathered on consumer buying behaviour; that information has become a valuable commodity that specialised firms purchase and repackage for food market actors, particularly large food manufacturing firms. This shortens the lag time between shifts in demand and supply in what is a highly competitive sector, where market share increasingly depends on brand loyalty and product diversification.

Economy: concentration and globalisation in the food sector

The food sector is one of the largest economic sectors in many OECD countries and an important source of employment. The food processing sector is a highly competitive, mature industry, which has led firms to intensify product diversification and marketing activities to increase sales and to search for efficiency and international scale through the consolidation. Mergers have been a major force in changing the organisation of food manufacturers: large companies increasingly handle a broader line of products and either own or strongly influence firms in the upstream and downstream sectors. In Sweden, for example, over 80% of the dairies and distribution centres closed between 1960 and 1994,

the result of a trend toward centralisation and large-scale operations. Vertical integration has helped keep food prices low. Changes in the Polish food sector have been even more dramatic. Liberalisation initially led to a widening gap between food prices and per capita income but also shifted consumer demand for certain products. As a direct result of liberalisation, the choice of food products in Poland has increased tremendously: popular items are widely available, new products have been introduced and a wide range of seasonal food products (*e.g.* citrus fruits) are now available yearlong. The quality of food products and the range of food packaging have also increased significantly as food producers face increasing competition and an increasingly discriminating consumer.

Summary: *driving forces behind household food consumption*

The discussion above highlights the key forces driving household demand for certain food products and services (Table 2). While some econometric studies of food demand show that as much as 97% in annual variation in per capita consumption can be explained with three variables – household income, product price, and the price of substitutes (OECD, 1998), in reality changes in food demand are more complex. Other forces such as demographics (ethnic pluralism, family size and organisation, female employment, education levels) and needs and attitudes (convenience, food quality, health) are very influential. In a sector where competitiveness is highly dependent on rapid capture of consumer markets, the consumer has a central role in shaping the food market, including by strengthening consumer demand for environmentally friendly food production. However, the analysis also shows that environmental criteria are far from being priority considerations in household food choices. As a result, environmental benefits would also often need to be paralleled by health and lifestyle benefits to attract consumer support.

Table 2. **The NOA model and household food consumption**

Technology (food production, preparation and conservation), **Economy** (globalisation and concentration in the food sector), **Policy** (food safety regulations, information), **Demographics** (household size and composition, employment structure), **Culture** (gender, religion, age)		
Needs	Opportunities	Abilities
Nutrition and health	Food prices	Per capita disposable income
Convenience	Available food products and services	Education : Nutrition, exposure to food and food preparation skills, environmental awareness
Variety	Advertising and information	

3.2.2. *Key driving forces behind household tourism travel*

Needs

Diversion, relaxation and variety

Until the post World War II era, tourism was generally an elitist phenomenon restricted to expensive products tailored to the wealthy. Along with a continued increase in disposable income, the spectacular rise in vacation entitlements, drop in working time, and advent of new transportation technologies have rapidly changed tourism into a mass phenomenon. A strong early motivator for tourism was the desire to escape from work stress and to seek relaxation. Tourists now seek multiple holiday objectives including sun-seeking, relaxation, new contact development, comfort, recreation, activity and distraction (OECD, 1999*a*). Over time, the development of a more experienced,

sophisticated clientele avid for new experiences has led to the development of "destination networks", where tourists become repeat patrons of a company while continually changing their holiday destinations (*e.g.* "Club Med" resorts) (OECD, 1999*a*).

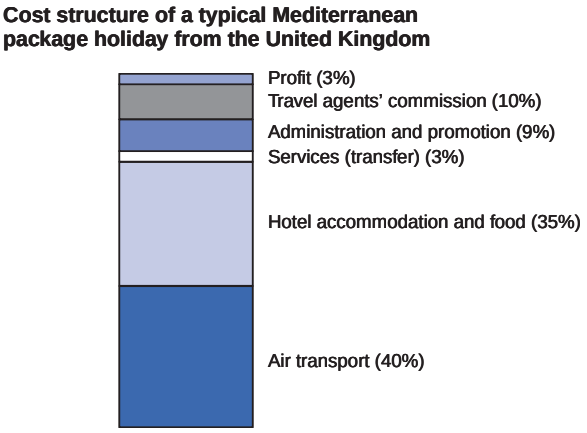
Other trends in consumer demand for tourism include trends towards: a "second home" combining comfort, refuge qualities and maximum convenience; sunny destinations; inexpensive trips (a trend that is fuelled by low-budget packages and growing market transparency); spontaneous decisions where trips can be booked at the last minute, are cheap, and include a surprise effect; more mobile travel behaviour (many different destinations as the main attractions of a tourism package); and more frequent and shorter trips allowing a quick change of scene (over the weekend or on public holidays) (OECD, 1999*a*).

Opportunities

Tourism travel prices

Estimates of consumer demand elasticity to changes in price for different types of tourism vary considerably across studies, national circumstances and travel modes considered. North American demand elasticity for leisure air travel, for instance, is higher than those studied in other world regions. There is also some uncertainty concerning the cross-elasticity of demand between modes (how the impact in the price of one mode effects the demand for another). However, one can generally conclude that demand for car travel is relatively inelastic while the demand for leisure air travel is more elastic than for business air travel. As a result, some analysts have suggested that price increases for air travel might be passed on disproportionately to business travellers thereby buffering leisure travellers from price increases. Price changes that are linked to fuel consumption might also have more of an impact on long haul flights since fuel costs represent a more substantial proportion of total costs for these flights (IPCC, 1999; Michaelis, 1997). Recent trends towards vertical integration in the tourism industry have also created the possibility to shift price increases between components of vacation packages (transport, lodging, labour, etc.). This could erode the impact of price fluctuations for travel (Figure 3). Moreover, the social importance and psychological investment in tourism decision-making are important forces influencing consumer responses to price changes: consumer habits and preferences dampen the impact of marginal price changes (OECD, 1999*a*).

Figure 3. **Package tour cost structure**



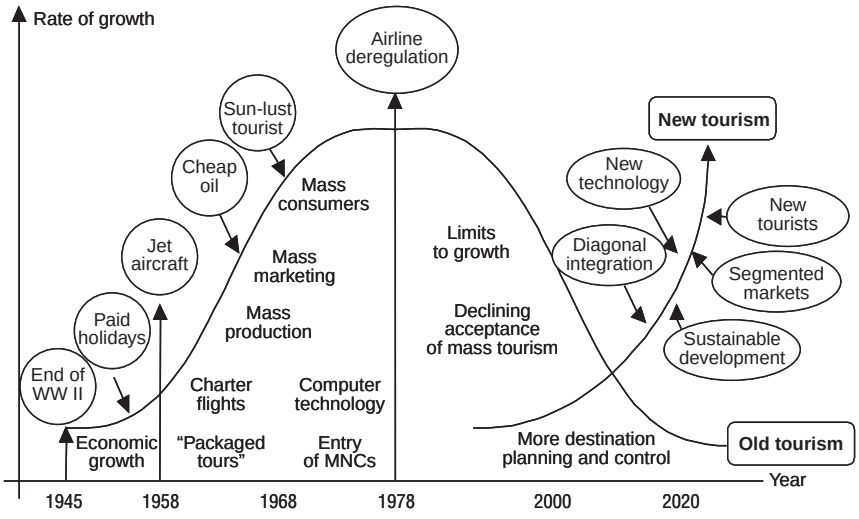
Source: Lickorish, 1997.

Currency fluctuations also lead to price differences for similar tourism products, which in turn can affect international tourism flows. The outcome of major currency changes (*e.g.* devaluation of the Spanish peseta in 1992 and of the Thai bath in 1997) have often led to a rise in tourism arrivals. In general, however, exchange rate fluctuations principally have an effect on the length of vacation rather than the choice of destination (Vellas, 1995).

Tourism products and services

The emergence of mass tourism in the 1950s and 1960s was both facilitated by, and an outcome of, the supply of standardised, mass-produced tourism products whose purpose was to achieve returns to scale through volume of sales. Initially, these services were principally oriented towards seasonal and thematic products (summer sun holidays, winter ski vacations and European capital cities). More recently, a "new tourism" has emerged that is characterised by demand-driven, "custom-tailored" shorter and high-quality tourism products (Figure 4). Destinations have become commodities that can be adapted and interchanged in order to suit new or changing demand. Many products, such as "Club Méditerranée" resort-type vacations or tour wholesaler offerings allow for a steady and recognisable level of quality across a range of geographically diverse destinations providing tourists with increased choice – and contributing to greater tourism travel.

Figure 4. **Evolution of tourism product offerings**



Source: Poon, 1993.

Advertising and information

Tourism consumer behaviour is usually characterised by both a careful ranking of available tourism options and emotional or other drivers behind tourism choices (Swarbrooke, 1999). Tourism services are different from many other common consumption goods in that they are relatively expensive, infrequently purchased, often bought sight unseen, and can only be experienced as they are consumed. They also have high emotional significance since a failed or unpleasant vacation experience cannot be made up until enough new vacation time is accrued (at least for non-retirees). As a result, despite

recent developments in last-minute tourism planning, most tourism decision-making includes extensive information searches and a high level of involvement by the consumer in planning vacation trips. In response, marketers of tourism products provide tourists with as much targeted information as possible about different tourism products (*e.g.* budget packages for cost-conscious travellers, specific activities for special interest groups, or luxury travel for wealthy tourists).

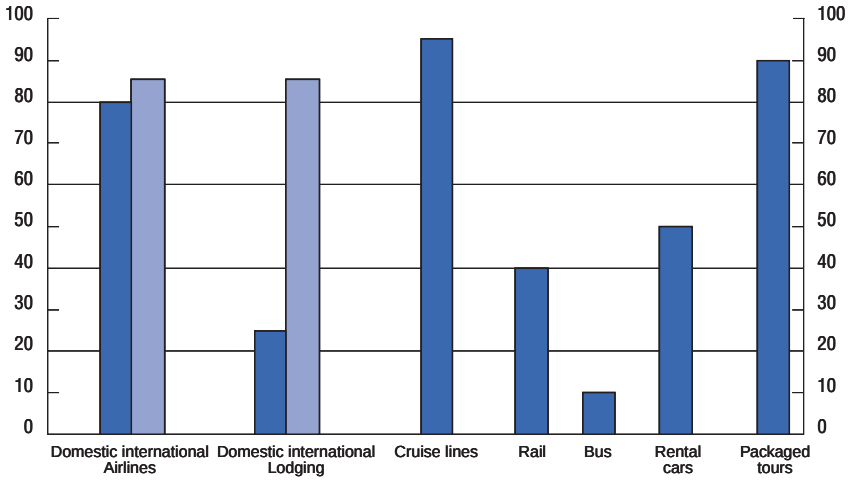
Consumers gather information on tourism products independently from a number of commercial sources or through industry actors. Foremost among these are travel agencies that provide direct booking services for tourism transport and accommodation products (Figure 5). Travel agencies also distribute information on packaged tourism products for tour operators and wholesalers. Because they rely on commissions from the sales of air travel [~60% of their revenue (Vellas, 1999)], travel agents typically concentrate more on information for this mode. Although travel agents principally provide transport and accommodation booking services for people who have already decided upon a destination, they can have a strong influence on the destination choice of undecided travellers, especially for booking tourism packages.

Tourism e-commerce web sites are fast becoming an important new source of information for both consumers and tourism providers. By allowing quick assess to information on destinations, services and prices throughout the world, the Internet is broadening the scope of tourism options households typically consider. "Push" technologies – providing tailored information to the Internet tourist's tastes (extrapolated from their Internet browsing habits) – is a powerful new tool for tourism marketing. With some notable exceptions (*e.g.* eco-tourism), tourism marketers rarely provide information on the environmental impacts stemming from travel.

The tourist's own past experiences (personal capital) and the informal information acquired through the example and/or advice of friends, family and or lifestyle groups that the tourist most identifies with are also important influences on tourism decisions. Insofar as two generations of OECD travellers have become accustomed to relatively inexpensive long-haul travel, and first-time tourists in emerging markets aspire to the same travel patterns, the demand for long-distance tourism is unlikely to decline in the near future.

Figure 5. **Travel bookings through travel agents**

Estimated Percentage of Volume booked by Travel Agents (US, 1995-1996)



Source: Swarbrooke *et al.*, 1999.

Abilities

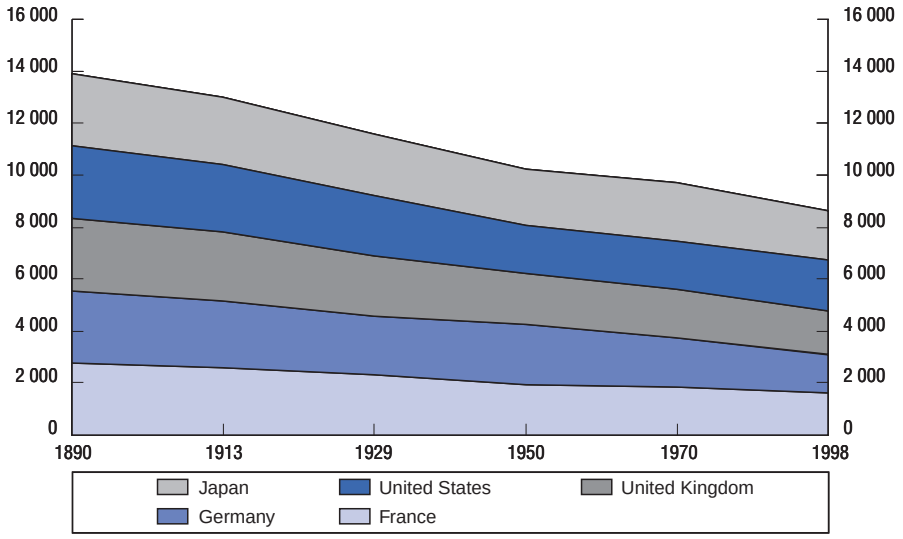
Per capita income

Increases in the disposable income of large segments of OECD populations have led to increased consumption of leisure services. Quantifying exactly how much of this income is devoted to tourism compared to other leisure activities is difficult at the aggregate level. However, rises in income are generally linked to an increase in tourism travel and high levels of GDP are associated with increased international tourism. Spending on leisure and tourism generally grows more strongly than increases in disposable income since saturation is quickly reached for lower-order goods (OECD, 1999*a*). Nonetheless, some countries with high levels of GDP have proportionally lower rates of participation in international tourism than other similar countries. Wealth, alone, does not determine tourism travel. On the micro level, broadening income differentials within many countries and increased competition from other leisure activities (*e.g.* hobbies) has sometimes led to a situation where those people most able to afford tourism travel often experience difficulty in finding time to get away for more than a short break (WTO, 1999*a*). One outcome of this is the steady increase in tailored vacation packages including high-speed air travel.

Changes in working time and paid leave

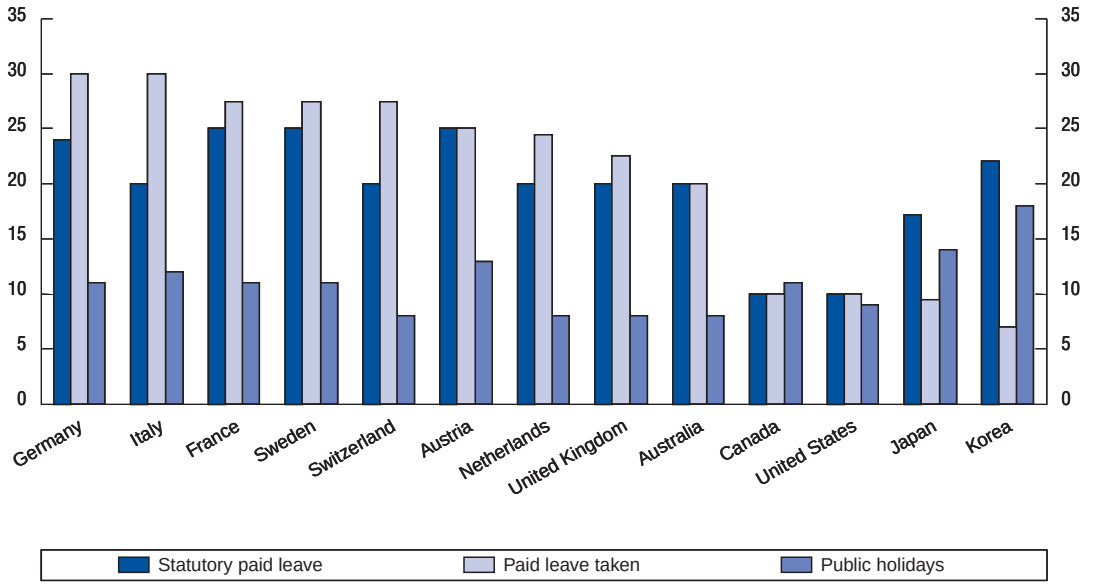
Most OECD countries have reduced statutory working hours (Figure 6) and increased vacation entitlements (Figure 7). This has led to less weekly working hours, increases in paid vacation and a reduction in the retirement age throughout the OECD. Two notable exceptions are Japan and Korea where average paid leave taken remains well below the statutory level. This can be explained by a number of forces, including cultural pressure against taking vacation leave, the economic slowdown of the late 90s and the possibility to take cash payments for leave not taken. Reductions in weekly working hours tend to favour local recreation opportunities. Increases in paid leave and reductions in the retirement age, combined with longer life expectancies, influence long-distance leisure travel.

Figure 6. **Evolution of annual hours worked in selected OECD countries: 1890-1998**



Source: Grubler, 1995; OECD, 1999.

Figure 7. **Annual holidays in selected OECD countries**



Source: WTO, 1999.

Working time arrangements in a number of OECD countries are also changing to fit seasonal or periodic variations in activity for certain businesses or economic sectors. Insofar as these arrangements open new blocks of leisure time during the year, they can have an impact on the frequency of vacations taken and more last -minute unplanned vacations. This trend may also be linked to relatively shorter principal holidays and the multiplication of shorter, secondary vacations. The massive entry of women into the workforce in OECD countries has had a significant impact on family vacation decisions. On the one hand this trend has led to more complicated household vacation planning, which ultimately favours shorter over longer vacations. On the other hand it has constrained the overall amount of leisure time available to the family.

Macro-level forces

Technology, factor endowments and tourism infrastructure

Countries with abundant or inexpensive tourism-attracting resources will likely develop a strong tourism service sector and generate inbound tourism traffic. These resources can be natural (sunny weather, attractive beaches, skiable mountains), cultural (historic cities, interesting architecture, unique local cultures) or artificially produced (*e.g.* theme parks). Natural and, to a lesser extent, cultural resources have the greatest influence in generating inbound tourism. Successful destinations, however, also have a developed accommodation sector, efficient transport infrastructure and a number of supporting services. This helps to explain why countries with relatively high levels of GDP and capital investment capacity, and well developed domestic tourism infrastructure, are the most successful international tourism destinations. Developing countries that have increased their tourism infrastructure, combined with relatively low labour costs and inexpensive transport prices, have gained market shares from OECD destinations. Insofar as these destinations generate new trips, or are further away than the destinations they are replacing, their development will lead to heightened environmental impacts, in particular from aviation.

Economics: globalisation, integration and consolidation

The second half of the 20th century has seen a rapid acceleration of international trade in goods and services, capital movements, corporate alliances and mergers, technological exchange and a general increase in the interdependence of national economies on a global scale. This process of globalisation serves both as a backdrop to changes in – and as a characteristic of – the tourism sector. Coupled with the rise in international mobility facilitated by air travel, globalisation means that tourist destinations throughout the world now compete directly for tourists. Competitive pressure has blurred lines between different tourism service providers and between these providers and tourism product distribution networks (*e.g.* vertical integration of operators in order to better control costs and gain new markets, wholesalers packaging different services into single tourism products, and airlines gaining market shares through alliances with other airlines serving different geographic bases). It is not uncommon for airlines to own hotels, for tour operators to lease aircraft and for tourism wholesalers to own travel agent distribution networks. Prices decreases for equal or better quality services have generally followed integration while tourism products have become more far-ranging and resistant to price changes in any one of the individual tourism trades (OECD, 1999*a*).

Policy: regulatory and political forces

The regulatory structure governing tourism services has an impact on tourism travel. This is perhaps most important in the transport sector. Increased deregulation of the airline industry has been a major factor in reducing the cost of air travel. The trend towards comprehensive regulatory frameworks allowing free access to national markets will likely keep steady downward pressure on air fares within the OECD. This has important implications for the environmental impacts stemming from tourism travel since, at least in Europe, the less environmentally damaging rail sector has yet to be fully deregulated.

The political climate of countries can also influence tourism demand. Political changes in Central and Eastern Europe and CIS states, for instance, have led to an opening of these regions as important new tourism destinations that are projected to gain market shares at the expense of other western European nations. Limited rail links with the rest of Europe suggests that most international tourism growth to these countries will be by car, coach and air. Households in these regions will also participate more actively in international tourism and go farther from home as their incomes grow. Other important political changes in a number of formerly closed countries, such as Vietnam, China and Cuba, will allow for growing tourism travel from OECD regions. In the case of the OECD Asia region, the emergence of China as an important tourism destination may replace some trips currently going to Europe and North America although the net effect on travel distances will likely be minimal as Chinese markets may stimulate new demand from Asia, North America and Europe.

Demographics: ageing population and changes in retirement income

OECD societies are undergoing significant ageing with an increased share of retirees in the population. This trend is important for tourism travel because retirees are generally characterised by high levels of disposable income, large amounts of free time, no work and few family responsibilities and, compared to previous generations, relatively high levels of fitness later into life. In absolute terms, for example, retirees in the United States are large generators of international tourism and their geographical situation *vis-à-vis* the major European tourism destinations are expected to lead to an increased use of air travel. Changes in OECD pension systems may affect these trends if they lead to an increase in the retirement age, greater participation in private pension schemes and/or reduced pension payments.

Summary: driving forces behind household tourism travel decisions

There are several major influences on tourism travel decisions (Table 3). The decision to take a holiday can be roughly broken into three levels that have an impact on consumer choice of destination

Table 3. **The NOA model and household tourism travel**

Technology (tourism infrastructure, transport modes), **Economy** (globalisation, integration, consolidation in tourism sector), **Policy** (regulations, information), **Demographics** (retirement age, employment, family structure)		
Needs	Opportunities	Abilities
Diversion, relaxation and variety	Tourism travel prices Tourism products and services Advertising and information	Per capita disposable income Working time and paid leave

and frequency of departure, both of which influence the environmental impact of tourism travel. The first can be resumed as the availability of money and time. The second level concerns family and work situations which have an impact on the frequency and duration of tourism travel and, to a lesser extent, on the type of tourism products and destinations chosen. Finally, the third layer principally concerns individual lifestyles and preferences for certain products and/or destinations. These preferences will have a strong impact on travel distances and modes used and consequently, the environmental impacts stemming from tourism travel.

However, the discussion above has shown that a number of other drivers shaping the tourism industry have both direct and indirect influence on consumer tourism opportunities. The World Tourism Organisation has identified 13 exogenous and market forces that come into play in the tourism decision-making process (Table 4). Generally, exogenous factors tend to fall into the first two levels of decision-making and therefore have an influence on the scale of tourism travel (departures and frequency). Market forces within the tourism and travel industry tend to influence the third layer of tourism decision-making and therefore have a strong impact on the structure of tourism travel (destinations chosen, distances travelled and modes used).

Table 4. **Factors that influence tourism travel demand**

	Exogenous factors	Market forces
Impacts on tourism travel	• *Economic and financial developments* • *Demographic and social changes* • *The safety of travel* • *Technological innovations and improvements* • *Infrastructural, equipment and facility improvements* • *Political/regulator y/legislative factors* • *Trading developments* • *Environmental planning and impact issues*	• *Consumer knowledge of tourism possibilities and tourism requirements* • *Destination product development and product/service development by the private sector* • *Trends in the structure of the tourism and travel sector* • *Marketing* • *Supply of experienced and skill human resources*
Source: WTO, 1996.		

3.2.3. *Key driving forces behind household energy and water consumption and waste generation*

Needs

Households need energy to provide a wide range of "services", in particular to heat and cool rooms, heat water, and run electrical appliances. Energy needs have grown along with the increasing demand for larger houses, greater floor space per capita, and comfort levels related to internal room temperatures and hygiene (more frequent and longer showering, more frequent clothes washing). Many of these same dynamics have also increased the demand for water.

In contrast, households do not need waste: it is a by-product of their need for different products and services, but which also creates a set of secondary needs (*e.g.* for waste management). Many influences shape household demand for different consumer goods, particularly current and expected future income and the prices of goods and services. These indirect influences on waste generation are discussed below.

Opportunities

Energy and water prices

Energy intensity (total primary energy supply per unit of GDP) fell rapidly in OECD countries following the oil price rises of 1973/74 and 1979. Although the rate of decrease slowed after 1985 when real prices fell nearly to their pre-shock levels, there was no sharp rise in energy use, indicating that some energy efficiency improvements have been "locked in" to OECD economies through changes in technology, infrastructure and permanent behaviour (OECD, 2001). Energy end-use prices have decreased in real terms from 1980 to 1999 (OECD, 2001*h*). Nevertheless, although energy price elasticities are asymmetric – consumers are more responsive to a price rise than a decline – energy is a "necessity" with a comparatively inelastic demand. In Germany, for example, energy price elasticities generally range from –0.2 to –0.1, meaning that higher prices only cause a moderate reduction in demand. At the same time, the absence or availability of home improvement credit, and whether a household owns or rents a dwelling, can influence household ability and willingness to invest in energy-efficient appliances and/or sustainable building design.

Energy is one of the most heavily subsidised sectors in the OECD area (OECD, 1998*a*). The bulk of support goes to nuclear, coal and oil production (de Moor and Calamai, 1998). Subsidies to specific fuels lead to an economically inefficient energy supply level and mix, and discourage new fuel or technological developments that could reduce negative environmental effects (OECD, 2001). Most OECD countries have begun a process of liberalising energy supply and distribution services. In most cases policy reform in the electricity sector can be expected to further drive down electricity prices, increasing demand. In order to counter-balance the negative environmental impacts that will result from these reforms, it will be necessary for countries to adopt policies to encourage greater energy efficiency, emission reductions, and use of cleaner fuels (OECD, 2001).

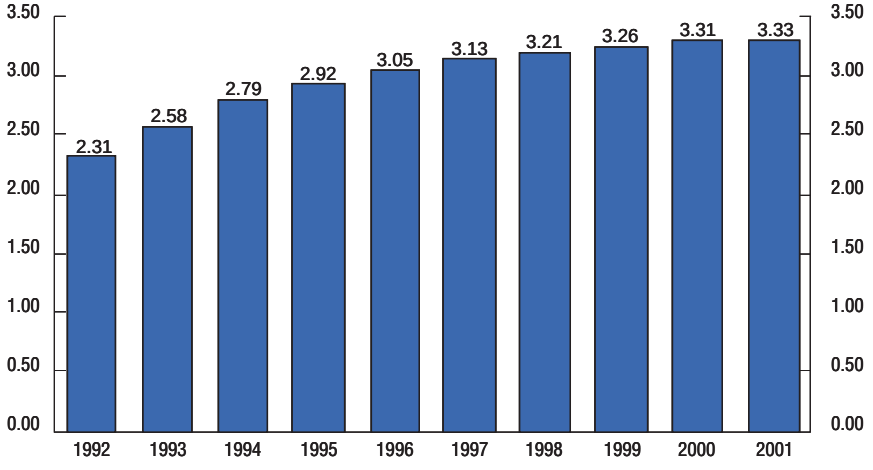
Water price increases do not appear to have had a strong impact on household consumption levels in many OECD countries, because households often do not know how much they consume or spend per cubic meter, or they perceive water prices as being rather low. In the Netherlands, for instance, household expenses on water (including drinking water and sanitation and water board taxes) currently account for only 0.78% to 1.9% of average household income. 50% of Dutch consumers do not know how much they pay for their water; of those who do know 43% consider it to be relatively inexpensive (although this is less than the 50% giving this same answer in 1995) (Correlje *et al.*, 2001). In Germany, although water prices have increased, water and sewage services still account for approximately only 1.3% of disposable income (Lorek *et al.*, 2001). 84% of German households know neither the price they pay for water and sewage nor the volume of their consumption. The only time price had a dampening effect on consumption was between 1992 and 1996, when consumers shouldered a rapid and large increase (11% in 1992) to cover the costs of infrastructure in the new Länder (Figure 8). Linking price to consumption via metering also appears to strengthen the effect on consumer behaviour.

Raising domestic water prices have had the most effect on consumption when coupled with volumetric or marginal cost pricing and individual metering (OECD, 1999*e*). Metering penetration varies considerably across countries and dwelling types. While in the majority of countries over 90% of single-family houses have meters, individual metering in apartment blocks – where most of the population live in a significant number of OECD countries – exists in only a few (OECD, 1999*d*). In some countries metering has helped reduce household water use. However, in Germany some studies suggest that households are primarily interested in metering for equity, not efficiency, considerations (Möhle, 1982 in Lorek *et al.*, 2001).

In Mexico, water is highly subsidised. The government currently pays 88% of the real pumping costs to meet domestic water demand (*e.g.* real costs of water abstraction and distribution not including

Figure 8. **Development of water prices 1992-2001**

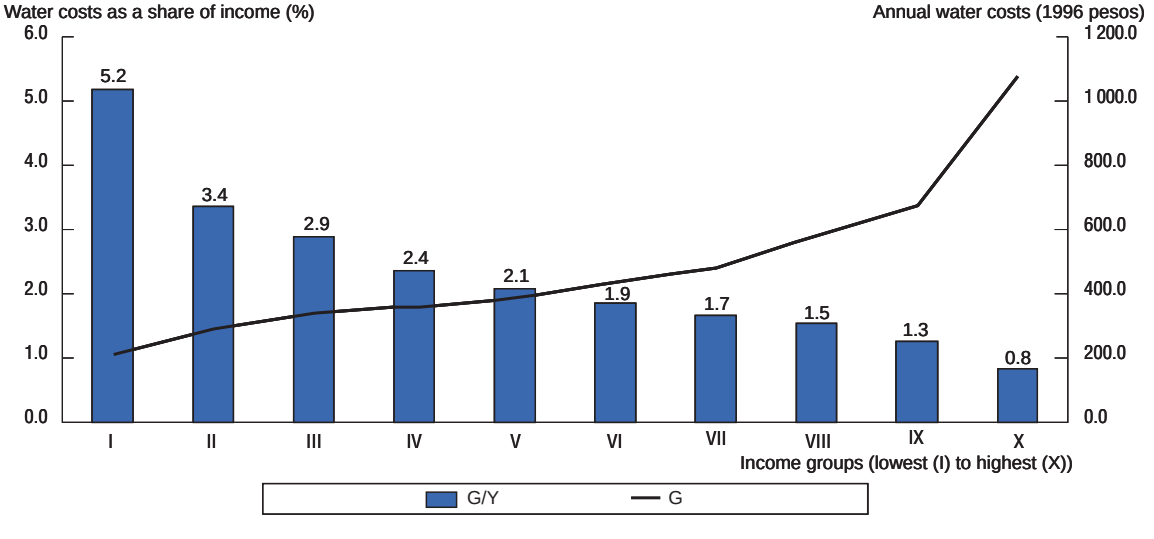
Average water prices in Germany in DM/m^3



Source: BGW-Wassertarifstatistik, 2002.

energy costs for transporting (pumping) the water to Mexico City (2 500 meters high) or maintenance and management costs of the water network) (CESPEDES, 2000). Debates over water subsidies and appropriate pricing have been fuelled by cultural views of water as a "free" good and social equity concerns. However, various studies have shown that inhabitants in very low income districts and rural areas who have no access to public water networks currently pay as much as 30% more for water than households in wealthy urban areas (CESPEDES, 2000) (Figure 9).

Figure 9. **Mexico: Average water expenses (G) per year by income group (Y)**



Source: CESPEDES, 2000.

Waste management costs

OECD countries commonly apply a range of *taxes* and *fees* to household waste collection. While these waste fees and taxes are essential to maintaining waste management systems, their impact on household behaviour is less clear. As is the case for household water consumption, it is commonly observed that households are rarely aware of the price that they pay for their waste. When they do know, the price is generally perceived as being low, so much so that households do not feel compelled to reduce the amount of waste they generate. In some countries, unit pricing is being used to make the cost of waste management visible to households. Unit pricing policies use marginal price structures that penalise higher levels of waste generation by charging on the basis of the volume (*e.g.* "Pay-As-You-Throw" – PAYT) or weight of trash discarded instead of a flat tax or monthly fee. In some instances these programmes have led to a reduction in waste, particularly where they combine waste fees with complimentary measures to provide the infrastructure, information and incentives to households to reduce and recycle their waste. Some countries expect taxes on disposable products (*e.g.* plastic beverage bottles) or excessively packaged products to have a stronger effect in encouraging household waste prevention. More experience and analysis is required on the impact of product taxes and waste fees on household waste generation patterns.

Available Products and Services

Household demand for energy and water and waste management services are strongly tied to rates of household appliance ownership and use and the volume and composition of product and packaging consumed. Household appliance ownership is expanding across OECD countries and converging towards US levels, although in 1992 US households still owned the most and the biggest appliances (IEA, 2000*a*). These trends explain the rising importance of electric appliances, and electricity in general, in the total household final energy demand by end use. The increased scale of appliance purchases and use explains why Dutch households, for example, increased their electricity consumption by 14% between 1974 and 1994 despite significant efficiency gains in many appliances (Table 5). Rising appliance ownership levels are driven by household demands to save time and labour and expanding leisure activities. Similarly, the increasing number of water appliances is linked with changes in lifestyles. "Product innovation systems" theory[7] explains this trend as a process by which new products and appliances enter households, help change lifestyles and routines, and then themselves become part of those routines. Over time products that were once considered as luxuries become necessities[8] (*e.g.* washing machines, dish washers, microwaves, mobiles, etc.).

At the same time, efficiency improvements embodied in new products have been key to slowing the growth of final energy demand by households and in reducing water consumption, indicating that some decoupling of economic growth from energy and water is taking place. Without efficiency gains,

Table 5. **Netherlands: Ownership and energy consumption of appliances**

Appliance	1973			1996		
	Penetration (%)	Efficiency (kWh/app.)	Energy use per hh (kWh)	Penetration (%)	Efficiency (kWh/app.)	Energy use per hh (kWh)
Fridge	88	450	396	112	342	382
Freezer	17	800	136	56	380	212
Dishwasher	4	900	36	25	303	76
Clothes washer	85	450	83	98	231	225
Wash dryer	5	700	35	52	542	279
Water boiler	16	1 750	280	18	1 352	238
CV-system	30	500	150	77	283	216
Television	96	175	168	166	100	166

Source: ECN, 1998.

household demand for energy services over the last 20 years would have resulted in a 30-70% increase in per capita residential energy consumption. Actual final household energy use has increased, but by 30% at the most, and has declined in some countries (IEA, 1997). In the same way, the diffusion of water-efficient fittings (low-flush toilets, low-flow shower heads, etc.) have been one of the most important forces influencing water consumption trends in countries that have reduced per capita residential consumption. Similarly, product composition, obsolescence, packaging, and recyclability are all factors determined higher in the product chain. Upstream efforts to reduce product packaging has led to smaller amounts of some types of packaging waste at the household level. Further gains could be achieved through eco-design and dematerialisation strategies for consumer products. Preventing excessive waste from entering households is an important way to reduce total generation without requiring onerous efforts by households. The provision of recycling infrastructure to facilitate waste sorting is also a key factor in creating the opportunity for households to recycle their waste.

Information

In many OECD countries, households now have better access to reliable information on their energy use through household energy audits, energy labels on household appliances, and in some cases detailed billing information (OECD, 2001*a*). Energy-efficiency labels and standards for household appliances and equipment are used in many OECD countries, and the range of products to which they are applied is expanding. Labelling has also stimulated manufacturers to improve the design of their products. For example, the sales-weighted annual average efficiency of "cold appliances" (refrigerators and freezers) improved by 4.5% from 1994 to 1996 during the EU's cold labelling programme (IEA, 2000*a*). More information is needed, however, on consumer awareness of energy labels and their importance in consumer decision-making, particularly in relation to other purchasing criteria (*e.g.* high up-front costs *versus* long-term, dispersed savings, etc.).

Public information campaigns on water conservation have been widespread in many OECD countries over the past three decades. In the Netherlands, information campaigns are considered to have been a key element in the stabilisation of household water demand (Correljé *et al.*, 2001). One Dutch study estimated that although the difference between concerted conservation efforts and the average is only 10 litres/person/day, it is 40 litres/person/day when compared to no saving behaviour at all (Table 6). New research suggests that after ensuring the uptake of water-efficient technologies, the greatest saving potentials can be obtained through providing information to identified target groups to modify individual behaviour (*e.g.* showering, laundry, etc) (Correljé *et al.*, 2001). Individual water meters and a clear water bill are important instruments for providing information.

The establishment of waste recycling programmes is also typically supported through the dissemination of information to households on waste sorting criteria and disposal methods. In Germany, the government has also used media campaigns to raise general environmental awareness, including on the need to reduce household waste. However, it is difficult to measure to what extent this has resulted in different behaviour. In contrast, in the Netherlands, some NGOs initiatives were able to lead households to reduce waste going to final disposal by 57 kg on average per household per year (Harland *et al.*, 2000). In Mexico, in the absence of any co-ordinated national environmental information campaigns, some environmental NGOs and local groups have launched information initiatives around waste minimisation and recycling projects. Public response, however, has been muted due to

Table 6. **Netherlands: Self-reported consumer water saving behaviour**

Behaviour	Average litres/person/day
Very careful	120.5
Not very careful	131.5
Not careful at all	160.2

Source: NIPO, 1999.

inadequate infrastructure and conflicting signals (separated waste being thrown back together in one garbage truck).

Abilities

Per capita income

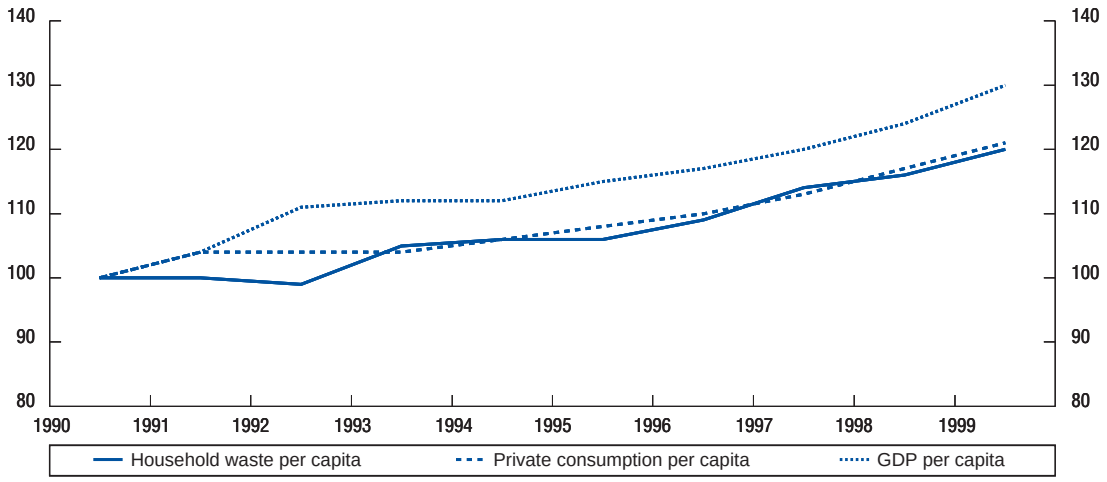
Disposable income has a dual effect on household consumption patterns. On the one hand rising incomes lead to a demand for more electronic appliances and larger houses. Larger dwelling areas are linked to a greater demand for energy for heating and cooling rooms, heating water, and other services. In Germany, estimated income elasticity for energy consumption is 0.1 to 0.4, reflecting that higher incomes lead to higher energy consumption (Lorek *et al.*, 2001). Higher incomes are also associated with increased consumption of product and services, and consequently with waste generation. In the Netherlands, for example, total and per capita levels of waste have increased steadily along with per GDP capita and private consumption since 1990 (Figure 10).

On the other hand, higher incomes also allow consumers to invest in energy- and water-efficient appliances and other conservation techniques (insulation, double-glazed windows, etc.) and to purchase more environmentally friendly goods. Studies in Germany and the Netherlands have shown that higher incomes can lead to greater participation in recycling schemes and more accurate waste sorting and composting. To date, however, there is no evidence that green purchases lead to a reduction of waste, simply because the total increase in consumption still outweighs gains from waste prevention. Experience suggests that disposable income must be combined with some external and internal stimulus, such as regulatory measures, environmental awareness, increasing prices, and the availability of efficient technology before consumers are stimulated to act in an environmentally friendly way. Higher income is often linked to education, access to environmental information, and greater environmental awareness, each of which is an important factor in reducing waste generation and environmental damage.

Infrastructure

Infrastructure (*e.g.* the housing stock, energy and water distribution systems, waste management structures) is part of the "hardware" that shape household consumption patterns. Energy use, for

Figure 10. **The Netherlands: Income, consumption and waste generation 1990-1999**



Source: RIVM/CBS, 2000, Correljé *et al.*, 2001.

example, is strongly influenced by dwelling type and age, structural surroundings and construction characteristics (insulation, building regulations). Similarly, multiple studies recognise the critical importance of an adequate infrastructure to facilitate and reduce the costs to households of sorting waste. Two types of waste collection systems exist in OECD countries: *collection systems*, where mixed or sorted waste is collected at the household door or public containers, and *disposal systems*, where citizens bring their sorted waste to containers (glass, paper and often bulky waste) located elsewhere. Along with clear separation criteria, the provision of appropriate waste containers for collection systems, and the location and appearance of waste containers for disposal systems have been shown to be critical factors in the acceptance (and consequently the recovery rate) of a recycling system.

Environmental awareness and education

Education and environmental awareness are key forces driving consumer participation in energy and water conservation initiatives, waste recycling schemes, and green buying behaviour. Environmental awareness is affected not only by public and NGO information campaigns, but also by general media coverage of environmental issues. In Germany, for example, coverage of the first regions to experience acute water shortages and scenarios of further depletion and effects on fresh water resources led a growing number of consumers to demand water saving equipment and to use less harmful household chemicals (Lorek *et al.*, 2001). Media coverage, however, can also discourage consumers. In recent years in the Netherlands, for instance, the mass media has given negative coverage to separate waste collection ("Separated waste is not treated separately, but incinerated or disposed of.") which led to a drop in consumer participation.

Although environmental awareness is a general conditioning factor that encourages environmentally friendly behaviour, it appears to be less important in ensuring consumer action when adequate technologies (water-efficient plumbing) or infrastructures (recycling bins) are in place and new behaviour has been integrated into household routines. Waste separation behaviour in the Netherlands and Germany, for instance, is so well organised and part of an accepted set of household activities that even people who do not consider themselves "environmentally aware" recycle their waste. In comparison, environmentally aware households in Mexico that have tried to recycle their waste have become discouraged by the effort and cost involved in the absence of an established waste recycling infrastructure.

Macro-level forces

Economic growth

Like per capita income, economic growth is tied at the same time to greater household consumption and higher investment in environmental protection. Higher levels of GDP, for example, are associated both with a greater number of household connections to water supply networks (a burden on the environment) and more efficient water technologies and effective water treatment plants (a plus for the environment). Almost 100% of Dutch and German households are connected to water supply networks and 95% to water treatment systems; in Mexico 87% of households have water connections but only 23% of urban public wastewater receives some kind of treatment. Household water consumption per capita is increasing in Mexico, but is declining in the two European countries.

Similarly municipal waste generation has paralleled household consumption expenditure (Stutz *et al.*, 2001).[9] While the qualitative and quantitative changes in household consumption of good and services do not themselves necessarily mean greater environmental pressure, evidence shows a significant and positive statistical correlation between final private consumption and municipal waste generation per capita. On the other hand, higher economic growth has enabled the development of cleaner technologies and more environmentally friendly waste management systems. There is a clear trend in OECD countries, for example, to move away from land filling waste towards implementation of the waste management hierarchy (waste prevention, material recovery, energy recovery, environmentally sound landfill).

Technological change

In many areas, technological innovations (increases in boiler efficiency, water saving appliances, double-glazing, insulation, efficiency gains in household appliances) have strongly influenced per capita household energy and water consumption. In the Netherlands, for example, energy consumption in new houses is about 40% of that in a home from the 1960s. At present, about 80 000 new homes are added each year to the existing stock of six million homes. Research has shown that at least 20% of energy for space heating could still be saved at relatively low cost in the existing housing stock (Correljé *et al.*, 2001). The advantage of technologically induced change is that it reduces the need for consumers to make conscious choices. However, technological "fixes" are not expected to be able to compensate for projected increases in demand for energy services in the next twenty years.

The general decline in recent years in the overall efficiency of converting primary energy to final energy will be somewhat offset in the future when available higher-efficiency technologies (*e.g.* combined cycle-gas turbines) come on stream through the turnover of capital stock for power generation. Renewable energy technologies are also growing quickly, but from a small base (5% in 1995). The power sector typically has a slow capital stock turnover, because fossil fuel and nuclear stations have life spans of at least 20 to 40 years. As a result, the bulk of generation facilities needed to meet demand in 2020 in OECD countries have already been built, limiting the extent to which new sources, including renewables, can penetrate the electricity generation market (OECD, 2001).

Demographic change

Household size and composition are important forces influencing energy and water use. Households with fewer members tend to use more water and energy per member than multiple-person households. Shifting from a one- to a two-person household can bring a 20% reduction in direct energy use. Consumption patterns also vary by age groups (Table 7). It is not clear whether young people's behaviour is "culturally determined" (*e.g.* a higher valuation of luxury) or whether it is associated with patterns of time spending (and so likely to change in later years). Future demand for water services in the different age groups is also not clear. For instance, while older generations probably have not changed the frugal patterns they grew up with, it could be expected that tomorrow's cohorts of elderly, accustomed to a more water- and energy-intensive lifestyle, will not likely change their consumption habits (Correljé *et al.*, 2001).

Culture

Cultural attitudes to certain goods can influence household consumption patterns. This is particularly true for water, which is often strongly connected to ideas of basic needs and/or "free goods". In Mexico, for example, water is perceived by many as a "free resource", which creates a strong cultural antipathy to paying the real costs of water supply. Although the same perception held in Germany and the Netherlands in the early 1980s, responsible resource use has gradually become a socially accepted

Table 7. **The Netherlands: Water use by household size and age group**

Household size	litres/cap./day	Water use by age group	litres/cap./day
1 *person*	127.6	0-12 years	113.7
2 *people*	132.8	13-17 years	137.5
3 *people*	123.5	18-24 years	149.6
4 *people*	123.7	25-34 years	134.5
5 *people*	120.1	35-44 years	125.9
		45-54 years	125.1
		55-64 years	129.7
		65 years and older	118.6

Source: NIPO, 1999.

indicator of progress in the 80s. Water saving behaviour – and the use of (usually more expensive) efficient kitchen, bath and garden equipment – are now even status attributes for some lifestyle groups (Lorek *et al.*, 2001). Culture, however, is context specific: Mexicans in water scarce regions practice more water saving behaviour than the average German or Dutch.

Summary: *driving forces behind household energy and water consumption and waste generation*

Several of the forces that influence energy and water demand and waste generation at the household level have a dual effect on consumption patterns. This is the case, for example, for per capita income, technology and information. These forces influence both *scale* pressures – by increasing the demand and availability of energy and water services and waste generation – and the *intensity* of use – through changes in technology and individual behaviour. As a result, it is difficult in some cases to project the net effect on consumption trends into the future (Table 8). Nevertheless, there is strong evidence indicating that energy use, water consumption and waste generation will increase over the coming years.

Table 8. **The NOA model and household energy and water consumption and waste generation**

Macro forces **Economy** (economic growth), **Technology** (energy and water supply technology; waste management systems), **Demographics** (household size and composition), **Culture** (frugality, water as a free good)		
Needs	Opportunities	Abilities
Energy for space conditioning; hot water; electrical appliances	Prices for energy and water Costs of waste management	Per capita disposable income
Water for consumption, cooking, cleaning, gardening	Available products and services (efficiency rates for household appliances; packaging)	Infrastructure
Waste management	Information	Education and environmental awareness

The trends in household water and energy consumption, and waste generation also shed light on the relative importance of technology and information- or culture-based change in different consumption situations. First, it is not clear that one or the other is the dominating driver across all consumption patterns. Technological innovation, by embodying environmental improvements in products, can reduce the need for consumers to make conscious decisions. Nevertheless, most energy and water impacts at the household level stem from the frequency and duration of use, which means that information and attitudes remain critical factors in promoting more sustainable consumption patterns. This suggests the need to tailor information to different consumer groups (proactive, "latent" actors, disinterested) at different points of time in the diffusion of a new product or technology. Second, it highlights the importance of general information and environmental awareness to both stimulate consumer demand for technologically superior products and to achieve necessary changes in consumer use patterns. These issues are discussed further in Chapter 4.

3.3. Conclusions on the driving forces that influence consumption patterns

The discussion of consumer decision-making and specific drivers of household consumption in the five areas studied lays out a broad web of influences on consumer choice, including for environmentally friendly purchases and behaviour. There are many different ways of explaining consumer demand. While the accuracy of projections of future demand trends are by definition conditional on how patterns actually unfold, marketing and sociological analysis appear to point strongly to the importance of several key driving forces behind consumption, including, for example, economic growth and growing per capita disposable income, lifestyle and cultural tastes for diversity and spontaneity, demographic trends toward more single-person households and a steady participation of women in the labour force,

and longer and healthier lifetimes. Combined with other influences on consumption patterns, such as existing technology and infrastructure, the policy framework in place, and available products, services and information, these driving forces help determine the environmental intensity of consumption patterns.

Several observations can be drawn about the utility of understanding these driving forces for policy development and implementation. First, the multiplicity of forces that influence household consumption patterns argues for a widening of models of consumer behaviour which take preferences as "given", particularly where they are used to guide policy development. The web of driving forces means that there are many options for policy to influence consumption patterns, and underlines the importance of applying combinations of instruments to reflect the fact that different driving forces act simultaneously on consumer decisions. Understanding these influences can not only help to design *effective* instruments, but also to determine the relative emphasis that should be given to different *types* of instruments (economic, regulatory or social).

The dynamics behind consumer demand also help identify where the impetus to shift consumption patterns can come strongly from consumers, or in contrast, will depend upon shifts in the technological or infrastructure characteristics of supply patterns. For instance, in the highly competitive food and tourism industries, consumers have a central role in shaping the products offered in the market. Consumer demand for environmentally sustainable options are likely to have a stimulating effect on supply. In comparison, consumers have significantly less influence on energy and water supply systems, or waste collection programmes. In these areas, shifting consumption patterns will require more emphasis on external driving forces.

Finally, some driving forces have a dual effect on consumption patterns, in particular per capita income and economic growth, which both extend consumer abilities and opportunities to increase their consumption, but which are also historically tied to rising levels of environmental protection. The net impact of these types of driving forces will depend on the development of other factors that influence consumption, including for example, technological innovation, levels of environmental awareness and concern, and environmental protection policies. Chapter 4 looks at the role of public policy in particular for stimulating more sustainable consumption patterns.

NOTES

1. This section is drawn primarily from OECD 2001*a*, "An Economic Conceptual Framework", OECD General Distribution Document ENV/EPOC/WPNEP(2001)12/FINAL.
2. The term public good refers to a good that is non-exclusive (no one can be excluded from consuming it, such as open access resources or some ecosystem services), and indivisible (one person's consumption of the good does not diminish the amount available for others, as in the case of clean air). An externality exists whenever the welfare of one agent (a firm or household) depends directly not only on his/her own activities but also on the activities of some other agent. Externalities can be either positive or negative and arise from improperly defined property rights, the existence of public goods, imperfect market structures (*e.g.* monopoly, market thinness), a divergence of social and private discount rates, or government failures (price floors or ceilings, subsidies, etc.).
3. Much of this analysis, which also explains why rich people save proportionally more, is due to Keynes.
4. Final private expenditure here includes final consumption of households plus final consumption of private non-profit institutions.
5. See Johanna Moisander and Liisa Uusitalo in OECD 2001*e*, Information and Consumer-Decision-making, OECD General Distribution document ENV/EPOC/WPNEP(2001)16/FINAL; see *www.oecd.org/env/consumption*.
6. This discussion is drawn largely from Gatersleben and Vlek in Noorman and Uiterkamp (1998).
7. See Villager, Wüstenhagen, and Meyer (2000), Jenseits der Öko-Nische (Birkäuser Verlag, Basel).
8. Mika Pantzar (2000), Do Commodities Reproduce themselves through human beings? Man *vs.* nature *vs.* technology: problems and new conceptualisations (see *www.comp.lancs.ac.uk/sociology/esf/papers.htm*).
9. For further information on waste generation and economic growth see articles by Christian Fischer (1999) and Vagn Isaksen (1999) at *www.etc-waste.int/*.

Chapter 4

POLICIES TO PROMOTE SUSTAINABLE HOUSEHOLD CONSUMPTION

The preceding discussion shows how households in OECD countries affect the environment through both their day-to-day decisions on what goods and services to buy and the use they make of them, and their decisions on where to live and work, what kind of dwelling to have, and where to go on vacation. Although the environmental pressures of individual households are sometimes minor compared to environmental impacts from the industrial and public sectors, the combined impact of many households is an important contributor to a number of environmental problems, including air and water pollution, habitat alteration and climate change. In areas such as household energy use, travel and waste generation, material and energy efficiency gains have been outweighed by the absolute increase in the volume of goods and services that are consumed and discarded.

Chapter 3 identified several key driving forces behind consumption trends and shed some light on which of these forces appear to have the most influence on consumer decisions and actions. This analysis suggests that there are many options for influencing consumption patterns. This means that promoting more sustainable consumption will require a multistakeholder approach, including public policy, market innovation, NGO mobilisation of consumer groups, and voluntary initiatives by consumers themselves.

Within a multistakeholder framework, what is the role of government in OECD countries? Section 4.1 examines the general framework for policies to promote sustainable household consumption based on the existence of environmental externalities. It also discusses why significant latitude remains in determining the goals such policies are intended to achieve, and in designing policies that effectively reach a very heterogeneous consumer population. Section 4.2 provides an overview of policies that influence household consumption, and the relative effectiveness of different types of instruments (economic, regulatory, social) in shifting consumer choice towards less environmentally damaging products and services. This section also looks in greater depths at two types of "social instruments" – information and participatory decision-making. Section 4.3 identifies specific policies to reduce environmental impacts from household food consumption, tourism travel, energy and water consumption, and waste generation. Throughout the discussion, Section 4.4 distils policy lessons not only on some of the problems inherent in shaping policy to influence consumer decisions, but also on good practice examples and areas of opportunity to generate greater consumer action.

4.1. The framework for policies to promote sustainable consumption

The rationale for affecting consumer choices and consumption as a whole lies in the existence of environmental externalities linked to the production and consumption of key consumer goods and services. These externalities arise from improperly defined property rights, market failures, a divergence of social and private discount rates, or government failures. Well designed policy instruments have a role to play in making the market work for environmental protection and sustainable development.

In the past, economics and economic policy devoted less attention to environmental assets. Early economic models tended to view pure air, for example, as a non-scarce resource and arable land as non-depletable. Real economic growth, fuelled by consumption and measured by the increase in output, did not necessarily jeopardise the consumption prospects of future generations. Intra-generation equity

issues remained, but inter-generation "taxation" was largely absent in these models. As the impacts of resource and pollution-intensive growth increased, economic models adapted to reflect the fact that man-made capital and labour availability were not the only constraints to growth, but so too were natural, human and social capital. The question of the substitutability between these different forms of capital is now even more relevant, especially since at current levels of technology and knowledge, substitutability may still be limited.

Two major views on sustainability form the basis of the substitutability debate and would have profound impacts in terms of directing policy. *Weak sustainability* refers to the assumption that one form of capital can be used up if its proceeds are reinvested in other forms. This definition does not imply that substitution is either cheap or easy (Pearce and Atkinson, 1998). Weak sustainability also does not allow for using up the proceeds of one form of capital on final consumption, but it does admit that substitutability among the different forms is feasible in one way or another. Alternatively, *strong sustainability* assumes that some forms of capital – particularly natural capital – have no substitutes, regardless of the technology available. As a consequence, in a sustainable system some limits may have to be set to avoid depletion of natural capital. In practice, there are several shades of interpretation between the polar positions of weak and strong sustainability, although debates on sustainable consumption have not always been successful in breaking away from extreme positions. This complicates the setting of policy goals.

Whether weak or strong sustainability is favoured, there is an overall concern for the long-run impacts of the natural capital constraint on patterns of consumption and the well-being of future generations. The fact that the "long-run" for many natural processes denotes a period much longer than that normally considered in economic analysis poses a problem for traditional approaches based on discounting. Some of the key environmental problems facing policy makers (climate change, biodiversity extinction, nuclear waste disposal) fall into this category. As one analyst illustrates: "if one discounts present world GNP over two hundred years at 5% per annum, it is worth only a few hundred thousand dollars, the price of a good apartment. Discounted at 10%, it is equivalent to a used car" (Heal, 1998).

The long-term boundaries on sustainability introduce significant uncertainty into identifying and planning for socially optimal[1] and sustainable patterns of consumption (as in other areas of environmental policy). This is because society's preferences change over time (and the preferences of future generations can never be adequately represented) (Section 4.2). It is also because the rate and nature of technological change cannot be forecast with any degree of reliability. Technological progress can offer the possibility to augment consumption opportunities for a given stock of wealth (Pearce and Atkinson, 1998), but it also may be insufficient in terms of environmental impact to keep up with an increase in scale pressures on natural resources. This is currently the case in the energy and transport sectors.

Notwithstanding these challenges to identifying the general goals of sustainable consumption, it is still possible to identify the direction and sometimes the magnitude of change needed. CO_2 levels, air and water quality, waste generation trends among other environmental indicators show not only key areas where environmental protection efforts should be strengthened but also the relative contribution of households to the problem and the solution.

Where are the areas that governments can be most effective in promoting less environmentally intensive consumption patterns and which tools are most likely to be best adapted? Macroeconomic analysis of the relationship between income and sustainable consumption via genuine savings shows that it is possible to have significant influence on consumption expenditure, not only from income but also through wealth effects. However, while it would be expected that by diminishing overall consumption levels, at least in developed countries, overuse of public goods and generation of negative externalities could be reduced, such a policy would have several drawbacks. First, such a policy penalises all inputs and outputs regardless of whether they generate a negative externality or not. Second, other factors held constant, curtailing consumption curtails growth; while this is often used for short-term macroeconomic objectives it is difficult to justify for long-run sustainable consumption, at

least given current levels of knowledge. This does not mean that there are not discrete areas where absolute reductions in aggregate consumption levels are necessary, only that macroeconomic policy (*e.g.* income tax, interest rates) would not be the most effective nor most feasible policy for reducing consumption of specific environmentally-damaging goods and services.

As a result, the boundaries of sustainable consumption policy then lie primarily around affecting choices within aggregate consumption patterns towards more sustainable patterns and finding ways for using the different forms of capital in a more environmentally efficient manner. These boundaries also recognise that well-being is not only composed of environmental public goods nor solely affected by environmental externalities. A comprehensive public policy addressing environmental externalities and the degradation of environmental assets cannot be devised in isolation from the rest of the economy; it must be concerned with both diminishing the gap between optimal and sustainable consumption and with the interactions of marketed and non-marketed goods in the formation of consumer preferences.

Considering the nuances of negative externalities caused by consumption, instruments intended to influence consumer decision-making directly can be more complicated to design than policies directed to producers for example. Consumers are a large, dispersed and heterogeneous group and their behaviour in generating negative externalities is varied. This means that policies to promote more sustainable consumption need to be both well targeted and in many cases to include a combination of instruments and strategies (regulatory standards, market instruments, information) that provide a consistent signal to consumers. The following Section 4.2 addresses this issue in depth.

4.2. Policy parameters and the effectiveness of different types of instruments

4.2.1. *Parameters*

Which policy tools are likely to be the most effective in reducing the environmental impacts from household consumption? Within the broad framework of long-term sustainability objectives discussed above, three broad parameters can be identified for guiding the design and implementation of policies to achieve sustainable consumption (Box 1).

First, it is resource use and environmental pollution that have to be brought to sustainable levels rather than the consumption of products and services as such. This means that government policies are needed to promote a shift in the *structure* of consumption and production so as to reduce environmental impacts. What about the scale impacts of consumption? Macroeconomic analysis of the relationship between income and sustainable consumption via genuine savings shows that it is possible to significantly influence consumption expenditure, not only through income but also through wealth effects. However, while it could be expected that diminishing overall consumption levels in OECD countries could reduce the overuse of public goods and the generation of negative externalities, such a policy would penalise all inputs and outputs regardless of whether they generate a negative externality or not. Moreover, other factors held constant, curtailing consumption curtails growth; while this is often used for short-term macroeconomic objectives it is difficult to justify for long-run sustainable

Box 1. Parameters for sustainable consumption policies

Focus on the ***structure*** of consumption patterns

Use a ***life-cycle strategy*** that reduces environmental impacts along consumer product chains

Address consumption through ***integrated, cross-sector policies*** that gives consistent messages to consumers

consumption, at least given current levels of knowledge. This does not mean that absolute reductions in some scale impacts of aggregate consumption are not necessary (*e.g.* CO_2 emissions), only that macroeconomic policy (*e.g.* income tax, interest rates) would not be the most effective nor most feasible policy for achieving those reductions.

Second, unsustainable consumption patterns result from market and institutional failures along product chains. As a result, sustainable consumption policy should be seen as part of a wider, *life-cycle* strategy that addresses environmental impacts at different points of the product chain of goods and services. Decisions by stakeholders along the product chain serve as potential policy intervention points for governments. Individual consumers can reduce their environmental impacts by using fewer resources (*e.g.* water saving), more eco-efficient resources (*e.g.* solar electricity), fewer products (*e.g.* one television set instead of three) or more eco-efficient products and services (*e.g.* public transport), and by producing less waste for final disposal (*e.g.* avoiding packaging, recycling). However the ability and willingness of households to choose such options also depends on a wider set of conditions over which they have little control at least in the medium-term: the supply of goods and services, materials and infrastructure (and their embodied environmental intensity), the availability of environmental information, environmental protection legislation and objectives, etc. The product life-cycle approach widens the set of options for reducing environmental impacts of consumption patterns by targeting efforts by different actors at different points in the product chain. This includes not only the private sector but also local or national governments as well – in so far that these supply infrastructure, public transport and other public goods – and non-governmental organisations, for instance offering access to national parks.

Third, the over-arching role for governments is to design and implement policies in such a way that both consumers and producers act in environmentally sustainable ways. This will require, in many cases, applying an *integrated* strategy and a combination of instruments that provide *consistent signals* to consumers and environmentally friendly consumption options. Providing consistent signals requires policy integration in two main aspects: *i*) integrating economic, environmental, and social (distributional) considerations of consumption patterns and environmental impacts and *ii*) making consistent cross-sectoral policies. This means that potential environmental implications should be given greater consideration in other sector policies that affect household consumption. Government *land-use planning, construction, energy, water, agricultural and transport policies* are particularly important, since these have a long-term impact on the existing infrastructure and product mix and hence determine to a large extent what choices can be made at the household level. Land use and transport policies in many countries, for example, have tended to encourage "satellite" communities and dependence on private cars.

4.2.2. *The effectiveness of economic and regulatory instruments*

Within these broad parameters for steering household consumption patterns in more sustainable directions, governments can use a broad range of policy instruments to influence household decision-making (Box 2). General lessons about the effectiveness of different types of instruments (economic, regulatory, social) can be drawn from measures OECD countries have in place, or are developing, to reduce the environmental impacts from household consumption. This section briefly examines the effectiveness of economic and regulatory instruments followed by a special focus in Section 4.2.3 on social instruments.

Economic instruments

Economic instruments – including full-cost pricing, environmental taxes and charges, green tax reform, and the removal of environmentally harmful subsidies – have an important role to play in influencing consumer behaviour. Where the prices of energy, road fuels, water, products, services and waste do not fully reflect the associated environmental costs, consumers are encouraged to consume more than they would if they faced the full costs of their consumption patterns. Environmentally related

Box 2. Policy tools for household sustainable consumption: some examples

Economic instruments: *e.g.* waste fees, taxes on energy and water use, deposit-refund schemes for beverage bottles and batteries, removal of water subsidies, subsidies for green energy, tradable permits for municipal waste, green tax reform…

Regulatory instruments: *e.g.* regulation on environmental labels and "green" claims, waste management directives, energy-efficiency standards, extended producer responsibility regulation, statutory pollution emissions targets, water quality standards, product bans…

Social instruments: *e.g.* public information and environmental awareness campaigns (on waste, energy, water, transport), education, public debate and participatory decision-making processes, support to voluntary citizen initiatives, partnerships with other actors (private sector, NGOS, etc.)…

Other tools: *e.g.* state of environment assessment and goal setting, development of sustainable consumption indicators, incentives for environmentally superior technological innovation and diffusion, infrastructure provision, zoning and land-use planning…

taxes can, depending on the various price elasticities, introduce price signals that help ensure that producers and consumers take account of the costs of environmental pollution.

Economic instruments are often assumed to be more cost-efficient (since implementation and enforcement are less demanding) and less intrusive in individual decision-making than regulatory instruments. General conclusions on relative effectiveness are difficult to draw, however, due to the range of economic instruments, and the variety of influences that shape consumer demand. OECD analysis of household water consumption, for instance, shows that while rapidly growing domestic water consumption in Mexico is closely tied to subsidised public water supplies, the successful decoupling of water consumption and economic growth at the household level in Germany and the Netherlands is more a result of information and appropriate technology than of user fees, because the cost of water in these countries represents a very small share of disposable income (see Section 4.3.3).

The market structure for some consumer goods also makes it difficult to pass price increases on to the consumer in a way that internalises environmental costs. Tourism agencies, for example, often offer tourism travel packages that include a range of services, including lodging and transportation. The cost to the consumer of a carbon tax on aviation fuel could be compensated for by a reduction of costs in other parts of the package – eliminating the incentive for travellers to choose a destination closer to home, or another mode of travel, to reduce carbon emissions (Section 4.3.2). Economic instruments can also be subject to other constraints – such as political acceptability, efficient raising of revenue and social equity concerns. Countries have begun to gain experience with ways to achieve both environmental and social equity objectives through differentiated tax structures or complementary assistance to low income households, for example in the area of water tariffs.

The limitations on the use of economic instruments do not diminish the importance of properly reflecting the environmental costs of production and consumption in the price of consumer goods and services. Instead, they highlight the importance of combining economic instruments with regulations or information to stimulate consumer behaviour (*e.g.* combining water supply prices with individual metering). It is generally true that economic instruments are a necessary if not always sufficient step in influencing household choices.

Regulation

Governments can act directly to influence or constrain household decision-making through regulatory limitations or constraints on product ownership or use. Examples include the enforcement of speed limits to slow and harmonise traffic flows, limitations on hosepipe use to reduce household water

consumption, bans on personal car use on peak pollution days, mandatory emissions inspections for cars, or waste recycling directives. The use of direct regulation, however, is relatively rare because it is more costly and difficult to implement and enforce and is relatively intrusive.

Governments have generally preferred to influence household consumption patterns through imposing or increasing standards or requirements further upstream in the product chain. Minimum product standards (*e.g.* minimum levels of energy or water efficiency), building regulations (*e.g.* insulation), and labelling requirements have influenced household consumption by improving goods and services in the market and increasing information to support consumer choice. Higher energy prices and government *efficiency standards* for household appliances, for instance, have driven gains in appliance efficiency over the last several decades. A 1996 US Department of Energy study estimated that the various US appliance standards in place would reduce emissions by more than 50 millions tons of CO_2 and 750 thousand tons of nitrogen oxide through 2000 (OECD, 2001*b*). Efficiency standards could be applied to a wider range of consumer goods.

The application of other regulatory instruments, such as quantitative restrictions or bans, is more limited, although well grounded policies are likely to be accepted where they maintain or increase the quality of the product or service concerned, or respond to consumer health and safety concerns. US consumers and food retailers, for instance, recently welcomed the imposition of a national standard for organic food labelling that will help them cut through a confusing plethora of individual labels. Similarly, few consumers would object to the absence of leaded petrol on the market, or complain that only efficient and emission-free refrigerators are available (provided that price and performance remain acceptable). Careful analysis of social relationships and trends shows that in certain cases environmental solutions can be found without government intervention, however, there are other areas where all parties involved feel a need for government to set clear ground-rules. The Dutch Ministry of Housing, Spatial Planning and the Environment, for example, has formulated five precepts for bringing the citizen and the environment together, including "intervening where the citizen expects government to do so" (OECD, 2001*g*).

4.2.3. *Social instruments: special focus on information and participatory decision-making*

Social instruments can broadly be characterised as influencing consumer knowledge and willingness to act in favour of the environment. OECD countries use different measures to make consumers aware of how they could adopt more sustainable lifestyles: information dissemination on specific household topics (energy or water conservation), eco-labelling schemes, public awareness campaigns, open forum debate and discussion, voluntary co-ordinated consumer initiatives, etc. The 1999-2001 Programme focussed on the use of information and participatory decision-making mechanisms to promote sustainable consumption. These are two policy tools that are frequently seen as central to more fully engaging consumers in environmental protection objectives, including in the area of consumption. This section provides a summary of key findings of that analysis.

The role of information in promoting sustainable consumption

Information can be a powerful tool for promoting more sustainable household consumption patterns. Nearly every government, private sector, or NGO initiative for the environment calls for a better informed and more active public. However, there are a number of barriers to effectively providing information to consumers and linking information to action. These barriers are related to the growing volume and complexity of environmental information available to consumers, consumer scepticism *vis-à-vis* the credibility of most information sources, and "free-rider" decision-making dilemmas – all in the context of a broader information and media environment that generally encourages indiscriminate consumption.

There are numerous initiatives in OECD countries to bring environmental information to the consumer. Some of these are traditional "information campaigns" limited to information pamphlets and posters or television and radio spots. But there are newer initiatives too that attempt to put information in an interactive context, and to combine information with other enabling conditions to encourage

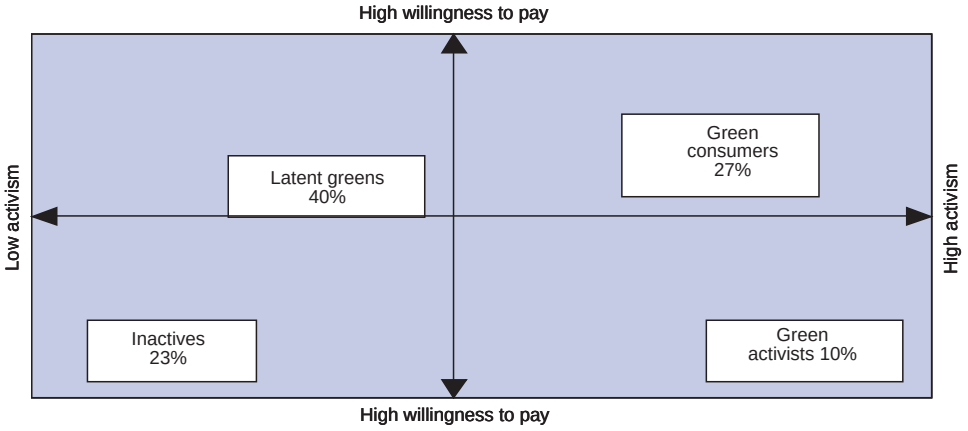
consumer action. This section identifies key issues and strategies for policy makers in using information to guide consumer choices. This summary is drawn from the presentations and discussion at the OECD Workshop on Information and Consumer Decision-making (16-17 January 2001, Paris).[2]

The demand for environmental information

Are consumers interested in the environment and environmental information? There is conflicting evidence. Although results at the retail level suggest that environmental criteria are not often reflected in actual consumer purchases, several marketing studies suggest that the number of "green consumers" is increasing (Environics, 2000; OECD, 1997*b*; OECD 1999*b*). For instance, one study conducted as part of an annual survey of trends in consumer attitudes about the environment, reported that OECD consumers care deeply about environmental problems, motivated in part by a concern for the impact that environmental quality has on children's health (range: 75% to 98% of the people interviewed). They feel empowered to address environmental problems and see themselves as a key part of the solution. Although the data is nuanced, more people in OECD countries believe individuals can do something to improve environmental quality than did one year ago. And while they put national governments at the top of the list of responsibility for environmental protection they rank individual citizens/consumers a close second (Miller, 2000).

Many consumers in OECD countries show a relatively high level of environmental activism but medium to low willingness-to-pay (Miller, 2000) (Figure 1). This is likely linked to consumer fatigue with so-called "green" products: environmental issues are not new to the public agenda, but market opportunism, "green washing" and some earlier inferior products have eroded consumer confidence and their willingness to pay premiums for environmental quality. Consumers also report both a declining faith in nearly all sources of environmental information (Commission Européenne, 1999; Environics, 2000) and confusion or misinformation about those actions that count the most or about which environmental problem should be given priority. As a result, although consumers today live in an

Figure 1. **2000 International Environmental Monitor Survey**



Environics classifies consumers into four basic groups measured by their self-reported environmental activism and willingness-to-pay (in this case 5% more for a car polluting 20% less) Self-reported "green citizen action" included avoiding a product or brand for environmental reasons (35%), gathering environmental information (23%), voting based on environmental policies (14%), supporting environmental NGOs (13%), writing a letter or making a phone call to express environmental concern (11%), and urging policy changes (8%). Based on both self-reported activism and willingness-to-pay roughly 27% of the global sample can be labeled "green consumers" expressing high willingness-to-pay and high environmental activism. Another 10% are considered "green activists" with high environmental activism but lower willingness-to-pay. These are the two groups of consumers who will be the easiest to engage in environmentally conscious decision-making. Another 40% of the market qualify as "latent greens" who could be engaged, but who will need a stronger enabling environment before they will act. For the final 23% of consumers – the "inactives" – the environment ranks low or not at all.

Source: Doug Miller, Environics, Presentation to the OECD Workshop on Information and Consumer Decision-making, 16-17 January 2001, Paris.

abundant and rich "information society", many find very little information of help in making environmentally aware decisions. This "information dilemma" poses certain challenges to governments and other actors seeking to use information to help consumers reduce their day-to-day environmental impacts.

Practical solutions to the "information dilemma"

There is a growing experience in OECD countries in overcoming the barriers to designing and delivering information and in creating a stronger link between information and action. A number of good practice examples can be identified for using information to promote sustainable consumption.

Responding to rising consumer scepticism and perceived information overload. The availability of accurate information is an important part of enabling consumers to make more environmentally aware decisions. At a minimum, governments need to ensure that environmental information in the marketplace is truthful and credible. Many OECD governments already have legislation on misleading advertising that has been, or could be, extended to cover "environmental claims". Enforcing such legislation will continue to be the most important and effective means to protect consumer rights to accurate information. The fast evolving nature of environmental labelling and advertising sometimes poses a practical problem for legislators, particularly for on-pack information (Leubuscher *et al.*, 1998). However, governments and business organisations can still make positive contributions in this area by providing practical guidance and monitoring the implementation of ISO standards for environmental claims, particularly the ISO 14021 standard governing "Type II" self-declared claims.

As a broader communication strategy, governments need to cut through the volume of information available in today's "information society" and better target environmental messages to consumers. Many of the more successful government and NGO consumer awareness programmes "meet consumers where they are". They appeal to general household concerns about the environment, local environmental pressures, or public health issues. They use polls, focus groups, and interactive tools to identify key consumer concerns. Talking to people about what concerns them or what they already know takes advantage of "top-of-mind" thinking where consumers are likely to be more receptive to new information and/or more willing to act. Similarly, many programmes support and reinforce positive actions already taken by consumers, even if some of these actions may not be priority concerns from an environmental perspective. Focusing first on "win-win" situations ("Save energy, Save money, Save the environment") or environmental problems carrying a sense of urgency can also elicit more interest and action than environmental issues with less immediate relevance to consumer concerns.

The call to "meet people where they are" has tremendous practical appeal, but there are some limitations to this approach. First, not all significant environmental impacts can be framed in a way that they tangibly link to personal behaviour or immediate local or personal concerns (*e.g.* emissions from long-haul air travel; climate change; watershed pollution). While information gaps contribute to these problems, so do personal perceptions of acceptable levels of individual and social risk: consumer concerns are not necessarily consistent with science. Similarly, not all pro-environmental actions are clear "win-win" situations. As a result, another key response is to move consumers forward on the environmental agenda. Practically this can mean starting with the "old agenda" (judging green products, energy, waste priorities) while educating on issues where consumers are confused or poorly informed (*e.g.* climate change, ozone, air quality). Many of these issues must also be addressed through longer-term consumer and environmental education. Earlier work in the OECD explored the role of education and learning in promoting sustainable consumption. That analysis identified the importance of nurturing active learning and responsible citizenship at all levels of formal schooling and in professional training and community education. Sharpening decision-making skills and fostering active citizenship are all part of achieving higher levels of pro-environmental awareness and action.[3]

Putting individual action into a wider context. Consumer decision-making is often not a purely individual process: it is embedded in a wider social context in which personal costs and benefits influence, and are influenced by, wider social considerations. The public nature of many environmental amenities or services, for example, leads to the possibility for strategic decision-making about whether

to co-operate or "free-ride". As a result, encouraging consumers to act in a particular way is likely to require information not only on what is expected of them, but what they can expect others to do. The attention that consumers pay to various environmental issues is also highly dependent on the frequency and the way these issues are represented in the mass media and other modes of public discourse. Rather than appealing strictly to arguments of individual costs and benefits, this means giving greater prominence to information on the costs and benefits to society and the role of the individual and the collective in achieving sustainable consumption patterns (Table 1).

Several governmental and NGO information and awareness raising initiatives on sustainable consumption use a variety of tools to support and reinforce individual action. The UK *Going for Green* campaign, the Norwegian *Environmental Home Guard*, the Center for a New American Dream's *Turn the Tide* initiative and the Global Action Plan, for example, put consumers in contact with one another to share experiences and compare their progress on reducing their environmental impacts. Besides helping to keep information flows at a level and in a language most appropriate for average households, it lets consumers know that they are not working alone. The Internet offers governments and NGOs a cost-effective way of creating a "virtual community" for supporting individual action. On the *Turn the Tide* website, for example, participants can set up their own personal workspace, and watch as an online calculator tallies both the environmental impact of each person's reported actions and the running total of the combined impact of all *Turn the Tide* participants (Taylor, 2000).

Communicating effectively. The kinds of information most likely to be effective in reaching the consumer and stimulating pro-environmental behaviour will depend on the particular group of consumers concerned, the nature of the environmental problem addressed, and the kind of action consumers are expected to take. But in general, cutting through the information barrier requires careful targeting of both the content and format of the information provided (Box 3). Moreover, new products or ideas may require targeting different types of communication (factual detail, promotional, etc.) to different groups of consumers at various points along the "diffusion curve".

Beyond the need to assure credible and non-misleading information, however, practical experience appears to suggest some common criteria when designing information campaigns. These include beginning by establishing the need for, and purpose of, consumer action: what local, national, or international goals are consumers expected to deliver? How will successful action be measured? Who is the target audience? Information campaigns should also serve in a broader sense to generate awareness, stimulate debate and build public support for environmental protection. Several NGOs and international organisations such as UNEP[4] are working with the advertising industry to find more effective means to communicate a positive message about sustainable consumption that motivates consumer action.

Table 1. **Information for promoting environmentally friendly behaviour and co-operation**

Appealing to "economic man" (self-interest) and "moral man" (personal morals)	Appealing to "social man"
• Information about the consequences of individual choices • Information on private side benefits (economic or social) from co-operative behaviour • Increase individual reflection on own choices and their consistency with preferences • Help to construct "green identity" • Appeal to aesthetic preferences • Increase motivation, ability and opportunity to make green choices	• Information about why commitment to social norms is needed • Information on the collective benefits from co-operative behaviour • Information about how others behave • Reduce feelings of insignificance • Create communities or imaginary communities with social norms • Use fair share, reciprocity arguments • Appeal to feelings and sympathy for others • Increase public reflective discourse on preferences and goals

Source: Liisa Uusitalo, presentation to the OECD Workshop on Information and Consumer Decision-making, 16-17 January 2001, Paris

Box 3. **An information checklist:**

"Information is a communication tool, not an end in itself. It should be:

- Targeted
- Actionable
- Relevant
- Clear and easy to understand
- Consistent
- Properly resourced
- Linked to an enabling context."

Source: Anna Fielder, Consumers International, Presentation to the OECD Workshop on Information and Consumer Decision-making.

Many of the current initiatives in the area of sustainable consumption assume that consumers understand that their consumption patterns have a link to the environment, but that most do not know what to do when making purchasing decisions or how to prioritise different actions. These initiatives shared a common "step-by-step" approach of providing the consumer with practical background information, motivation, and specific action recommendations.

The wealth of slogans and messages captured in many current information and awareness campaigns makes it clear that no one message, nor one type of information is the best or only way to communicate with consumers on sustainable consumption (Box 4). Messages differ in tone, directness, and appeal to individual or social roles in achieving sustainable consumption. There is a clear trend, nevertheless, to use simple language that is meaningful to an average consumer. Few initiatives use the

Box 4. **Sustainable consumption: Multiple messages**

More fun, less stuff
Center for a New American Dream

Are you doing your bit ?
UK DETR

No Coal, No Nukes, No Kidding. It's a small planet. Choose wisely.
Green Mountain…

Is the Future Yours?
UNEP SC Youth Campaign

From words to action
Norwegian Environmental Home Guard

Environmentally friendly* DIY*-ing is doing a good
(*Wie miliubewust klust is zeker goed bezig*)
Dutch Min. of Housing, Spatial Planning and the Environment

Going for Green*: *Making a world of difference – together
UK's biggest public environmental awareness campaign

Source: OECD Workshop on Information and Consumer Decision-Making, 16-17 January 2001, Paris.

terms "sustainable consumption" or "sustainable development". Many do not even refer to the environment, but use terms such as "quality of life" and "public health and safety" – both more relevant to immediate consumer concerns.

Combining information with other instruments. Information can be a powerful tool to promote sustainable consumption, but information alone is insufficient if other important conditions for environmentally aware decision-making are absent: a price structure for consumer goods and services that internalises environmental costs and benefits; a policy and regulatory framework that identifies priorities and direction for change; the availability of a range of environmentally friendly goods and services; technology and infrastructure that include environmental quality criteria; and an educational and learning environment that empowers consumers to use information to its best advantage.

Some public information campaigns are trying to link information with as many of these enabling conditions as possible. In the Netherlands, for example, a Ministry of Environment campaign on environmentally sustainable do-it-yourself (DIY) jobs combines information communicated through the media and at the retail level, with efforts to increase the supply and visibility of environmentally friendly products on store shelves, and in some cases, retail price reductions or government financial incentives to stimulate environmentally sound purchases. An important aspect of this initiative, which is also reflected in public information campaigns in other OECD countries, is the reliance on a network of partners (NGOs, product manufacturers and retailers, municipalities) to provide regular and consistent information to consumers.

The outstanding challenge for most information and awareness raising initiatives is how to reach the approximately 25% of the market made up of "in-active" consumers. Along with the "Latent Greens" – consumers who are potentially interested in acting for the environment but need additional encouragement and motivation – these groups represent nearly 60% of all consumers. While from a product marketing standpoint it may be sufficient to capture the 10 to 15% of consumers interested in pro-environmental behaviour, for many environmental problems (*e.g.* transport, waste and energy) a larger critical mass is needed. Some campaigns have taken up this challenge. In the UK, the Department of Environment, Transport and the Regions (DETR) decided to focus its "A*re you doing your bit*?" campaign on the 87% of the population classed as "concerned" and particularly the 51% who were "persuadable" – doing a bit, but capable of doing much more. A strong message to come from these initiatives is that providing information to "inactive" or "latent" consumers will achieve little without a stronger enabling environment that makes environmental protection an explicit component of decision-making.

Summary: *information and consumer decision-making*

Given both the challenges and opportunities consumers face in finding and using information to reduce their environmental impacts, it is important to improve the effectiveness of measures and policies to stimulate action from individuals and communities. This raises a number of challenges for all actors that dialogue with consumers. The discussion above suggests a number of strategies for successfully responding to rising consumer scepticism and perceived "information overload" and for choosing and designing information instruments and their delivery.

There is little information available on the cost-effectiveness of information based instruments in helping households to reduce their environmental impacts. However, new tools such as the Internet have certainly lowered the costs of information delivery, although perhaps not to the same extent the cost of information search and assimilation by consumers. Ensuring accurate and reliable information in the market and prioritising public environmental information strategies will be important in reducing the outlay of time and resources by households. Consumer demand for information on sustainable consumption practices will also increase if there is a market and policy environment which internalises environmental costs and benefits (see Chapter 5). In the absence of these stronger signals to consumers, discrete information campaigns will have little effect.

Participatory decision-making for sustainable consumption

A recurrent theme in the discussion of environmental problems today is the need to more fully engage the public. At a minimum *engagement* means greater consumer awareness of the environmental impacts of their purchases and behaviour. Increasingly, however, engagement is also taken to mean an active participation of the consumer/citizen in public decision-making processes as one of several "stakeholders" or "partners". Here the means for promoting engagement are much more numerous, ranging from consultation in traditional public hearings and focus groups to more intensive public participation in the definition of problems and the development of alternative policy responses.

The call for participatory decision-making is common in work on sustainable consumption. Implicit in many of these calls is the assumption that increasing the awareness and engagement of the public in decision-making processes for environmental protection will ultimately strengthen that protection (by improving the quality of information fed into the decision-making process or by helping private and social welfare objectives converge). A second assumption is that public participation may also result in behaviour change by consumers. To further explore these issues, the OECD Environment Directorate commissioned a paper on trends and issues for participatory decision-making in the area of sustainable consumption policy.[5] This section describes some key findings from that paper as well as work in the OECD Public Management Service (PUMA) on engaging citizens in policy making.[6] The discussion covers both theory and practice in the use of participatory decision-making to promote sustainable household consumption patterns.

Trends in the use of participatory decision-making

Policy making in all OECD countries rests on the foundation of representative democracy. Within this framework, many OECD countries have long standing traditions of extensive citizen involvement and are looking for new, and complementary, ways to include citizens in policy making (OECD, 2001*i*; see also Bacow and Wheeler, 1984; Susskind and Cruikshank, 1987 in OECD, 2001*f*). Government-citizen relations cover a broad spectrum of interactions including one-way information flows, two-way consultation processes, and active participation based on partnerships (Box 5).

Box 5. **Defining government-citizen relations in policy making**

Government-citizen relations cover a broad spectrum of interactions at each stage of the policy making cycle: from policy design, through implementation to evaluation. OECD working definitions include:

- **Information:** a **one-way relation** in which government produces and delivers information for use by citizens. It covers both "passive" access to information upon demand by citizens and "active" measures by government to disseminate information to citizens.

  Government → Citizens

- **Consultation:** a **two-way relation** in which citizens provide feedback to government. It is based on the prior definition by government of the issue on which citizens' views are being sought and requires the provision of information.

  Government ⇄ Citizens

- **Active participation:** a **relation based on partnership** with government in which citizens actively engage in the policy making process. It acknowledges a role for citizens in proposing policy options and shaping the policy dialogue – although the responsibility for the final decision or policy formulation rests with government.

  Government ↔ Citizens

Source: OECD (2001*i*), Engaging Citizens in Policy-making: Information, Consultation and Public Participation.

A recent survey by the OECD Public Management Service (PUMA) shows that the scope, quantity and quality of government *information* provided to the public has increased greatly over the past decade. This finding was confirmed in a recent OECD Environment Directorate review of progress in providing public access to environmental information and in environmental reporting by government in OECD countries.[7] *Consultation* and opportunities to provide feedback on policy proposals are also expanding, albeit more slowly. Large differences in the use of consultation exist between OECD countries. *Active participation* and efforts to engage citizens in policy-making on a partnership basis are still rare and confined to a very few OECD countries. They are often undertaken on a pilot basis (OECD, 2001*j*).

The different approaches to public participation are linked to various country-specific factors, including political and cultural perspectives on the goals of public dialogue, the perceived added value of participatory decision-making mechanisms as opposed to "traditional" decision-making processes, and the public's interest in participation. They also appear to depend on the degree to which the public holds veto power over the results of the ordinary decision processes, either by legal or extra-legal means (OECD, 2001*f*).

At the international level, there have also some movement to strengthen citizen participation. These include: Principle 10 of the Rio Declaration (United Nations, 1991), the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (United Nations Economic Commission for Europe, 1998); the OECD Council Recommendations on Pollutant Release and Transfer Registers (OECD, 1996) and on Environmental Information (OECD, 1998); and the European Union Directive on Freedom of Access to Information on the Environment (EU, 1990).

Participatory decision-making and sustainable consumption policy: theory and practice

The nature of environmental problems has changed considerably since the 1970s; many evolve from discrete patterns of resource use and pollution but play out at higher geographical scales and seem to transcend the level of local property rights. As a result, greater citizen participation is seen not only as a counter-force against polluters, but also as a potentially constructive instrument. Citizens involved in participatory processes must not only recognise their responsibility for some environmental problems but also help design effective solutions.

Consultation and active participation are only slowly developing in OECD countries; there are currently few examples related to sustainable consumption policies. However, the body of empirical experience is growing and helps illustrate the potential for participatory decision-making to contribute to sustainable consumption patterns. The following section discusses four practical examples (Box 6) and links them to different policy considerations, including the impacts of participation on policy development and consumer decision-making, the importance of institutional and process characteristics for determining the outcome of participatory processes, and some special considerations related to more active participatory decision-making, including potential tensions with traditional representative democracy, the resources and timing required for participation to be successful, engaging a critical mass, and gauging the "effectiveness" of participation.[8]

The potential impact of participation on decision-making. Participatory decision-making processes can be classified in many different ways, for instance according to: the institutionalisation of participatory decision-making in legislation; the timing of participatory processes or tools in the policy process; the methods, approaches or techniques used; or the function or purpose of the participation (OECD, 2001*f*). The list of types of decision-making processes could be expanded considerably, but what unites the techniques is the belief that ordinary people should be involved in a decision process, that common problem solving in a public spirit takes place, and that the outcomes are binding to some degree upon others (see Innes, 1995; Dietz, 1995 in OECD, 2001*f*).

The growing interest in more consultation and active participation, including for the development of environmental policy, is generally backed by three arguments:

1. Participation will increase the legitimacy of decisions taken and reduce the level of conflict by allowing the interests of the different stakeholders to be articulated.

Box 6. Participatory decision-making and sustainable consumption: case studies

The OECD study on *Participatory Decision-Making Mechanism for Sustainable Consumption* (OECD, 2001*f*) examined four examples of participatory decision-making linked to policies influencing household consumption patterns. The case studies varied across countries and continents, fell within different policy fields and on different government levels, and concerned both strategic and concrete issues with the use of different participation techniques. The policies studied sought either to directly influence consumers or to influence the context for consumer decisions. The consumers play different roles in these cases, for instance as a target group to be mobilised, a societal stakeholder or co-producers of policy.

The four case studies were:

- Citizen participation in an open planning process to develop more sustainable transportation modes (Groningen, the Netherlands);
- Generating local community initiatives in sustainable consumption through Local Agenda 21 processes (Albertslund, Denmark);
- A consumer Internet comment forum on proposed national standards to govern the marketing of organic agricultural products [United States Department of Agriculture (USDA), National Organic Program]; and
- Consumer participation in the development of water supply and consumption strategies (ACT Water strategy, Australia).

2. Participation contributes to the quality of decision-making by giving government the information necessary for decision-making and contributing to the systematic identification of problems and their causes and the consideration and assessment of alternative strategic options.

3. Through participation, people will develop active citizenship skills and a greater understanding of environmental problems (*e.g.* due to unsustainable consumption). In this sense, the "output" of the decision-making process reaches far beyond the actual decision, and participation is relevant both before and after the formal decision is taken (*e.g.* in developing a vision, setting objectives, planning, implementing, monitoring and evaluating the impact).

All four case examples illustrate in different ways the possibilities for linking participatory decision-making with greater consumer environmental awareness and behaviour change. In the Groningen urban transport example, the Dutch mid-size City of Groningen led a three-phase open planning process to address public discontent with existing traffic planning through broad participation in updating traffic policy. To gain insight into traffic and transport policy problems, a telephone survey among 600 respondents and a questionnaire through a local newspaper (5 000 respondents) were undertaken. Two roundtable discussions were held in order to present the results of the surveys and initial conclusions on the main problems. All inhabitants of Groningen were invited to the roundtables. 18 working groups, with a total number of 300 participants, worked out the analyses of the problems and possible solutions. A smaller number of participants were involved during the second and third phases in which policy directions were identified and final decisions made. During the entire process general information was offered to the inhabitants of Groningen through a series of door-to-door information bulletins and through articles in the local newspaper.

The process had several impacts on citizen understanding and attitudes about traffic policy. The many opportunities given citizens to express their discontent of traffic policy and to participate in determining alternative approaches to transport systems helped reduce frustration and increased support for new policy. An indicator of this support is that the official public enquiry procedure was

relatively short and no main adjustments were made. In addition, separate research after the process found that many participants were generally satisfied with the final result (Paf, 1997 in OECD, 2001*f*). The research also showed that people had gained more insight into the environmental dimension of traffic problems and greater appreciation for the difficulty of finding adequate solutions.

Similar results were found in the consultation process led in 1993 by the ACTEW Corporation, responsible for the Australian Capital Territory's energy, water and sewage needs. Faced with an imminent supply shortage and a continuing rise in water demand, ACTEW worked in partnership with the communities it supplied to develop a detailed F*uture* W*ater* S*upply* S*trategy*. Although there was a formal consultation process based around an issue paper and regional community and specialist workshops, ACTEW also engaged a research firm, Quadrant, to analyse community attitudes. Quadrant organised a series of well-advertised open forum workshops, but also used other strategies to actively approach the community, including by meeting members of a large range of community service clubs and organisations at their venues and meetings; by meeting consumers in convenient community venues and through static displays in shopping centres; and by distributing discussion documents and broad media articles. Consumer reactions were facilitated by including comment sheets and pre-paid, pre-addressed envelopes in all documents.

Market research showed an increase in consumer understanding of the problems related to water supply – including household consumption patterns – and their solutions. More importantly, the consultation process resulted in an important shift in policy and consumer behaviour. Earlier projections had indicated that a new dam would be required around the year 2005. The consultation process, however, revealed a clear desire in the community to defer the need for a new dam by strengthening demand management initiatives where this was the least cost, more sustainable option for providing water in the future. A staggering 97% of the community felt that ACTEW's education and awareness campaign needed reorientation on "how to save" aspects, and 92% wanted a reform of the ACT's water pricing structure in order to include a conservation signal. A further 88% felt that the pricing system should be based on use levels and should meet all financial and environmental costs associated with harvesting and delivering water. The community agreed to a set of water conservation targets: 15% of annual per capita demand by 2000; 25% of annual per capita demand by 2010, and 35% of annual per capita demand by 2020.

Institutional and process characteristics. The scope of the participatory decision-making process, as set by rules about who has what authority for different elements of the process, is very important for the final outcome. For instance in the case of Groningen the outcome depended crucially on whether participants were to decide about transport policy as a whole or just the choice between more or less sustainable modes of transport.

Similarly, the type of information and feedback offered to and by the participants also influences the outcome. This means that before shaping a participatory process it is important to be clear about what kind of information or exchange is needed (*e.g.* lay knowledge, local information, or opinions and support) and what emphasis will be given to the input of different participants. For example, while information flow in the ACT case centred essentially around facts about water consumption levels and supply trends and options, the United States Department of Agriculture's (USDA) rule-making process on Organic Standards was more of an exchange on perceptions and acceptable norms. The USDA proposed national standards to govern the marketing of organic food on the Internet in December 1997 and opened a public comment forum to gather feedback. This followed a four-year period during which a 15-member board (NOSB) – made up of organic farmers, handlers, retailers, certifiers, environmental experts, public and citizen's group representatives, and one expert grounded in toxicology, ecology or biochemistry – had consulted with the public and stakeholders in the organic food industry and prepared an elaborate set of recommendations for a national organic standard. The goal was to create a uniform set of guidelines so that US consumers purchasing food labelled "organic" would know precisely which farm practices went into the creation of the product. The NOSB report included guidelines for, among many others, a national list of accepted and prohibited materials, pest control and fertilisation practices, and feed and confinement of livestock.

When the initial proposed rule came out it appeared to disregard the NOSB's rejection of specific practices, including irradiation, the use of sewage sludge as fertiliser, and the use of genetically engineered crops. Over the next several months, the department received 275 000 comments from the public by e-mail, fax and postal mail. A pilot sample of comments showed an almost unanimous rejection of the inclusion of the three controversial methods in the rule based on feared known and unknown health risks and environmental impacts associated with the processes. The public also saw a mismatch between these methods and the concept of organic food and feared the intrusion of big business into the organic sector. As a result, these three methods were prohibited in the revised rule despite the USDA's view that there was no current scientific evidence that use of the excluded methods presented unacceptable risks to the environment or human health, and might even offer certain benefits. The USDA explained the revision as the appropriate response to strong consumer expectations within a general context of high standards for food safety. The rules were "about giving consumers choices as to how their food is produced. [These should be] informed choices, but they are the consumers' to make."[9]

Potential tensions with representative democracy. Citizen participation often carries connotations of *direct democracy*. Whether or not this is compatible with representative democracy is a topic of intense debate. One strand of literature contends that participatory decision-making should be seen as a complement and not a substitute for conventional ways of decision-making (*e.g.* Goldberg, 1985; Alexander, 1996; Woltjer, 2000 in OECD, 2001*f*). Other analysts (*e.g.* Huitema, 1998; Dryzek, 1997; Williams and Matheny, 1995 in OECD, 2001*f*) point to potential conflicts with representative democracy, for example due to the fact that participants are not elected and cannot be replaced. Studies from the 1970s revealed that only well informed people with high levels of education and income seize the opportunity to participate; men also participate more often than women as do people who are already active in society.[10] The most distinct problem with selective participation is that participatory decision-making may serve only the common interest of a narrow group of participants, and not the public interest. The ACT case shows that it is possible to work on representativeness through the way one approaches the public, but the overrepresentation of certain interest groups can be an important problem in some participatory processes.

Another consideration is that "ordinary" decision mechanisms in OECD countries do not only include representative bodies, but also the bureaucracy and expert bodies. In many cases, environmental issues are considered technically complex or politically sensitive and politicians may feel safer in leaving significant discretion to the bureaucracy or experts. Such a move is often ideologically supported by the notion that experts are neutral and objective and can calculate the ideal decision or at least determine the options between which politicians should choose. Despite a vast and growing literature that points out that experts have their own biases, often have disagreements, and can be politically motivated (see a.o. Williams and Matheny, 1995; Jasanoff, 1986 in OECD, 2001*f*), where the belief in objective and scientific rationality is strong it can be used as an argument for restricting citizens participation in decision processes. The USDA comment forum is an interesting counter example, and underlines the central importance of the objectives behind public participation in determining the emphasis given to input from different stakeholders.

Resources and timing devoted to participation in the decision-making process. International experience of the practical implementation of participatory decision-making techniques [Crosby *et al.* (1986), Burns and Uberhorst (1988) and Petts (1995) in OECD, 2001*f*) suggests that the required conditions for participatory decision-making include providing for an adequate amount of time for discussion and ensuring that all participants have an equal position in terms of knowledge and capabilities. Participatory decision-making is demanding for citizens. To have an opinion, people need experience with the matter and at least some circumstantial information. The capability to articulate concerns and discuss interests related to potentially abstract topics, such as genetically modified organisms, is also often lacking. As a result, without attention to the timing and resources devoted to public involvement, mechanisms for participatory decision can be biased in favour of the dominant actors (*e.g.* experts, officials and interest groups) who have the time, energy and money necessary to participate in deliberations (Woltjer, 2000 in OECD, 2001*f*). In the Groningen case, for instance, the sharp

drop in participation in the second and third phases of the project was linked in part to the length of time over which the decision-making process stretched and an amount of information that overwhelmed some participants, particularly those with lower education levels. The ACT and USDA examples suggest some techniques that can be used to facilitate and reduce the effort required of citizens.

Engaging a critical mass. One of the areas where participatory decision-making has most clearly made ground is in Local Agenda 21 initiatives. Local Agenda 21 initiatives share an objective of combining new governance and participation structures with local sustainable policies. In practice, LA21 initiatives have a strong relationship with the sustainable community movement. Sustainable communities pursue economic development and environmental stewardship on the basis of maximum community participation, empowerment, and local activism, often challenging at the same time the inevitability of poverty and inequality. They concentrate on the relationships between civic education, civic involvement, economic growth, and environmental protection. A central characteristic of the sustainable communities movement is the pursuit of the institutionalisation of community involvement in formal programs of physical renewal of neighbourhoods, economic and social regeneration, and environmental protection and management (Stewart and Collett, 1998 in OECD, 2001*f*).

Comparative research has shown that successful pioneering sustainable communities have similar characteristics, although they may have very different roots and motives. Some of the major common characteristics (Lafferty, Coenen and Eckerberg, 1998 in OECD, 2001*f*) are an active and politically mobilised population; interested and motivated civil servants; local politicians with a particular concern for environmental issues; positive international contacts and networks; and existing environment-and-development initiatives. A certain "critical mass" in community forces appears to be necessary for socio-political mobilisation and awareness with respect to sustainable policies.

The Danish municipality Albertslund is one of the best known pioneering LA21 municipalities (Holm and Mabui, 2001, in OECD, 2001*f*). The Albertslund Municipality (approximately 30 000 inhabitants) is a new town founded in a western suburb of Copenhagen in the 1960s. Albertslund has four characteristics that make it an especially interesting example: a population strongly engaged in the environment; a strong community sense; a culture of public participation; and a long history of environmental initiatives.

Central in the Albertslund LA21 are the environmental latitude (or environmental space) concept and the Green Accounts. Since 1992 the Municipality has tried to define its environmental space, for instance for CO_2 emissions and the use of groundwater, as a basis for the LA21 objectives. The local Green Accounts quantify the municipal consumption of energy and resources. These Green Accounts have also stimulated local consumers to reduce resource over-consumption. In planning LA21 initiatives, all interested and affected groups or persons were invited to express and define their targets. They were also encouraged to take part in the process of ensuring that these targets were to be met. According to the municipality they have achieved considerable success: in 1997 groundwater consumption had been reduced by 21% and the consumption of pesticides dropped dramatically by 91%. The participation in LA21 has been very broad; nearly all inhabitants are aware of the LA21 and the underlying plans. Organised environmental grassroots organisations play an important role in the LA21.

How important was participation in achieving these reduction targets? Public participation has provided useful data and information in the formulation of the respective LA21 plans, while local grass root organisations have been active in their planning, formulation and implementation. In addition, given the lack of economic, judicial and legal support from the central government, most municipal initiatives rest on "voluntary" or soft approaches: *e.g.* customer and supplier requirements of environmentally friendly products; positive and negative incentives; public consciousness and awareness raising activities; and setting a good example by the municipality itself. Citizens must be an active part of this process. Participation has influenced the publics' general attitude to the environment and generated better dialogue between the citizens, stakeholders and local authorities.

A promising tool for expanding government-citizen interaction at both local and central government levels is the use of the Internet and interactive media. Government agencies are increasingly deploying new technologies to improve citizen/government interaction in the hope that through means like the Internet this interaction becomes more open, efficient, and responsive. Efficiency lies in standardised systems for gathering and analysing citizen input. In the USDA case, for example, the Internet comment forum allowed all comments to be scanned, entered into a database and made available on the Internet through a searchable Web interface. This electronic document management system eliminated the need to make paper copies of each comment, saving the USDA US$300,000 in copying costs and related human resources. Similarly, the USDA avoided the costs of setting up a reading room for the proposed rule by creating a virtual reading room on-line, which also significantly reduced US Freedom of Information Act requests. Another advantage of the on-line forum over traditional participation methods was the ease of submitting comments, which encouraged more people than usual to participate, making the USDA's National Organic Program the most open, publicly accessible rule-making the government ever ran.[11] A growing number of OECD governments are expanding their use of "E-government".[12]

Gauging the "effectiveness" of participation. The effectiveness of participatory decision-making of course depends on the type of effect one wants to achieve (*e.g.* citizen empowerment in its own right, the improvement of decision outcomes) or on the perspective taken towards environmental quality and its ethics (Coenen *et al.*, 1998; Howe, 1994; Wachs, 1982 in OECD, 2001*f*). Overall, it is possible to distinguish between a normative perspective (with an emphasis on democratic and empowerment values) and an instrumental, or functional, perspective (with an emphasis on pragmatic usage). Whereas much of the literature predominantly stresses the normative, democratic and participation related arguments surrounding participatory decision-making, policy practitioners tend to take an instrumental positionpragmatism" and to stress efficiency and effectiveness (OECD, 2001*f*).

For each of the four case studies it is possible to raise the question of whether participatory decision-making arrived at more sustainable options. Sustainable development is not an objective criterion and often it is difficult to determine if a certain policy option is more or less sustainable. The relative effectiveness of participatory decision-making is also tied to the geographic context and time frame in which decisions made will apply. Sustainability often refers to long-term impacts and to impacts for large, cross-boundary geographical areas. However, by definition the interests of future generations or those in other places (and thus not at the table) are at risk of not being fully integrated in participatory processes. Moreover, the effectiveness of participatory decision-making also depends on several contingent characteristics, including: the complexity of the problem and decision to be taken; whether the decision is on strategic goals or operational realities; and the level of social conflict associated with the problem or decision (see OECD, 2001*f*).

Participation can help refine the definition of what is sustainable development in any particular case. For instance in the case of the USDA Organic Standard the discussion added a demarcation of what the general public perceived as "organic" food. In the Albertslund case there is an attempt to search for objective sustainable development by using the environmental space concept and formulating (long-term) goals. In Groningen, sustainability was clearly tied to both environmental and economic considerations as citizens made clear their preference that commuters make greater use of public and non-motorised transport, while allowing economically important traffic (freight, business and shopping traffic) full access.

Neither theorists nor practitioners provide absolute clarity on what successful participation means (see OECD, 2001*f* for a full discussion). Instead, there is greater consensus on how an effective or successful participatory process works. The OECD, for instance, has identified a number of guiding principles for engaging citizens in policy development. These cover issues such as leadership and commitment at different policy levels; grounding citizen rights to information, consultation and active participation in law and policy; providing clear objectives, and limits, to information, consultation and participation; clarifying roles, responsibilities and accountability; and providing adequate time and resources for consultation and participation to be effective (see OECD, 2001*j*).[13]

Summary: *participatory decision-making and sustainable consumption*

What is the potential contribution of more active participation in decision-making for promoting more sustainable consumption patterns? Theoretical analysis and practical experience outline many promising features of participation, but also some limitations. This means that the decision to engage in more or less active participation must include a careful consideration of a number of practical considerations, such as the availability of adequate mechanisms, information, resources and time, but also the objectives behind participation and the public's interest and perception of their role in the decision-making process.

Some caution is necessary in drawing conclusions on international trends and issues for participatory decision-making based on only four case studies. For instance, the examples discussed do not adequately capture a number of important considerations and trends which need to be addressed including: the trend to more targeted, inclusive research and participation (*e.g.* youth and aboriginal communities), and the increased pressure on government to accomodate participatory decision-making while faced with limited resources, expertise, infrastructure or appropriate information systems to support it.

One general conclusion that can be drawn is that consultation and active participation should be viewed as being complementary, and not a substitute, to conventional representative decision-making mechanisms. This means that while the quality, acceptability and implementation of policy can be improved through the participation of different social actors (including government, industry, consumers, and environmental organisations), governments continue to bear the ultimate stewardship responsibility for promoting and facilitating dialogue about environmental protection objectives and strategies, including those related to household consumption patterns. Agenda 21 calls for a stronger engagement by OECD governments in this sense than is suggested by the small number of cases of participatory decision-making existing today.

It is not possible to draw general conclusions about the "right" level of participation. On the one hand, policy making for sustainable consumption requires sometimes complex decisions over the life-cycle of products, at different levels of scale (local, regional, national, international), along the whole decision-making process (policy development and implementation), for current and future generations of people, and in relation to other public policies (*e.g.* transport, land-use, economy). This can make public involvement more challenging. However, in many instances sustainable consumption is perhaps one of the most appropriate areas for public input, because it directly concerns the activities that define everyday life and thus is closest to many consumer interests and concerns. For this reason, participation should not be confined to just reaching agreement on a specific policy, but can also include the careful exploration of the ideas, values and objectives of participants. In this sense, participatory decision-making works well as an instrument to improve the insights necessary for decisions to be made, and not just as an instrument to resolve disagreement (Gregory, 2000 in OECD, 2001*f*).

As several of the case studies show, participation can also change the direction of policy in ways policy makers may have been reluctant to propose for fear of constraining consumer freedom. As a result, it is important to emphasise not only the decision-making process, but also its potential substantive outcome. Participatory decision-making can be an instrument to increase the local and regional relevance of sustainable consumption decisions, to build good understanding and knowledge about possible consumption patterns, and – by relying on representative government – to ensure an emphasis on collective interests, long term solutions, and coherent policies.

4.3. Reducing the environmental impacts from key household consumption patterns

Building on the analysis of environmental impacts and driving factors, the sector case studies analysed policy options for reducing environmental impacts from household food consumption, tourism travel and energy and water consumption and waste generation. This section presents a summary of that analysis.

4.3.1. *Promoting sustainable household food consumption*

The sector case study on household food consumption identified several links between public policy and planning and household food consumption patterns, and measures policy makers could take to help households reduce environmental pressures in the food cycle. The discussion in this section summarises those findings. The discussion shows that some policies exist to deal with general household energy consumption and waste generation patterns, including some specific measures relevant to household food activities. On the other hand, there are few examples of policies to deal specifically with food transportation or the greenhouse gas effects of food consumption patterns. The discussion also makes clear that household food consumption patterns should not be treated in isolation but rather as one important part of a set of daily household routines that influence and reinforce one another. More systematic analysis of the environmental and cost effectiveness of policy instruments to reduce the environmental impacts of food consumption is needed to refine this discussion. This section also discusses policies and information to support informed consumer choice as one way of influencing upstream impacts in the food production and processing sectors and identifies issues where additional research is needed to better understand the net environmental impact of evolving food consumption trends.

General policy objectives and framework

Food policy in OECD countries focuses on ensuring adequate access to a food supply that is nutritious, safe and of high quality. Although there are no "sustainable food consumption policies", growing concern in many OECD countries over environmental health and food security are forging stronger links between traditional nutrition guidance, consumer safety and environmental policy.

Forecasts suggest that the principle factors driving food consumption trends today will continue to play a dominant role in shaping household demand over the next twenty years. As a result, government measures targeted directly to consumers will need to work alongside these trends to increase energy efficiency along the entire food production and consumption cycle, increase source reduction and recycling of packaging and food waste, and to rationalise food transportation needs. Governments and other actors can also use information and economic instruments to raise consumer awareness and understanding of the ways in which they can make food choices with lower environmental impacts. In some cases (*e.g.* transport and energy) government policies to influence impacts from food consumption patterns will need to be placed in a wider context related to overall household behaviour.

Improving energy efficiency and conservation for food conservation and preparation

OECD countries have successfully pursued a reduction in household energy demand, particularly for space and water heating – the two most important categories of household energy use (Section 4.3.3). In contrast more progress needs to be made on household electricity consumption, which continues to grow with GDP due largely to greater household ownership of appliances, including food related appliances (refrigerators, freezers, dishwashers, microwaves and various other kitchen appliances).

Higher energy prices and government *efficiency standards* for household appliances have driven tremendous gains in appliance efficiency over the last several decades. Standards have increased product quality across the board and eliminated from the market those products with the poorest performance. Different studies in the US have estimated the economic costs and benefits of household appliance standards, including one by the American Council for an Energy-Efficient Economy which estimated that although the standards would cost consumers US$59 billion in higher appliance and equipment prices, they would save consumers and business about US$190 billion on their energy bills over the forty-year period between 1990 and 2030 (Geller, 1995 in Brower and Leon, 1999). A 1996 Department of Energy study estimated that the various US appliance standards would reduce emissions by more than 50 millions tons of CO_2 and 750 thousand tons of nitrogen oxide through 2000 (Brower and Leon, 1999).

There remains significant potential for efficiency gains for many household appliances, and some key household food-related appliances (ranges, ovens, stovetops) are not subject to minimum efficiency standards. This suggests a continuing and extended role for government minimum performance standards. In the future there could also be an expanded role for *voluntary agreements* with appliance manufacturers to improve energy efficiency. New voluntary, or negotiated, agreements are being set up in some OECD countries for other consumer appliances, such as clothes washers and consumer electronics (IEA, 2000*a*). A voluntary agreement on clothes washers as part of the European Union's SAVE agreement succeeded in phasing out the least efficient washers in 1994 (OECD, 2001).

E*nergy labels* on household appliances are a second important area of government intervention to promote household energy efficiency. Thirty-seven countries currently use energy-efficiency labels and standards. Labelling has stimulated manufacturers to improve the design and formulation of their products. The sales-weighted annual average energy-efficiency index of "cold appliances" (refrigerators and freezers) in the EU, for instance, improved by 4.5% from 1994 to 1996 during the EU's cold appliance labelling programme (IEA, 2000*a*).

More information is needed, however, on consumer awareness of energy labels and their importance in consumer decision-making, particularly in relation to other purchasing criteria (*e.g.* high up-front costs *versus* long-term, dispersed savings, etc.). Appliance retailers could play an important role in better informing consumers about the comparative performance of different appliances because consumers are typically willing to invest time in gathering information for high budget purchases. However, retailers and shop personnel often have other concerns and are reluctant to volunteer "environmental" information unless requested by the consumer (OECD 2001*e*). Thus, while governments can provide concrete technical and other support to help retailers become more effective at providing environmental information, continued incentives are needed to boost consumer demand for energy-efficient appliances. In some countries, governments have combined efficiency standards and labelling with *financial incentives* to stimulate consumers to purchase higher efficiency models.

There is also a potential for *public information campaigns* to improve household understanding and awareness of their energy consumption patterns (*e.g.* technical information to households on food storage and preparation, efficient use of electric appliances). Public information can also help correct consumer misperceptions of food conservation information (*e.g.* "sell by dates") or food preparation techniques that currently lead to large variations in energy use for the same meal. New channels for communicating with consumers should be used (primary schools, television, Internet).

Reducing the environmental impacts from food transport

As noted above, it is usually difficult to distinguish household travel patterns related to food purchases from other travel purposes: households often link a number of travel destinations together. As a result, household travel patterns should be addressed as a whole.[14]

Reducing the environmental impact from personal travel will require measures to induce the use of new or improved motor vehicle technology, the use of renewable and/or less polluting fuels, reorienting and augmenting investment for public transport systems, downsizing vehicles and resource use, and re-examining incentives for private car use (*e.g.* company car policies, flexible working hours) (OECD, 2001). But it will also require going beyond the current public *versus* private transport debate that tends to focus on means of transport rather than transport system objectives. A new and promising approach of multi-modal mobility services offers a wide palette of transport options for "seamless" multi-modal trips that would reduce the need for personal car use. Such systems are already being successfully marketed in a number of OECD countries. In the longer-term, integrated land-use and transport planning should aim to increase household accessibility to jobs, shops and other facilities without the need to travel by car (OECD, 2001).

The net environmental impact of some transportation patterns are not yet clear. For example the net impact of greater out-of-town location of food stores, and related consumer travel, will depend upon the ability of manufacturers and distributors to rationalise distribution systems and make significant transport efficiency gains. Similarly, the net effect of shifts in consumer food shopping

patterns (*e.g.* e-commerce) will depend on whether consumers use e-commerce to substitute or merely supplement regular car trips to the shop. A clearer systems view of consumer goods transportation patterns, including cumulative "food miles" of major food products, is needed to determine strategic planning objectives.

Reducing household food-related waste generation

OECD countries use several policy measures to reduce food-related waste (organic and packaging), including measures that target food waste specifically and others that address household waste generation in general. Many OECD countries use *economic instruments* including *deposit-refund* systems to promote the collection, reuse and recycling of beverage packaging (milk, mineral water, soft drinks, beer). These systems have been somewhat successful in reducing packaging waste for final disposal. However as the percentage of beverages packaged in plastic rise, the portion of beverages affected by deposit-refund systems is shrinking. In Austria for example, although the re-use quotas in the sectors of beer, bottled water, wine, non-alcoholic beverages and milk are quite high in comparison to other countries, the share of re-useable beverage packaging continues to decline. Economically feasible and effective policy solutions to the rising amount of plastic bottle waste have yet to be found. Germany and the Netherlands plan to impose a tax on plastic disposable beverage bottles, but the tax is under debate in the European Union.

User charges for municipal waste collection and treatment affect household food waste generation more broadly and final disposal in particular. Waste charges typically are in the form of a flat tariff and represent only a minor part of household income. As a result, a new generation of policies uses unit pricing to make the cost of waste management visible to households. Unit pricing policies use marginal price structures that penalise higher levels of waste generation by charging on the basis of the volume (*e.g.* "Pay-As-You-Throw" – PAYT) or weight of trash discarded instead of a flat tax or monthly fee. In the US, PAYT has been adopted in over 3900 communities. Although success rates vary, PAYT communities on average have reduced total waste generated by about 14-27%, while increasing recycling by about 32-59% (Miranda and LaPalme, 1997). Complementary programmes (recycling, yard waste collection, bulky item pick-up, and education) can increase PAYT effects on source reduction and recycling rates, and discourage illegal dumping. PAYT programmes are also more equitable than flat-fee waste collection systems, in which households that reduce their waste in effect subsidise those that do not. PAYT programmes are spreading globally and have been tried in several other countries, including Japan, Germany, Canada, Italy, the Netherlands, and China.

Regulatory measures related to the installation and operation of waste management facilities have also driven changes in waste management at the household level. Limitations on landfill capacity, such as the EC directive on the landfill of waste, has contributed to a greater sorting and/or pre-treatment of waste destined for landfill. This has translated into a wider penetration of recycling at the household level. However, economic incentives (*e.g.* rebates for the proper disposal of household appliances) and disincentives (*e.g.* higher waste fees or landfill taxes, taxes on disposable products and packaging) are likely to be needed to encourage households to reduce the absolute quantity of waste they generate. Some OECD governments provide *information* to households on voluntary waste minimisation strategies (re-use potential, product life, minimum packaging, minimum toxicity, "no-buy" options). Information to strengthen consumer food conservation and preparation skills can also help reduce household food and packaging waste.

In view of likely demographic trends medium- and long-term government promotion of waste minimisation *technologies and infrastructures* will be important to adequately address household waste trends. Waste policies need to be more comprehensively integrated into an economy-wide approach of life-cycle resource management to reduce the material input into the economy and into the household. In the area of food consumption, some OECD governments have begun to develop technical assistance programmes to improve waste reduction and management skills in the processing and food service sectors. Measures will also be needed to improve recycling of packaging wastes and composting organic

wastes. The low recovery rates for plastics are of particular concern and indicate the need for advances in private sector technology and public policy to make the safe reuse of plastic packaging possible (*e.g.* that allow for minimum content of recycled material in food and cosmetic packaging) (see Section 4.3.3 for a wider discussion of policies to reduce household waste).

Reducing GHG *emissions from household food choices*

There are no policies in place in the case study countries specifically designed to address the climate change impacts of food choices at the consumer level, although a range of policies have been developed or are in the making to address the GHG impacts of food production and processing and transportation in general. Where these policies (*e.g.* carbon taxes on transportation fuel) have an impact on food prices or availability they could have an impact on consumer food choices. Energy and transport efficiency measures at the household level would also have an effect on GHG emissions attributable to the household sector.

Influencing upstream impacts of household food consumption patterns through information

Food labelling and information

Although consumers do not have direct influence on upstream environmental impacts, their food purchases have an impact over time in stimulating changes in food production and processing patterns. Food labelling is a crucial aspect in empowering consumers to evaluate their options and "vote with their pocketbook".

To be effective, labels must convey information that is relevant, concise, understandable and credible. However, food labels share the same difficulties as ecolabels on other consumer goods, including a proliferation of labels in the market and problems of transparency and credibility. In the US, for example, although the price differential for organic produce is a dissuasive factor for some consumers, the low penetration of organic foods has also been linked to an overwhelming and opaque mass of information on organic goods in the market. Consumer confusion on what really qualified as "organic" food prompted the US Department of Agriculture to issue national standards in February 2001 for the production, handling, and processing of organically grown agricultural products. In Austria the growing market share for organic produce has been supported in part by the creation of private, store-backed labels for organic foods in major hyper-market chains that has facilitated consumer decision-making.

The effectiveness of food labelling in addressing information asymmetries in the market and in stimulating more environmentally sustainable food production and consumption patterns depends on a number of factors, including the type of information involved and the level and distribution of the costs and benefits of providing that information (Golan, Kuchler and Mitchell, 2000). For example, the US National Organic Standard, which is backed by a government-mandated certification process, is expected to be effective in reducing transactions costs between farmers and food manufacturers and in facilitating consumer decision-making. It responds to a perceived information gap in the market place, while recognising that consumer preferences for organic food differ, allowing preferences and purchases to be more closely matched. The environmental impact of the Standard will be more modest. Organic food production represents only a marginal portion of world agricultural production. As a result, the net environmental benefit from organic labelling will be measured by the extent that it causes organic production to grow (Golan, Kuchler and Mitchell, 2000). Moreover, while organic production of some food products is often environmentally preferable to conventional, input and resource -intensive production, it is not possible to generalise the net environmental and social impact of organic production *versus* sustainable, or integrated, agricultural techniques (which are usually not indicated on food labels) (Jungbluth and Frischknecht, 2000). Other government tools (*e.g.* bans, quotas, production regulations or standards, Pigouvian taxes) will be more effective at promoting widespread progress towards sustainable agriculture.

Nevertheless, although environmental labelling may not be the best tool for promoting environmental change it still may be a good policy where political or regulatory consensus is difficult to achieve (Golan, Kuchler and Mitchell, 2000). This is currently the case for GMO labelling. Labelling can also play a role in motivating improvements in production processes. Whether food products are subject to mandatory labelling, or market pressures are such that producers feel the need to voluntarily label their products, the transparency this brings can stimulate manufacturers to look for ways to improve their environmental impacts. This has been the impact, for example, of the Marine Stewardship Council (MSC) labelling programme, who labelling certification has stimulated sustainable fishing practices.

Information campaigns

Consumer information campaigns contribute to general consumer awareness and understanding of food and environmental issues. In Austria such campaigns are mainly undertaken by environmental and consumer protection organisations, but are often supported by public funds. For example, the Austrian Ecology Institute, with the support of the Federal Ministry of Agriculture, Forestry, Environment and Water Management, published a consumers guide including an "eco-ranking" of more than 160 selected product examples from all the important food product groups (Gupfinger *et al.*, 2000 in Payer *et al.*, 2000). Based on several international eco-balances and similar studies, the eco-ranking covers the categories of transport, agriculture (plant and animal production), packaging, processing and preservation. The ranking is supplemented by further rankings with regard to health and social tolerance, background information on the different product groups and shopping hints.

Toxic Release Inventories

The US national case study also shows the potential for using information in the public domain to place additional pressure on food processors and the food service industry to reduce the environmental impacts of their activities through the extension of the Toxic Release Inventory (TRI) programme. The TRI programme, which now includes more than 650 toxic chemicals, requires industrial facilities to submit an annual report of listed toxic chemical releases to the environment. While TRI was viewed with scepticism at the time of its passage, the corporate and grassroots response has been extraordinary. It has helped communities to understand the impacts of local industries on their environment, and has also contributed to improved product and process "stewardship" by many companies. Major corporations, confronted with publication of their annual releases and anticipated reactions of local communities, pledged significant reductions in toxic emissions and commenced intensive waste reduction initiatives (Shameek Konar and Mark A. Cohen, 1997; James T. Hamilton, 1995 in Kauffman and Chevrot, 2000). While TRI is currently limited to industrial facilities, it suggests the possibility of a similar initiative for the service sector. Reporting requirements that focused on toxic emissions, energy use, materials throughput, and solid waste could lead to improved environmental behaviour and stewardship in the food service industries as well as to consumer education about the environmental impacts of food consumption (Kauffman and Chevrot, 2000).

Food advertising: a role for governments?

Each of the national case studies notes the role of advertising in providing consumers with information about their food choices. Although none of the case studies argue for new or additional controls on advertising, the Polish, US, and Swedish studies nevertheless note the correlation between advertising dollars and consumer demand for certain food products. Another issue raised, but not discussed in depth is the role of publicly funded generic advertising for specific food products. Generic advertising in the US, for example, raised fluid milk sales about 6%, or 18.1 billion pounds (8.2 billion kilograms), between September 1984 and September 1997. Sales of cheese rose by about 6.8 million pounds (3.1 million kilograms) (milk equivalent) in the same period because of increased generic advertising. An assessment of 15 cents per hundredweight of milk sold commercially, mandated by the

Dairy and Tobacco Adjustment Act of 1983, funded the advertising (USDA, 1999). Support for generic advertising funded by public money could also be tied to environmental performance.

Summary: polices to promote sustainable food consumption

OECD governments are acting in several areas to reduce the environmental impacts of household food consumption patterns, although most of these come under other areas of public planning (energy, waste). There are several areas where cross-country exchange of experience could help OECD countries move forward, particularly in the areas of food-related energy use, food and packaging waste reduction and management; and transportation rationalisation.

To have an even larger impact governments will need to eliminate perverse subsidies to production and promote technology, product and service innovations in the primary production, intermediate (processing, service, retail, distribution), and waste disposal sectors to maximise resource efficiency and reduce releases to the environment. The role of food and appliance retailers and food service providers is an area that has been inadequately examined to date. Retailers and food service providers anticipate and respond most quickly to consumer demands and can help consumers identify environmentally beneficial products. They can also influence the supply chain that determines what is offered to consumers by increasing awareness of value added products that are environmentally sound. Retailers and food service providers can also make significant reductions in energy consumption and waste generation. The national case studies give examples of technical support programs to the food service and retail sectors in the US and of the promotion of environmental management systems (EMS) in the food sector in Sweden. Voluntary initiatives could play an expanded role in these areas. In the interest of maintaining a wider perspective on net environmental impacts, efficient government measures should be targeted first to those sectors with large or concentrated impacts. Energy use and environmental impacts from the transportation of food are key points of focus for the food processing, distribution and retail sectors. Energy use and waste generation are important areas for the food service sector.

Governments should make greater use of indicators to identify key environmental impacts from household food consumption and to monitor the effectiveness of policies to reduce those impacts. Annex Annex recommends seven indicators that focus on key impacts and that can be measured with currently available data. Additional work could be based on this core set of indicators to develop generic quantitative indicators that could be used to measure environmental trends across OECD countries.

The discussion raised other issues that are important for determining the net environmental impact of food consumption patterns. Trade-offs in energy consumption between food sector actors (from producers down to waste disposal firms) is one such area. In view of relatively high rates of refrigerator/freezer ownership, for example, household energy demand for food consumption could stabilise or decrease if more energy efficient cooking appliances and practices are adopted. This takes as given that consumers will continue to demand more pre-prepared foods that require little cooking at home. The net environmental effect from energy consumption from such a trend would require additional analysis, however, to take into account energy consumption for food processing, chilled conservation, distribution and storage, and disposal of food packaging. Similarly, the net effect of changes in food preparation and distribution on both freight and personal travel patterns requires further investigation to estimate the real environmental impact of household demand for certain food products and services and market driven modifications in the structure of the food sector. This type of analysis would require an integrated analysis of both food consumption and production systems in order to identify the most effective points for technological innovation or policy intervention.

4.3.2. *Reducing the environmental impacts from household tourism travel*

The environmental impacts from tourism-related travel are related to the frequency of departure and the destination choice. These two issues arise upstream in the vacation planning process and involve decisions made at the household level. However, directly targeting the frequency of departure and/or choice of destination through limitations on travel or restrictions on destination choice is not a

realistic option (although several OECD countries have done both in the past). Nonetheless, there remain several indirect strategies for influencing the departure rate and destination choice that should be further explored if countries wish to reduce the impact of consumer tourism travel. Governments have more latitude to influence mode choice, and a broad range of policies already exist that are, or could be, applied to tourism-related travel. There exists very little empirical work on environmentally sustainable tourism travel and policies to promote consumer decision-making in this area. As a result, the discussion of policy options to reduce environmental impacts is exploratory and would require a deeper analysis of design and implementation issues, net environmental impact, and compatibility with other planning objectives.

Options targeting households: vacation frequency and destination choice

Providing information on the environmental impacts of travel

Travel industry studies indicate that most tourists are neither aware nor overly concerned with the environmental impacts of their travel (Swarbrooke, J. and Horner, S.,1999). As a result, it is unlikely that information on the environmental impacts of destination choice will have a significant effect on consumer decisions without a broader, long-term effort to raise awareness on the impacts of household travel in general. Nonetheless, information on travel alternatives within certain tourism destinations and targeted to certain groups can be effective where it heightens the overall attractiveness of the destination (*e.g.* bicycles in resort areas, public transport in European capitals, etc.) or taps into other motivations. Although still a niche market, "green" or "eco-tourism" represents a rapidly growing segment of the tourism market, and could be extended to include the travel component of eco-tourism holidays.

Promoting other forms of leisure activity

Disposable income and available leisure time contribute to tourism travel. Channelling either of these into other forms of non-tourism leisure activities could reduce long-distance tourism travel (*e.g.* by developing closer-to-home leisure destinations like urban and/or regional parks). Countries with a high incidence of secondary home ownership (*e.g.* France and Italy) have relatively less international tourism travel than other countries. Linking these two phenomena, however, is not a straightforward affair, as these countries also have very strong domestic tourism resources.

Promoting domestic tourism

Countries promote domestic tourism to retain a favourable trade balance (overseas tourist travel is considered an import in that the other countries are the beneficiaries of international tourist spending), to reduce the national tourism industry's vulnerability to variations in international tourism flows, and to use tourism as a rural development strategy. One positive outcome from successful attempts to strengthen domestic tourism is that people generally have a wider range of closer-to-home destinations to consider when making their vacation decisions. It is not clear, however, whether people will choose these destinations if they can travel to far-off places that offer, at the same or lower price, sought-for features (*e.g.* beach holidays in the winter) that cannot be found at home. Furthermore, in the United States, Canada and Australia – all countries with high levels of tourism travel – domestic tourism can still involve considerable travel distances by air. Even within Europe, there has been a sharp rise in the amount of domestic air travel. Efforts to promote domestic tourism by improving tourism infrastructure and developing tourism resources will likely lead to increased in-bound international tourism thus mitigating the overall environmental impact from hypothetical reductions in out-bound travel.

Promoting long stays

Promoting longer vacations while keeping vacation entitlements constant can lead to fewer tourism trips. However, as indicated earlier, there are currently strong countervailing trends. Policies would have

to address these if they were to seek to reduce the frequency of tourism trip-taking by, for example, setting up labour codes that allow for flexibility in working arrangements while guaranteeing access to uninterrupted vacation time.

Options targeting travel modes

Reducing the environmental impacts of tourism-related ground transport

Most tourism travel is by car over short-to-medium distances. It involves relatively high load factors for both automobile and coach travel. The environmental problems stemming from ground transport for tourism are mainly localised in tourism generating urban centres and tourism destination areas. For many of the latter, tourism traffic accentuates many of the same environmental problems already associated with the operation of motor vehicles (air pollution, land-take, surface water run-off and noise). However, many tourism destination areas are not equipped to deal with massive seasonal variation in motor vehicle use and lack comprehensive plans and alternative transport possibilities to address the problem. On a global scale, insofar as leisure transport is an important element of overall transport activity (up to 50% of trips), the CO_2 emissions from ground transport for tourism can be significant.

Changes in automobile *technology and fuels* have led to significant improvements in the environmental performance of cars on a per vehicle basis. This has especially been the case for reductions in lead, NO_x and VOC emissions. Fuel efficiency has improved and a decrease in per vehicle CO_2 emissions has been observed. These improvements, however, have been eroded by increases in overall travel volumes and vehicle weight. Thus, despite a drop in NO_x and VOC (both ozone precursors) emissions, many urban areas and heavily-visited tourism destinations (especially in enclosed mountain valleys), are expected to continue to experience health- and ecosystem-damaging peaks in ozone concentration. Noise and particulate emissions (especially ultra fine particles) will also continue to be a problem although, in the case of noise, rail transport will also be a major source in certain areas.

Planned and expected changes in technology, such as the spread of latest generation fuel efficient cars, "clean" diesel engines equipped with catalysts and particle traps, hybrid engine vehicles and eventually fuel cell technology will greatly contribute to reducing the impacts from motor vehicle use. These improvements, however, may be offset by a general rise in travel volumes associated with the rise of short holidays and will take time to have an impact as these new technologies work their way into the overall vehicle fleet. There are few technology-oriented policies for tourism-related motor vehicle use that are specific to the tourism sector. Rather, general policies that facilitate the development and uptake of these new vehicles (*e.g.* research, "green" fiscal measures, instruments aiming to accelerate fleet turn-over, vehicle emission testing, etc.) should be pursued since these will have an impact on the environmental performance of vehicles used for tourism travel. One exception might be a special focus on reducing emissions from buses and coaches since these have a particular incidence on air quality in a number of tourism destinations.

It is generally recognised that technology alone will not be sufficient to reduce the environmental impacts stemming from motor vehicle use to a level compatible with sustainable development. As a result, *managing demand* for tourism-based motor vehicle transport is as important a strategy as focusing on supply-side technology issues. The underlying assumption of most demand management approaches is that transport systems ultimately serve to provide *access* to people, places and goods, rather than to simply move people about. While mobility is an important component of providing access, it (and car-based mobility in particular) is not the only way to ensure that citizens have high levels of access. Demand management instruments for tourism can be effective in reducing many of the environmental impacts from car traffic in tourism destinations (*e.g.* outlying coach and tourist parking coupled with efficient shuttle services, public transport passes, information about public transport services, car bans, differential road or area pricing and dissuasive parking policies). A recent survey of 214 popular tourism sites throughout France found that 55% of these had implemented a parking policy for tourist cars, 36% have or are planning on implementing a parking policy for coaches, and 38% have

developed or will soon be developing a comprehensive plan to address overall traffic impacts from tourism (AFIT, 1998).

One commonly-cited motivation for tourism destination choice is escaping from the congestion of urban areas. As a result, many tourism destinations have used reduced motor vehicle traffic as a selling point. In particular, a number of Swiss and Austrian Alpine tourism destinations have developed and explicitly targeted "car-free" tourism as their marketing strategy, including partial or complete bans on car traffic within the community combined with high levels of non car-based access and mobility. They co-ordinate the entire network of tourism providers (hotels, transport services, restaurants, cultural attractions, etc.) to provide a seamless transport network based on public transport, bicycle/ski and pedestrian access and mobility services (baggage handling, car-sharing, freight and delivery services, information provision, etc). In the most advanced cases, these communities have co-ordinated with tour wholesalers and upstream tourism transport service providers such as railways and coaches to organise and provide a complete car-free home-to-hotel-and-back transport chain (OECD, 2001*c*).

Reducing the environmental impacts of tourism-related air travel

While a large majority of tourism trips are not made by air, this form of transportation contributes disproportionately to the environmental impacts of tourism travel, especially climate change. A range of options exists to address these impacts. Technology and air traffic control measures principally target the environmental performance of aircraft while pricing and modal shift measures tend to target overall levels of traffic. Overall, however, given the large projected growth rates and climate change impact of aviation, it is unlikely that any of these measures in isolation will be sufficient to significantly reduce environmental impacts from aviation. Furthermore, if a strong reduction in radiative forcing from aviation is targeted by governments, it is unlikely that current technology, flight control and mode shift measures will be sufficient.

Latest-generation commercial jetliners are approximately 70% more fuel efficient on a passenger kilometre basis than 40 years ago. Engine improvements and better airframe design will continue to allow efficiency gains. However, because of the long lifetimes of aircraft and the low replacement rates within the global aircraft fleet, these technologies will take some time to penetrate and have an impact. Overall improvements in aircraft efficiency will be of the order of 1% per year (IPCC, 1999).

Currently aircraft emissions are only regulated for the landing and take-off cycle. As a result engine makers have focussed on developing new technologies that reduce these emissions (mainly NO_x). However, there exists a trade-off between NO_x reduction and CO_2 emissions. At present, without advances in engine combustion chamber technology, any increase in the fuel efficiency of aircraft engines will lead to increased NO_x emissions while any effort to reduce NO_x emissions will lead to increases in CO_2. Another trade-off to consider is that more fuel efficient engines tend to have lower-temperature exhaust which, for the same water content, leads to increased contrail formation. It seems that in the short-run, technology policies seeking to address the range of climate change impacts from aviation should seek to break the inverse correlation between energy efficiency and NO_x emissions through innovation in engine design technologies. Longer-term possibilities include radically changing aircraft engine design away from a dependence on kerosene towards alternatives such as hydrogen. Although such a switch would eliminate in-flight CO_2 emissions, water vapour would continue to pose a potential problem. Furthermore, as in the road sector, it is not entirely clear that the overall life-cycle CO_2 impact would be reduced substantially depending on the way in which the hydrogen is produced.

Air traffic control presents other options for reducing environmental impacts from air travel. For a number of operational, safety and military reasons, commercial flights rarely follow efficient point-to-point routing. By addressing some of the contributing factors (for example by attributing militarily-restricted airspace on a real-time or daily basis or implementing free-flight rules in uncongested corridors), changes in air traffic control could lead to a 6% to 12% increase in fuel efficiency. Furthermore, more precise navigation information regarding humid air layers could lead to reduced contrail formation which, despite increasing fuel use and CO_2 emissions, would in many cases lead to an overall decrease in radiative forcing. Many air traffic control authorities are already considering a number of changes in

order to reduce the incidence of congestion, air travel delays and costs to airlines. Recent evidence indicates, however, that time saving flight paths are given at lower altitudes, which leads to increased fuel use and CO_2 emissions (Carter, 2000).

The IPCC has reviewed a number of potential economic instruments for reducing the environmental impacts from aviation including the following (excerpted from IPCC, 1999): fuel taxes and charges/levies aiming to stimulate fuel efficiency improvements and reduce overall demand; emissions charges aimed at encouraging adoption of lower emitting technologies and/or practices; emissions trading to encourage emission reductions through market forces; ticket taxes or charges; levies on empty aircraft seats to promote higher load factors; levies on excessive traffic per destination, destinations served, or type of equipment serving a destination; levies on route length to reduce the number of flights that are less than a minimum distance; and subsidies or rebates to act as an incentive for polluters to change their behaviour.

One important element of any levy or charge will be its capacity to provide specific signals regarding the entire range of aircraft emissions contributing to radiative forcing rather than focussing on CO_2 alone. One prospective German study has proposed a differentiated levy package addressing CO_2 and NO_x emissions and contrail formation that would provide incentives to account for trade-offs in emissions and reduce the overall radiative forcing from aircraft (Brockhagen, 1999).Most studies and/or experience with charges/levies have a more limited scope as they typically consider only one target (*e.g.* fuel use/CO_2 emissions, NO_x emitted in the landing and take-off cycle or noise).

Studies carried out by the OECD and the Dutch Centre for Energy Conservation and Environmental Technology (CE) have concluded that taxes and levies resulting in fuel price increases have relatively less impact on travel demand than they do on increased fuel efficiency. In the short-term, airlines will pass on increases in fuel prices to business travellers whose demand for air travel is relatively inelastic and cut non-fuel costs elsewhere. Furthermore, as outlined earlier, the vertical integration of the tourism industry enables tourist wholesalers to compensate for transport price increases by reducing the prices of other components of the vacation package. These studies conclude that relatively large increases in fuel prices would only serve to offset approximately one year 's growth in travel demand under current trends, and would have a proportionally higher effect on the development and uptake of more fuel efficient technologies and practices(IPCC, 1999; OECD, 1997*a*; CE, 1998). In contrast, a study carried out by the International Civil Aviation Organisation (ICAO) investigating the potential economic impacts and environmental effectiveness of environmental levies concluded that increases in prices would be passed on to all airline customers resulting in a subsequent decrease in demand. The study also found that price increases would have a supply-side impact, although to a lesser degree than was predicted in the OECD and CE studies. Finally, the study points out that insofar as a portion of price increases cannot be passed on to customers, airlines will have to pay for these out of their profits which will reduce their capacity to invest in new, more efficient aircraft and engines (IPCC, 1999).

Finally, an important aspect to consider when developing pricing instruments for aviation is the geographical scope of the instrument. International treaties and negotiated bilateral agreements exempt fuel from being unilaterally taxed on international flights. However, within a region such as the European Union, there exists the possibility of reaching a common accord on kerosene taxation. Furthermore, existing international aviation law tends to discourage – but not prohibit – the application of environmental or service levies and charges. For a charge to be effective and not lead to competitive disadvantages, it is important that the geographic scope of application be as wide as possible.

Modal shift

In the medium- to long-term, if aviation came under strong pressure to reduce its contribution to radiative forcing, it is possible to envisage the return of ocean liners (albeit at higher speeds and fuelled by hydrogen) to handle some of the demand for intercontinental travel. While these journeys would be on the order of 5-7 days and would entail less frequent cross-ocean trips, the possibility of using much of this time for productive work purposes because of efficient communication and computing technologies make oceanic liners an interesting possibility for long-haul travel (CST, 2000). In

the short- to medium-term, however, there exist no travel modes that can effectively replace long-haul air travel. Discussions of mode shifts for aviation therefore focus on short-haul travel. The IPCC concluded that the overall scope for replacement of short-haul air travel with its next-most competitive mode, high speed rail, is approximately 10% (IPCC, 1999).

In Europe, many airlines face pressure to switch short-haul slots at congested airports to long-haul flights, which represent the most profitable routes and fastest growing traffic segments. One result has been the emergence in Europe of increased co-operation between airlines and rail operators (*e.g.* Lufthansa-Deutsche Bahn, KLM-NS and United Airlines-SNCF). These partnerships take advantage of well-developed high-speed rail connections to replace short-haul regional feeder travel (Rolls Royce, 1998). This trend confirms that high-speed rail in Europe is competitive with air travel over distances up to approximately 500 kilometres. Given that Eurocontrol, the European Air Traffic Agency, estimates that almost 50% of European air traffic involves flights of less than 500 kilometres, this indicates considerable substitution potential as high-speed rail networks develop. Similarly, in Japan, the extensive high-speed rail network has been singled out as a factor in limiting the development of regional airlines.

Notwithstanding this potential, the likely net effect of substitution of rail for short-haul air travel may be increases in long-haul aviation travel as short routes are replaced by long distance flights (Robinson, 1999). Furthermore, because short-haul flights tend to fly at lower altitudes, they contribute less to the non-CO_2 (especially NO_x and contrail formation) radiative forcing impacts of aviation. Despite the trend in more efficient engines producing cooler exhaust at lower altitudes (and thus more contrail-forming condensation) and the overall fuel use (and corresponding CO_2) penalty from flying at these lower altitudes, it is likely that reducing short-haul flights will not result in a proportional reduction in the radiative forcing impact from aviation.

Reducing the environmental impacts of tourism-related maritime transport

Options for reducing the environmental impact from maritime leisure transport are relatively limited as these impacts are low to start with. These measures would focus on ensuring a general decline in the sulphur content of shipping bunker fuels and addressing the introduction of non-native species into new habitats by curtailing the practice of changing ballast water while at anchorage. Other measures would tighten control and monitoring of effluent discharges by ships, especially at ports of call. Generally, however, these measures would only have limited impacts in reducing the overall environmental impacts from the cruise ship package holiday if no measures were introduced to curb emissions from air travel to and from the port of embarkation.

Summary: policies to promote sustainable tourism travel

Households have a relatively large degree of control over the frequency of their tourism trips and almost complete control over their destination choices. A number of factors come into play in these decision-making processes including the desired attributes of their vacation experiences and relative prices of different options. Tourists also invest themselves quite heavily in searching for information about their vacation options. All of these factors indicate that, given information about the travel impacts of their destination choices and information or about alternative destinations and/or modes that might satisfy their desires, households might change their trip-making patterns. However, most tourists are typically not looking for such information and even if they are open to re-evaluating their destination choices based on the environmental impact of travel, such concerns typically rank lower than many other factors. Furthermore, trends in tourism travel develop against a backdrop of trends in economic activity, demography and social development. Information alone is unlikely to counter these since they are strong, pervasive and bring about multiple benefits.

Households also make their decisions within a framework where many costs are external to the price structure of the tourism market. This is especially true for the external climate costs of air travel and, to a certain extent, the external costs of tourism transport in many tourism destinations. As long as market pricing or government regulations fail to account for these market failures, household decision-making will not fully account for environmental impacts. Governments help to set the general

framework in which households make their tourism choices. They do this through actions concerning the degree of market openness, labour policies, macroeconomic orientations, the provision of transport infrastructure and assistance to the tourism industry. All of these actions except the last have indirect impacts on the frequency of household trip-taking and tourism destination choice. Given the large and growing importance of environmental impacts from tourism travel, governments can and should improve the way they account for tourism travel when making policy decisions (*e.g.* when modifying tax codes, labour laws, etc.). When looking at the integration of environmental concerns into sector policies, impacts on the scale and scope of tourism travel should be taken into account.

This may prove to be difficult since governments typically view tourism as a relatively environmentally benign sector of the economy (compared to industry, energy, urban transport, etc), that generates tremendous amounts of economic activity and in-flows of foreign exchange. Many national tourism organisations aim to contribute to a favourable balance of trade by maximising the ratio of incoming *versus* outbound tourists. Where these strategies contribute to growth in international aviation without accounting for international greenhouse gas emissions, they can lead to policies that generate new emissions while simultaneously extracting them from international monitoring processes. Assigning responsibility for aviation's radiative forcing impact is a key hurdle to overcome when developing government responses to reduce the environmental impacts of tourism travel. All OECD countries have developed policies to reduce the environmental impacts of ground-based transport and these should be pursued and extended to take into account the specific impacts and characteristics of tourism travel.

4.3.3. *Promoting sustainable energy and water consumption and waste generation*

This section reviews policies for promoting sustainable energy consumption, responsible household water consumption, and waste prevention and recycling at the household level. In contrast to household food consumption and tourism transport, there is more OECD countries experience with policies to influence household behaviour in these areas. As result, more can be said about the opportunities and limits for using economic instruments, for example, or the relative importance of increasing the supply of environmentally sound goods and services *versus* supplying consumers with information on environmental impacts. This discussion also provides several examples of successful *packages* of instruments to influence household decision-making.

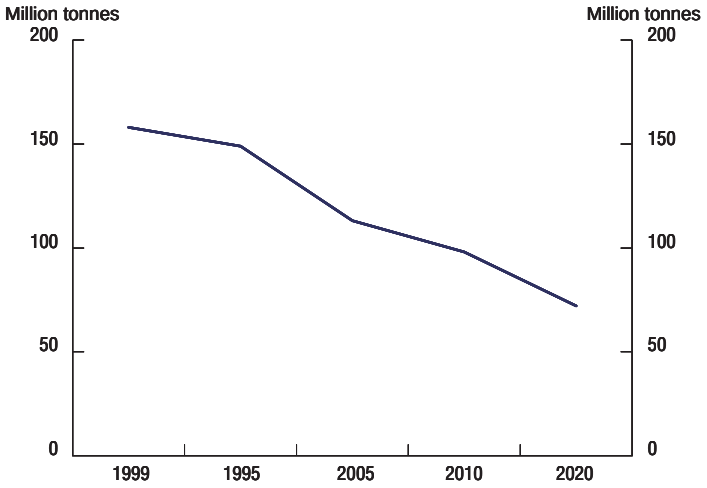
Promoting sustainable household energy consumption

In OECD countries, there have been rapid increases in both energy production and consumption since the 1980s, although the energy intensity of the economy has been declining. Market liberalisation and increased competition in the energy markets is contributing to lower energy prices which could increase energy demand. The main environmental driver for new energy policies in OECD countries will be to meet agreed targets for reducing greenhouse gas emissions. Unlike emissions of "conventional" air pollutants, there are no economically viable end-of-pipe controls available as yet for emissions of CO_2, so the challenge will be great. In order to reduce the environmental impacts of energy use, energy policies will be needed for strengthening demand-side management (to reduce growth in overall energy demand), encouraging the development and uptake of low emission and energy efficient technologies; and ensuring a higher share of low-emission energy sources in the fuel mix. These objectives can be met under the new competitive market conditions, but it is crucial that they be included in liberalisation efforts at the beginning of the process (IEA, 1999*b*).

Reducing growth in overall energy demand

The need to reduce greenhouse gas emissions has driven a number of countries to address household consumption patterns through climate protection policies. The German government has targeted a general 25% reduction of carbon dioxide emissions by 2005 compared with 1990 levels (BMU, 2000). Corresponding reduction targets for households were established at 13-20 million tonnes (Mio t) of CO_2 from buildings and a further 5 Mio t from private households. In one reduction scenario, household CO_2 emissions could drop from 158 Mio t in 1990 to 72 Mio t in 2020 (Figure 2).

Figure 2. **Germany: Scenario of household CO_2 emissions (1990-2020)**



Source: BMU, 2000.

In order to reach the results in this scenario, the German Climate Protection Programme provides for a package of regulatory, economic instruments, voluntary agreements and incentives to technological innovation that have been co-ordinated across sectors:

- a cross-sector *ecological tax reform* (1999-2003) to increase energy prices to stimulate reduced energy intensity and improved resource productivity in general. Higher energy prices are judged to be necessary to achieve existing energy savings potential, and to develop renewable energies (see Box 7);
- an *energy saving Ordinance*, expected to be in force in the beginning of 2002, combining regulations for insulation and efficient heating systems (CO_2 emissions reduction target of 4 Mio t);
- *subsidies* to motivate household use of green energy and implementation of energy efficient systems (CO_2 emissions reduction target of 4-7 Mio t); and
- *information measures* directed at electricity consumption (particularly stand-by mode) of electrical and electronic appliances in households and offices; voluntary agreements and legislation on energy consumption labelling (CO_2 emissions reduction target of 5 Mio t).

In addition, the program foresees additional measures without specific reduction targets, such as greater market penetration of calorific boilers, small district heating power stations, fuel cells, connections to district heating supply systems, measurement and control technology, and energy efficient household appliances (BMU, 2000 in Lorek *et al.*, 2001).

In line with the liberalisation of the energy sector, in the Netherlands, Dutch energy policy is relying increasingly on market instruments. Specific user categories are also still approached through traditional covenants and benchmarking agreements, but the new approach is more strongly directed to energy users, and consumers are seen as occupying a dominant position in a "demand driven" liberalised market. Like in Germany, the Dutch government is using a combination of economic instruments (taxes on fossil fuel, tax rebates on sustainable energy use or production) and regulated efficiency standards to stimulate the development of sustainable energy supply and technology. Where demand-side oriented policies are not sufficient, subsidies to technology development and basic R&D activities are used to enhance "policy-induced efficiency improvements" (Correljé *et al.*, 2001). The Dutch *Energy Conservation Action Programme* (1999-2002) aims to increase the rate of energy efficiency improvements from 1.6% to 2.0% per annum.

Box 7. Germany: Ecological tax reform in the energy sector

In 1999, Germany initiated an *ecological tax reform*, through which energy taxes are to be progressively raised without increasing the overall tax burden. The first step was to raise the fuel tax (by DEM 0.06 per litre of petrol or diesel and DEM 0.04 per litre of fuel oil) and to introduce an electricity tax (DEM 0.02 per kWh). Levied on the producer, these taxes are passed on to consumers and will be increased annually until 2003. Electricity generated from renewable energy sources is exempt from the eco-tax, and electricity for local public transport enjoys a 50% tax reduction (OECD, 2001*h*). The new energy tax is subject to two types of exemptions: one for coal and nuclear energy and the other for industry and agriculture, which pay only 20% of the standard tax rate. The new tax reform will also be used to subsidise renewable energy (DEM 200 million per year) and public transport. The ecological tax also includes an increase for petrol and gasoline of DEM 0.06 per litre each year from 2000 to 2003 and DEM 0.05 per kWh for electricity (Table 2).

Table 2. **Development of taxes due to ecological tax reform in Germany**

Energy carrier		Tax	Taxes from ecological tax reform and mineral oil tax, as of:				
		March 1999	April 1999	Jan. 2000	Jan. 2001	Jan. 2002	Jan. 2003
Petrol	Pf/l	62	68	74	80	86	91
Gasoline	Pf/l	98	104	110	116	122	128
Heating oil	Pf/l	8	12	12	12	12	12
Natural gas	Pf/kWh	0.36	0.68	0.68	0.68	0.68	0.68
Electricity	Pf/kWh	0	2	2,5	3	3,5	4

Source: Federal Environment Agency (2000) in Lorek *et al.*, 2001.

By gradually increasing the energy tax, and applying a zero-tariff for renewables, the government intends to give a powerful stimulus to reduce fossil fuel use and increase sustainable energy use (Correljé *et al.*, 2001). As of 1 January 2001, small-scale consumers will be paying over one-third more for their energy through a tax levied on gas and electricity. This tax is passed from producers to consumers, and depends on energy consumption levels (Table 3). Most of the extra revenues from the tax are to be redistributed to taxpayers through reductions in wage and income taxes, although a portion will be redistributed through tax incentives for energy conservation measures as of 2001 (Correljé *et al.*, 2001).

In the context of falling energy prices, taxes on energy can have an important role in internalising environmental costs of energy use. Although energy demand is relatively inelastic, a price elasticity significantly different from zero indicates that price increases can reduce the demand for energy, especially in the long-run (OECD, 2001*i*). However, given the drivers behind household energy

Table 3. **Netherlands: Natural gas tax rates (in cents per cubic metre, excl. VAT)**

Cubic metre	0-800	800-5 000	5 000-170 000	170 000-1 million	Over 1 million
1996	0	3.18	3.18	0	0
1997	0	6.36	6.36	0	0
1998	0	9.53	9.53	0	0
1999	0	15.78	10.24	0.71	0
2000	0	20.82	11.44	1.54	0
2001	26.50	26.50	12.38	2.30	0

Source: Central Planning Bureau: *www.cpb.nl.*

consumption (see Section 3.2.3), further analysis is required to measure the impact of higher energy prices on household energy consumption. The social (distributional) implications of the imposition of higher energy taxes on low-income households would also need to be addressed in order to increase public acceptance.

In Mexico, the energy sector is largely managed by state monopoly. However, there has recently been some deregulation opening the way to improved economic efficiency and possibly better pollution control. In 2002 the Mexican government introduced reforms to residential electricity rates subsidies. Households consuming between 280 and 500 kilowatts per hour (kWh) bimonthly will face a gradual and differentiated reduction in their electrivity rate subsidy, while the subsidy has been eliminated for those households that consume more than 500 kWh. Low-consumption households (less than 280 kWh) are not affected. These consumers represent 75% of the population. The reduction in residential electricity subsidies is expected to amount to 5 billion pesos (620 million euro)(Mexican Ministry of Finance, 2002). A financial support programme will be implemented in order to encourage the acquisition of more efficient refrigeration, air conditioning, and insulating equipment for consumers who live in regions with extreme climate.

Encouraging the development and uptake of low emission, energy efficient technologies

Another mechanism for meeting environmental objectives is the use of energy efficiency programmes which help to reduce emissions. Two important mechanisms for promoting energy efficiency gains have been the introduction of energy efficiency standards to improve the range of consumer appliances on the market, and energy labelling to provide consumers with comparable information on appliance performance.

Research indicates that energy efficiency standards can be particularly effective in overcoming market barriers to investment in energy efficient equipment (IEA, 2000*a*). In Mexico, the 1992 Federal Metrology and Standardisation Law made the application of energy efficiency standards obligatory. By the end of 1996, 11 such standards had been developed for various households devices, including water pumping systems, water heaters, boilers, lighting systems and thermal insulation materials. These standards are expected to drive electricity consumption reductions of 10% by 2005 (OECD, 1998*b*).

Energy efficiency labels for appliances and equipment are used in many OECD countries, and the range of appliances to which they are being applied is continuing to expand. The EU Energy Labelling Framework Directive (92/75/EEC) makes labelling compulsory for refrigerators and freezers, dishwashers, light bulbs, washing machines, dryers, and combined washing machines and dryers. The Directive is implemented in Dutch law via the Energy Conservation (Appliances) Act. Energy labels are in preparation for a number of appliances covered in the Framework Directive, including central heating boilers and hot water appliances. A second generation of labels is in preparation for refrigerators, freezers and washing machines.

Energy labels can have an impact on consumer decision-making, particularly in the purchase of large, high-cost electronic appliances (refrigerators/freezers, washing machines, televisions, computers etc.), for which consumers often seek more complete comparative product information. However, while more consumers than before give greater consideration to energy efficiency characteristics, it is not a prime purchasing criteria. Questions also remain about the clarity of energy labels and the ability of the average consumer to translate the information on labels into meaningful decision-making criteria, for instance to compare up-front purchase price and long-run operational costs. Retail sale staff are ideally placed to facilitate consumer decision-making by explaining energy labels, but they are not always well informed or motivated and may not volunteer information the consumer has not requested. The *Sustainable Do-it-yourself* initiative in the Netherlands has attempted to strengthen the information flow at the retail level through retail personnel training but has achieved mixed results linked in part to staff turnover rhythms and lack of interest (OECD, 2001*e*).

The design of buildings and houses is a potential source of energy savings. Improving the energy efficiency of buildings generally means reducing the quantity of energy necessary to meet owner or user requirements in terms of the internal environment and energy services. Various design elements affect energy efficiency, ranging from very basic elements (*e.g.* the orientation and shape of the building structure which influence the heat gain from daylight) to detailed elements such as the method of sealing joints between building components. There are three basic principles in the design of an energy efficient building: minimising the energy demand for the operation of equipment by optimising the design of building structure; installing energy efficient equipment, and maximising the use of renewable energy technologies and sources[15] (OECD, 2001*k*).

Ensuring a higher share of low-emission energy sources in the fuel mix

Energy is considered to be one of the most heavily subsidised sectors in the OECD area. To accelerate the process of developing and adopting sustainable energy systems, including more energy efficient end-use appliances, governments will need to provide further support to research, development and up-take of alternatives. While the share of total IEA government support to energy research and development that is devoted to energy conservation and renewables (respectively 13.6% and 8.2% of total support) now surpasses the share attributed to either coal or oil and gas, most R&D support continues to go to the development of traditional fuels such as nuclear (IEA, 2000 in OECD, 2001).

Subsidies to specific fossil fuels lead to an economically inefficient energy supply level and mix, and discourage new fuel or technological developments that could reduce negative environmental effects. In OECD countries, the reform of environmentally damaging subsidies – particularly those that are tied to the use of more polluting fuels (*e.g.* fossil fuels, especially coal) or to energy production or consumption – could contribute to meeting Kyoto targets for greenhouse gas emission reductions and national environmental targets (OECD, 2001). Ensuring price differentials that reflect environmental externalities between different fuels and energy technologies would provide significant incentives for the use of cleaner energy systems (OECD, 2001).

The German Renewable Energy Sources Act (April 2000) guarantees a minimum premium to operators of renewable energy (*e.g.* wind, photovoltaic, biomass) power plants for each kilowatt hour of electricity input into the public grid. The cost of these premiums are divided among electricity customers by a special calculation system (Staiβ, 2000 in Lorek *et al.*, 2001). Germany has set targets of 10% of electricity to be produced by renewable energy sources in 2010 and 50% by the 2050 (OECD, 2001*d*). Germany also adopted an Act in 2000 that obliges network operators to purchase electricity produced through co-generation in the public sector, and has developed different subsidy programmes for green energy. Another federal programme is promoting the installation of 100 000 photovoltaic plants by the end of 2002, while German Länder and regional energy suppliers also offer a broad range of financial support for the promotion of renewable energy. Households have welcomed these programs: between 1999-2001, the Program to Promote the Use of Renewable Energy received over 113 000 applications for financial aid, the majority of which were for solar energy plants or a combination of solar energy with energy efficiency housing modernisation (Lorek *et al.*, 2001).

In Mexico, the government has been working since the 1950s to shift consumers to cleaner energy sources, particularly by promoting the substitution of wood-stoves by gas. Mexico is also promoting solar energy for rural communities: its photovoltaic rural electrification programme, aimed at providing energy to 40 000 households, is one of the most world's ambitious (OECD, 1998*b*).

Regulatory reform of the power sector will also need to include a review of subsidies and cross-subsidies and their impact on the expansion of renewable energy markets. For example the subsidisation of rural electricity consumers in big, sparsely populated countries such as Australia is thought to destroy niche markets for non-grid renewable electricity supply options (IEA, 1999*b*). Government subsidies are designed to support different economic, social or environmental objectives. Greater consideration should be given, however, to the unintended impacts of subsidies in other areas, such as the environment (IEA, 1999*a*).

Summary: policies to promote sustainable energy consumption

Governments have an important role to play in new liberalised energy markets. They will need to ensure that markets work effectively to generate competition and provide consumers with greater choice, address market entry barriers to renewable energy generation, and especially, internalise the environmental externalities generated by energy production and consumption. Environmental regulation will need to be redesigned to fit this new framework; experience suggests that more can be achieved by shifting towards more transparent and incentive-based measures rather than command-and-control legislation.

Energy is one area of household consumption that has received significant, if sporadic, public attention. It is also one of the areas where information and standards have been most vigorously developed to influence consumer behaviour, and where they have had an impact. However, past and projected trends in household energy demand in OECD countries clearly shows that additional measures to promote energy conservation and efficiency will be needed in the future. This will require a combination of supply-side efficiency gains and shifts to less polluting energy sources – to accelerate the use of natural gas, renewables and other low emission technologies, and to quicken the pace of improvements of conversion efficiency for fossil fuel use in the power sector. It will also require policies aimed at consumer demand management to improve efficiency, moderate the demand for energy services, and promote the purchase of "green" energy (OECD, 2001).

Promoting responsible household water consumption

Strengthening the price signal

One of the pillars of responsible household water consumption is ensuring that the costs of water supply and treatment are reflected in household decisions. Household water supply and sewage disposal prices have generally increased in the OECD region, significantly so in some countries. This has been accompanied by significant reductions in both total subsidies to water use and cross-subsidies between different user groups. The reduction of subsidies has largely stemmed from pressures to finance essential water infrastructure repairs, extensions, and operating costs, but also reflects a growing desire to manage water demand in the face of potential scarcity and to employ the Polluter Pays Principle in wastewater charging systems. Where subsidies exist, there is now more emphasis on the need to make them transparent (*e.g.* Mexico). Subsidies to household water use are a less pressing priority than subsidies to the agricultural sector, however, where water for irrigation is still associated with the lowest charges and the highest subsidies in most OECD countries, and where the reduction or elimination of subsidies would have the largest impact on water savings and efficiency (OECD, 1999*d*).

Incentives to conserve water generated by current household water price structures vary considerably across OECD countries. There is a clear trend away from flat-fee pricing structures, towards individual uniform volumetric tariff systems, which give a stronger conservation signal. Currently, most OECD countries use two-part tariffs (*i.e.* with fixed and volumetric components), with the volumetric portion making up at least 75% of the total water bill (OECD, 1999*a*). As part of volumetric tariffs systems, more OECD countries are also increasing household water metering, which allows charging systems to be linked directly to individual consumption. Nearly two thirds of OECD countries meter more than 90% of single family houses, and some countries are now expanding their metering of apartments.

There is a broad range of practices in OECD countries concerning the imposition of water taxes (in addition to basic charges). VAT is the most common type of tax. Within Europe, Finland, Sweden, Norway and Denmark all charge VAT on water services at more than 20%. In contrast, the UK "zero-rates" water services while the remaining EU members have rates between 5% and 10%. The Netherlands raised its value added tax (VAT) on water consumption from 6% to 17.5% for all water use exceeding 60 guilders. The tax was introduced as an eco-tax, and simultaneously levied for electricity and fuel and

lowered for labour. It was intended to induce water saving behaviour by different users, but appears in fact to have had little impact (Correljé *et al.*, 2001).

Despite increases in water charges and taxes, however, few OECD countries achieve full cost recovery of the operating and maintenance costs of water services provision, not to mention any additional environmental or social externality. Table 4 estimates the effect an increase in water prices necessary to move toward "full cost recovery" would have on household incomes. The results indicate the need to raise water prices considerably in the EU "Cohesion Fund" countries, while the more mature EU economies would experience relatively small price increases.

Table 4. **Effects of "Full Cost Recovery" on household incomes in selected OECD countries**

	Water charges as a proportion of household incomes	
	Existing water charges	Full cost tariffs recovery
Portugal	0.5	2.8
Greece	0.4	2.1
Ireland	0.3	1.9
Spain	0.4	1.6
France	1.1	1.5
UK (England and Wales)	1.2	1.3
Germany	1.0	1.2
Denmark	0.8	0.9
Korea	0.6	0.9

Note: The study assumed *i*) water services provision for the first time to a "greenfield" site in a hypothetical urban area (with primary and secondary wastewater treatment); and *ii*) full cost recovery of all direct operating and capital economic costs.
Source: Ecotec, 1996, and OECD 1999*d*.

Concerns about the affordability of household water services for low income groups have led to the development of innovative "social" tariff structures, many of which contribute to environmental and economic goals at the same time. Tariff-based solutions modify water tariffs themselves (tariff specification, amendment, innovation) for different user groups. Target-group based solutions focus on solutions to individual households or specified groups of households via tariff discounts (lower prices) or via general income support (OECD, 1999*d*).

Stimulating the supply and uptake of water-efficient plumbing and appliances

The regulatory framework is a second important catalyst for improving promoting responsible water consumption. Many OECD countries are introducing new regulations and setting higher standards for eco-efficient water appliances (toilets, washing machines, dishwashers). These have motivated technological improvements, often through voluntary initiatives. More rapid penetration of water efficient appliances could be achieved by mandatory appliance efficiency requirements (minimum performance levels) for new and refurbished buildings and by increasing information to consumers (*e.g.* water-efficiency labels for households' appliances, information on efficient lawn watering and gardening practices, etc). These measures will be especially important in countries like Mexico where water consumption per capita is increasing, but also in countries where technological options have improved but where consumer use patterns (frequency and duration of water use) are still water-intensive.

Some governments have promoted the uptake of water-efficient appliances through targeted subsidies. In the Länder of Hesse, in Germany, for example, subsidies supported consumer purchases of water saving kitchen and bath equipment as well as apartment water meters. A combination of bath

equipment and water meter installation was the most effective in stimulating water reductions (Neumüller *et al.*, 1998 in Lorek *et al.*, 2001). However, the general success of this subsidy is controversial, because water consumption per capita dropped to the same level in other Länder over the same period, without financial promotion instruments.

The institutional framework in which water is managed is an important consideration for promoting responsible water use. In the three case study countries, water is considered to be both a public good and a public (national) monopoly. While the national state holds water rights, generally, municipalities are responsible for water extraction, distribution and treatment. Many also concede water management to private sector operators under certain conditions and for specific services. The participation of the private sector in public water supply in many countries has improved water technologies, infrastructure, and supply service. In contrast, in Mexico, where the lack of capital [estimated at 1.2% of GDP (CNA, 2000)] is one of the major obstacles to maintaining and improving water supply and treatment infrastructure, private sector involvement would be stimulated by the removal of subsidies across all sectors and a regulatory framework that clearly defines the responsibility of different actors in the water sector. The involvement of private sector in the water management should also be evaluated in terms of the private incentives to promote water savings outside periods of water shortages.

Summary: policies to promote responsible water consumption

Households are relatively low consumers of water compared to other sectors in most OECD countries. As a result, on an aggregate scale, greater efficiency and conservation gains could be made by addressing larger users, particularly irrigated agriculture. At the same time, water is the one area where consumption trends are stabilising or declining in some countries. It is useful to draw comparisons from this situation to other areas of household consumption where environmental impacts are intensifying. Lessons can be drawn, for instance, about the combinations of government instruments that have influenced household water consumption, in particular full-cost pricing, water metering, efficiency standards and voluntary agreements with the private sector to increase the availability of water-efficient household plumbing and appliances. In countries with these policies, water conservation has become an integral part of household behaviour without imposing a significant burden on household decisions or routines. However, these experiences also suggest that once technology has been optimised, additional gains in water conservation programmes will have to come from information-induced behaviour change to reduce the frequency and duration of household use of water services.

Encouraging waste prevention and recycling at the household level

General framework for waste policy

Many OECD countries are currently shifting away from uniquely managing generated waste to waste prevention and minimisation through "cradle-to-grave" life-cycle management of activities and substances. Governments have used a range of policy tools to promote the minimisation, recycling and environmentally sound disposal of waste, including regulatory tools [environmental standards for waste management, extended producer responsibility (EPR), mandatory recycling systems, product labels, etc], economic instruments (taxes and fees on waste generation, deposit-refund schemes) and environmental information and education.

In Europe, the EU Strategy on Waste of 1989, amended in 1996, is based on the polluter pays principle and precautionary and preventive action. It establishes the waste hierarchy of prevention, material recovery, energy recovery and final disposal (ACR, 2001). In 1994, the European *Packaging Directive* laid down boundary conditions and objectives to reduce packaging waste across Europe by 50% by the year 2001 (EC, 1999). The EU has also implemented a set of policies intended to reduce the amount of waste going to landfill, increase recovery targets and waste minimisation, and to apply extended producer responsibility (EPR). OECD countries have non-binding but morally persuasive Council *Acts* to promote economically efficient and environmentally sound waste management such as

the Council Recommendation on "Comprehensive Waste Management Policy" (1976) and the Council Recommendation on "Integrated Pollution Prevention and Control" (1991) (OECD, 2001*a*).

In the Netherlands, Dutch waste policy is based on waste hierarchy that lays out five consecutive steps for waste policy planning: avoidance of waste production, re-use, recycling, treatment and disposal (Domus, 1999 in Correljé *et al.*, 2001). Five policy guidelines are applied (Vrom, 2001 in Correljé *et al.*, 2001):

1. the development and use of instruments to promote and enforce prevention and re-use;
2. formulation of conditions under which waste may be disposed of;
3. building a planning structure for waste disposal on a national level;
4. implementation of producer (co)responsibility for disposal of their products when they become waste; and
5. regulation of waste import and export.

In Germany, the "Waste Avoidance, Recycling and Disposal Act" of 1994 provides the basic framework for waste management, supplemented by federal ordinances and statutes. In Germany, waste management rests on two pillars: municipal responsibility for the collection, treatment and disposal of household waste, and private sector responsibility for the collection and treatment of recyclable materials (the "*Green Dot*" system). The dual system stems from the *Ordinance on the Avoidance and Recycling of Packaging Waste* (1991), which placed a legal obligation on retailers and manufacturers to take back and recycle transport, secondary and sales packaging (Box 8).

In contrast to the situation in Germany and the Netherlands, waste management has been hampered in Mexico by the lack of a clear regulatory framework. The "waste hierarchy" has not been incorporated into Mexican waste regulations and there is no regulation mandating waste separation and recycling. Existing laws create conflicts and confusion about the responsibilities of different actors. In addition, they focus more on hygiene (and municipal cleaning services) than on environmental aspects. Waste is not a priority on municipal agendas. Waste management in Mexico is further complicated by the existence of an informal waste management system and waste market (OECD, 2001*d*).

Box 8. Germany's dual waste management system (*Duales System Deutschland*)

Ninety-five enterprises founded the *Dual System Deutschland* (DSD) in 1990 to establish a common take-back system for sales packaging, following government offers to exempt participating producers and retailers from individual take-back responsibilities. The DSD, originally a private company with a state-guaranteed quasi-monopoly, is now a non-profit public limited company. It is financed through the sale of the *Green Dot* seal. Often mistaken as an environmental label, the Green Dot is a trade mark that serves as proof that an enterprises takes part in the DSD programme and as a sign to consumers to give the package to the DSD collecting system.

The DSD budget of about 4 billion DM is raised through a material-specific fee paid by almost all packaging producers and importers. The licence fee varies according to packaging material, weight and volume. It is structured in a way to give the over 18 000 licensees an incentive to reduce the volume of their packages and to choose environmentally friendly materials. Licence fees collected are used to pay companies to run the collection and sorting system, for subsidising plastics recycling, for disposal costs and for public relations (Fishbein 1994 in Lorek *et al.*, 2001).

Until 1998 the DSD was the only organisation practising common packaging take-back, which meant that the DSD had to fulfil the take-back quota from all packages produced in Germany. Other companies have since entered the market.

Source: Lorek *et al.*, 2001.

Encouraging waste prevention and minimisation

Waste policies in OECD countries are increasingly moving towards waste prevention and minimisation to reduce the amount of materials that pass through households and must ultimately be disposed of. A number of policy instruments are being applied both at the household level to motivate consumers to reduce the amount of waste they generate and upstream in the product chain to encourage resource efficiency in product design and composition.

At the household level, *taxes* and *fees* on household waste collection are the most common instruments used. There are different types of waste taxes and fees, including general taxation regimes, specific taxes, fixed fees, variable fees and variable fees linked to the production of waste.[16] In several countries (*inter alia* Netherlands, Denmark, France, Italy, Luxembourg), national legislation provides for the level of taxes and fees to be established at levels that cover the management costs of the services provided. The most common waste charge in Germany is a variable fee based on the cost of the waste management system provided to the taxpayer. The size of the fee is generally not directly related to the production of waste, but to the type and/or size of the dwelling and the type of waste management system used in the municipality. On average, for instance, communities with a landfill pay 150 DM per tonne of waste for disposal compared to an average of 370 DM per tonne of waste in communities with an incineration plant, due to oversized and (for the moment) unnecessary incineration capacities.[17] The cost of waste management has grown faster than the general cost of living (Table 5).

As in Germany, waste taxes in the Netherlands are generally not linked to the volume of waste produced. Most Dutch municipalities impose a variable annual waste fee based on a fixed amount, the rental value of the residence, or the size of the household. Due to stricter regulations for landfill and incineration, waste disposal costs increased substantially between 1990 and 1995. As a result, municipal waste collection charges increased over the same period by almost 150% on average, from 137 to 341 guilders per household (Figure 3). Waste collection costs, however, are still very small relative to income (0.5% in 1998). The waste tax is also integrated into other taxes, such as electricity.

Some Dutch municipalities have begun experimenting with a variable fee linked to waste production under the assumption that weight- or volume-based collection costs to households will lead to lower waste generation and higher separation rates. Although these experiments have been somewhat successful in increasing separate waste collection and lowering overall waste generation, they have also shown that households generally view waste generation costs as very low. As a result, the scope for influencing waste generation through higher costs may be limited. It is also feared that linking waste collection costs too closely to weight or volume may substantially increase littering (Correljé *et al.*, 2001). Unit-pricing programmes in the United States (Pay-As-You-Throw) have tried to address this problem by combining variable pricing with complementary programmes to dissuade illegal disposal. In the US, about 3 400 local communities in 37 states apply volume-based taxes on household waste. The result has been a reduction in the volume of waste to be disposed of and an increase in recycling (Miranda *et al.*, 1997).

In Mexico, waste charges takes the form of a specific tax, which is intended to cover collection of household waste, but from which revenues are usually directed to the general budget of the authority,

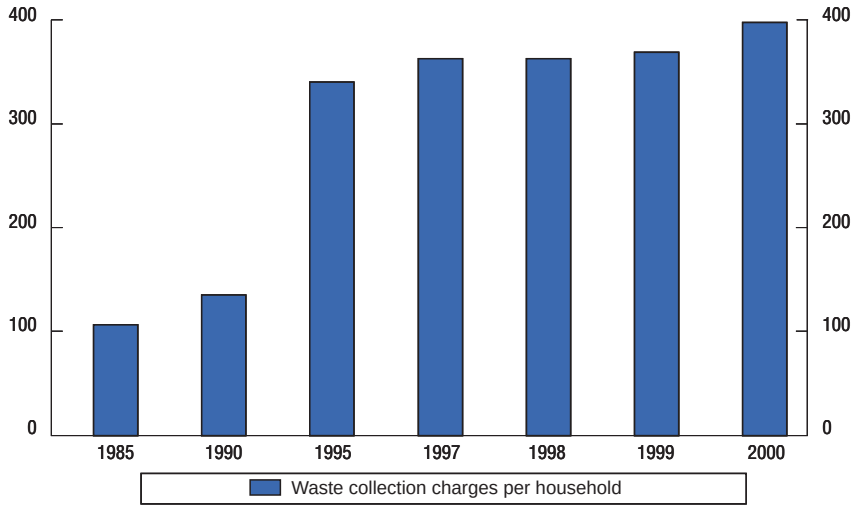
Table 5. **Germany: Consumer price index and waste fees index**

1995-2000 (1995 = 100)

	1995	1996	1997	1998	1999	2000
Total consumer price index	100	101,3	103,23	104,1	104,8	106,9
Waste fee	100.0	106.7	114.7	122.7	125.7	128.1

Source: German Federal Statistic Office, 2000.

Figure 3. **The Netherlands: Waste collection fee per household (guilders) 1985-2000**



Source: RIVM/CBS 2000 in Correljé *et al.* 2001.

without necessarily being earmarked for waste management. The amount of the tax is established on the basis of a range of considerations including the size and location (urban or rural) of the residence, but does not represent the real costs of waste management. This compounds a general lack of household awareness of the costs of waste.

Economic instruments can also be used to shift consumer preferences away from products that are neither reusable nor recyclable (taxes on packaging or disposable products). The German *Green Dot* licence fee, for instance, has become part of cost calculations for packages over time; as a result, it is estimated that the average household now pays around 200 DM (102 € or US$93) for the DSD System via increased product prices (Zülch, 2000 in Lorek *et al.*, 2001). It is likely that because the fees charged differ by type of packaging (glass, paper, plastics, etc.) and weight, licensed companies will look to shift to materials that are cheaper to recycle or to significantly smaller packages, but not necessarily to enhance the recyclability of the packaging. The cost of reducing packaging are growing over time. As a result, it may be that in the future further progress will have to be obtained through a levy on disposable products and packaging that would incite both consumers and producers to reduce waste.

Higher in the product stream, eco-design has significant potential for waste prevention. Eco-design has the advantage of reducing the impacts of consumption patterns without requiring conscious decision-making at the household level. Some pioneering industries have started to develop new products based on eco-design and de-materialisation objectives (*e.g.* refillable packages for household cleaning products, toothbrushes with changeable heads, more concentrated detergents). Governments could create incentives to accelerate eco-design initiatives.

Promoting waste recycling

Many OECD countries have made significant progress in increasing household participation in municipal waste recycling and in reducing the impacts from different waste disposal systems. Recycling has reached its highest level ever in many OECD countries and is one of the activities households most often equate with environmental awareness. Concerted efforts have been made in particular to eliminate or minimise the amount of waste that goes to landfill. For example, the EC landfill directive introduces a framework and schedule for decreasing land filling of biodegradable material by 65%

from 1995 levels within 15 years. In some OECD countries, the sorting and/or pre-treatment of waste destined for landfill has gradually become a part of waste treatment processes (OECD, 2001).

Infrastructure and information are the two most important drivers for household recycling. If the private costs of sorting waste and/or bringing it to the proper containers are high, household participation will be minimal. In the Netherlands, an extensive recycling system has grown out of national policy to dispose of waste within the country. As a result, shipments of waste abroad are only allowed if this results in a higher percentage of waste to be re-used or recycled. Currently, waste also has to be disposed of within provincial borders (although this is expected to change under a forthcoming national waste policy programme) (Correljé *et al.*, 2001). Dutch recycling policy requires that there be a recycling centre for paper and glass waste within a few hundred meters of every household. Small chemical and organic waste are collected directly from households and batteries can be handed in at retail shops. In the Netherlands, as in Germany, where recycling infrastructures are also well developed, recycling has become a routine household activity requiring little "environmental consciousness". In Germany debate has progressed to how to further improve waste treatment technology, primarily for plastic packaging treatment. Options include high-tech waste separation to further reduce the burden on households, or improved household separation and bio-bin separation. Public acceptance and cost of the different options are under consideration (NABU, 2001 in Lorek *et al.*, 2001). The lack of recycling infrastructure in Mexico is a key reason for low waste recovery levels there. Composting structures have also lagged behind the development of recycling of packaging materials across most OECD countries, but are now becoming a major option for reducing the total volume of waste sent to disposal (OECD, 2001).

Deposit-refund systems to promote the collection, reuse and recycling of beverage containers, and product charges on batteries, cars, tires, and home appliances are also used in many OECD countries to promote the collection and recovery of post-consumer waste. In Germany, consumers pay 0.15 DM (0.076 € or US$0.07) on beer bottles and 0.30 DM(0.15 € or US$0.14) for bottled soft drinks. Because the share of refillable bottles has decreased continuously over the last years, consumers will also pay a deposit for recyclable beverage packaging (aluminium cans, disposable glass, plastic (PET) bottles) beginning in 2002. A similar system is under study in the Netherlands for small PET bottles and aluminium cans, but is heavily opposed by industry.

The expansion of waste recycling and recovery in OECD countries has not reduced the absolute volume of waste generated. A 1996 survey in OECD countries on the status of waste minimisation showed that although all responding countries prioritised waste prevention over any other waste minimisation method, and many countries had introduced targets for the absolute reduction of municipal waste generation, only a very few reported show actual progress in these directions. In general terms, most performance improvements in waste management have been due to efficiency gains (*e.g.* less waste per unit of GDP) and to increased recycling and recovery. In view of the projected 43% increase in municipal waste generation to 2020, additional efforts will be needed to reduce the material-intensity of consumer goods, to provide adequate waste recycling and recovery infrastructure and increase consumer education and information on waste avoidance(OECD, 2001). In a few countries, an additional dynamic is introduced by existing surplus incineration capacity, which results in pressures on the waste market. For economic reasons, incinerators try to contract as much waste as possible. If parties involved in waste incineration also take part in waste collection (like some Dutch municipalities), incentives for waste reduction initiatives are reduced (Wolsink and de Jong, 2000 in Correljé *et al.*, 2001).

Extended producer responsibility (EPR) is an emerging policy approach that is expected to help reduce post-consumer waste. EPR programmes give producers significant financial and/or physical responsibility for the treatment or disposal of post-consumer products. Through EPR, producers are encouraged to re-evaluate decisions concerning the materials that go into their products, production processes, product design, packaging, and marketing strategies in order to reduce the costs of take-back requirements. While the idea of EPR began with a focus on packaging waste, today there is an expanding range of EPR programmes in operation for a variety of products and waste streams. EPR has an important role to play in increasing resource efficiency by harnessing materials that would have gone to landfill,

while at the same time influencing product designers to reduce raw material inputs and to select materials that are easily reused and recycled (OECD, 2001*a*). EPR has been introduced in the Netherlands on a voluntary basis for some waste streams, such as scrapped cars, paper, glass, metals and some plastic construction materials. Legal foundations for EPR programmes have also been established for car tyres, batteries and durable household appliances. The German DSD is a type of legalised EPR.

Summary: policies to encourage waste prevention and recycling

Along with economic growth and changes in production and consumption patterns, per capita waste generation has steadily increased during the last twenty years in OECD countries. Higher environmental standards, stricter waste management policies, and cleaner technologies have contributed to reducing the environmental impacts of waste. However, while waste recovery (*e.g.* recycling or reuse) has increased considerably, reducing the rate of growth of waste for final disposal in some OECD countries, it has not been sufficient to reverse the trend of increasing volumes of waste destined for final disposal.

OECD countries have made significant progress in reducing the environmental impacts from different waste disposal systems. The installation and operation of waste disposal facilities are generally controlled by legal standards and requirements to minimise the emission of pollutants. The regulations applied to landfill sites and incineration plants have been strengthened in a number of OECD countries and emission standards and operating criteria have been implemented for municipal and hazardous waste incinerators. Stricter monitoring of waste treatment installations and methods is still necessary to ensure compliance with regulations (OECD, 2001*a*). In addition, more OECD countries are likely to introduce total or partial prohibitions against land filling mixed municipal waste and certain specified recoverable waste streams, such as tyres, paper, electronic scrap, etc. The goal is that only inert, non-hazardous waste should be land filled in the future, justified mainly by requirements to decrease the emission of greenhouse gases from landfills and the pollution of groundwater.

Reducing waste-related environmental problems in the future will require stronger implementation of existing waste recycling and disposal policies, but also changes in consumption and production patterns to reduce the total amount of waste generated. Both the Dutch (Box 9) and German cases illustrate the range of different types of policies that have been implemented in order to reduce waste generation: changes in the regulatory framework, the establishment of clear and high waste minimisation targets, economic instruments, extended producer responsibility schemes, household information and awareness raising, and investment in cleaner technology and the provision of

Box 9. **The Netherlands: Broad waste reduction policy**

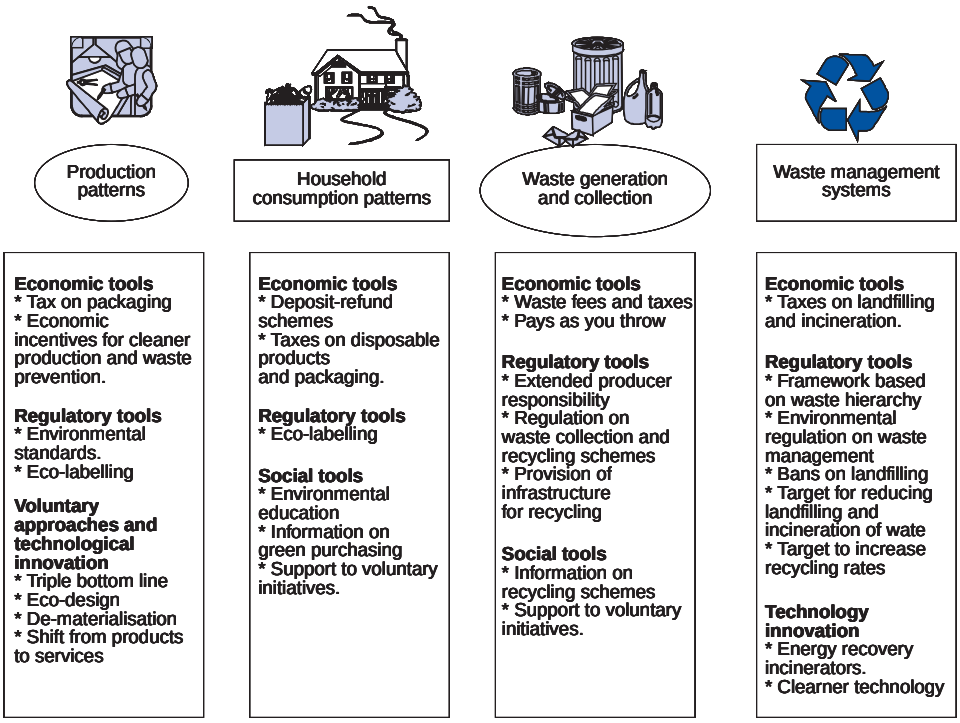
Four different kinds of measures are taken by the Dutch Government in order to stimulate waste reduction:

- Influencing consumers behaviour towards more environmentally friendly consumption patterns, and reduction of waste generation by prevention, re-use and recycling of products.
- Influencing product and service design towards waste reduction, including a reduction of packaging waste.
- Provision of an infrastructure for re-use, recycling and incineration/disposal of waste.
- Influencing waste markets by regulation, standard setting, influencing prices and specific buying policies of governmental organisations.

Source: Correljé *et al.*, 2001.

infrastructure. Different policy tools can be used at different areas of the product waste chain in order to reduce waste generation and improve waste recovery and disposal systems (Figure 4).

Figure 4. **Government policy instruments on waste prevention and waste management**



4.4. Conclusions on policies to promote sustainable household consumption

This section explored the role of governments in promoting sustainable household consumption. The existence of environmental externalities linked to consumption patterns means that governments have a role in ensuring that markets work properly to accurately reflect the environmental and natural resources costs, and in ensuring that public policy across all economic sectors promotes sustainability objectives.

Several parameters can be suggested to guide the design and development of sustainable consumption policies. It is resource use and environmental pollution that have to be brought to sustainable levels rather than the consumption of products and services as such. This means that government policies are needed to promote a shift in the *structure* of consumption and production so as to reduce environmental impacts. To do so in an efficient and effective way, governments should use a *life-cycle approach* in order to reduce environmental impacts along consumer product chains.

Sustainable household consumption would also be more effectively promoted through *integrated, cross-sector* policies that give consistent messages to consumers. The integrated approach is attractive for two main reasons. First, it responds to the fact that achieving sustainable consumption patterns is a multistakeholder task, and highlights the importance of government co-operation and interaction with the private sector, civic stakeholders and consumers. Second, it widens the number of options available

to reduce the environmental impact of consumption. Consistency, however, also means that greater emphasis needs to be given not only to policies explicitly designed to influence household behaviour, but also to other areas of public policy that influence consumption trends (energy deregulation, land-use policy). Slowing or redressing projected environmental trends from consumption will require that governments give more attention to consumer demand dynamics than they have in the past.

Within these broad parameters, governments can use a broad range of policy instruments to influence household decision-making. Experience in OECD Member countries, particularly in the areas of household energy and water consumption and waste generation, has contributed to identifying the relative effectiveness of economic, regulatory instruments, and social instruments. Several conclusions can be drawn from these experiences. First, the effectiveness of particular instruments depend to a large extent on the most important driving factors behind consumption patterns. For example, while "getting the price right" for consumer goods and services remains an important priority for sustainable consumption policies, user fees or taxes have an often weak impact where demand is relatively inelastic (at least in the short-term) because of lifestyle patterns or technological options, or where consumers perceive after-tax costs to be low. In these cases, regulatory standards to improve product performance or information-induced behaviour changes are likely to be more effective in bringing about change. Similarly, regulatory or social instruments have both strengths and weakness when applied to consumer behaviour.

The special consideration of social instruments – defined widely as information-based instruments designed to inform, raise awareness or promote dialogue about consumption patterns – highlights some important issues for sustainable consumption policies. I*nformation* is clearly one of the most important tools governments have to stimulate consumers to make environmentally sustainable consumption decisions. It is also the least intrusive. However, information is often hard to target and its impact is unpredictable and difficult to measure. Lessons can be drawn from experiences with information-based strategies and the application of different theories of consumer behaviour about the objectives information can fill (to raise awareness, motivate specific actions, put individual action into a wider, supportive context of community action for the environment) and about specific strategies for improving the targeting and delivery of information to different consumer groups.

Conclusions from earlier OECD work on the role of *education* for sustainable consumption are directly relevant to this discussion as well. In particular, that work has shown that consumers are most receptive to, and most able to act on, environmental information where there is a general level of environmental awareness. As a result, while the 1999-2001 Programme did not reopen this issue, it is important to reinforce the link between individual information campaigns on specific environmental issues (*e.g.* energy and climate change) and longer-term initiatives to improve environmental education and public awareness and decision-making skills.

Expanding public debate and involvement in policy development related to consumption patterns through participatory decision-making mechanisms can not only help improve policies (by providing consumer input on needs and priorities) but can also contribute to generally increasing consumer awareness and commitment to environmental issues. Currently there are only a few examples of participatory decision-making applied to sustainable consumption policies. However, this is an area which is likely to increase in importance in the years to come, particularly as governments adopt partnership or "multistakeholder" approaches to environmental policy development. More empirical experience would help determine when participatory decision-making mechanisms have clear advantages over other forms of public involvement in policy development.

The sector case studies of household consumption of food, tourism travel, energy, water and waste generation begin to explore some of the policy issues for promoting more sustainable consumption trends in these areas. Drawing on conclusions about the different driving factors behind consumption trends in each area, this analysis suggests that governments will achieve more by applying a combination of instruments than by using ad-hoc or isolated measures. This conclusion is particularly borne out in the areas of energy, water and waste, where governments have made most progress in slowing or redressing environmental impacts from consumption by using combinations of taxes or fees,

information to raise awareness or to hone specific skills (water conservation, waste recycling), product standards, and infrastructure provision to create the facilitating conditions for consumer to reduce their environmental impacts. The fact that environmental impacts will intensify in these areas, however, suggest that existing initiatives should be reinforced.

In the areas of food and tourism travel it should be noted that OECD analysis is among the first of its kind in these areas. As a result, there is very little empirical work on policies, with the exception of food (and more recently tourism) labelling. As a result, the policy options outlined for reducing environmental impacts in these two areas are tentative and would require deeper analysis of design and implementation issues, as well as probable environmental impact.

NOTES

1. Optimal consumption has been addressed by the literature through theories analysing the consumption function. These are well known in the macroeconomic debate and are based primarily on the microeconomic theory of consumer choice. They generally assume that observed patterns of consumer behaviour are attempts by rational consumers to allocate their preferences so as to maximise their individual welfare. In addition, they assume that consumption today is a function of the present value of current and future incomes at present.
2. See OECD (2001*e*), Information and Consumer Decision-making for Sustainable Consumption, ENV/EPOC/WPNEP(2001)16/FINAL. Available on the OECD website *www.oecd.org/env/consumption*.
3. See "Education and Learning for Sustainable Consumption", OECD, document COM/ENV/CERI(99)64, available on the OECD Website, *www.oecd.org/env/consumption*.
4. UNEP, 2000. Advertising for a Better World: Second International Expert Meeting on Advertising. Paris, June 2000. See also *www.uneptie.org*.
5. See OECD (2001*f*), Participatory Decision-making for Sustainable Consumption, document ENV/EPOC/WPNEP(2001)17/FINAL commissioned from Frans Coenen, Dave Huitema and Johan Woltjer, Centre for Clean Technology and Environmental Policy (CSTM), University of Twente, the Netherlands.
6. See OECD (2001*j*), Engaging Citizens in Policy-making: Information, Consultation and Public Participation (OECD, Paris) and OECD Public Management Policy Brief No. 10 (July 2001) available at *www.oecd.org/puma/citizens*.
7. OECD (2001*k*), Environmental Information in OECD Countries: Progress and Challenges, document ENV/EPOC/SE(2001)1 and ENV/EPOC/SE(2001)1/ADD.
8. See OECD 2001*f* for a fuller discussion of theoretical issues linked to participatory decision-making, and details on the case studies described here.
9. Remarks of the US Secretary of Agriculture Glickman, on the proposed Organic Standards, December 15, 1997, Release No. 0443.97 *www.usda.gov/news/release/*1997/12/0443.
10. See Castenmiller, 1988; Dahl, 1961; Jolles, 1974; Lindblom, 1968; Peattie, 1968; Checkoway and Van Til, 1978; Piven *et al.*, 1970; Van Deth and Leijenaar, 1994 in OECD, 2001*f*.
11. Personal communication with Mr. Gary Scavongelli, Agriculture Associate Deputy Administrator for Transportation and Marketing Programs, US Department of Agriculture.
12. See for example the Third Global Forum on Governance "Promoting Democracy and Development through E-government" (Naples, Italy, March 2001) [*www.globalforum.it*], and forthcoming work in the OECD Public Management Services [*www.oecd.org/puma*].
13. The OECD PUMA "Guiding Principles for Engaging Citizens in Policy-making" are available at *www.oecd.org/puma/citizens/*.
14. See a second case study on Household Tourism Travel: Trends, Environmental Impacts and Policy Responses, OECD document ENV/EPOC/WPNEP(2001)14/FINAL and past work on Individual Travel Behaviour [*www.oecd.org/env/consumption*].
15. For further information on sustainable building see Design of Sustainable Building Policies: Scope for Improvement and Barriers, OECD 2001, document ENV/EPOC/WPNEP(2001)5/REV1/FINAL, see *www.oecd.org/env/construction*.
16. See The Application of Local Taxes and Fees for the Collection of Household Waste [Association of Cities for Recycling (ACR), Brussels, 2001].
17. Range: 125 DM/ton to 850 DM/ton. At the moment, incineration in Germany is declining due to a drop in landfill prices in response to legislation, to take effect in 2005, requiring waste to be treated in an incineration plant or mechanical biological plant before it is land filled. Owners of landfills that will not be able to reach these standards have lowered waste disposal prices to fill their landfills before the cut-off date.

Chapter 5

POLICY RECOMMENDATIONS AND UNRESOLVED POLICY QUESTIONS

This report has documented important trends in household consumption. Pressures on the environment from household activities in OECD countries have increased in recent decades and are expected to continue to intensify to 2020. In particular, pressures from the household sector will arise from growing energy consumption, greater use of motorised transport and air travel, increases in household waste generation, and in some countries, growing water consumption.

National and local governments in most OECD countries have implemented policies to reduce the environmental impacts from household activities. Certain of these policies aim to influence household decision-making directly by encouraging energy conservation or waste recycling, for example. Others influence the options open to consumers in the market by imposing standards to increase the availability of environmentally benign goods, or by using taxes or fees to increase the relative prices of products with greater negative environmental impacts. Some of these policies have generated some positive changes in behaviour, but in general results so far appear to have been modest.

It seems clear that OECD consumers care about the environment. At the same time, however, environmental trends show that consumer concerns are not usually translated into action. The market and its driving forces are capable only in theory of matching the short-term supply and demands of goods and services, and long-term collectively desired outcomes in terms of sustainability. It is clear that because prices or information will never be absolutely "right", government intervention is needed. This also holds true where the time frame implied by sustainable development means that the market may take too long to signal socially efficient solutions. Governments must also address institutional failures that send the wrong signals to consumers and producers about the sustainability of their actions.

Governments could play a more active role in facilitating household action than they currently do. In particular, they will need to clarify objectives for household action, reinforce existing policies, ensure the provision of infrastructure, improve the co-ordination and consistency of policies, and support the initiatives of private sector and civic actors to help households develop less material- and pollution-intensive lifestyles. This chapter summarises general policy recommendations for addressing consumption patterns more coherently and identifies several questions concerning the design of cost-efficient and environmentally effective policies.

5.1. General framework conditions for promoting sustainable consumption

The examination of sector trends in household consumption, and particularly the driving forces that shape consumer preferences, gives rise to five framework conditions that are necessary if a critical mass of consumers – more than just the small market segment of highly motivated "green" consumers – are to make environmentally aware decisions. These five conditions are:

A price structure for consumer goods and services that internalises environmental costs and benefits. Many of the environmental externalities from consumption result from the fact that environmental costs are inadequately reflected in the price of key consumer goods or services (energy, waste, water). While price increases in some cases would not be sufficient on their own to significantly shift consumption patterns, they are a necessary step. Moreover, there are still broad corrections to be

made to the costs of natural resource use and pollution in OECD economies, in particular through the removal of perverse subsidies (*e.g.* to the agricultural sector, to environmentally damaging energy sources) and the elimination of pollution tax exemptions to industry. Attempting to shift consumer demand to environmentally sound products and services will have little net environmental effect as long as broad signals to energy and natural resource use are still in the wrong direction.

A policy and regulatory framework that makes clear the priorities and direction for change. OECD countries in general have a strong base of environmental protection legislation. The *polluter* and *user pays principles* provide a clear foundation for policies to promote sustainable consumption. In contrast, governments still need to more clearly define the objectives for household participation in environmental protection, and better communicate these to the public. OECD consumers are concerned about the environment, and believe they have a role to play in environmental protection. However, most consumers do not know how to prioritise their actions. Only through government (at national, state or municipal level) can OECD countries set and rank environmental protection objectives. In the first ten years after Rio many activities have been inspired by the qualitative concept of sustainable consumption. Moving forward now will require a more quantitative approach. While in general it would not be operational to translate the contribution of consumers to a "factor 4 or 10" overall target, sub-targets could be developed, based on sector-specific analyses (food, energy, transport, waste), showing how much direct behavioural change is to be expected from consumers *versus* environmental progress embodied in products and services. An important step in this direction is improving environmental impact data and indicators related to consumption.

The availability of a range of environmentally friendly goods and services. The shift in OECD economies towards greater reliance on services offers significant opportunity for creating less environmentally intensive consumption options through new consumer goods and services (personal "mobility packages"; leased carpets; re-use water plumbing). Nevertheless, there remains a tremendous potential for applying principles of design for the environment and for finding new ways to satisfy consumer needs at lower environmental costs. Resources should be targeted to those areas where life-cycle analysis identifies material flows or pollution from consumption, use or disposal patterns to have significant implications for the environment. Governments can quicken the pace of product innovation through a variety of measures, including taxes on pollution and waste, producer responsibility programmes, legislative standards for minimum product performance and using information and economic instruments to stimulate consumer demand for environmentally friendly goods and services.

Technology and infrastructure that include environmental quality criteria. Addressing the environmental challenges from consumption in the future will require adopting a wider "systems of provision" perspective of persistent environmental pressures. The systems of provision perspective reveals the close and mutually reinforcing links between physical infrastructure and production and consumption patterns, and underlines the importance of medium- and long-term development of technologies and infrastructures (energy, transport, waste) that will support sustainable household behaviour. In some areas (*e.g.* electricity generation) OECD countries are already more or less locked into fixed provision systems for the next few decades, which means that opportunities to increase the share of more sustainable technologies are years away. The lag time in technology and infrastructure development underlines the importance of setting clear environmental protection objectives. The implications of consumer demand trends for future infrastructure needs, and related environmental impacts, should be reinforced in current public policy planning.

An educational, learning and information environment that motivates and enables consumer action. To be able to make environmentally aware decisions, consumers must have both information and certain practical skills and knowledge (*e.g.* to be able to identify eco-labels, to sort waste, to consider the environmental characteristic of a product or service). They must also have individual and collective competencies for decision-making to engage in public debate on environmental protection. Currently, OECD countries suffer somewhat of an "information dilemma"; consumers have access to an abundance of information, but find very little of it useful for identifying environmentally sustainable

actions. Governments and other stakeholders must make progress in better targeting environment and consumption information and communicating it more effectively. Closely linked to this is the need to reinforce general environmental awareness and education in OECD countries. Despite widespread acknowledgement of the importance of education for attaining environmental sustainability in OECD countries, a major effort is still needed to integrate environmental and sustainability education into school curricula, continuing education, and professional and workplace training. An important part of information and education strategies should be to bring consumers "up to date" on current environmental priorities, particularly climate change.

5.2. Broad policy guidelines

Within the context of these five framework conditions, several broad guidelines for policies to promote sustainable consumption can be drawn from OECD analysis.

Shift the structure of consumption. There is broad consensus that policies affecting aggregate consumption, without differentiating for the type of consumption, are inefficient compared to policies that change the ratio of consumption to natural capital (decoupling consumption and resources and pollution). This means that "*consume differently*" (products and services requiring fewer resources and causing less pollution) is the preferred strategy. Consuming differently, however, can be linked to quantitative targets to reduce absolute impacts from consumption (*e.g.* CO_2 emissions).

Change both the "hardware" and "software" of consumption patterns. Promoting a shift in consumption requires changes both in available products and infrastructure – the so-called "*hardware*" for consumption behaviour (which requires actions by governments and business), and in consumer attitudes towards purchasing and using alternative goods the "*software*" of consumption behaviour. Analysis of the driving factors behind the development of specific consumption patterns is critical to determining the relative emphasis that needs to be given to changing the "hardware" and/or "software".

Use a life-cycle approach for determining points of policy intervention. Decoupling environmental pressures from economic growth, while continuing to satisfy human needs, requires a *life-cycle approach* to addressing consumption and production patterns, including encouraging more efficient resource use. As a result, policies to promote greater resource productivity must address both supply and demand, and may include economic instruments (*e.g.* green tax reform, removal of environmentally harmful subsidies and other market-based instruments), consumer and product information based instruments, regulatory instruments and voluntary approaches addressed to producers and consumers.

Upstream intervention is generally more efficient. Generally speaking, *upstream intervention* (economic and legal instruments targeted at producers) should be strengthened in order to reduce the effort needed by consumers. This prevents not only policies for sustainable consumption from becoming too complex for governments to handle (due to the multitude of products) but also governments from having to intervene too far in consumer choice. Financial or legal incentives targeted to resources are generally expected to prompt producers to look for alternative and more cost-effective ways of meeting consumer demand. Consumers would not be the primary target for these measures, except in their role of water and energy users. The effects of upstream policies will come to them via better or new products (due to innovation) or different prices for existing products (depending on price elasticities). However, where environmental impacts stem in large part from consumer use patterns (*e.g.* water and energy use), upstream interventions to increase efficiency may not be sufficient to off-set scale impacts of consumption. In these cases, additional measures directed to consumers will be required.

A combination of policies will be most effective in stimulating change. One of the key conclusions emerging from government successes in past years to slow (energy) or reverse (water) consumption increases is that a combination of policies is more effective than one instrument applied in isolation. This is because a combination of instruments compensates for the weakness of any one type (*e.g.* the long-term and unpredictable impact of social instruments; intensive implementation and enforcement requirements of regulatory instruments; weak influence or political or distributional obstacles to economic instruments). It is also because the signal that each type of instrument

communicates is felt in different areas of household decision-making (general environmental awareness and specific "action" information; legal efficiency standards embodied in household appliances; user fees), and in this way contributes to providing a consistent message to consumers about the direction (and possibly the magnitude) of change required at the household level.

Ensure integrated, cross-sector policies. Because of the range of economic, socio-demographic, technological and other influences that shape consumption patterns, promoting more sustainable patterns requires *integrated, cross-sector policies* that gives consistent messages to consumers. Despite this, household consumption today remains a peripheral issue in most OECD countries, treated in an ad-hoc fashion. Integration requires both a clearer set of policies explicitly designed to increase the environmental sustainability of household consumption in the key areas of energy, transport and waste (and water in some countries), but also more routine consideration of the potential impact on consumption patterns and environmental impacts of policies in other areas (land-use planning; energy deregulation; institutional aspects of water management). Governments should apply complementary measures (*e.g.* imposition of energy taxes where energy prices are falling through deregulation) where these policies, which are implemented to achieve other social objectives, are likely to have unacceptable environmental impacts.

It is sometimes argued that the implementation of firm financial and legal instruments is complicated by the fact that governments must meet several social goals simultaneously. However, exactly the same kind of difficult choices (for instance, involving trade-offs between short-term convenience or financial advantages and collective environmental gains) are part of some consumer decisions. Governments should be expected to better take into account the environment than individuals, since the gains are dominantly of a collective nature. It can also be observed that many pioneering decision-makers in firms or organisations have been motivated to voluntarily improve their products and services by the expectation of government intervention.

Promote and support initiatives by private sector and civic organisations. The preceding analysis shows that there are many options for influencing consumption patterns. This means that promoting more sustainable consumption will require a multistakeholder approach, including public policy, market innovation, NGO mobilisation of consumer groups, and voluntary initiatives by consumers themselves. While governments have a clear and important role to play in designing policy and framework conditions that stimulate all actors to make environmentally aware decisions, they have an equally important role in supporting and facilitating action by other stakeholders, for example by stimulating private sector innovation, including through environmentally sound public procurement policies, or by supporting efforts of non-governmental organisations to initiate debate and reflection on consumption trends and well-being in OECD societies.

5.3. Some unresolved policy questions

What additional scope for economic instruments?

Most environmentally related taxes are in fact already paid by households through taxes on the purchase or use of motor vehicles and fuels (petrol and diesel) and because exemptions and rebates currently granted to business mean that environmentally related taxes are levied almost exclusively on households and the transport sector.[1] These exemptions and rebates create inefficiencies in pollution abatement and undermine the application of the *polluter pays principle*. It is also true that environmental taxes are still not well targeted (they do not truly reflect environmental externalities) and they are unpopular. Taxes that would internalise external costs related to production and consumption patterns would, in many instances, be higher than existing ones, particularly for energy and transport. Additional taxes could also be required on other products. While ideally governments would look for opportunities to shift taxes (*e.g.* from labour to resources or pollution) rather than add additional taxes, questions still arise about the *distributional and social implications* of policies that would raise consumer prices for key goods and services. The scope for economic instruments in policies to promote more sustainable consumption needs additional consideration, including a complete assessment of distributional effects

(*e.g.* the secondary impact of compensation payments, tax reductions, induced employment effects, or the distribution of environmental benefits resulting from the tax).

Where can governments most effectively target and combine policies to promote sustainable consumption?

While experience and analysis give some indication of the relative effectiveness of different types of policies for influencing household and private sector decision-making, less has been learned about effective targeting of policies to different actors in the production and consumption chain. Depending upon the structural characteristics of the sector concerned policy signals may be imperfectly transmitted up and down the product chain. It is important now to look more closely at how information and price signals are transmitted for different consumer goods, and how these and other drivers affect consumer preferences. This approach will help identify where policy is likely to be the most cost-efficient, environmentally effective, or equitable, and which instruments should be applied. Progress is also needed in identifying and implementing effective packages of instruments that give consumers a consistent message on the sustainability of their consumption choices.

What potential exists for using social instruments to promote sustainable consumption?

Consumers are the most difficult economic actors for governments to reach. They are a large, dispersed and heterogeneous group and their behaviour in generating negative environmental externalities is varied. Governments also want to avoid excessive intervention in consumer decision-making. As a result, more attention should be given to the scope for different social instruments to promote sustainable consumption.

Co-ordinated voluntary initiatives – Co-ordinated voluntary approaches are currently targeted to the production sector but could also be used with households. Co-ordinated voluntary consumer initiatives, often under the aegis of an NGO or collection of civic groups, support consumers by providing information, encouragement (sometimes financial) and other types of support through small group meetings, the Internet, workshops, etc. (*e.g.* GAP International, the Norwegian Environmental Home Guard). Co-ordinated voluntary initiatives can be effective responses to information and motivational barriers to more environmentally friendly behaviour. While there is anecdotal evidence of the impact these initiatives have on individual consumers, not as much is known about their long-term impact on key consumption patterns and consumer attitudes toward environmental protection. Lessons could be drawn from existing initiatives on how governments can effectively support co-ordinated voluntary consumer initiatives, for example as information providers, facilitators, negotiators, regulators, or funders.

Participatory decision-making for sustainable consumption – Early analysis suggests that participatory decision-making mechanisms can, under certain conditions, ultimately strengthen environmental protection policy (by improving the quality of decision-making and/or building support for selected policies), but that they are best suited to certain types of decisions (OECD, 2001*f*). There are few empirical examples, however, of participatory decision-making applied to public policy related to consumption patterns. An open question remains whether public participation may also result in behaviour change by consumers.

Dealing with the "information overload" – Given both the obstacles and opportunities consumers face in finding and using information to reduce their environmental impacts, another important challenge is to improve the quality of information-based strategies targeted to households. OECD analysis has identified a number of strategies for successfully responding to rising consumer scepticism and perceived "information overload" and for choosing and designing information instruments and their delivery.[2] Ensuring accurate and reliable information in the market and prioritising public environmental information campaigns will be important in reducing the effort required of households to make environmentally friendly choices. Consumer demand for information on sustainable consumption practices will also increase if there is a market and policy environment which internalises environmental costs and benefits.

NOTES

1. See OECD 2001, *Environmentally Related Taxation in* OECD *Countries: Issues and Strategies*, and the OECD/EU database on environmentally related taxes and charges, available at *www.oecd.org/env/taxes-database*.
2. See OECD, 2001, Information and Consumer Decision-making for Sustainable Consumption [ENV/EPOC/WPNEP(2001)16/FINAL].

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Annex

MONITORING PROGRESS TOWARDS MORE SUSTAINABLE HOUSEHOLD CONSUMPTION PATTERNS

Household consumption patterns are a relatively new area of environmental impact and policy analysis. This explains in part what the discussion of consumption trends in the areas of food, tourism travel and household energy and water consumption and waste generation has shown: that in many cases data on household patterns are incomplete or unavailable at a level of aggregation that facilitates linking household behaviour to specific environmental impacts. There is a need to improve the data and related methodologies available for evaluating household consumption trends and for monitoring the level of success of policies to promote more sustainable patterns.

Environmental indicators are cost-effective and powerful tools for tracking environmental performance and for monitoring policy effectiveness. Over the past ten years academic institutions, governments and international organisations have made significant advances in developing indicators of household consumption trends. The OECD published a first compilation of indicators of sustainable consumption in 1999 (OECD, 1999).

This Annex describes the state of indicator development on sustainable consumption in the OECD. It outlines the framework and objective of the original core set of indicators published in 1999 and provides preliminary results drawn from the sector case studies on indicator sets for food, tourism travel, energy and water consumption, and waste generation.

OECD sustainable consumption indicators

The OECD set of indicators on sustainable consumption builds on earlier work by the Working Group on Environmental Information and Outlooks and was developed in close co-operation with the UN Division for Sustainable Development. The set of household consumption indicators relates closely to other indicator sets developed and used by the OECD, including the OECD Core Set of environmental indicators that includes indicators common to all OECD countries and various sets of sectoral indicators (*e.g.* energy, transport, agriculture) that supplement the Core Set.[1]

The indicators are intended to:

- highlight the links between changes in household consumption patterns and environmental issues, and in particular help to better understand how different driving forces and policy instruments interact and affect the environmental sustainability of consumption;
- contribute to the further integration of environmental and sustainability concerns into decisions and policies related to household consumption; and
- provide a basis for monitoring policy effectiveness and progress in moving towards more sustainable household consumption patterns.

The framework adopted to structure sustainable consumption indicators resembles that of other OECD work on sectoral indicators and is based on an adjusted pressure-state-response (PSR) model. The indicators are structured around three themes: environmentally significant consumption trends and patterns (indirect pressures and/or related driving forces); interactions between consumption and the environment (direct pressures, such as pollutant releases and waste generation, and resulting environmental effects, such as ambient air quality) and economic and policy responses (environmental damage and expenditure, fiscal instruments, etc.) (Table A1). Each indicator is evaluated for policy relevance, analytical soundness and measurability (data availability and quality) (OECD, 1999).

Data availability and quality vary greatly among individual indicators: while for some precise definitions and good quality data already exist (*e.g.* energy) for others additional conceptual and statistical work is needed (*e.g.* food, waste, travel). In some areas, data is not collected at the household level. The classifications used for environmental statistics also very often differ from those used in the national accounts framework, and make inter-linkages between environmental and economic indicators difficult (OECD, 1999).

Table A1. **Summary of the OECD indicator set by major consumption activity**

GENERAL TRENDS		
ECONOMIC TRENDS – Consumption expenditure shares of GDP – Saving rates (genuine savings) – Government consumption: public final consumption expenditure – Household consumption: private final consumption expenditure SOCIO-DEMOGRAPHIC TRENDS – Household size – Population structure	LAND RESOURCES – Urbanisation	REGULATORY INSTRUMENTS ECONOMIC INSTRUMENTS – Consumer price index – PAC expenditure (public, households) INFORMATION/SOCIAL INSTRUMENTS – Consumer attitudes – Public expenditure on environmental INFORMATION AND EDUCATION Public support to green NGOs
KEY HOUSEHOLD CONSUMPTION ACTIVITIES		
Transport and communications		
– Passenger transport – Passenger car stocks and ownership – Energy consumption by transport; consumption of road fuels – Communication tools	AIR – Air emissions from (passenger) transport NOISE Population exposed to road traffic noise	ECONOMIC INSTRUMENTS – Subsidies for transport – Road fuel prices and taxes TRADE ASPECTS (see below)
Consumption of durable and non-durable goods		
– Household consumption expenditure by type of good – Ownership of selected household commodities – Average length of product life	WASTE – Generation of household waste – Waste recycling rates NOISE Population exposed to neighbourhood noise from various sources	ECONOMIC INSTRUMENTS – Tax rates on natural resource – use vs. services TRADE ASPECTS – Composition of internationally traded goods – Ratio between imported and domestically produced goods in domestic consumption INFORMATION/SOCIAL INSTRUMENTS – Eco-labelled products
Recreation and tourism		
– Trends in international tourism: – international tourist receipts – Household consumption expenditure on recreation – Leisure travel	LAND RESOURCES – Land use patterns and conversions in sensitive areas – Land used for recreation – Access to green areas in cities BIODIVERSITY – Protected areas	– to be developed
Housing related energy and water use		
ENERGY – Total final energy consumption – Residential energy consumption – Green energy consumption	AIR – Air emissions from residential energy use	ECONOMIC INSTRUMENTS – Household energy prices and taxes – Subsidies for efficient building technologies and practices – Subsidies for energy saving devices
WATER – Household water consumption	WATER – Water abstractions for public supply – Waste water discharges by households – Population connected to waste water treatment plants	ECONOMIC INSTRUMENTS – Prices for public water supply – Charges for waste water treatment – Subsidies for water saving devices

Note: For the full set of indicators see OECD 1999. Shaded areas refer to indicators measured and published in OECD 1999.

The OECD indicator set is being reviewed to refine the proposed indicators and to further develop the set on the basis of the sector case studies, which identified additional indicators, and estimated the quality and accessibility of the necessary data. This helps to identify where current measurement tools are missing or need to be reinforced to support environmental impact analysis and policy planning related to household consumption patterns.

Indicator results from the sector case studies

1. *Indicators of household food consumption*

The OECD sustainable household consumption indicator set included two indicators related to household food consumption, *i.e.* consumption:

1. by type of food (fish, meat, etc.) in kilograms per capita, as a percentage of total consumption; and
2. by growing method and level of processing (share of processed food, share of organically grown produce over total agricultural produce consumed) as a percentage of total food.

The sector case study on Household Food Consumption (OECD, 2001*b*) reviewed these two indicators and identified an additional twelve indicators that could be used to quantify and compare the environmental effects from food consumption patterns in different countries over different years (Jungbluth and Frischknecht, 2000). These indicators are organised in five groups: production methods, transportation, purchasing, consumption levels, and household behaviour. An additional group of non-quantifiable indicators were also identified.

In identifying these 14 main indicators, emphasis was given to the following criteria: policy relevance for monitoring and priority setting; analytical soundness of the indicator with regard to the environmental effects; and measurability. Available methods to quantify the environmental impacts were also identified (OECD, 2001*b*).

Given current data availability and the importance of the measured impact, seven out of the fourteen indicators could be given priority (Table A2). These indicators cover important environmental impacts from household food consumption and it is possible to calculate them using available statistical databases. Some of the indicators proposed are also linked to other fields of household consumption or may intersect with indicator sets for sustainable development in other economic sectors. The indicator for eco-labelling, for example, might also be dealt with in indicator sets for agricultural production practice. Or the share of different modes of transportation to bring food products to the household might also be covered by an indicator describing the general impacts of private mobility. As a result, the indicators should be cross-checked with indicators from other fields of household consumption or for industries to ensure that there is no double counting of the same effects.

Table A2. **Indicators of the sustainability of household food consumption**

Production	1. Share and per capita availability of products from *e.g.* organic, integrated, conventional and greenhouse production
	2. Share and per capita consumption of food products with different degrees of processing (fresh, chilled, conserved, deep-frozen, pre-prepared, ready made, self-service and restaurant).
	3. Total energy use per capita and the share of different economic sectors (chemical industry, agriculture, food industry, retailers, restaurant, freight carriers, households) for meeting food demand
	4. Percentage of actors in the food chain that have implemented an environmental auditing or management scheme for their company
	5. Food products produced with genetically modified organisms
Transportation	6. * Per capita average distance and mode of transportation for domestic food transports
	7. * Per capita average distance and mode of transportation for imported food transports
Purchasing	8. Share of different eco-labels for food products sold in a country
	9. Types of food distribution (direct on farm, market, small shop, supermarket, fast-food, restaurants, etc.)
Consumption level	10. Per capita food availability (kg or MJ nutrition value per head) and share of different product categories (meat, vegetables, grains, fats, beverages, etc.) in food consumption
	11. Food availability against food consumption as an indicator for wastage or per capita food waste from waste statistics
Household behaviour	12. Per capita packaging wastes, recycling quotas and means of waste treatment for different materials like glass, paper, metals or plastics
	13. Mobility for home transport
	14. Distribution and energy use of household appliances for food storage and preparation.

Notes: Indicators 6 and 7 should be summed together for cross-country comparisons of the impacts of household food consumption patterns. In small countries the impacts due to imports are higher while in large countries domestic transport is important. Shaded cells are priority indicators.

Table A3. **Summary of the criteria for evaluating different methods for investigating the environmental impacts of food consumption and level of decision-making addressed by the methods (product = product and/or service)**

Methodology	Principle	Indicators and weighting principle	Data availability	Scientific background	Strength, purpose, level of decision making	Weaknesses
Cumulative energy requirements analysis (CERA), Process-Chain Analysis	Energy use summed up for all stages in the life-cycle of a product.	Aggregation (with different methods) of the primary energy content of energy resources used for the production of a product (*e.g.* MJ/kg).	In general good.	Long tradition with publications in different journals, like Energy Policy, and published guidelines for the methodology.	Easy to apply; single indicator and good databases available. Analytical tool that can be used for information of consumers	Energy is not necessarily a good indicator for all types of environmental impacts caused in the life-cycle (*e.g.* agriculture outputs).
Input-Output Analysis (IOA)	Economic flows among different sectors of economy are used to calculate energy (or environmental) intensities for goods from single sectors.	Primary energy content of energy resources used (pollutants emitted) in a sector per economic value created (energy or environmental intensity, *e.g.* MJ/CHF).	Good in some countries (*e.g.* USA, Germany, The Netherlands), poor in others (*e.g.* Switzerland).	Developed as a tool for economic research. Publications in different journals.	Easy to apply for the analysis of a full range of household activities.	Not specific for different environmental impacts and not suited for decisions about single products because of high level of aggregation.
Hybrid-Analysis	Combination of input-output and process-chain analysis to calculate the energy intensity of consumed products.	Primary energy content of energy resources used per household expenditure for a certain product (energy intensity, *e.g.* MJ/CHF).	High initial effort in a country. Good database for the Netherlands.	Developed mainly in the Netherlands.	Easy to apply for the analysis of a range of products.	High initial effort in a country for input-output database.
Life-cycle Assessment (LCA)	Investigation of environmental impacts over all stages in the life-cycle of a product.	Different methods for characterisation of elementary flows to impact or damage categories based on their effect or damage potential (*e.g.* global warming potential per kg) or on political targets.	Good background data for energy processes, different case studies, but not a full survey of all food products.	Different journals, LCA group within SETAC, LCA network Food, ISO-standard.	Structured and flexible approach for inventory and weighting principles. Detailed analysis of environmental impacts	High data demand for single products. Some methodological problems while accounting for the impacts of agriculture.
Material-Flux Analysis (MFA)	Assessment of material flows or energy uses due to certain activities in a defined system.	Analysis for indicator elements or energy use, regarded as environmentally relevant, and aggregation of chemical substances with the content of the indicator element (*e.g.* total C mass from CO_2, CH_4, etc.).	Data from different statistics and information about production processes. Data availability depends on the case study investigated. No specific background data for MFA.	Several working groups in *e.g.* Germany, Austria, Switzerland.	Easy to communicate, good for a system analysis and flexible in terms of weighting environmental problems.	Equivalence of different emissions with unequal environmental impacts. No clear procedure to choose indicator elements and to assess their environmental relevance.

Table A3. **Summary of the criteria for evaluating different methods for investigating the environmental impacts of food consumption and level of decision-making addressed by the methods (product = product and/or service)** (*cont.*)

Methodology	Principle	Indicators and weighting principle	Data availability	Scientific background	Strength, purpose, level of decision making	Weaknesses
WASP/WASD and other transport-related methodologies	Assessment of transported distances over some or all stages of the life-cycle of a product.	All modes of transport are aggregated Indicator is the total distance of freight movement in kilometres or indication of tonne-kilometres.	No good public databases for different transport steps. Information relatively easy to obtain from producers.	No standardised methodology. Mainly developed in Germany and Sweden. Different case studies for food products.	Easy to communicate. Yardstick for the analysis of transport related impacts due to globalisation.	Transport trends do not provide a full picture of the environmental impacts caused. Different modes of transportation not distinguished.
Material Intensity per Service Unit (MIPS) or Ecological Rucksack (ER)	Investigation of materials moved over all stages in the life-cycle of a product.	Aggregated mass flows. All masses are added non-weighted in 5 categories (*e.g.* kg/kg product).	Case studies mainly from Germany. No good public databases.	Mainly developed by the Wuppertal-Institute in Germany.	Useful as a proxy indicator to communicate the necessity for a change of consumption patterns and to monitor progress in dematerialization. Single indicator for mass and energy	Fixed weighting scheme that does not reflect the environmental impacts caused by the masses moved. Considers only inputs, but no outputs to the environment.
Ecological Footprint (EF)	Investigation of actual and theoretical land uses over the full life-cycle of certain activities.	Calculation of the theoretical area necessary to deliver the demanded goods and services with data for direct land use and indirect assessment of the area for absorbing CO_2 emission from fossil fuel use.	Case studies mainly not specific for food consumption. Harmonised data on the level of nations.	Email discussion list. Articles in Ecological Economics.	Easy to communicate as a proxy indicator for sustainability.	Fixed weighting scheme that disregards the emissions of some toxic substances that are assumed to be unsustainable.

The direct quantitative measurement of the environmental impacts due to household food consumption patterns is not easy. Different methods can be used to estimate generic indicators. As a result, it remains difficult to compare results for different countries in detail, as this would require original calculations of environmental impacts for each country. Today, it is also difficult to compare with precision impacts over a time period, because this requires that all underlying calculations of environmental impact be made for different years separately in order to also monitor improvements of *e.g.* production methods. Additional research work is required.

Further research is also needed on the indicators and methods that could be used by OECD decision-makers in order to generate generic quantitative factors that can be used to calculate the environmental impacts based on statistical data for different countries. Jungbluth and Frischknecht review several different methodologies and their utility for developing generic factors that later can be multiplied with statistical data to compare the environmental impacts or energy uses of consumption patterns quantitatively: Cumulative Energy Requirements Analysis (CERA); Input-Output Analysis (IOA); Hybrid Analysis (HA); Life-Cycle Assessment (LCA); Ecological Footprint (EF); Material Intensity per Service Unit (MIPS) or Ecological Rucksack (ER); Material-Flux Analysis (MFA); and Transport related methods (OECD, 2001*b*) (Table A3). For the moment, calculations for energy use with Cumulative Energy Requirements Analysis (CERA), Input-Output Analysis (IOA), Hybrid Analysis (HA) or Life-Cycle Analysis (LCA) would be the easiest approach for calculating generic factors for the indicators proposed for tracking household food consumption. It would subsequently be possible to extend these indicators using other methodologies that quantify the environmental impacts more accurately (*e.g.* LCA).

2. *Indicators of household tourism travel*

The OECD sustainable household consumption indicator set included several indicators related to household tourism travel:

1. passenger transport
2. passenger car stocks and ownership
3. energy consumption by transport; consumption of road fuels
4. trends in international tourism
5. household consumption expenditure on recreation
6. leisure travel.

The sector case study on Household Tourism Travel (OECD, 2001*c*) used a number of additional indicators to describe tourism travel. One major difficulty in addressing the environmental impacts from tourism related travel is collecting aggregate data at the OECD level on travel distances, modes and occupancy levels. Existing international data sources such as those collected by the OECD and the WTO focus on measuring the economic activity of the sector (*e.g.* volume of trips, spending, use of lodging facilities, etc.) and are only partially useful for assessing the environmental performance of travel. Data is collected on origin of tourists and visitors arriving at the border or different forms of lodging, and can be used as a rough proxy for distances travelled. Furthermore, some data is collected on the number of international air arrivals that can be used to approximate modal split. The two, however, are not comparable and at present, it is difficult to match modes to travellers and their origin/destination.

International comparisons of tourism trends and environmental impacts are currently difficult to make. National sources of data treat tourism-related travel statistics differently. Domestic tourism, with its relatively large share of automobile use, is difficult to disaggregate from national transport statistics without the use of detailed (and periodic) travel surveys. Countries with these data can provide fairly detailed insight into the environmental impacts stemming from domestic tourism travel. Many can also provide detailed information on international travel by nationals, although this information tends to be less comprehensive (*e.g.* some surveys do not record travel distances beyond national borders). Definitions and assumptions used in travel data also differ between countries. For one survey "holiday" travel may be measured only if the trip lasts 4 or more days, while for another all trips requiring an overnight stay may be recorded. Even within countries definitions can vary from survey to survey. Finally travel surveys vary in their ability to capture long-distance trips, which are the most relevant for measuring tourism activity. Surveys focusing on travel occurring within one representative date will likely under-report the overall scale and scope of long-distance travel. Care must be taken in the selection and treatment of data sources so as to ensure that they serve as a reasonable basis for describing the scope and scale of impacts stemming from tourism travel.

The indicators in Table A4 describe the frequency, distance and mode of household tourism travel. Combined with average energy use and emission factors (CO_2, NO_x, etc.) for the different transport modal shares this information can provide quantitative estimates of the environmental impact of tourism travel patterns. It is more difficult to quantitatively estimate at an aggregate level the separate contribution of tourism travel to other environmental impacts of personal travel, such as land-use, biodiversity and noise pollution, although locally these effects may be acute and directly traceable to tourism travel activity (*e.g.* road construction and run-off in fragile mountain or coastal areas).

Table A4. **Indicators of the sustainability of household tourism travel**

	Indicator
Domestic tourism	1. Domestic tourism arrivals as a percentage of total arrivals 2. Frequency of departure 3. Estimated distances travelled 4. Estimated average distance per trip 5. Tourism modal split (car, air, rail, coach)
International tourism	6. International tourism arrivals as a percentage of total arrivals 7. Gross departure rate (number of trips/population) 8. Estimated distances travelled 9. Estimated average distance per trip 10. Percentage of long-haul *versus* intra-regional travel 11. Tourism modal split (car, air, rail, coach)

3. *Indicators of household energy and water consumption and waste generation*

The OECD sustainable household consumption indicator set included several indicators related to household energy and water consumption and waste generation. The sector case study on Household Energy and Water Consumption and Waste Generation (OECD, 2001*d*) identified additional indicators. These are described below by theme.

Data availability and measurability vary greatly among individual indicators for household consumption; while for energy and water good quality data already exist, additional conceptual framework and statistical work is still needed in the area of waste, especially at the household level. Data is often aggregated in clusters such as "public water supply" or "municipal waste", which includes not only households but also other sectors (*e.g.* small business, waste from public areas, etc.). Classifications at the national level also often differ from country to country, which makes international comparisons difficult. Additional progress is also needed in identifying data and methodologies for measuring social indicators, for example to measure environmental awareness and household behaviour towards the environment.

3.1. *Indicators of household energy consumption*

Good quality data is available and measurable for household energy consumption in many OECD countries. The 1999 OECD set of indicators included *total final energy consumption intensity* and *structure*, *air emissions from residential energy use* (CO_2, NO_x, SO_x), and indicators of economic and policy responses such as *energy prices*, *subsidies and taxes* for households. In addition, the case study on Household Energy and Water Consumption and Waste Generation used other indicators for which data currently are available, such as *energy fuel mix* and *energy efficiency*, and identified others that have been explored in a few countries, but for which data is not yet collected periodically. These indicators are: household energy use per activity, *household ownership of electronic appliances*, *market penetration of energy-efficient appliances*, *household green energy demand*, *eco-labels*, etc. (Table A5). Further work is needed to develop social indicators to measure environmental awareness (*e.g.* the willingness to pay a premium for "green" energy).

3.2. *Indicators of household water consumption*

Household water consumption data is of good quality and available in many OECD countries, which allows the development and measurement of a number of indicators. Many of these are commonly used to analyse household water consumption patterns and interactions with the environment, for example, *abstractions* (*underground and surface*) *for public water supply*, *water consumption structure and intensity by sector*, *wastewater discharges by households*, etc. Other indicators are less frequently used, but could provide useful information related to household consumption patterns, including *public water losses by leakage* (an indicator of inefficiency), *availability and penetration of water saving devices*, *environmental awareness and water saving behaviour*, etc. New indicators used in the case study on household water consumption used that are highlighted in Table A6.

The main obstacle for developing household water consumption indicators is that data on the household sector is often aggregated in clusters such as "public water supply", which includes other sectors (*e.g.* commerce, institutions and small business). Countries also use different data categories and aggregation methodologies which frustrates comparison at the international level. For example, Germany and the Netherlands do not include agriculture when accounting for the sector breakdown of water consumption, while Mexico often excludes power generation from water consumption statistics.

Table A5. **Indicators of the sustainability of household energy consumption**

Energy	Indicator
Consumption	Total final energy consumption per capita
	Total final energy consumption by economic sector
	Household energy use per activity (space heating, hot water, lighting, cooking, etc)
	Energy intensity per unit of GDP
	Source of energy generation (fuel mix) (nuclear, oil, coal, gas, solar, etc)
	Residential green energy consumption
Environmental Impact	Air emission from residential energy use (CO_2, SO_X, NO_x)
	Water pollution
	Waste generation (Nuclear waste)
Policy and Economic Responses	Energy prices for households
	Energy taxes and subsidies for households
	Energy Efficiency
	Household electronic appliance ownership
	Market penetration of energy-efficient appliances
	Eco-labels for energy efficiency
	* *Household demand for green energy*
	* *Environmental awareness and energy saving behaviour*

* *indicators that need to be better developed.*
Source: Shaded cells are new indicators used in the case study (OECD, 2001*d*)

Table A6. **Indicators of the sustainability of household water consumption**

Water	Indicator
Consumption	Structure of water consumption by sector
	Household water consumption per capita
	Household water use per activity (flushing, hygiene, washing, food preparation, etc).
	Water losses by leakage
Environmental Impact	Water abstractions for public supply (underground or surface)
	Percent of the population connected to waste water treatment systems (primary, secondary, tertiary)
	Household waste water discharges (Water pollution by households (BOD))
Policy and Economic Responses	Cost of household water supply and treatment
	Household water prices, taxes, subsidies, fees
	Household water metering
	* *Availability and use of water efficiency (water saving devices)*
	* *Environmental awareness and saving water behaviour*

* *indicators that need to be better developed.*
Source: Shaded cells are new indicators used in the case study (OECD, 2001*d*).

3.3. *Indicators of household waste generation*

The indicators used in the case study on Household Energy and Water Consumption and Waste Generation include waste generation by principal sectors, the composition of municipal waste generation, generation intensity, air pollution, recycling rates, waste management charges, and the availability of waste management facilities, etc. (Table A7). The OECD Working Group on Waste Prevention and Recycling (WGWPR) is currently working on indicators for waste prevention.[2]

Analysis of household waste generation trends and interactions with the environment is currently based primarily on municipal waste generation data. This provides an imprecise picture of trends at the household level because municipal waste also includes waste generated by the public and the commercial sectors. International comparisons of household waste generation and trends are also difficult because national data sources treat municipal waste statistics differently. Currently, it is also difficult to collect environment impact data at the national and at the OECD level on municipal waste, in part because environmental impact will depend on the type of waste

Table A7. **Indicators of the sustainability of household waste generation**

Waste	Indicator
Generation	Waste generation by principal economic sectors Municipal waste generation per capita Household waste generation per capita Composition of municipal and household waste generation
Environmental Impact	Air pollution (GHG emission) Recycling rates Waste management (landfilling, incineration, composting, recycling)
Policy and Economic Responses	Fees and taxes for household waste collection Charges for waste disposal Infrastructure for recycling **Environmental awareness on waste prevention* Households participation in recycling schemes **Indicators for waste prevention*

* *indicators that need to be better developed.*
Source: Shaded cells are new indicators used in the case study (OECD, 2001*d*).

treatment technology used and the site-specific characteristics of the country or area. For example, environmentally sound landfills may be the best waste management option in a land-rich country (USA, Canada, Australia) but not in smaller, more densely populated countries (*e.g.* EU countries).

NOTES

1. For more information on OECD Environmental Indicators see *www.oecd.org/env/consumption*.
2. See OECD Workshop on Waste Prevention: towards Performance Indicators, Paris, 2002. [ENV/EPOC/WGWPR(2002)1].

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