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Integration of Environmental Considerations at Different Levels of Decision Making

Environmental Ressource Management

Miljøstyrelsen
Miljø- og Energiministeriet

The Danish Environmental Protection Agency will, when opportunity offers, publish reports and contributions relating to environmental research and development projects financed via the Danish EPA.

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The reports are, however, published because the Danish EPA finds that the studies represent a valuable contribution to the debate on environmental policy in Denmark.

CONTENTS

1 INTRODUCTION

1.1 CONTEXT

ERM has been contracted by the Danish Environmental Protection Agency to undertake a study:

> *Developing a methodology for assessing progress with integration of environmental considerations at different levels of decision making (micro, meso, macro).*

The importance of integrating environmental considerations into sectoral policy and wider decision making is a relatively new concept of environment policy. It was a key issue at the United Nations Conference on Environment and Development ('Earth Summit', Rio de Janeiro, 1992) which highlighted the need for environment to be integrated into the development processes. Agenda 21 (Chapter 8) describes objectives and activities for integrating environmental and developmental decision making at all levels and in all ministries. It also emphasises the need for everyone to take responsibility and act to change their behaviour, and in particular their production and consumption patterns. However, Agenda 21 only describes activities in a generic manner, and emphasises the need to adapt these to national and regional circumstances and conditions. It encourages research to improve the understanding of interactions between social, economic and environmental considerations and to assist with policy decisions. It also recognises that national institutional capability and capacity may need to be strengthened to facilitate integration at all levels of decision-making and implementation.

Partly in response to Agenda 21, the concept of integration is being promoted by the EC, EEA and Member State environment agencies as a key policy objective. At the European level the main interest is in promoting the concept and developing criteria for assessing progress. At the Member State level there is interest in developing systematic methodologies for assessing progress towards integration, and understanding how policy tools can be used to integrate environmental considerations in decision making processes to promote sustainable development. In the most basic terms the aim is to influence the supply and demand of goods and resources, to reduce adverse environmental impacts, and thereby move towards a position of sustainable production and consumption. Ultimately, market based actors should be aware of the impact of their actions and be in a position where the parameters underlying their decisions point towards the most sustainable option.

1.2 PURPOSE

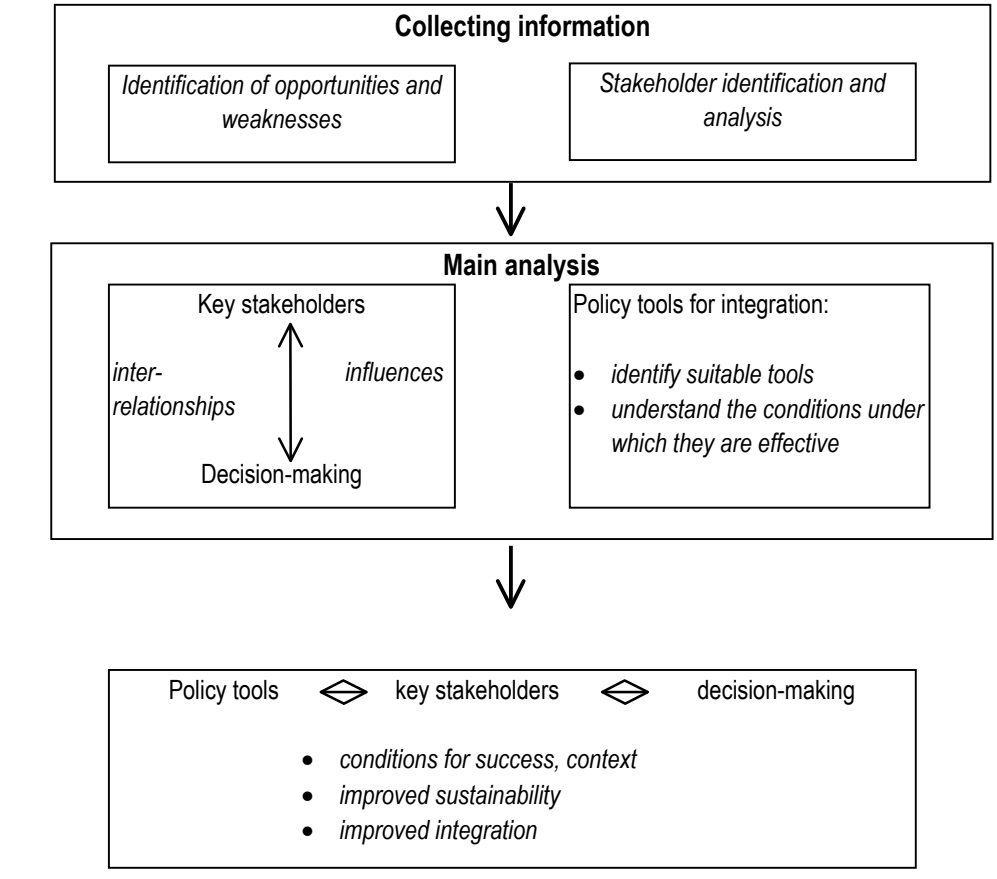
The purpose of this study has been to develop a methodology for assessing the progress towards integration. The methodology presented here provides a structured approach for sectoral agencies to consider gaps in the current

policy framework and to provide incentives for market based actors to make more sustainable consumption and production decisions. This framework will help to identify additional tools which could be used to progress integration, to establish the necessary conditions for their effective implementation and to identify the key stakeholders to be involved in the process.

1.3 THE APPROACH

The methodology was developed through an analysis of decision making in four sectors: agriculture, energy, transport and industry. The approach taken was to understand the context for integration in Denmark, analyse the relationship between key market based actors and the frameworks they operate within, and develop a simple process for assessing progress and moving towards integration. This approach is outlined in *Figure 1.1*.

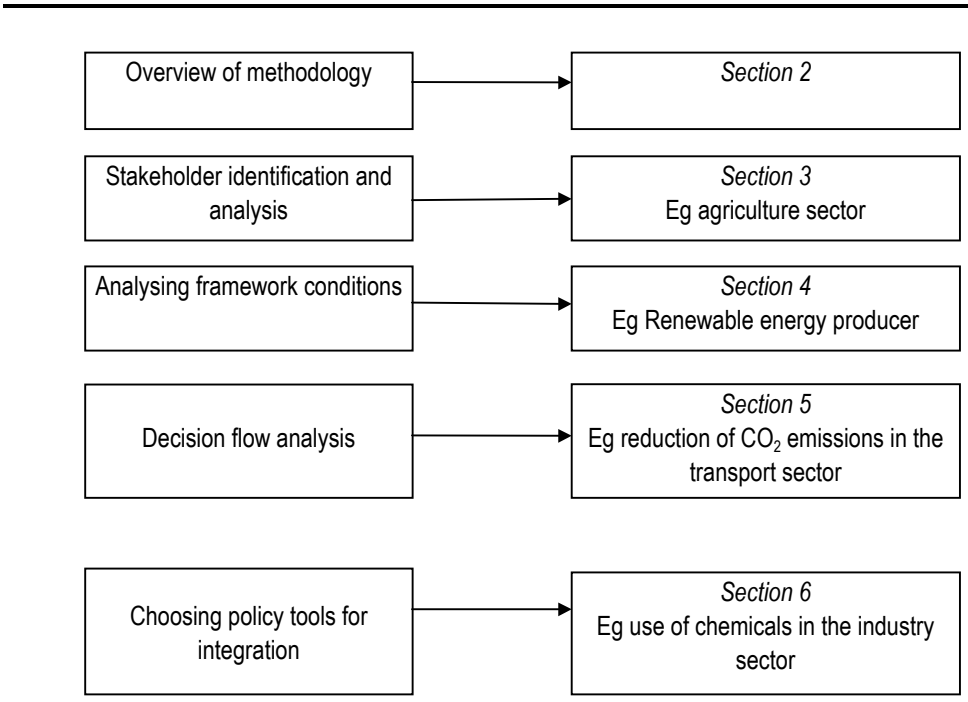
Figure 1.1 Study Approach



1.4 STRUCTURE OF THE REPORT

The methodology is presented in *Section 2*. The remainder of the report is illustrated in *Figure 1.2* and presents further explanation of key stages of the methodology illustrated with selected results from the sectoral analyses.

Figure 1.2 Structure of the Report.



- *Section 3* describes the stakeholder analysis in terms of different actors, types of decisions and the parameters which affect these decisions.

- *Section 4* provides an overview of the framework conditions for decision making.

- *Section 5* describes the decision flow analysis and highlights the key framework conditions for successful implementation of integration tools.

- *Section 6* presents a series of generic tools or instruments which could be used in many sectors and describes the type of actor and decision they are aimed at, the detailed requirements and wider framework conditions for effective application.

A full description of the sectoral analyses are presented in a series of Annexes:

- *Annex A: Agriculture*
- *Annex B: Energy*
- *Annex C: Transport*
- *Annex D: Industry*

2 *A METHODOLOGY FOR INTEGRATING SUSTAINABILITY IN SECTORAL POLICIES*

2.1 INTRODUCTION

This methodology provides a structured, systematic approach for considering how the integration of environmental considerations into decision making by key stakeholders at different levels could be improved, and the policy tools which might be suitable for facilitating this. It should be noted that there are no existing widely agreed and clearly defined processes or methodologies for evaluating, measuring or improving progress towards integration, and the methodology developed here should be seen in that context.

The methodology is based on identifying the following aspects of decision making:

- Who are the key actors in each sector?
- What are the key decisions that they are or could be making that have an impact on the environment?
- What are the parameters which determine the outcome of their decisions?
- What is the policy framework in which they are making such decisions and how does this influence the parameters?
- What are the gaps in the current use of tools to address the parameters?
- What additional tools could be used to promote the integration of environment into decisions by addressing current disincentives and promoting more sustainable options?
- What are the conditions for effective implementation of such tools, both specific to each tool and to the wider policy framework?

By following this approach it is possible to understand the driving forces behind consumption and production decisions by market based actors and how the development of sectoral policy and related tools can provide incentives for and facilitate more sustainable choices.

There are two stages in the methodology, summarised below and described in the following sections:

1. Identify areas where integration could be improved, involving:

    - Identify current opportunities and weaknesses
    - Identify the stakeholders in the target area
    - Conduct a decision flow analysis for key stakeholders

2. Identify the policy tools that would be suitable for improving integration, involving:

    - Consider the parameters and framework conditions

- Short-list potentially useful tools for improving integration
- Discuss the use of tools with key stakeholders

2.2 *STAGE ONE: IDENTIFYING IMPROVEMENT AREAS*

The purpose of the first stage is to identify the areas that might benefit from improved integration of environmental considerations into decision making processes, and understand the context of these areas and the key stakeholders involved.

2.2.1 *Identify Opportunities to Improve Integration*

The first step is to identify those areas where integration would assist in addressing environmental degradation. This could be approached by identifying known areas of weakness or by capitalising on areas of opportunity.

Areas of weakness, in terms of environmental performance, are likely to be well known and understood by sectoral agencies. However, the challenge is to address the fundamental issues for sustainability - often driving forces such as overall demand management and resource efficiency - rather than pressures and ambient conditions (states). By understanding the general context or framework conditions for integration, it will be possible to identify the areas where integration would assist in improving environmental protection and overall sustainability. Working in conjunction with the EPA could facilitate the process. *Box 2.1* presents a list of potential criteria for assessing the current status of integration at the sectoral level and identifying areas of weakness. Wider stakeholder involvement, particularly involving stakeholders who have not so far been very pro-active, is a useful part of this identification process.

The alternative approach is to improve integration where opportunities are presented by relevant activities within the sector. This might include major policy reforms, at the local/regional or national level, or the development of industry/sectoral environmental initiatives, such as voluntary commitments to improve environmental performance.

In either case it should be recognised that integration *per se* is not leading the process - there must be another process or activity that is taking place and integration is a way of improving the sustainability of that process/activity and its outcomes.

Output:
- *Identified and defined target areas within different sectors e.g. more sustainable consumption patterns, shift from conventional production techniques to more eco-efficient products*

Box 2.1 Criteria for Assessing Integration at the Sector Level

A	Institutional Integration
1	Are environmental objectives (eg. Maintenance of natural capital and ecological services) identified as key sectoral objectives, and as important as economic and social objectives?
2	Are synergies between economic, environmental and social objectives maximised?
3	Are trade-offs between environmental, economic and social objectives minimised, and transparent?
4	Are environmental targets (eg. on eco-efficiency) and timetables agreed? And are there adequate resources allocated to achieve the targets within the timetables?
5	Is there effective horizontal integration between the Sector, Environment and other key authorities eg. Finance and Planning?
6	Is there effective vertical integration between EU, National, Regional and Local administrations, including adequate public stakeholder information and participation measures?
B	**Market Integration**
7	Have environmental costs/ benefits been quantified?
8	Have environmental costs been internalised in market prices through market based instruments?
9	Have revenues from these market based instruments been directly recycled to maximise behaviour change?
10	Have revenues of these market based instruments been directly recycled to promote employment?
11	Have environmentally damaging subsidies and tax exemptions been withdrawn or refocused?
12	To what extent have incentives been introduced which encourage environmental benefits?
C	**Management Integration**
13	To what extent have environmental management systems (EMS) been adopted?
14	Is there adequate strategic environmental assessment (SEA) of policies, plans and programmes?
15	Is there adequate environmental impact assessment (EIA) of projects before implementation? Is the purchasing of 'green' supplies by public institutions encouraged?
16	Is there an effective 'green' procurement (supplies) programme in public and private institutions?
17	Is there an effective product and service programme that maximises eco-efficiency (eg via demand side management; eco-labelling; "products to services" etc.) ?
18	Are there effective environmental agreements that engage stakeholders in maximising eco-efficiency?
D	**Monitoring/Reporting Integration**
19	Is there an adequate sector/environment reporting mechanism that tracks progress with the above objectives, targets and tools?
20	Is the effectiveness of the policies and tools for achieving integration evaluated and reported and the results applied?

Source: EEA 1999

2.2.2 Identify Stakeholders

Once the target area has been identified, the next step is to undertake a stakeholder identification and analysis to:

- identify all stakeholders, especially those that are particularly active but also those that are currently not involved;
- determine the level at which they operate, whether micro, meso or macro as outlined in *Box 2.2* (for further explanation see *Section 3*);
- consider the policy drivers and pressures that they respond to and generate, bearing in mind the generic framework conditions for the use of policy tools for integration (see *Box 2.3*); and

- map the relationships between them, both within and between the three levels.

Box 2.2 *Levels of Decision Making*

- *Micro-level*: innovative actors (households and companies) bringing about economic change. Policy can support them by promoting and stimulating environmental innovation drivers at the company level or through fiscal incentives and awareness raising at the household level.
- *Meso-level*: institutions in the business environment and efficient network structures linking companies, consumers, governmental organisations and intermediary institutions facilitating a change in economic structures. Policy has the task to re-structure business oriented institutions and stimulate re-orientation.
- *Macro-level*: Policy makers setting the regulatory and fiscal framework and environmental guidelines which must provide adequate incentives for integration.

Source: Kundte and Liedtke (1999) *Companies' and Sectors' Path to Sustainability*. Wuppertal Paper

The stakeholder analysis investigates the range of decisions that key stakeholders are taking, and those that they could take, that influence the sustainability of production or consumption within that sector. It should consider the specific context of the sector including, where required, looking at sub-sectors (eg dairy farming within the agriculture sector) or at a user groups (eg company car fleet operators within the transport sector) or those actors who have not been fully involved to date (eg SMEs). *Section 3* presents an example of a generic stakeholder analysis and illustrates the approach further with an example from the agriculture sector.

Outputs:
- *Identified and defined the key stakeholders for key integration opportunities/gaps*
- *Understanding of their interrelationships*
- *Understanding of the framework in which they operate and their own sphere of influence*
- *Identified the range of decisions that stakeholders are making*

2.2.3 Conduct Decision Flow Analyses

For the key stakeholders, conduct a decision flow analysis to identify:

- how the decisions they are making influence the sustainability of their activities/outcomes;
- the parameters which determine the outcome of those decisions; and
- the policy tools and mechanisms that are currently being used to influence those parameters.

The analysis should take account of the specific context in which the stakeholder is acting (eg businesses as users of transport services, and businesses as providers of transport services, businesses as manufacturers of vehicles). It should also consider the framework conditions and how they relate to the parameters for decision making.

Section 5 describes how to conduct a decision flow analysis and presents examples from each sector as a one page flow chart. This form of presentation provides a useful overview of the different aspects of the decision flow analysis and may highlight any gaps in the current use of integration tools.

Outputs:
- *Decision flow analyses for key stakeholders in the context of relevant decisions*
- *Understanding of the experiences with the policy tools that are currently being used*
- *Description of the framework conditions that affect the stakeholders in decision making*

2.3 STAGE TWO: IDENTIFYING SUITABLE MECHANISMS

The purpose of the second stage is to carry out a gap analysis and develop a strategy for specific environmental issues and stakeholder groups based on identifying which parameters of their decisions are not currently being addressed, the type of integration tools which might be effective and the framework conditions within which they could be implemented successfully. The main task here is to understand how these tools would be most effective in the context of the target area and decision making by the key stakeholders.

2.3.1 *Consider Parameters and Framework Conditions*

The parameters and framework conditions are the main factors determining the suitability of policy tools to improve integration in the target area.

The wider framework conditions place constraints on the effectiveness of policy tools. An analysis of the wider framework conditions as they apply to the target area will provide an understanding of which tools are suitable to the framework context or how the framework itself could be addressed (if possible taking into account limits on jurisdiction, responsibility and influence). This analysis should build on the general consideration of framework conditions in *Identifying Stakeholders* and *Conducting Decision Flow Analyses* in Stage 1, and should also consider how the framework conditions relate to the parameters for decision making so that the choice of policy tools can be narrowed. A suggested set of generic frameworks conditions are described in *Section 4*.

Outputs:
- *Understanding how the wider framework conditions apply to the target area, and the constraints on the use of policy tools*
- *Understanding the parameters affecting the sustainability of decision making and how these relate to the framework conditions*

2.3.2 *Short-list Potentially Useful Tools*

A short-list of potentially useful tools can be constructed by considering how the framework conditions and parameters apply in the target area with the key stakeholders, building on the consideration of parameters and framework conditions. Further explanation and examples of how parameters and

framework conditions relate to a range of generic policy tools are presented in *Section 6*. This is a manual exercise that will also raise issues common to all policy making, about environmental benefits and social impacts and equity, economic implications, and institutional issues etc.

A list of framework conditions and a non-exhaustive checklist of questions is summarised in *Box 2.3*.

Box 2.3 ***Framework Conditions Checklist***

- ***Sustainability Awareness***. An awareness of wider sustainability issues, government policies and targets (where these are relevant) and the specific environmental issues which are being addressed by the tool (and the options for making environmentally less damaging production or consumption choices) is necessary for the success of most tools.
    - Do producers know what they can do to improve processes, products, disposal?
    - Do consumers understand the impact of their consumption choices and know what they can do to shift to less damaging products and services, use products in more environmentally friendly ways or reduce the quantity of goods and services they consume?
    - Is there a sound scientific basis for government or other institutions favouring particular technical solutions to production or consumption decisions?

- ***Availability***. For any tool except R&D to be effective less environmentally damaging products, processes, services need to be accessible and known.
    - Are technologies - capital equipment or processes - (eg for planting, weeding, harvesting organic crops) for producing environmentally less damaging products and services available?
    - Is supply of goods or services reliable?
    - Are goods and services perceived as meeting desired quality requirements?
    - Are they safe and convenient to use compared to conventional processes or products?
    - Are goods or services accessible through normal outlets or is the consumer forced to use new and less convenient purchasing routes?

- ***Affordability***. Prices of less environmentally damaging goods and services need to compare favourably with conventional products and services unless there is a clearly defined niche market where buyers are prepared to pay a premium.
    - If production costs are higher are these passed on to businesses or consumers?
    - Are businesses or consumers willing to pay a premium, if so how much?
    - Are higher prices likely to have impacts on competitiveness or regressive impacts on quality of life for specific groups (poorer households, pensioners, the disabled, rural households etc)

- ***Competitive Context***. Global conventions and the EU regulatory and policy framework should be reviewed and the competitiveness implications of the tool considered.
    - Do WTO or EU rules prevent restrictive purchasing policies, the use of subsidies or collaborative activities by producer or retailer organisations?
    - Is cost and price determined by factors (such as EU price support) which are outside the control of national macro decision makers?
    - Are tools likely to adversely effect the competitiveness of national businesses without conferring any PR or prime mover advantages?

- ***Existing Market Structure***. The structure of the market from producers through wholesalers, retailers to consumers will have an effect on decision making parameters and may affect the effectiveness of integration tools.
    - What is the structure of the industry and services sector (size of businesses, technology base, age, costs, market shares)?

- Is this likely to encourage action?
- Are there a small number of major players who need to take a leading role or who can prevent integration?
- Is the sector very traditional in its outlook? Do they have experience in working with government or competitors on environmental (or any other) issues?

- ***Institutional Capacity***. The majority of tools require sufficient institutional capacity to support the implementation, monitoring and enforcement of the tool and to put supporting policies in place.
  - Are credible independent organisations able to provide verification of company environmental reports, ecolabels and green claims etc?
  - Can independent organisations provide consumer advice on the use of products?
  - Are all possible interested stakeholders being actively involved in addressing the problem (eg Water and Sewage Utilities providing advice to consumers on the disposal of chemical products)?

- ***Willingness to take action***. Finally even where all of the above framework conditions are right there are a number of intangible factors, which might be summarised as a cultural predisposition towards more sustainable production and consumption decisions, which need to be right. At the overall level this requires that government, civil society and the market share a perception of the risks of not moving towards sustainability. It also requires that all groups are willing to accept that there may be higher costs of more sustainable consumption and production decisions and a willingness to share the burdens. The key issues are different along the supply chain.

  - ***Producers***: If producers have the necessary knowledge and access to affordable and appropriate technology, goods and services are they prepared to translate this into action?
    - Does past experience encourage them to do so?
    - Do businesses/producers believe that government regulations and market based instruments will be actively enforced?
    - Will government policies, targets and negotiated agreements be followed through?
    - Does sustainable production fit with producers 'world view' and sense of 'the right thing to do'?
    - Do they see non monetary advantages to action (eg corporate social responsibility)?

  - ***Consumers***. If consumers are aware of the need to change and have access to affordable goods and services does this translate into changed consumption and purchasing decisions?
    - Is the timeframe of the purchasing decision important (eg differences in time and effort for purchasing of household appliances or cars compared to weekly consumables shopping)?
    - Does the environmentally preferable product or service imply inconvenience (eg additional labour or travel time)?
    - Does it have negative lifestyle, style or wealth connotations?

Output:
- *Short-list of the policy tools that are most suitable in the context of the parameters affecting decision making and the wider framework conditions in the target area*

2.3.3 Working with Stakeholders

The effectiveness of integration will depend on the successful use of policy tools. Both will be improved if the use of policy tools is discussed with key stakeholders before they are introduced. If stakeholders have been involved in the initial assessment of key integration challenges and opportunities then it will be useful to involve them again in identifying potentially effective tools and the conditions for their success.

Output:

- *Shared understanding of how the policy tools would work, what they are trying to achieve, whether this is feasible and the best way in which to apply policy tools.*

3 STAKEHOLDER IDENTIFICATION AND ANALYSIS

3.1 INTRODUCTION

Agenda 21 aims to engage a wide group of actors in the integration of environment and development. Principle 10 of the Rio Declaration on Environment and Development, which provides the framework for the Agenda 21 action programme, emphasises this point: "*Environmental issues are best handled with the participation of all concerned citizens, at the relevant level…..*". Changing production and consumption behaviour to achieve more sustainable patterns will only be effective if policies and tools focus on the key actors at the different levels in each sector who can really change their behaviour and the decisions which underpin their choices.

The methodology focuses on market based actors because ultimately they are the key test of the extent and effectiveness of integration, particularly when it is a top-down process. However, it is important to identify the key actors at all levels of decision making to ensure the involvement of all key stakeholders, particularly those at macro and meso level who can influence the decision making framework for market based actors.

As a first step, stakeholder analysis identifies how different stakeholder groups influence the policy drivers and pressures within each sector. *Section 3.2* describes the analysis of stakeholders in a generic sector. A more detailed example is presented in *Box 3.2*

3.2 ANALYSIS

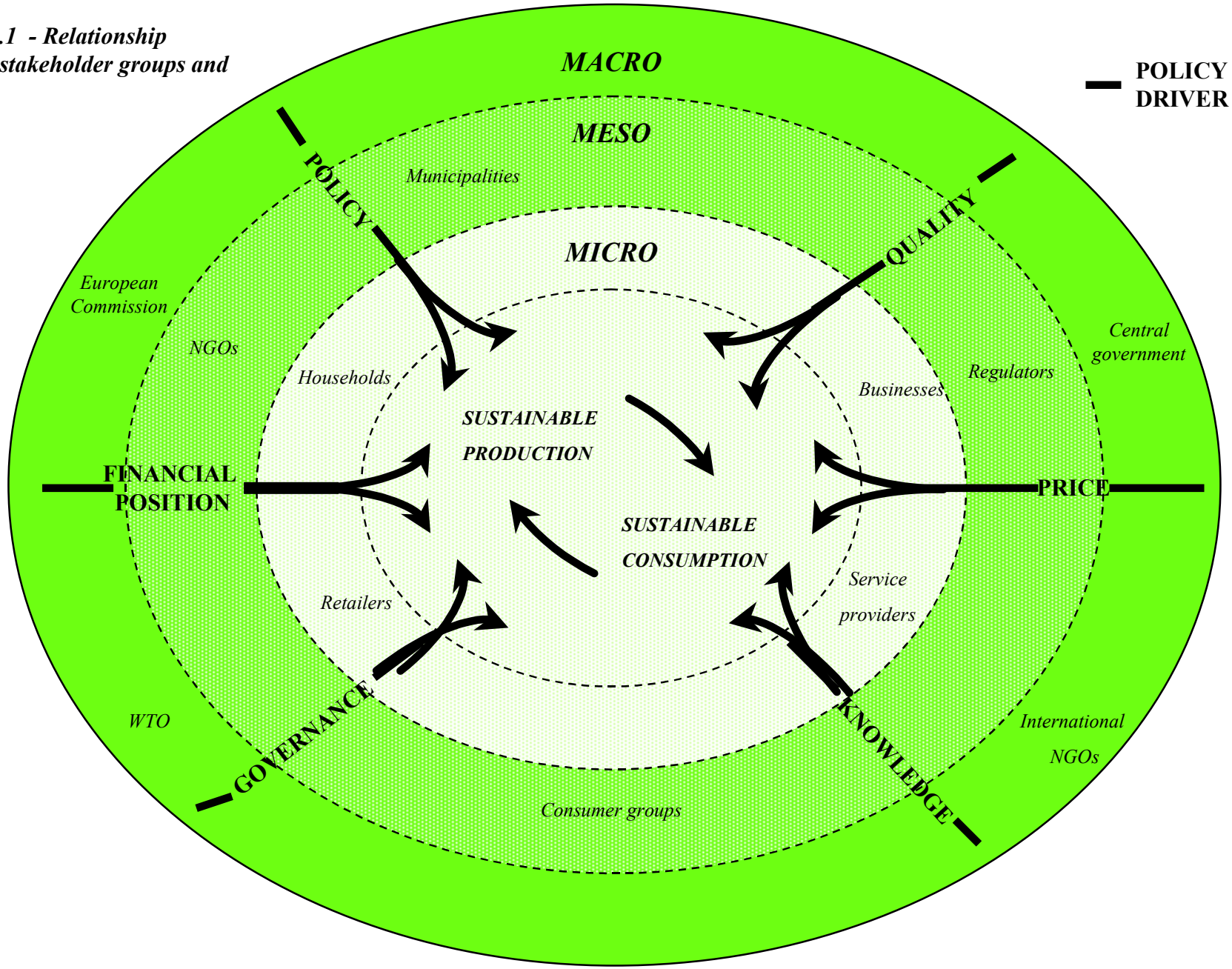
The generic stakeholder analysis identified three broad groups of stakeholders, distinguished by their legal and economic power, influence on policy and the types of integration decisions they are involved in. The relationships between the stakeholder groups, and the drivers that affect them, are presented in *Figure 3.1* and described in *Section 3.2.1*. A description of the three stakeholder levels is presented in *Section 3.2.2*.

3.2.1 *Parameters for Market Based Decision Making*

Figure 3.1 summarises the relationships between the different levels of stakeholders, and highlights the drivers that affect stakeholder decision making.

Figure 3.1

Figure 3.1 - Relationship between stakeholder groups and drivers



At a very basic level production of goods or provision of services by businesses is driven by:

- ***Policy -*** the need to comply with EU, government and sectoral policies, targets and regulations. Perceptions of how efficiently and effectively policy will be monitored and enforced is key for companies in deciding when and how to comply.

- ***Financial performance*** - the structure and competitiveness of the industry sector; the companies age, size, capital investment and cost structure and position in the supply chain; cost implications of adopting more environmentally friendly practices, processes or products; potential for passing price increases on to consumers or gaining competitive advantage through green marketing. These factors all influence the perceived opportunities for moving to more sustainable production and consumption patterns.

- ***Governance -*** businesses are increasingly motivated by employees, shareholders, clients, NGOs and local communities' perceptions of their wider role as being environmentally, ethically and commercially responsible and managing risk. These issues and market positioning are key in encouraging some companies to be early developers and adopters of new products, processes and practices such as environmental management systems and environmental and social reporting. Wider access to information via the internet increases both pressures and opportunities for businesses to communicate their sustainability performance to stakeholders.

Consumption of goods or use of services by households, other businesses and government or institutions is driven by:

- ***Price*** - the relative price of environmentally preferable products and services in relation to conventional products and services and the willingness to pay an environmental premium where production costs are higher.

- ***Knowledge*** - and awareness of sustainability issues, environmentally preferred products and services, where to buy them, how to use them and willingness to translate knowledge into action.

- ***Quality*** - availability, suitability and perceived fitness for purpose of environmentally preferred products, services or ways of using them.

Policy may also be a driving factor for institutional buyers where central or local government or institutions are required (either by external legislation or internal policies) to take environmental considerations into account in their purchasing decisions.

3.2.2 Three Level Model

Actors in the decision making process can be ascribed to one of three levels of decision making based on their legal and economic power, influence on policy and the types of integration process they are involved in. These three levels are described below.

The Macro Level

Macro level actors include the European Commission, central government and its agencies. Dependant on the legal context, they are responsible for establishing both generic and sectoral policies including strategies, objectives, targets, regulations, guidance, and the fiscal framework - which may or not incorporate sustainability principles. Macro level policies set the framework for decision making about sustainable production and consumption at the meso and micro levels.

Macro level actors are responsible for strategic decision making which helps create the context, send messages and provide incentives for decision makers at the meso and micro levels to consider integration. Without this macro level foundation, it is difficult for integration to become systematic at other levels. Both EC and national governments are recognising this responsibility and the necessity to involve meso level actors (particularly academics, agencies, NGOs and producer and consumer groups) and civil society in strategic decision making processes to achieve integration.

To date, consultation by macro level actors has tended to favour groups over individuals, larger over smaller enterprises, and institutions already involved in the subject area. However, consultation does not necessarily guarantee that actors at meso and micro levels will be motivated to consider integration in their own decision making. The responsiveness of actors at different levels is often dependant on the historical context, tradition or corporate culture. This issue is discussed further in *Section 4* (on framework conditions) and *Section 6* (on integration tools).

The Meso Level

Meso level actors typically include trade associations, producers groups, NGOs with a particular sectoral or environmental focus, and municipalities (see *Box 3.1*) in both policy making and enforcement roles at a local level and as providers of information to businesses and consumers. In this context the meso level also includes regulators who set standards for commercial , social or environmental performance for deregulated service providers (eg energy companies).

Box 3.1 *Municipalities as Meso level actors*

Municipalities have been included as meso level actors because they are influential in influencing central government policies and setting their own at a regional level, and are also key in influencing market based actors (producers and consumers) in their sustainable production and consumption decisions.

- Municipalities are generally consulted by central government on sustainability policies and generally set and implement their own land use and urban development policies. They may also be responsible for implementing national sustainable production programmes (e.g. agri-environment schemes). Many municipalities have developed their own sustainability strategies, means for assessing the sustainability of their current plans, screening new policies and projects and sustainability indicators for measuring progress.

- As planners and implementing agencies in some sectors (such as road development) they are able to influence the infrastructure for sustainable consumption choices (e.g. in the transport sector). They are also able to address key parameters for businesses decisions about production (e.g. by monitoring air and water quality they can influence perceptions about the need to comply with EU and central government environmental standards)

- They can provide information via NGOs or directly to consumers on environmentally preferred products and how to use and dispose of them (e.g. through local information campaigns and through lists of hazardous chemicals, a route followed by a number of Swedish municipalities).

Municipalities are also micro level actors in their own right as:

- Providers of goods and services such as housing, waste management services, transport services and, in Denmark, production and distribution of energy. They can therefore set themselves targets for sustainable production and move to less damaging processes (e.g. renewables and CHP) within the competitive confines of the market they are operating in.

- Consumers of goods and services on their own account and also on behalf of businesses and households. As consumers they are generally more accountable than true micro level actors since they may be subject to central government set procurement policies, and will have to report to their constituents on value for money and quality of services. Thus their ability to make environmentally preferred purchasing choices may be constrained by their obligation to provide the most economical goods and services.

Meso level actors tend to make sustainability decisions in a consultative way because they are not able to directly affect the macro level framework for integration by introducing regulations or fiscal measures. They therefore tend to be key movers in raising government awareness of environmental issues and lobbying at both the international and national level for changing the framework conditions for integration.

They can affect producer behaviour by setting good practice standards, entering negotiated agreements with government on the part of groups of producers and by providing enabling information to help businesses make more sustainable production and consumption decisions.

Meso level actors - particularly NGOs - also have a role in influencing framework conditions for individuals and households to make more sustainable consumption decisions eg by providing independent and credible information on products, their contents and how to use them. They are also increasingly involved in disseminating information on the environmental and

social performance of companies through financial rating and ranking schemes for the benefit of shareholders. NGOs and producer associations have also been directly involved in developing and independently verifying Ecolabels and may also be involved in voluntary product taxes and green tax break schemes.

An example of how a non governmental meso level actor can work to influence both policy makers and market based actors is highlighted in *Box 3.2*.

Box 3.2 Meso Level Actors in the Industry Sector - Chemicals

CEFIC (European Chemicals Industry Association) has recognised the key environmental challenges affecting the sector and the need to be pro-active in addressing them. In particular the association recognises the public's growing concern with health issues and product safety which are increasingly requiring companies to listen to stakeholders and be ready to take voluntary action. At least three such actions are already being taken by the sector:

- Firms have pledged to fund accelerated risk assessments for priority, high-production volume chemicals in the context of the EU's review of regulation of "existing" chemicals;
- CEFIC has recently strengthened an existing voluntary commitment on improving energy efficiency at manufacturing plants by adopting a new goal to achieve a 20% improvement over 1990 levels by 2005.
- A long term research programme of funding independent research on potential future environmental and health issues.

In similar fashion the UK chemical industries association (CIA) has recently announced a series of 'high-level commitments' to sustainable development. The CIA has decided to form both a sustainable development strategy group and an 'industry reputation board' designed to communicate the industry's commitment to sustainable development and its substantial achievements.

Meso level actors have been included in the study to the extent that they are involved in either changing framework conditions or directly implementing tools for integration aimed at micro level decision makers.

The Micro Level

Micro level decision makers comprise the market based actors in the supply chain for goods and services including producers, wholesalers, retailers and consumers (individuals, other businesses and institutions such as municipalities in their role as producers or consumers of goods and services). These actors make day to day production and consumption decisions within the wider framework set at the macro level, although their decision making tends to be driven by perceptions of risks, opportunities and the immediacy of pressures. These characteristics enable much more rapid and less constrained decisions to be made.

The parameters which constrain and influence micro level decisions reflect the characteristics of the actors and the significance of individual decisions in environmental terms. The availability of information and knowledge, the importance of perceptions (quality and suitability), habit or established behaviour, and the importance of price (which may/not encompass wider

economic considerations through the life-cycle) are often the determining parameters in decision making.

Individual decisions at the micro level, about production/provision (eg. choice and source of raw materials, operation for energy efficiency, etc) or about consumption patterns (eg. choice of transport mode, choice of food retailer, etc) are generally only significant in environmental terms when considered in aggregate. As these decisions are constantly being made, it is important that integration is achieved to address potential environmental impacts. The challenge at this level is the very large number of individuals that are making decisions, generally on an ad hoc and inconsistent basis. The fact that they are not held accountable for their day to day decisions also results in the problem that surveys show little relation between reported decisions and actual purchasing decisions (the so called 'big mouth' problem with the purchase of 'green' products such as organic foods).

Micro level decision makers are generally less accountable to other stakeholders compared with the meso and macro levels. However, businesses are becoming increasingly accountable: to their employees, shareholders and those above and below them in the supply chain (all micro level); and indirectly to meso level actors who may develop and influence investment and reporting policies (financial institutions and regulators, NGOs etc). There is also the increasing likelihood of civil society holding producers responsible for damage to the environment and human health (eg class actions on tobacco producers, proposed environmental liability legislation, etc).

3.3 IDENTIFYING KEY ACTORS

Table 3.1 illustrates the different levels of actors within the four sectors. An example of a stakeholder analysis is presented in *Box 3.2* and a full description of the actors and their roles within each sector is presented in *Annexes A-D*.

Table 3.1 Summary of Key Actors and Decision Making Levels

Industry	Transport	Agriculture	Energy
Macro level			
EC, Ministry of Energy and Environment, DEPA WTO; International NGOs	EC, Ministry of Transport, DEPA, Ministry of Environment and Energy, WTO; International NGOs	EU, Ministry of Agriculture, Market Management and Intervention Board, WTO; International NGOs	EU, Ministry of Energy and Environment, Danish Energy Agency, International NGOs
Meso level			
Municipalities NGOs: • Danish Consumer Council • Danish Ecological Council • Danish Society for Conservation of Nature • Europe Environmental Bureau Industry organisations: • Confederation of Danish Industries • CEFIC	Counties Municipalities Modal regulators Passenger organisations Transport representatives bodies Danish Society for the Conservation of Nature	Counties Municipalities Representative organisations: • Danish Farmer's Union • Family Farmer's Association NGOs: • Danish Society for the Conservation of Nature • Danish Angler's Federation	Council for Sustainable Development Electricity Savings Trust Municipalities Housing Associations Danish Society for the Conservation of Nature
Micro level			
companies households	companies transport operators households	farmers processors and retailers (MD Foods) households	municipal and commercial energy providers domestic, business and institutional users

Box 3.2 Example of Stakeholder Analysis: Agriculture

The agriculture sector is the primary supplier of food and raw materials. The total agricultural area in Denmark covers approximately 2.8 million hectares and is the main use of land. The sector is highly diverse at the regional and local levels, in terms of the types of production systems and their products, and the size and structure of production units but with a dominance of cereals and livestock farms.

Macro Level

- The Danish Ministry of Agriculture is responsible for setting the policy framework and drawing up agricultural policies, principal among these being the implementation of the EU Common Agricultural Policy. The administration of the CAP is the responsibility of the Market Management and Intervention Board (EU-Direktoratet), including the distribution of payments under the CAP. Agri-environment schemes are drawn up by the Ministry, who consults with an advisory committee comprising central, regional and local government representatives, farming organisations, land-owning associations, nature, recreation and forestry interests.

Meso Level

- Municipalities are the environmental authority in relation to agriculture, with responsibility for supervision of farms. The Counties are responsible for administering and negotiating contracts under agri-environment schemes with farmers. In relation to biodiversity issues, the Counties administer nature conservation legislation at the local level and manage a large number of protected areas. The Municipalities are fully involved in all planning processes and therefore can influence both macro and micro actors.

- Two agricultural organisations - the Danish Farmers' Union and the Family Farmers' Association - between them represent around 95% of Danish farmers. These organisations have an influential role in shaping policy, negotiating directly with the Ministry of Agriculture. They also support and influence individual farmers through the Danish Agricultural Advisory Centre (DAAC) which they jointly run. The DAAC's aims include the communication of knowledge and information, development of methods and tools, experiments and studies and education and training. Local centres provide specialist advice to farmers in all farming-related areas, for which farmers are charged about 90% of the cost. The DAAC is highly influential, providing about 80% of the major advisory, training and information services to farmers.

- Non-governmental organisations also play a role in influencing policy. The Danish Society for the Conservation of Nature had considerable influence during the 1980s on the Action Plan on the Aquatic Environment, and the Danish Angler's Federation has had a consistent and significant influence mainly regarding the condition of watercourses.

Micro level

- Farmers and households are the principal players as producers and consumers of agricultural produce.

- Processors and retailers are even more important in influencing sustainable production and consumption decisions. For example, in the dairy sector, MD Foods dominates the market with an effective monopoly in the retail and distribution of all dairy products in Denmark. The majority of dairy farmers sell their milk solely to MD Foods and as such the company is in a position to exert a strong influence on the market, product standards, prices *etc*. The only other real outlet for independent farmers is Irma, which was the front runner in developing labelling in the 1970s and a leader in organics, quality foods and traditional produce.

4 ANALYSING FRAMEWORK CONDITIONS IN THE SECTOR

4.1 INTRODUCTION

This section describes the framework conditions within which market based actors are making their day to day production and consumption decisions.

In preparing a full description of the framework conditions sectoral agencies will need to consider the following points:

- *Competitive Context* established by the EU or supra national organisations. The regulatory and competition context for producers, wholesalers and retailers and the extent to which they can make more sustainable choices without contravening trade rules or European directives.

- *Institutional Capacity* at central, local and Non Governmental level for supporting progress towards integration in terms of providing the support or regulatory bodies, staff expertise, finance, promotional schemes and campaigns etc.

- *Market Structure* and market opportunities for more sustainable consumption and production, in particular the size, age and number of producer and retailer organisations.

- *Sustainability awareness* of the key issues facing consumers and producers; the extent to which they have information on the key sustainability issues in the sector, what their own impacts are and how they can take direct actions to make more sustainable decisions.

- *Willingness to act*. Where businesses or individuals have the appropriate knowledge, regulatory and financial incentives to use/buy accessible and affordable processes/technologies and products whether social and lifestyle choices lead them to 'do the right thing' in terms of sustainable decisions.

- *Technical availability* of appropriate processes, products and technologies for more sustainable production or consumption; the extent to which these are accessible to key actors (ie on the market rather than in the R&D phases, on supermarket shelves rather than available only through alternative retail routes etc).

- *Affordability*. Relative prices of processes, products and technologies in relation to less environmentally preferable options and the direct and indirect fiscal instruments which impact of prices.

The following section provides an overview of the framework conditions in the energy sector. Descriptions of the framework conditions for all four sectors are shown in *Annexes A-D*.

4.2 THE ENERGY SECTOR

4.2.1 The Overall Context: EU and National

The competitive context for energy production and consumption in Denmark is determined by EU environmental and competition policy for the sector and by national policy. The three pillars of the EU energy policy are security of supply, competitiveness and environmental protection. The major elements to integration policy at the EU level are:

- **An overall framework** for energy policy is provided by the Community's Climate Strategy which has been developed since Kyoto (EC, Community Strategy on Climate Change and Negotiations with industry on carbon dioxide emissions from motor vehicles, EU Environment Council conclusions, 23 March 1998)
- **Increased energy efficiency**. The Energy Efficiency Strategy sets a goal of improving energy intensity by 20% by 2010 in relation to the 1995 levels. Under the umbrella of the SAVE II programme the EU is implementing measures aiming for absolute annual cuts in energy intensity of one percentage point over "business as usual" levels (Communication on Energy Efficiency in the European Community - towards a strategy for the rational use of energy (COM(1998)246).
- **The White Paper on Renewable Energies** (1997) set a target for energy production from renewable sources in the EU at 12% by 2010. This is supported by the ALTENER II programme (Decision 98/352/EC).
- **The Combined Heat and Power (CHP)** Strategy (October 1997) sets the goal of doubling the current share of electricity produced from CHP generation by 2020 from 9% to 18% which would lead to a reduction in total CO2 emissions of 4%.
- A proposed Directive (March 1997) would set **minimum excise duties** for energy products.
- **Labelling.** The European Commission is currently drafting a proposal for a directive which will aim to make compatible the promotion of renewable energies with the internal electricity market.
- **The Large Combustion Plant Directive** (88/609/EEC) has established limits for emissions of acidifying substances from the large scale thermal electricity generation sector.
- **The IPPC Directive** (EU 96/61/EC) on integrated pollution prevention and control has widened the coverage of IPC systems to include energy efficiency at the plant level
- **the Fifth Environmental Action Programme**, 1992 sets targets for reductions in SO_2 and NOx.

Danish energy policy, as set out in Energy 21, aims to stabilise energy consumption and increase the use of renewable energy sources and combined heat and power production. Key drivers behind Danish Energy policy are energy security, the EU Electricity and natural gas directives and environmental objectives.

Goals outlined in *Energy 21* are:

- to **reduce CO_2 emissions** by 20 % compared to the 1988 level by 2005.
- **renewables should contribute to around 35 %** of total primary energy supply in 2030 (235 PJ). (1) Currently renewables accounts for about 9 % of the total energy demand, coming mainly from wind and biomass. The implied target is a 1% per year increase to 2030. *Energy 21* stresses renewable energy as a priority research area. The Danish programme for the Development of Renewable

(1)International Energy Agency, 1998

Energy (DPRE), established in 1991, aims to provide support for the development and implementation of renewable energy technologies. In 1996 grant payments under the programme amounted to DKK 65 million. (1)DPRE is supplementary to the Danish Energy Research Programme (ERP). The framework for renewables is also set by the *Electricity Reform Agreement, 1999* which provides for substantial modification of the support for renewable energy from subsidies to a market based scheme.

- **a greater use of biomass** and 2-300,000 ha of energy crops (2) are expected to contribute 145 PJ annually by 2030.(3) This is expected to lower Denmark's total CO_2 emissions by around 12.5 %. The *Biomass Agreement* outlines the future use of biomass. Electricity utilities are obliged to use 1.2 Mt of straw, 200,000 tonnes of wood chips and 200,000 tonnes of either straw, wood chips or willow chips annually by 2000. (4) This represents 6% of the total consumption of coal.
- **CHP** is a key element of the CO_2 emissions reduction strategy. By 1998, 50% of the electricity generated for domestic supply was produced as CHP. The bulk of the country's future heat demand and electricity consumption is expected to be covered by CHP, including district heating plants running on biomass.

4.2.2 *The Institutional and Market Context*

The institutional capacity and market structure is summarised below.

- At the macro level **the key government actor is the Danish Energy Agency** which sets the policy framework and targets at the national level and provides fiscal incentives for sustainable energy production and consumption.
- **Municipalities** are actively involved in setting procurement policies for energy efficient products and for the fuel mix of energy supply to new developments. They also have a role as part owners of heat and power generation businesses and as energy consumers.
- **Heat and power generators**. The current ownership structure of the Danish electricity sector is complex with heat and power generators being partly owned by municipalities and partly by the consumers. All distribution companies have a so called public service 'obligation to supply consumers that do not have the possibility to choose their own supplies. This consists of a minimum package of services at a set price' overseen by a 'public regulator'. On the other hand, distribution companies have the obligation to buy the cheapest electricity. Deregulation of the sector as a result of the 1999 Electricity Reform will see a concentration of productive capacity in the hands of two commercial producers. The Danish electricity market is too small to contain additional producers. Competition in the Danish electricity sector will come from abroad.
- **Consumers of energy** comprise all economic actors including industry, transport and other service providers and households. The latter includes both individual homeowners and owners of apartments who may take decisions more collectively through housing associations.

4.2.3 *Availability of affordable technologies and products*

Technical availability of renewable energy technologies and electricity products to encourage energy companies to invest in renewables and CHP and for consumers to buy green electricity are influenced both by R&D

(1) Danish Energy Agency Brochure: 'Energy Research and Development in Denmark'. 1996

(2)Current wood resources are likely to be exhausted in 2000, but a programme of afforestation is taking place. Increased production of bioenergy, including energy crops, will be required to meet demand for biomass after 2005.

(3) European Energy Crops interNetwork: http://www.btg.ct.uwente.nl/eeci/archive/biobase/B10101.html

(4)Danish Energy Agency, 1999

programmes, and through market based instruments intended to encourage production and distribution of easily accessible and affordable renewable energy. A similar range of policies is intended to encourage energy efficiency by municipalities, businesses and individual households. The framework of existing tools to encourage renewables and energy efficiency are summarised in *Table 4.1* and *Table 4.2* respectively. Householders will be influenced by the type and age of their housing, their income level and how long they expect to stay at their current dwelling to recoup investment costs. Fiscal instruments in Denmark appear to be well targeted at different groups (e.g. house owners, renters and pensioners) who require different incentives to make energy efficient choices. Policies also recognise that individual investors are becoming an important target group for raising finance for investment in renewables, particularly wind turbines.

4.2.4 Sustainability awareness and willingness to act

In addition to the macro policy framework and the availability of practical and affordable solutions to their consumption decisions, consumers are greatly influenced by their understanding of sustainable production and consumption issues, their own impacts and how they can take direct actions to make more sustainable decisions. The Council for Sustainable Energy is a key part of this awareness raising process.

Council for Sustainable Energy

The Council for Sustainable Energy is an independent council charged with promotion of energy conservation and efficiency and the use of renewable energy, and launching new ideas and debate. It has 24 members personally appointed by the Danish Minister of Environment and Energy. Its activities to raise public awareness include:

- An annual "Energy Day" including a conference and information activities with themes such as "The Danes' Individual Energy Choices" (1997) and "Private Transportation" (1998).
- Energy training for students 14-16 years of age; and
- general information at a home page.

During 1999 its focus has been on energy savings in the liberalised market, including a prize winning competition for ideas to include in the upcoming Danish act on energy conservation.

Finally where businesses or individuals have the appropriate knowledge, regulatory and financial incentives to use/buy accessible and affordable processes/technologies and products it will be a question of whether social and lifestyle choices lead them to 'do the right thing' in terms of sustainable decisions.

Table 4.1 ***The framework for encouraging decisions to produce and consume more renewable energy in Denmark***

Tool	Aims and operation
Regulation	• The Heat Supply Act requires municipalities to draw up heating plans including district heating. Renewable local energy sources (straw, biogas, forestry residues, waste incineration etc) have to be considered.
Green electricity certificates	• An important new development in the electricity reform of 1999 is the development of a market in green certificates, which represent the production of green energy. Utilities have an obligation to purchase green certificates. The most efficient (competitive) renewable energies are encouraged to develop through the price system. If the consumer/distribution companies of electricity do not fulfil their quota, a penalty of 0.27 DKK/kWh is levied.
Green taxes	• Taxes and tax concessions on different sources of energy aim to restore the price imbalance between fossil fuels and non-fossil fuel energy.

Subsidies	• Subsidies are paid to generators of electricity from renewables which act as compensation for the automatic levying of the CO_2 tax on all electricity. For a period still to be specified, the following fixed tariffs apply to power generated from biomass:
	  • Biogas plants: 0.33 DKK/kWh
	  • Local biomass plants: 0.27-0.33 DKK/kWh
	  • For biogas and biomass plants erected during 2000,2001 and 2002, a fixed tariff of 0.5 DKK/kWh will apply for 10 years.
	• In addition an electricity production subsidy of 0.17 DKK/kWh is available. In 1996 support in subsidies amounted to DKK 276 million for wind power and DKK 122 million for biomass.

Obligation to purchase green energy	• The current system of state subsidies for wind power is to be replaced by an obligation on consumers and energy distributors to obtain up to 20% of the energy they use from renewable sources. The only exception will be large users who will face this obligation for only up to 100 GW of electricity. The Danish Energy Agency does not expect it to be fully functional until 2003.
Buy-back rates for wind generated electricity	• Fixed prices have been set in the electricity reform in 1999, for wind energy sold to the grid
Reporting and awareness raising	• Council for Sustainable Energy responsible for major awareness raising campaigns and events
Subsidies for households	• Subsidies are offered to replace an oil boiler with a biomass boiler. The subsidy for the biomass boiler varies from 10 to 30% of the investment. In 1996 the Danish Energy board granted a total of 128 million DKK.
Danish Programme for Development of Renewable Energy	• Established in 1991, it aims to provide support for the development and implementation of renewable energy technologies to fulfil national energy plans. In 1996 grant payments under the programme amounted to DKK 65 million. Support is given to development of technologies, dissemination of information and investment subsidies are granted for the purchase of straw and wood pellet boilers, small scale biogas plants, solar panels, heat pumps etc. DPRE is supplementary to the Danish Energy Research Programme.
Development and Demonstration	• Investment subsidies are offered to spur the dissemination of commercially available technologies. The subsidy varies between 15-30% of the

Tool	Aims and operation
Programme for Renewable Energy	construction costs. In 1996 a total of 71 million DKK was spent on investment subsidies. Subsidies for demonstration of pre-commercial technologies amounted to 56 million DKK.
Renewable Energy Island	• The island of Samsoe with 4,400 inhabitants will have its entire energy supply based on renewable energy, including the transport sector. The programme will be financed from the existing grant schemes.

Table 4.2 The framework for reducing energy demand in Denmark

Tool	Aims and description
Regulation	• Inspection of oil burners used in central heating systems by authorised firms since 1997; the initiative is supported by an information campaign with the objective of increasing energy efficiency in new buildings by 50% by 2005. • Since 1992 energy management and annual reporting on energy consumption have been mandatory in every government building. • Local energy managers must be appointed by every institution. • Mandatory individual metering of all buildings since 1997.
Energy Labelling Schemes	• Energy labelling for domestic appliances (fridges, freezers, washing machines, dishwashers, office equipment, lighting, electric motors, process ventilation, pumps, boilers and technical insulation) in line with EU programme. • Energy arrows inform consumers of electricity consumption of different appliances (developed by utilities). • Voluntary scheme for other products gives a label to the best products on the market, updated on an annual basis
Energy labelling of buildings	• Since 1997 mandatory audits and labelling of small buildings (1,500 m2) by the vendor prior to sale.
Guidance	• Building Code 1995 sets limits for heating and ventilation systems. • Future changes aimed at ambitious energy efficiency targets (45 kWh per m2) are expected to enter into force by 2005
Subsidies	• Grants for energy saving investments in central government buildings financed from a tax of 5% on government energy consumption. The annual yield of this tax is around DKK 50 million. • subsidies for energy savings in pensioners dwellings • compulsory energy conservation pool financed by contributions based on consumption at county and municipal level being considered. • Subsidies for installation of water borne central heating in housing erected before 1950. Some 65000 dwellings to be connected over 10 years. • Electricity Conservation scheme: investment grants for heat saving or support for development of supplementary sources of energy, with a particular focus on switching electric heating in areas with district heating and natural gas supply. Financed for fixed amount levy on household and public sector energy consumption. Annual total of DKK 100 million.
Reporting	• Introduction of green accounts at county and municipal level is being considered. • More detailed, frequent and graphic reporting of individual household consumption on electricity bills.
CO_2 quota system	• Power companies will be allocated a specific emissions cap within the

Tool	Aims and description
	framework of a total cap of 23 million tonnes of CO_2 for 2000, falling to 20 million tons in 2003. Over the following three years the total will drop by 1 million tons annually. For each ton of CO_2 by which a company exceeds its quota it will penalised $5.60. Unused amounts may be banked and applied to the following year. The quotas will be tradable within Denmark only but the government hopes that over the next few years the system can be expanded at least to the Baltic region.
Energy efficiency subsidies	• Subsidies are granted for the development and implementation of energy efficiency appliances and products with a focus on dwellings and the public sector. Subsidies will also be granted for marketing and procurement of energy efficiency products.
Negotiated Agreements	• Voluntary agreements on energy efficiency will be negotiated with trade organisations, housing associations etc for specific products and technologies.
Purchasing policies	• 'Buying clubs' are drawing up stringent requirements related to energy efficiency, price, materials for products and then guaranteeing contracts to the best performing manufactures. • From 1997 housing associations have been encouraged to take this route on energy efficiency.

5 DECISION FLOW ANALYSIS

5.1 INTRODUCTION

The development of decision flow analyses for key actors in relation to sector specific environmental issues provides a clear and transparent summary of the decisions being taken, why and what tools can be used to influence these decisions. The analysis consists of the following steps:

- *Identifying key decisions* that affect the sustainability of production or consumption.

- *Identifying key parameters* which underlie these decisions. The parameters are the factors that the actor takes into account (consciously or unconsciously) when making a decision and the choice of possible outcomes. For example, whether a particular outcome is available, whether it will have an implication on the cost of the action, whether it will be suitable to the task, whether the actors know about all the options including the alternative with a lower environmental impact etc. These are all issues that may be of greater or lesser importance than environmental issues.

- *Identifying gaps in current policy*. Identification of the parameters allows policy makers to consider whether the current framework influences these parameters in favour of more sustainable production and consumption decisions or whether there are currently disincentives.

- *Identifying potential tools* which can be used to influence the parameters.

- Any *framework conditions* for the sector that can place constraints on the effectiveness of tools.

Examples of decision flow analyses for each of the four sectors are shown in *Figures 5.1-5.4*. These show the generic tools (*right-hand side*) which are used to influence the parameters (**left-hand side**) of each decision (columns). Presenting the information in this form may allow the policy maker to identify opportunities to use new types of tools in relation to a parameter or consider the use of existing tools in a new context. Further examples of decision flow analyses are presented in table form in *Annexes A-D*.

Section 5.2 describes the key parameters that emerged from the analysis of decision making in the transport sector in relation to climate change. Other decisions in the industry, transport, agriculture and energy sectors are illustrated in *Annexes A-D* respectively.

5.2 *TRANSPORT AND CLIMATE CHANGE*

The decisions made by households and businesses, both in terms of passenger and goods transport, are generally the same for both actors:

- *Is the journey necessary*?
- If yes, *what mode of transport should be chosen*?
- If road transport is to be used, *what make and model of vehicle should be purchased for personal use or for a company fleet*?
- Finally, *how should the vehicle be driven in terms of speed and technique*?

Is the Journey necessary?

The key parameter for determining whether individual transport is necessary either for personal or businesses travel is the **availability** of alternatives to travel, currently largely determined by telecommunications technology for teleworking and the recent development of e-commerce facilities. Land use and urban planning also play a role in supporting mixed and high density development that reduce the need to travel long distances to work, school, shop or for leisure. For businesses involved in the transport of goods, the availability of resources and demands for supply arising from the transport of goods is also a key parameter. This will reflect the efficiency of production processes, logistics and the distances involved and will be largely influenced by **costs**.

The choice of which transport mode

- **Affordability**. For passenger travel this is the cost difference between private road transport and public transport, reflecting purchase cost, fuel prices, road user and parking costs. For goods transport the comparison is between road and non road freight transport. The extent to which externalities are internalised in prices is key.
- **Availability** of the different transport options determined by infrastructure requirements, operator costs and regulation of services.
- **Suitability** of different transport options. Whether public transport services and rail freight services are designed to include the necessary facilities for different user groups and the capacity and capability of carrying different goods. Suitability also encompasses timetabling, reflecting frequency of services and journey duration. This parameter also includes considerations of convenience, since an option may be suitable but would require more thought or planning compared to getting into a car.
- **Reliability**. A major issue for all users which can be addressed through improved transport planning, regulation of services, collaboration between operators and provision of real time information to operators and users.
- **Perception/habit**. This is probably the overriding parameter for decisions about private car use by households. Despite an awareness of problems associated with private car use and access to other options, a poor perception of public transport and a dominant 'car culture' can lead to users being unwilling to change their reliance on car use. Conversely a well established culture of DIY transport (e.g. bicycle) for short journeys creates peer group pressure which may discourage those who would otherwise wish to use private cars in cities such as Copenhagen.

Decision making by transport service operators, in areas such as which service to provide, timetabling and route planning, are largely based on considerations of demand, as set out above. Other parameters are capital and operating costs and the availability of suitable infrastructure.

Choice of vehicle make and model

The key parameters for these decisions are generally the same for households and businesses. If cars are the chosen form of transport then a key decision is which car to purchase in terms of energy efficiency or even alternative technologies? The key parameters are:

- **Availability and affordability**. At present alternative technologies are not generally available but energy efficiency is being addressed by most manufacturers. Research and development is key to providing affordable technologies but the use of fiscal instruments can support market penetration of low energy use vehicles, helping manufacturers to achieve a critical mass and achieve economies of scale until higher environmental standards are emulated by other manufacturers or incorporated in legislation.
- **Suitability**. Basic vehicle design is unlikely to change drastically for either more efficient vehicles or those based on alternative technologies. However, the introduction of alternative technologies will need to be supported by the provision of the necessary fuelling infrastructure.

Driver behaviour is emerging as an increasingly important issue for reducing CO_2 emissions from road transport. This has mainly been influenced by safety concerns and enforcement of speed limits but now the issue of reducing fuel consumption is being highlighted through driver education.

The key framework conditions for the transport sector are the *availability* and *affordability* of efficient public transport services and non road freight services. This includes the availability of the necessary infrastructure and a fair and efficient pricing system for the transport sector. The key instruments used to address these decisions include economic incentives, land use planning, and integrating transport services in terms of transport planning, timetabling, planning of intermodal transfer and network co-ordination.

The divergence between awareness of sustainability issues and actual willingness to act is an increasingly important consideration in encouraging sustainable transport decision making by households. Despite a general awareness of transport related environmental problems and the major role played by private car use it appears that a majority of those who own a car are unwilling to using public transport. The tools currently in place do not overcome the 'car culture' that predominates in many countries. A recent survey in the UK revealed that motorists are most concerned with price, fuel economy, safety and reliability. Few support the idea of higher fuel prices, electric cars or fitting cars with speed limiters. In the Netherlands, the advisory council VROMraad has stated that the government should shift policy from reducing mobility to cutting its negative effects through technology improvements, since 'forcing' people to use public transport is not succeeding.

Figure 5.1

Figure 5.1a: Agriculture - decision flow analysis for farmers in relation to water pollution

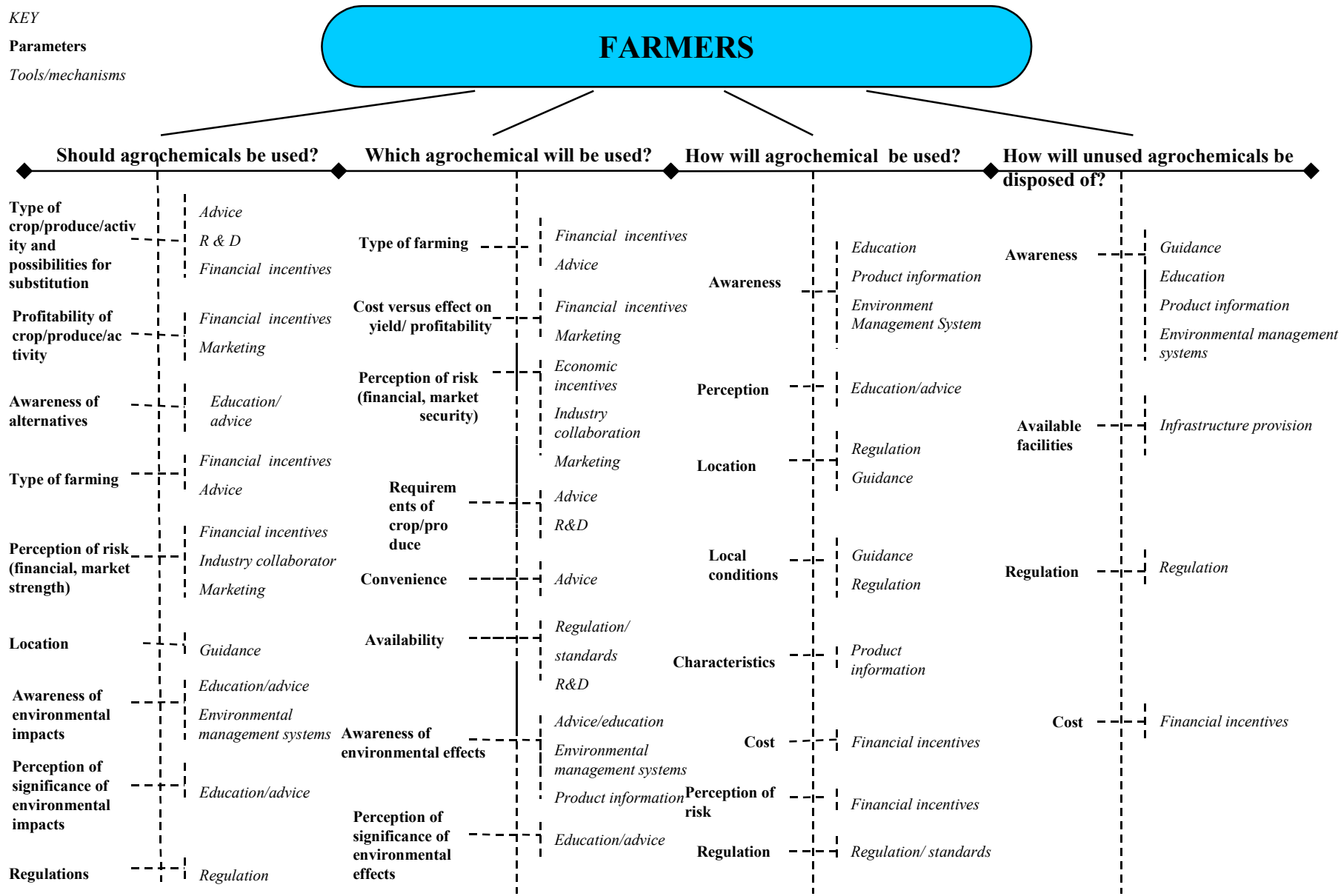


Figure 5.1b:Agriculture - decision flow analysis for farmers in relation to water pollution

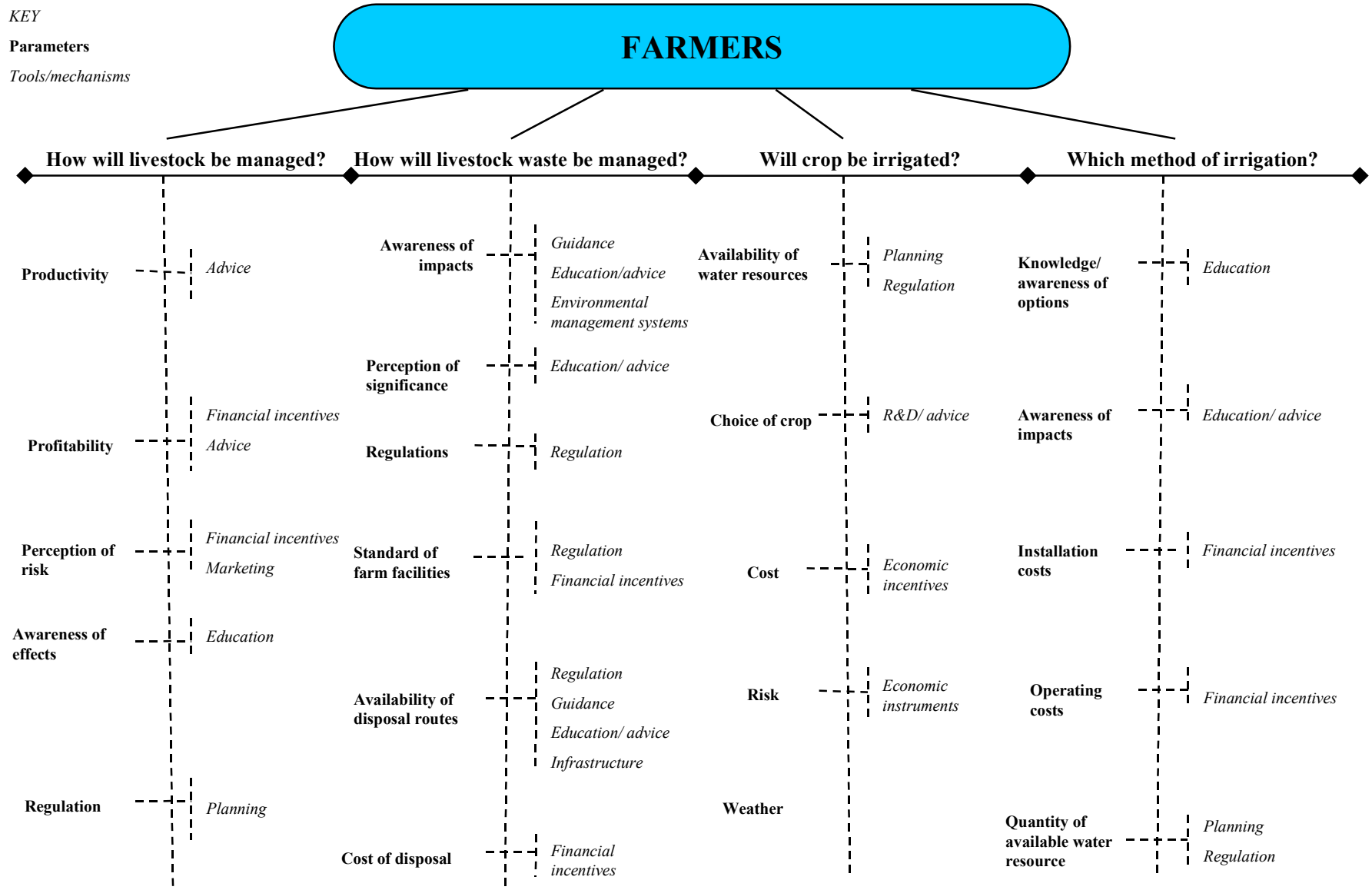


Figure 5.2: Energy - decision flow analysis for households in relation to climate change

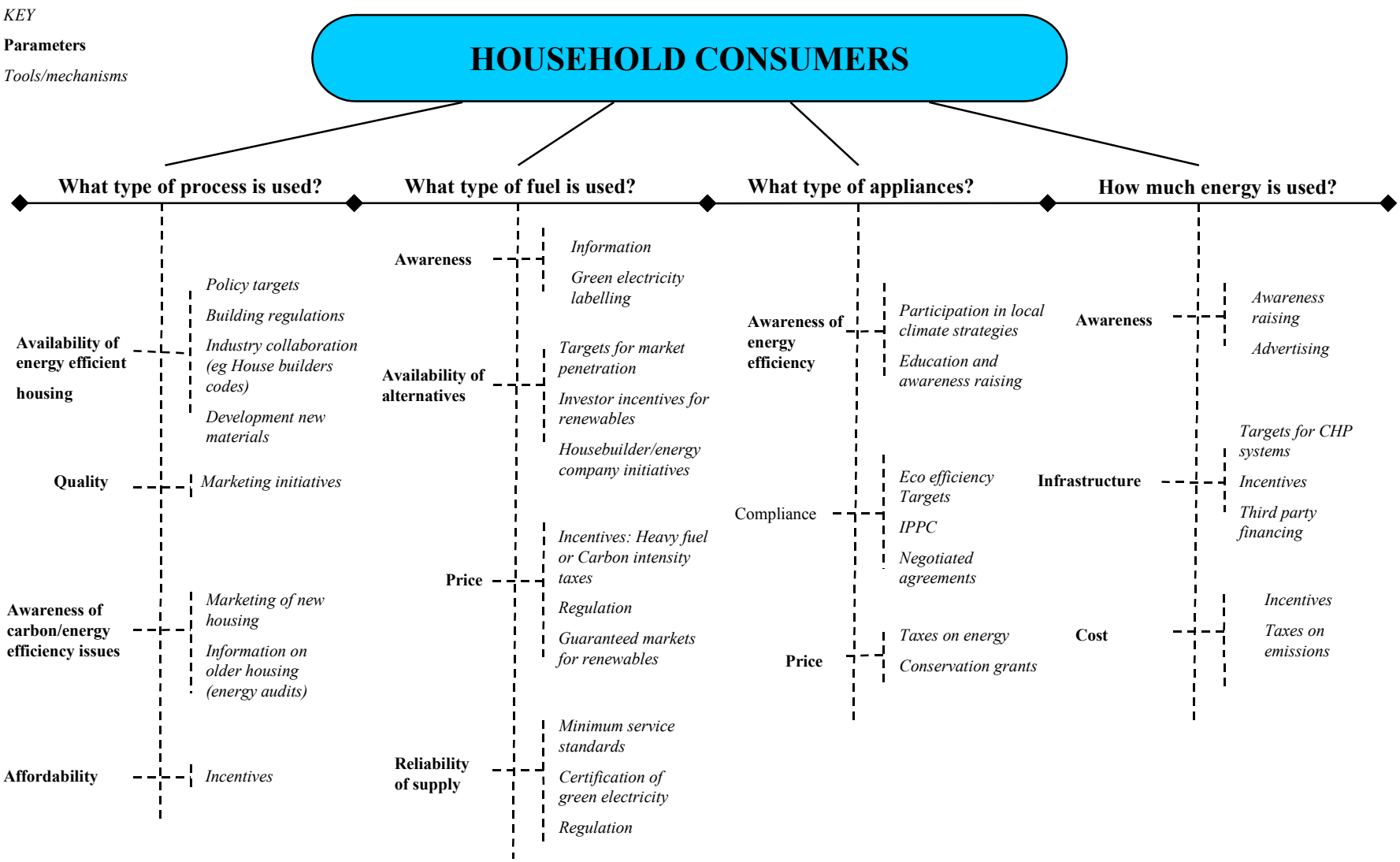


Figure 5.3: Transport - decision flow analysis for households in relation to climate change

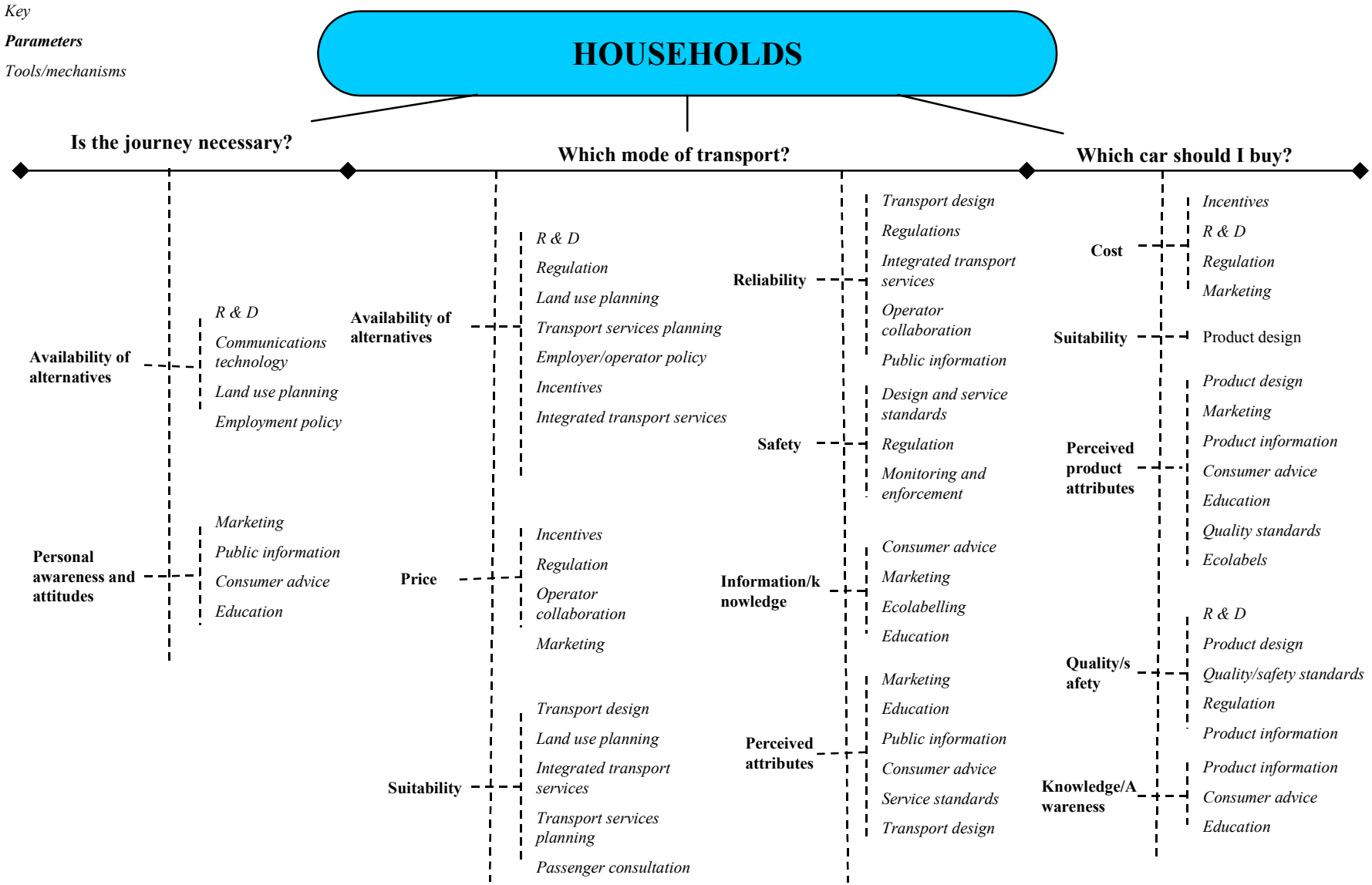
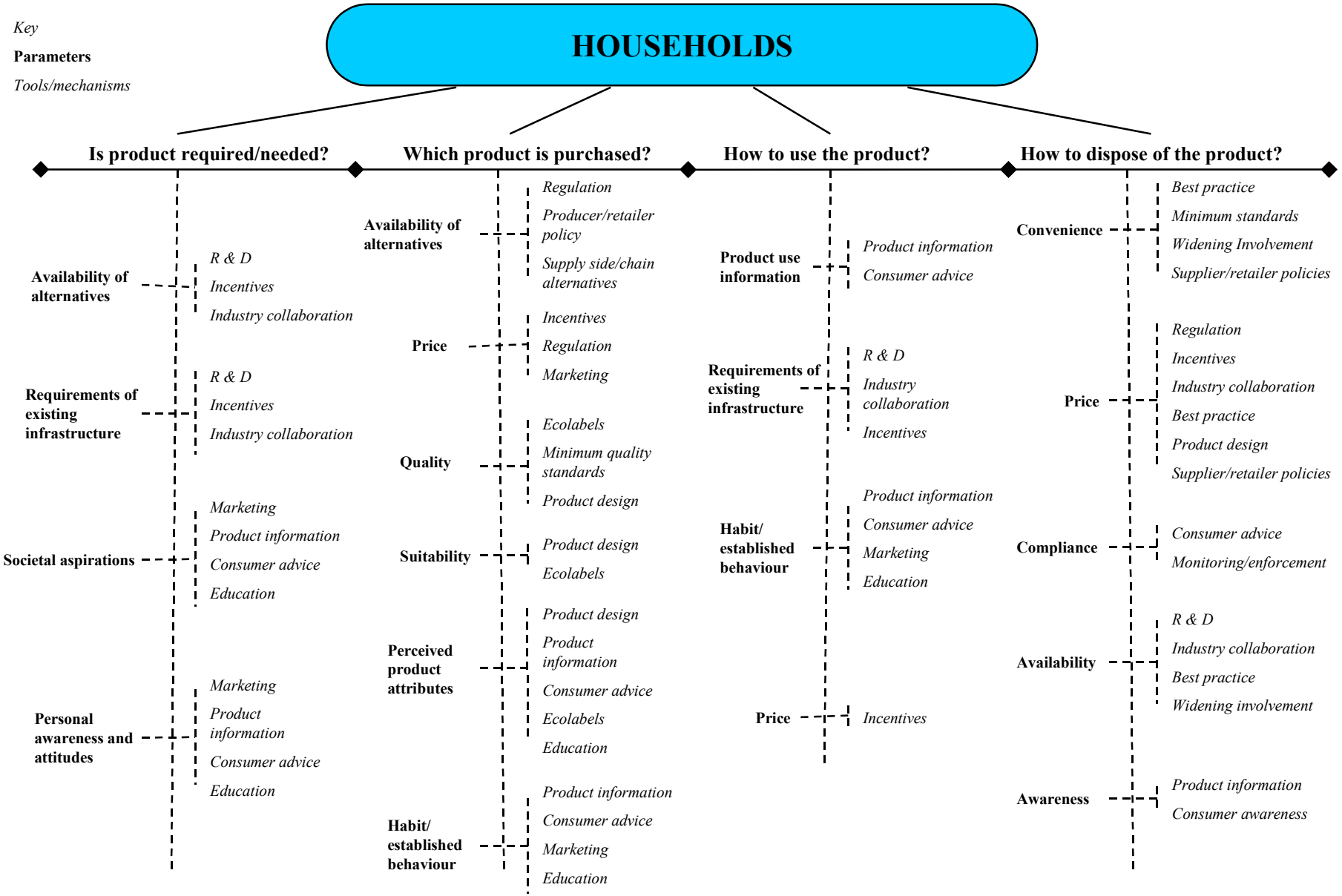


Figure 5.4: Industry - decision flow analysis for households in relation to chemicals



6 CHOOSING POLICY TOOLS FOR INTEGRATION

6.1 INTRODUCTION

The decision flow analyses described in *Section 5* identify a large number of tools which are or could be used to influence decision making at the micro level and encourage actors to improve the sustainability of those decisions. For example, *Table 6.1* shows the range of tools identified for the industry sector to influence the decision of which product a business should produce, to reduce the environmental impact of chemical use.

It is evident from this example and the other sectoral examples in *Annexes A-D* that there is considerable overlap between the types of tools which can be used across sectors in addressing a certain type of decision (eg what product to buy and how to use it) whether by businesses, individuals or institutional consumers. This section therefore presents a range of generic tools as a non-exhaustive list of potential tools to address decision making at the micro level for other sectors.

For each generic tool we have identified the specific conditions which need to be in place for them to achieve the desired change in decision making. These differ by type of tool but include the following factors:

- Effectiveness, implying that the tool must be able to achieve the desired outcome more effectively than other approaches, such as regulation.
- Efficiency and practicality, e.g. not requiring new institutions to implement it or implying higher collection costs than the revenues raised in the case of a market based instrument.
- Acceptability to those that the tool is aimed at. Acceptability is generally increased by participation of stakeholders in the design and implementation process. It is also increased where the implementing body or information provided is credible.
- Compatability with the existing policy context.

In addition there are a range of macro or wider framework conditions which must be in place for the tool to be effective at a wider level. The relative importance of each of these factors will vary according to the sector, nature of the decision and the decision maker. For instance, in the case of farmers deciding what to grow and what inputs to use in the process, the CAP price support structure for conventionally produced high input products is likely to be the overriding factor. Likewise, for consumers deciding whether or not to buy low input or organic produce the price differential will be key, although price considerations may be overridden where consumers feel that they are getting other quality, health or life-style benefits from a more sustainable choice (e.g. organic food). For other products, such as public transport, perceptions of safety, reliability and convenience may be far more important in encouraging passengers out of their cars than price, even though in most

countries policy makers are focusing on getting the pricing signals right in order to tackle growing demand for road transport.

These wider framework conditions to a large extent echo the parameters for day to day decision making by market based actors. These include:

- ***Sustainability Awareness***. Do market based actors understand the issues, the need for action and what they can do about it?

- ***Availability***. Are environmentally less damaging products and services available through the normal channels or is additional research, development, piloting or effort required relative to conventional processes, products or services?

- ***Affordability***. Are the preferred alternatives affordable?

- ***Competitive Context***. Does the wider policy context (EU or WTO etc) support the use of this tool?

- ***Existing Market Structure***. Are more sustainable production or consumption decisions feasible within existing market structures? Is additional support required to avoid distortions to competition or to prevent some groups bearing unfair burdens?

- ***Institutional Capacity***. Is there sufficient governmental and non governmental capacity to support more sustainable decisions?

- ***Willingness to take action***. For producers, where they have the necessary knowledge and access to affordable and appropriate technology, goods and services are they prepared to translate this into action? For consumers, are they willing to act on knowledge, access to products and the right price signals to actively change their consumption and purchasing decisions?

The generic tools are described as follows:

- target audience;
- type of decision;
- conditions for success (specific to the tool);
- wider framework conditions; and
- interesting examples of how the tools are applied in different sectors.

Describing the tools in this way provides an overview of the potential use of the tool and highlights the conditions and constraints for the success and effectiveness of the tool in influencing market based decisions.

Table 6.1 Industry and chemicals: Business as Providers/Producers

Parameters	Tools / Mechanisms:
Which product/service is produced?	
Compliance	Regulation • Prohibitions/Restrictions eg • IPP (Integrated Product Policy) • Producer responsibility • Product standards Monitoring and Enforcement Facilitation of future compliance via • Indicators of future legislation eg DK list of 'undesirable' chemicals • Clear signals re direction of environmental policy • Voluntary agreements EC Energy label voluntary agreement Advice Awareness raising and information regarding regulations, partic. for SMEs
Liability	Widening involvement Regulation • Degree of liability, level of fines Monitoring and Enforcement • Availability of legal aid/resources to bring actions Role of investors and banks in driving liability legislation
Corporate culture/ethics/ reputation	Environmental/Sustainability/Ethical corporate policy e.g. training, reporting, EMAS and ISO 14001 T encourage corporate citizenship/responsibility e.g. award schemes, media exposure, watchdogs, public debate, ACCA/CERES Environmental Reporting awards
Design process	Product Design • EMS applied to design • DfE (Design for Environment) • LCA (Life Cycle Assessment) • H&S assessment • Environmental awareness raising/training of employees involved in design procedure

Parameters	Tools / Mechanisms:
	• Linking of environmental aspects and innovation - tools/training to encourage creative thinking
	• E-Co Challenge, UK: exploring novel approaches to product development via university/company collaboration
Technology	R&D and associated Economic incentives
	• government, investor, NGO support/commissioned R&D into development of clean technology/products and their acceptability
Cost	Economic Incentives
investment costs vs expected profits,	• Rebates for clean/sustainable products
payback time	• Favourable start-up schemes for new 'sustainable' businesses esp. SMEs
	• Preferential lending criteria, interest rates for 'sustainable' products/services e.g. Tridos Bank
	• Ethical/environmental investment funds e.g. Friends Provident
	• Sustainability Index Ratings e.g. Dow Jones/SAM
Market opportunity	Education
Market demand	• Public environmental awareness campaigns/education
Competitors activity	Marketing
	• 'Green' marketing
	• Market analysis and research to combine environmental awareness with innovative business tools e.g. Porter's model.
	Regulation
	Restrictions on monopolies of producers and retailers
NGO/Citizen/Employee pressure	Widening involvement
Civil Society	Consumer advice
	Product information
	• Product Registers e.g. re chemicals
	Education
	• Public environmental awareness campaigns/education
Existing Infrastructure	Industry collaboration
	• Supply chain networks/co-operation
	• e.g. domestic appliance and detergent manufacturers; automobile companies and service stations regarding fuel provision for LPG vehicles

6.2 DESCRIPTION OF GENERIC TOOLS

PRODUCT/SERVICE DESIGN

Target Audience
• producers, service providers, planners
Type of decision
• What to produce/provide? • What process and inputs to use? • How to minimise environmental impacts (inputs, emissions, waste)? • How to make product/service attractive in relation to more environmentally damaging alternatives.
Conditions for Success
• Ensure the product or service is practical, effective, safe and high quality as well as reducing environmental impact • Achievable and practical based on affordable technologies and processes • Acceptability to users can be facilitated through early consultation and participation in the design process • Must not lead to displacement • Most effective when the design process is based on a life cycle approach
Wider Framework Conditions
• *Sustainability awareness*. Awareness of producers and service providers of the full range of impacts and to encourage designers to address the source of the problem. • *Availability of affordable* technical solutions and designs that will not lead to a prohibitively expensive product. • *Competitive Context*. Product design must not breach EU standards or reduce competitiveness of the sector, especially if regulation is required to ensure adoption of the design throughout the sector. The uptake of new designs within a sector may be hindered by restrictions of commercial confidentiality. • *Market Structure*. Research and development costs for new designs may be prohibitively expensive where a sector is dominated by small and micro producers and may require a collaborative approach. Where there is a monopoly or unwillingness to adopt new approaches government intervention may be required. • *Institutional Capacity*. Is there a need for institutions to undertake research and development or can progress be achieved through the establishment of collaborative networks? In some sectors it may be necessary to establish a body to oversee and guide the process. • *Willingness to act*. Producers and service providers may be unwilling to implement new designs if they are unsure that there is a market for the new or amended product. Marketing, economic incentives and regulation may all play a part in facilitating uptake.
Examples
Integrated transport systems: The Netherlands Integrated transport services address various aspects of the transport system to improve connectivity and co-ordination within and between different modes to reduce the negative impacts of transport. This includes timetabling and provision of transfer facilities as well as co-ordinating planning of transport infrastructure. Several good examples have been implemented in the Dutch transport network and include, but are not limited to: • carefully planned and designed transfer points including the Amsterdam Transferium which has capacity for 2,500 vehicles • allocation of rush hour only lanes • real time information panels on roads • shared use of bus lanes with freight traffic and car poolers • legally instituted car pool schemes

Target Audience
• consumers, producers, retailers
Type of decision
Can be an effective tool in most decision making, in particular: • What to produce/provide? • What process and inputs to use? • How to minimise environmental impacts (inputs, emissions, waste)? • How to make product/service favourable in relation to more environmentally damaging alternatives?
Conditions for Success
• It is important to establish trust and transparency in the process to overcome any preconceptions held by participants entering the process • Most effective early on in the decision making process • Participants should have realistic expectations for the process and be aware of any limitations on the outcome eg it is not always possible to reach a consensus and many unpopular decisions may still be taken • Participation and involvement are better than consultation ie it should be a two way process • Needs adequate resourcing - financial, staffing and materials • Requires careful selection of the target audience in relation to the decision being taken and issues such as technical knowledge required etc
Wider Framework Conditions
• *Sustainability awareness*. An understanding of the issues being discussed and their importance in relation to other issues facilitates constructive and informed dialogue with other decision makers. Awareness also provides motivation to become involved in the decision making process. • *Availability.* Inviting other stakeholders to become involved in the decision making process necessitates the consideration of alternatives and different options, otherwise the process will be viewed as a token effort and will be of little value to either party. • *Affordability*. Early involvement of consumers can provide a means of determining if they are willing to pay a premium for less environmentally damaging goods, and if so how much. However, it is often difficult to establish whether such opinions will translate into purchasing decisions. • *Competitive Context*. Issues of commercial confidentiality may discourage early involvement of stakeholders and limit the potential for their views and opinions to be taken into account. • *Market Structure*. Stakeholder involvement may need to be undertaken by sector level organisations due to resources required. May be difficult to encourage sectors with a traditional outlook that are not used to working in an open, transparent market. • *Institutional Capacity*. Is there a need to provide specialist training to facilitate discussion? Establishing an ongoing framework or forum for discussion may reduce costs and facilitate the sharing of experience and expertise. It is particularly difficult to provide the general public with a means of participating. Often those with an interest in a particular issue are the most vocal and organised and can present an unbalanced view of general opinion. • *Willingness to act*. Although producers may actively seek the views of stakeholders, these views may not be given any weight when the decision is actually made. Other issues, in particular cost, may outweigh the generally preferred option or they make be restricted by other requirements (including regulations). Again it can be difficult to motivate the general public into participating in decision making despite general agreement in the value of public participation.

ADVICE

Target Audience
• consumers (households and businesses), producers
Type of decision
• What to buy? • How to use a product and dispose of it? • What process and inputs to use? • How to minimise environmental impacts (inputs, emissions, waste)?
Conditions for Success
• Easily accessible - may need promotion • Accurate and easy to implement • Unbiased/credible source • Co-ordinated with or complimentary to other sources of advice • No/relatively low cost for users • Relevant to target user group
Wider Framework Conditions
• *Sustainability awareness*. Users must be aware of the issues to want to seek out further information. Do they understand the implications of the advice enough to want to put the advice into practice? • *Availability of affordable* alternatives to provide the basis of feasible, affordable advice which users can put into practice. • *Competitive Context*. Advice that favours one product over another may lead to objections of providing competitive advantage, particularly if a government body is providing the advice. • *Market Structure*. Advice services often need financial support, in particular where the information is technical or specialist in nature and the recipient is a small organisation or company. It may be necessary to involve representative bodies to facilitate the dissemination of information and to add credibility. • *Institutional Capacity*. Is there a need to monitor/regulate the advice being provided? It may be necessary to establish a register or accreditation system for advisors. • *Willingness to act*. Even though the consumer or producer has sought the advice, do they actually put it into practice? How will the success of the advice service be measured in terms of implementation?
Example
SME business-environment advice schemes SMEs often have a very low awareness of environmental issues, legislation and relevant tools, due to resource constraints concerning time, funds and expertise. To address this gap, advice schemes for SMEs comprising of information provision, grant and funding opportunities, networks, workshops, use of environmental consultants and best practice dissemination have been established in several EU member states. These often involve collaboration with government bodies, charities or educational institutes in order to provide low-cost advice and reduce the expenditure incurred by the SME.. The Groundwork Environmental Business Service (EBS) in the UK, part of the Groundwork Trust which is one of the UK's leading environmental partnership organisations with over 40 local offices. EBS provides practical support, advice, information and training together with an emphasis on local regeneration. The following services are offered: • Groundwork business clubs, associations and networks to bring businesses together to share best practice and develop common solutions eg waste minimisation programme focusing on cost savings; • Environmental Business Review - offers a baseline review, action plan audit, single issue reviews, preparation of EMS, verification of public statements etc; • Management systems - Environmental, Quality, Health & Safety, Integrated, Waste, energy and transport management, Supply chain management; • Information services - up-to-date information and databases on environmental, health and safety legislation, phone and fax helplines, newsletters and bulletins, environmental legislation update; • Training - employee training programmes providing specific environmental information and skills tailored to the needs of each business in terms of level, price and minimum time away from work.

Target Audience
• all actors
Type of decision
• forms a basis for all decisions
Conditions for Success
• Appropriate audience for the issue or message being addressed - either the general public or a targeted audience for more specific issues - and selection of relevant media to communicate that message. • Clear and interesting • Compatible with and complimentary to other education and awareness raising campaigns and programmes • Technically accurate with a firm scientific basis and support
Wider Framework Conditions
• *Sustainability awareness*. Education and awareness raising form the basis for the success and effectiveness of other measures. • *Availability of affordable* alternatives to provide a means of acting on information and knowledge. Consumers and producers may not act on this knowledge if environmentally less damaging goods and processes are prohibitively expensive or do not meet other needs such as safety, security of supply etc. • *Competitive Context*. Is the message promoting and encouraging actions that might be restricted by EU and WTO rules and regulations. • *Market Structure*. Is it necessary to involve NGOs or sectoral organisations to facilitate information dissemination to SMEs? Do these companies need additional support to be able to act on this knowledge? • *Institutional Capacity*. Is there a need to establish an independent body to support the dissemination of information and involve all the necessary actors? • *Willingness to act*. Are producers and consumers acting on the knowledge being given to them? Are other overriding issues not being addressed?
Example
Are you doing your bit?, Department of Environment, Transport and the Regions: UK The campaign was launched in 1998, and is designed to communicate elements of sustainable development and encourage small but important behavioural changes in everyday actions. The first year of activity focused on climate change, transport and air quality issues, and achieved measurable consumer recognition on a budget of £2 million, using national women's press and consumer interest magazines. Activity in 1999/2000 is designed to substantially increase the campaign's national presence and awareness with an expanded initiative based on a series of humorous TV advertisements supported by national radio, consumer press, sheet posters and bus sides. It is backed by a strategic campaign extension support programme of nation-wide and regional promotional events. Pages on the DETR website provide further information.

Target Audience
Consumers
Type of decision
• Which product to purchase?
Conditions for Success
• marketing claim must be credible to the consumer; • must have a system of regulation and monitoring, with effective penalties for unfounded claims; • needs to relate to issues of public environmental awareness and concern; • greater effectiveness if targeted.
Wider Framework Conditions
• *Sustainability awareness* Unless the consumer is aware of the environmental issues in relation to the type of product, they are unlikely to be influenced by marketing of more environmentally benign variations or alternatives. However, awareness raising is a primary objective of the tool. • *Availability* For many consumers, unless the marketed product is readily available, purchasing habits will not change: many will be unwilling to make extra efforts to obtain the alternative product. • *Affordability* Environmental goods can often command a price premium, but in reality this is limited. The goods must be perceived as affordable. • *Competitive Context* The market for 'green' goods has developed rapidly in recent years but has been largely unregulated until recently. Regulation may be required to prevent unfounded environmental claims that may provide a competitive advantage. However, any regulation or restriction on marketing needs to take account of EU and WTO trade rules. • *Market Structure* A diversity of retailers will tend to encourage the power of marketing to change purchasing behaviour. Where there is an effective monopoly or the equivalent of a cartel of retailers, there will be fewer purchasing options for consumers, and there may be less incentive for retailers to provide a choice of alternatives. • *Institutional Capacity* There must be a system of regulation which has the confidence of consumers for the marketing to be credible and effective. • *Willingness to act* Despite the provision of information and support for less environmentally damaging goods, consumers may be unwilling to change their purchasing decisions due to other factors including habit or perceptions regarding product quality
Example
ECOVER ECOVER was established in 1979 and produces a range of 'green' household washing and cleaning products. The development of a brand identity and market has been facilitated through primarily selling through the health food shops and other alternative retailers, although more conventional outlets now stock the product. The green approach has been implemented consistently throughout all aspects of company operations and supported by an open and transparent environmental policy. Marketing has also focused on information campaigns and provided a clear self explanatory message. Uptake has been encouraged by comparable pricing to competing products rather than charging an environmental premium. The credibility of the company is reflected in its involvement in the establishment of the European Ecolabel for washing products and the Environmental Detergent Manufacturers Association (EDMA) which represents the "real green" producers.

Target Audience
• Producers, processors and retailers of goods and services • Producer organisations • Public sector eg national or regional/local government, research institutes
Type of decision
• Is the product /service needed? • Which product (including house or car)or service? • How is the product used and disposed of ?
Conditions for Success
• Cooperation/trust between parties; • Avoidance of highly competitive sectors where confidentiality is imperative; • Effective involvement/leading role of trade associations; • Transparency (notably for public private sector collaborations).
Wider Framework Conditions
• *Sustainability awareness*. The sector and its actors need to be aware of the importance of achieving the goal of improved environmental performance or reduced impacts, otherwise the efforts at collaboration are likely to be undermined by other factors, *eg* competition, commercial confidentiality • *Availability* Industry collaboration is primarily aimed at making alternatives available. • *Affordability* Unless collaboration results in goods or alternatives which are affordable, they are unlikely to have sufficient success or acceptance to reward the collaborative effort. • *Competitive Context*. Industry wide R & D initiatives which result in new product standards being adopted at the European level could be questioned by WTO. • *Market Structure*. If the sector is characterised by SMEs, collaboration will be more difficult, both in terms of securing agreement to co-operate and financing the venture. However, there are notable exceptions to this, for example the Danish Agricultural Advisory Council. Collaboration may also be more difficult to achieve in more traditional sectors, or where competition is intense, or where the structure of the market does not encourage change. • *Institutional Capacity*. Industry collaboration may operate outside the sphere of institutions, however involvement of government or other public sector organisations may be helpful for effective collaboration, e.g. on updating product standards. • *Willingness to act*. Collaboration requires a forward-looking, possibly innovative and determined, attitude on the part of those businesses and other organisations involved. A previous history of collaboration in the sector can make it easier culturally for the various actors, and may also mean that any administrative or organisational structures and mechanisms are already in place. The willingness to act is sometimes increased by the threat of government intervention as an alternative.
Examples
Sweden: Catchment based watershed groups, Federation of Swedish Farmers (LRF) This collaborative scheme has been developed to promote good practice in the reduction of nitrate leaching using local, grass-roots knowledge to deliver information in a form which is more accessible and user friendly than a conventional published code of practice. Each group consists of farmers, rural residents and public officials who work jointly within a specific catchment area to reduce plant nutrient leaching. An environmental plan for the area is developed with a co-ordinator who serves as an advisor and possesses knowledge of plant nutrients and other environmental issues. The plan includes goals for the group, required measures, a chart/flow diagram showing the local nitrogen cycle and how various practices contribute to plant nutrient leakage *etc.* Those who take part may be granted exemption from a number of legal requirements; this in turn provides an incentive to participate and assists with devising creative solutions. Experience suggests that nitrate pollution can decrease by 30-50% through this type of co-ordination. Since the fundamental idea behind these groups is flexibility and local knowledge, there are no detailed instructions or framework. The material that is distributed consists of a brochure and a video. A network between the LRF and existing groups is in place to support new groups when they start.

R & D

Target Audience
• Producers, consumers
Type of decision
• Which product/service to produce/provide? • How is product/service produced/provided? • Is product needed? • How to use product? • How to dispose of product? • Should inputs (e.g. pesticides or chemicals) be monitored/regulated? • How should inputs (e.g. chemicals) be monitored? • Which house to purchase? • How much energy to produce?
Conditions for Success
• innovation; • resources/funding; • leader or fast follower, in order to gain competitive advantage; • clear direction from present policy objectives; • clear evidence/understanding of the environmental issue being addressed.
Wider Framework Conditions
• *Sustainability awareness* R&D in the context of a tool for integration is often focused on increasing knowledge and awareness of environmental impacts and issues relating to the sustainability of products, processes and services. • *Availability*, *Affordability* The aim is often to make available alternatives which are also affordable. • *Competitive Context*. Industry wide R & D initiatives which result in new product standards being adopted at the European level could be questioned by WTO. • *Market Structure* A market characterised by SMEs makes investment in commercial R&D less likely, as it is often only the larger organisations which have sufficient resources. Alternatively, trade associations often take on the role on behalf of members. • *Institutional Capacity* Research is often carried out within academic institutions, and therefore a sufficient academic resource is required to ensure the quality and excellence of the research. Even where the research is carried out by private sector companies or institutions, a good base or centre of academic research and facilities is often a precondition for excellence in commercial research. Clear policy statements from central government/EU can make R&D investment an easier corporate decision. • *Willingness to act* R&D is often carried out by the more innovative organisations, which requires a particular corporate culture and willingness to invest.

Target Audience
• Businesses as consumers, producers, retailers and employers
Type of decision
• Which product/service to produce/provide? • What process and inputs to use? • How to minimise environmental impacts of business operations?
Conditions for Success
• Developed with the support of top level management and integrated throughout company operations. • Specific policies may be developed and implemented to address specific environmental impacts eg commuter transport plans • Focused on main environmental impacts of the full life cycle of the product/service. • Developed with the involvement of stakeholders • Implementation must be based on realistic and practicable measures • Integrated with existing company policies and procedures and given equal importance in terms of finance and resourcing • Regularly reviewed and revised
Wider Framework Conditions
• *Sustainability awareness* Businesses should understand the environmental impacts of their operations and recognise the environment as a legitimate business concern. • *Availability and affordability* of technical solutions to implement the policy. The potential for cost savings through eg increased energy efficiency or reduced raw material use, should be taken into account in determining the affordability of less environmentally damaging alternatives. • *Competitive Context* The environment is now seen as a legitimate business concern by many businesses and the rate of uptake of tools such as environmental management systems is increasing rapidly in some sectors due to supply chain pressure. In this context management of environmental issues implies a competitive advantage. Other sectors have not shown such rapid uptake and may need encouragement from central government, however any such measure must not contravene EU or WTO rules or standards. • *Market Structure* The implementation of environmental policy may be viewed as prohibitively expensive for smaller producers. Government subsidies advise and the involvement of trade organisations can overcome initial lack of expert knowledge and resourcing difficulties. • *Institutional Capacity* The development of a commonly recognised framework or collaboration between the supply chain of users of services may be beneficial. Where the main environmental impacts of a product or service involves other actors eg transport users it may be necessary to provide means to involve a wider range of stakeholders. • *Willingness to act* A corporate policy is of no use unless it is effectively implemented across all aspects of business operations. This requires all parties to take part, most importantly employees. Tools must be effective in practice and relevant to normal practice.
Example
Product Related Environmental Management Systems Programme: Netherlands Unlike the more familiar ISO 14001 or EMAS systems the product related EMS focuses on an assessment of environment impacts throughout the supply chain and the development of a co-operative approach between suppliers and buyers to address these issues. The Ministry of Economic Affairs has established a support programme to encourage implementation, consisting of financial support for more than 60 pilot projects involving sectoral organisations as well as individual companies from a diverse range of sectors. In addition, a set of draft guidelines has been developed including a toolkit for self analysis and systems implementation. The uptake has so far been greatest in the chemical and construction industries.

Target Audience
• Consumers; businesses and municipalities in relation to procurement decisions
Type of decision
• What and when to buy, how to use it, how to dispose of it
Conditions for Success
• *Comprehensible information*. Provided in a form and language which is understandable to consumers (eg referring to biodiversity impacts may mean little, while energy consumption over product life cycle is easily understood). • *Accessible information* - shown on packaging, product itself, point of sale or through a free helpline according to the nature of the product, where it is bought and how it is used. • *Relevant and defensible* - information should be relevant to the major environmental, health and safety issues associated with the products' use and disposal. Information should give relevant comparisons with comparable products. • *Credible*. Information should be verifiable with an independent source. • *Cost effective*. Not too costly for producers to provide information or for consumers to access it.
Wider Framework Conditions
• *Sustainability awareness.* Requires that there is a wider understanding of sustainable consumption and how this product choice contributes to overall objectives. • *Affordability* Information may have limited impact if the price of environmentally preferred products is higher than conventional products. • *Competitive Context* Labelling unlikely to contravene trade rules unless environmental standards are being used as the exclusive criteria for purchasing decisions. Effective labelling can give competitive advantage to prime movers and stimulate competition. • *Market Structure* If market is dominated by a few large producers, wholesalers or retailers effectiveness may be limited unless these key actors take a lead. • *Institutional Capacity* In order to avoid consumer confusion (greenwashing) over label claims there needs to be a meso level institutional structure (such as ISO bodies and independent verifiers and NGOs) that can verify claims, prepare ratings reports or provide additional product information. • *Willingness to act* Time, nature of purchase, life and style choices and peer pressure may be more important underlying factors in motivating individuals to act than the actual information on the label.
Examples
Power Content label operated by the California Energy Commission: USA A 'nutrition label' which shows the mix and emissions for each energy product compared to the average California Power Mix (based on 1995). This information is sent to each customer with their bill and prior to Green-e was seen as a means for green companies to highlight greener credentials. *Product declarations, Volvo Environmental Product Profile: Sweden* In 1998 Sweden introduced a regulation to encourage companies to provide externally verified product declarations based on ISO Type III eco-labels. Product panels comprised of companies from the energy, furniture, paper and automotive industry sectors were established to develop standardised environmental indicators for their product categories. The scheme is overseen by the Swedish Council for Environmental Management which checks the sector guidelines and product declarations conform with the regulation. Its advantage over 'branded' type I eco-labels such as the Nordic Swan is that it provides the consumer with easily understandable but detailed information covering manufacture (e.g. solvent emissions), use and end-of-life environmental impacts, thus being both educative and enabling comparison between products. The first example has been produced by Volvo for its S80 passenger vehicle. The company hopes the declaration will attract the interest of fleet buyers and other car manufacturers. At present the Swedish Automobile Manufacturers Association has not finalised sectoral guidelines and therefore Volvo's version represents a pilot version and may be changed in future.

Target Audience
• Producers, wholesalers and retailers of goods and services
Type of decision
• What to produce? • What process and inputs to use? • How to minimise environmental impacts (inputs, emissions, waste)?
Conditions for Success
• *Technically effective* (and if necessary integrated with other environmental issues ie not encouraging inter-media transfer of impacts) • *Achievable* and practical based on affordable existing or future technologies and processes (ie Not Entailing Excessive Costs) • *Compatible* with existing regulatory framework • *Acceptable* to producers and to civil society (generally implying some involvement of stakeholders in the standard setting process) • *Equitable* - not involving excessive costs on any one group (eg SMEs, or particular regions)
Wider Framework Conditions
• *Sustainability awareness*. Awareness by industry of what the regulations are trying to achieve so that if more radical or creative approaches can be found these are explored rather than relying on prescriptive end-of-pipe solutions • *Availability of affordable* technical solutions. If these are not available then a framework for public or private financed R&D will be required. • *Competitive Context*. Standards need to fit with EU Directives; if they go further they must not be set in a way which contravenes WTO competition rules. • *Market Structure*. If the sector is dominated by small and micro producers or old capital equipment regulation may prove costly for producers and uncertain in effect (with derogations more likely to be granted to SMEs and those with equipment at the end of its useful life). • *Institutional Capacity*. Where there are a large number of small players or regulated emissions or activities are from non-point sources greater institutional capacity will be required to monitor, enforce and collect fines for non-compliance. • *Willingness to act*. Based on past experience producers will view old style regulations as very likely to be actively enforced. It may be less clear how more recent approaches, such as framework regulations, negotiated agreements in lieu of regulations, service standards and quotas (eg for deregulated energy companies) and liability legislation will be enforced and indeed whether there are likely to be penalties from not acting straight away or whether they can afford to wait and see.

Target Audience
• Consumers of final products; Businesses procurement of inputs
Type of decision
• What to buy, when, how much and how to use it
Conditions for Success
• *Effective* Must be high price elasticity of demand to ensure tax changes behaviour rather than just raising revenues (e.g. pesticide taxes might need to be 15% of product cost to effectively change behaviour). • *Efficient* Tax should be levied on pollution emissions, product (inputs or environmentally damaging product or services) or as a user charge depending on nature of issue, product or service. • *Transparent* and clear in its working. • *Monitored* and enforced. • *Equitable and acceptable* based on the polluter pays principle but not with disproportionate impacts on one group (e.g. SMEs or poorer households). • *Compatible* with existing regulatory and fiscal framework.
Wider Framework Conditions
• *Sustainability awareness and willingness to act.* Wider awareness of sustainability objectives and how investment in more sustainable consumption or production will contribute to the process makes greed taxes more effective. This needs to be backed by a willingness to act. Supporting policy tools in the form of regulatory standards for cleaner production, quotas and voluntary agreements may be necessary as sticks to encourage up take of available grants. • *Availability* of technologies and processes. Uptake of grant schemes may be limited by lack of near to market technologies which can be used in a way which is acceptable to producers (eg for certain organic crops price support or taxes on conventional produce might be insufficient since small producers may not be able to afford specialised weeding and harvesting machinery that is required for efficient production). Grants may need to be supported by R&D programmes. • *Affordability* Subsidies are costly to government unless financed from ear marked revenue sources such as pollution charges, product charges or other forms of levy on polluting behaviour. Subsidies and taxes work well in tandem. • *Competitive Context* Needs to reflect the polluter pays principle and not provide state aids which will distort EU competition. • *Market Structure* The size of enterprises and the age of their capital stock may influence successful uptake of grants; SMEs and those with modern capital may be less willing to replace existing equipment or processes unless required to do so through legislation. • *Institutional Capacity* linked to the above there may be a need for an extensive technical advisory service to make producers aware of grant schemes, how to apply and the options (eg in the agricultural sector).
Examples
Denmark subsidies in support of Energy Efficiency: Denmark Grants are provided for up to 30% of the initial investment costs on projects with pay back periods of 2-9 years. In the period between 1996-9 there was provision for grants worth DKK 2.6 bn of which around 40% was expected to be allocated to industrial CHP projects. This allocation may not have been fully spent due to lack of proposals which fully met the criteria of the scheme.

MINIMUM STANDARDS

Target Audience
• Producers and Service Providers • Public sector eg national or regional/local government
Type of decision
• What to produce/provide? • Design parameters, conditions, etc that must/should be incorporated into product/service design and operation? • Identifying market requirements/conditions for new products/services?
Conditions for Success
• Consumer awareness of voluntary standards. • Authority issuing the standard must be credible to consumers/users. • Standards must be supported by a system of information dissemination, regulation and monitoring, with effective penalties for breaching required standards. • Cost burden (on producers/providers, which will be passed on to consumers) must be considered in setting levels for the standards. • Effort involved in meeting standards must be considered to ensure producer/provider acceptance and cost implications/market reception. • Must relate to relevant environmental issues. • Public awareness of the standards.
Wider Framework Conditions
• *Sustainability awareness* Producers and consumers must be aware of relevant environmental issues in order to consider the benefits of minimum standards. • *Affordability* Compliance must not entail a significant cost penalty to maximise uptake rates and market penetration. • *Competitive Context* WTO etc rules may restrict the use of voluntary environmental standards as the basis for restricting market access. • *Market Structure* A diversity of retailers/suppliers or producers provides better conditions for using standards to achieve market differentiation. • *Institutional Capacity* Compliance requirements (regulation, enforcement, monitoring and reporting) must be modest and straight-forward to ensure appropriate support. • *Willingness to act* Voluntary standards assume a certain level of knowledge and awareness of the advantages of compliance on the part of producers/providers. Regulatory standards must be underpinned by reliable and credible advice of the environmental implications of not conforming

Target Audience
• Producers, processors and retailers of goods and services • Producer organisations
Type of decision
• Where to source raw materials and components • Who will carry/sell/offer goods and services in the market • Production processes used • How to package the product
Conditions for Success
• A driver company that is offering a considerable amount of business on the basis of harmonising environmental management practices. • A large pool of potential suppliers, some of which will see the advantage in conforming with supply chain requirements. • Co-operation and trust between parties, and a willingness to develop long term business relationships • Recognition of business advantages through partnerships. • Acceptance of environmental conditions as one factor considered in procurement decisions. • Effective involvement/leading role of trade associations. • Transparency (notably for public/ private sector collaborations).
Wider Framework Conditions
• *Sustainability awareness*. Companies must be willing to work together to meet sustainability objectives, and must recognise that this requires solutions that extend beyond their sites of operation, along the supply chain. • *Availability* Industry collaboration is primarily aimed at making alternatives available. • *Affordability* Compliance costs must be returned through increased reliability or availability of supply contracts. • *Competitive context*. EU procurement rules may restrict the extent to which public sector purchasers can use environmental criteria as the basis for supply decisions. • *Market Structure*. There must be market leaders that are willing and able to use their influence to shape the nature of the supply chain, and a sufficient body of potential suppliers from which some will see advantages in long term supply chain relationships • *Willingness to act*. There must be a willingness to enter into partnerships along the supply chain. This could involve public and private sector actors, who are willing to meet their supply requirements by considering environmental performance/impacts.

Target Audience
• Producers/providers • Public sector eg national or regional/local government, research institutes
Type of decision
• How is product/service produced/provided? • Which product/service to produce/provide? • How to dispose of product?
Conditions for Success
• Information must be effectively disseminated. • Information must be practical (eg case studies must be transferable), relevant to environmental issues that producers/ providers are struggling with, and must demonstrate advantages of more sustainable decisions. • Innovation (links to R & D). • Must not entail significant cost penalties to ensure uptake (and demonstrate wider advantages). • Must be provided by a credible source that producers will recognise and respond to. • Must minimise disruption to supply chain partnerships.
Wider Framework Conditions
• *Sustainability awareness* Best practice must demonstrate advantages of implementing best practice - they could be through reduced costs, reduced wastes, etc. Consumers/Users must recognise the value of environmental performance that goes beyond statutory requirements. • *Availability* Are technologies available on a competitive basis, and are technical support services, raw materials, parts etc generally available? • *Affordability* A key issue. There should be economic incentives for adopting best practice if this reduces environmental costs which would otherwise fall to the public sector. • *Market Structure* Best practice cannot readily be developed by one actor in isolation from others in the sector. Meso level actors, such as producer groups and trade associations, have an important role in developing and disseminating best practice. • *Institutional Capacity* Dissemination of best practice requires the existence of suitable channels of communication and a relationship between regulators and operators that goes beyond compliance/enforcement. • *Willingness to act* Producers must be pre-disposed towards accepting practice that may exceed regulatory requirements. Development and up-take of best practice relies on a culture of innovation in the private sector.
Examples
LEAF (Linking Environment And Farming): UK LEAF is an organisation which aims to develop and promote Integrated Crop Management (ICM). It encourages farmers to take up ICM through the production of practical guidelines on ICM and through a scheme of self-assessment through environmental audit. LEAF brings together a broad range of interests and organisations, representing farmers, consumers and environmentalists and supported by both the private and public sectors. The audit is designed as a management tool to help farmers assess their farm practices and performance against the standards of ICM, including identifying practices that if adopted would benefit the farm business. The system of annual self-assessment provides a framework to monitor farm systems and help determine priorities in order to adopt a fully integrated approach.

Target Audience
• Consumers
Type of decision
• Intended to promote environmental awareness, individual responsibility and action in relation to the decisions what to buy and how to dispose of it.
Conditions for Success
Eco-labels are a specific form of product information, providing consumers with information about the environmental credentials of a product in a format which is • *Credible* because externally verified • *Comprehensible* and easily recognisable because based on standardised criteria and a logo (enabling both comparability and greater recognition) in a form which is recognisable to consumers and accessible on packaging and the product itself. Careful promotion is required to ensure that the label is recognised and understood by retailers and the general public. • *Relevant and defensible* - information should be relevant to the major environmental, health and safety issues associated with its use and disposal. For example the EC eco label requires the label to provide information on the main environmental impacts of the product based on a LCA approach, product profiling in Swedish industry provides information on the main impacts of the whole product lifecycle plus other aspects such as environmental management of the production process. The example of the product profiling therefore indicates scope for extending the coverage of issues in other sectors. • *Cost effective*. Not too costly for producers to provide information or for consumers to access it.
Wider Framework Conditions
• *Sustainability awareness.* Requires that there is a wider understanding of sustainable consumption and how this product choice contributes to overall objectives. • *Availability*. Requires a critical mass of products having received labels to ensure consumer recognition. Some confusion may arise between the EU and national schemes e.g. EC 'flower', Nordic Swan, Fuel efficiency labelling, green certificates for renewable electricity and EC ecolabel for white goods and organic labelling. • *Affordability* Many ecolabelled products likely to be too expensive for majority of consumers, eg organic food still only a small niche market. Costs of certification may be too high for SMEs. • *Competitive Context* Labelling unlikely to contravene trade rules unless environmental standards are being used as the exclusive criteria for purchasing decisions. Effective labelling can give competitive advantage to prime movers and stimulate competition. • *Market Structure* If market is dominated by a few large producers, wholesalers or retailers effectiveness may be limited unless these key actors take a lead. • *Institutional Capacity* Need to ensure that capacity for assessing, certifying and verifying a critical mass of products and producers exists. Must be supported by training of retailers in terms of understanding and encouragement to utilise the label as a sales point. • *Willingness to act* Time, nature of purchase, life and style choices and peer pressure may be more important underlying factors in motivating individuals to act than labelling information.
Examples
Renewable Energy Accreditation Scheme (REAS): Green Electricity Labelling: UK The aim of REAS is to provide consumers with information on clearly defined energy products and avoid confusing the consumer with 'greenwash'. The scheme offers accreditation for renewable electricity (of which at least 50% comes from renewable sources and the remainder comes from sources with lower SO_2, CO_2 and NOx than the average emissions mix) so developing the market for green electricity. The scheme was approved by the UK government in February 1999 and started operation in June 1999. So far some 10 suppliers have been accredited. REAS is run by the Energy Savings Trust, a UK NGO which also runs an Energy Efficiency brand for products aimed at domestic consumers. REAS provides certification for each 'green' tariff (companies typically offer one or two) which identifies the type of scheme and renewable mix based on a typical year. Pre 1990 schemes and large scale hydro are exempt. It includes both premium tariffs (typically 5 or 10% above the normal tariff) and Eco Funds (where the premium paid by consumers is paid into an investment

fund and matched by the utility and invested in renewables development or R&D). The annual cost of accreditation is £5000 per tariff. When the Climate Change Levy is introduced REAS certification may be used to identify energy which should be exempted from a carbon/energy tax.

CONTENTS

Annex A

Agriculture Sector

A1 AGRICULTURE

A1.1 STAKEHOLDER ANALYSIS

The agriculture sector is the primary supplier of food and raw materials. The total agricultural area in Denmark covers approximately 2.8 million hectares and is the main use of land. The sector is highly diverse at the regional and local levels, in terms of the types of production systems and their products, and the size and structure of production units [(1)] .

At the macro level, the Danish Ministry of Agriculture is responsible for setting the policy framework and drawing up agricultural policies, principal among these being the implementation of the EU Common Agricultural Policy. The administration of the CAP is the responsibility of the Market Management and Intervention Board (EU-direktoratet), including distribution of payments under the CAP. Agri-environment schemes are drawn up by the Ministry, and commented on by an advisory committee comprising central, regional and local government representatives, farming organisations, land-owning associations, nature and recreation interests, and forestry interests.

At the meso level, the Municipalities are the environmental authority in relation to agriculture with responsibility for supervision of farms, of which just over half are livestock farms. The Counties are responsible for administering and negotiating contracts with farmers under agri-environment schemes. In relation to biodiversity issues, the Counties administer nature conservation legislation at the local level and manage a large number of protected areas. The Municipalities are fully involved in all planning processes.

The two main agricultural organisations at the meso level are the Danish Farmers' Union and the Family Farmers' Association, who between them represent around 95% of Danish farmers. These organisations have an influential role in shaping policy, negotiating directly with the Ministry of Agriculture. They also aim to support and influence the individual farmer: the Danish Agricultural Advisory Centre (DAAC) is owned and run jointly by the two main farmers' organisations. The DAAC's aims include the communication of knowledge and information, development of methods and tools, studies, education and training. Local centres provide specialist advice to farmers in all farming-related areas, for which farmers are charged about 90% of the cost. The DAAC is highly influential, providing about 80% of the major advisory, training and information services.

Non-governmental organisations also play a role in influencing policy. The Danish Society for the Conservation of Nature had considerable influence during the 1980s on the Action Plan on the Aquatic Environment, and the

[(1)]Cereal production accounts for just over half of this, with other important crops being oilseed rape, sugar beet, potatoes and grass seed. Much of the land is also given over to pasture, and just over half of farms are livestock farms

Danish Angler's Federation has had a consistent and significant influence mainly regarding the condition of watercourses.

At the micro level, farmers and households are the principal players as producers and consumers of agricultural produce, although processors and retailers play a significant role in influencing agricultural markets and practices. For example, in the dairy sector, MD Foods dominates the market with an effective monopoly in the retail and distribution of all dairy products in Denmark. The majority of dairy farmers sell their milk solely to MD Foods and as such the company is in a position to exert a strong influence on the market, product standards, prices *etc*. The only other real outlet for independent farmers is Irma, which was the front runner in developing labelling in the 1970s and a leader in organics, quality foods and traditional produce.

Although the agriculture sector in Denmark only contributes 3.7% to GDP, the sector's influence is far greater. This may be attributable to the fact that farmers hold many influential positions, for example in Municipal and County Councils, and that much of the Danish population has not too distant roots in the countryside.

A1.2 KEY ENVIRONMENTAL ISSUES

Agriculture can have beneficial and harmful effects on the environment. The extent and causes of environmental impacts vary significantly across Europe largely due to differences in farming practices and local conditions. Some general trends are presented below and *Table A1.1* sets out the relative importance of environmental problems related to agriculture in Denmark.

- semi-natural landscapes and habitats which were shaped over centuries by traditional forms of extensive agriculture have undergone dramatic change in recent decades;

- the intensification and specialisation of farming in more productive areas has led to larger field sizes, uniform landscapes and loss of hedgerows and other linear features;

- the marginalisation of less viable farming areas has in some cases led to abandonment and scrub invasion, which often reverts to a state of poor biodiversity;

- an increasing reliance on commercial fertilisers and pesticides, and greater mechanisation has affected soil fertility and erosion rates;

- levels of soil contamination, air pollution in some areas has led to nutrient enrichment of surface and groundwaters; and

- drainage and water abstraction for irrigation purposes lowers the water table and changes soil quality and fertility. In some places, this has led to loss of wetlands.

Table A1.1 Relative Importance of Environmental Issues in Danish Agriculture

Environmental Issue	Significance
Pollution, and environmental contamination caused by chemical inputs, high concentrations of livestock, and greenhouse gases	Highly significant impact nationally
Loss of biodiversity and landscape quality caused by removal of landscape elements, reclamation, monoculture farming and intensification in general	Highly significant impact nationally
Water shortage, soil compaction, soil erosion, and loss of wetlands caused by intensive arable farming, irrigation and drainage	Historically, significant national impact
Loss of biodiversity and landscape quality due to marginalisation and abandonment of agriculture	Significant impact in some areas

Source: Primdahl (1999), *Environmental Aspects of Agenda 2000*, Danish Nature Council, in Conference Proceedings 'Agriculture and the Environment' University of Warwick April 1999

In Denmark two key environmental issues that have been identified by central government [(1)] are:

- *The need to protect groundwater resources:* The quality of groundwater is affected by pesticides and leached nutrients from agriculture. Predominantly sandy soils and the Atlantic climate contribute to a high risk of leaching due to a relatively high nitrogen surplus. Pesticides residues have been found in groundwater in most areas of Denmark and leaching of fertilisers is also polluting groundwater resources. This is of key significance in Denmark as 99% of the water supply is taken from groundwater sources, and its quality is therefore of great significance to the health of the nation. As a result, all of Denmark is designated a nitrate vulnerable zone. In addition, recent incidents of marine eutrophication have emphasised the problem of nitrate leaching from agricultural land.

- the need to conserve areas for diversity of species and to bring areas back into their natural state, especially wetlands.

The Common Agricultural Policy (CAP) is the key driver of agricultural policy in the European Union. It has had a powerful influence on the nature and type of farming practised in the EU today. The enormous budgetary pressure which CAP places on the EU, and the incentives it has created for environmentally damaging agriculture are now widely recognised. The CAP was initially reformed in 1992 to incorporate provisions for environmental protection schemes, and these have been developed further in the Agenda

(1) [(2)] Personal communication, September 1996

2000 reform of the CAP adopted in May 1999, although their role in influencing agricultural practices is still minor.

In addition, public concerns, primarily about food safety but also about intensive production methods and animal welfare, are creating consumer-led incentives for the adoption of organic and low-input farming. However, the cost of transition to organic production is high, particularly as it is several years before produce can be sold as organic, and therefore financial support to assist farmers in the transition to organic production is important. Financial subsidies for organic production also ensure that retail prices of organic produce can be competitive with conventional produce as the market develops.

For the decision analysis described in *Section A1.4*, we have taken as examples two of the key environmental issues for the agricultural sector:

- ***Water quality***
- ***Biodiversity***

A1.3 FRAMEWORK FOR MARKET BASED DECISION MAKING

A1.3.1 EU Context

The Common Agricultural Policy subsidises European farming on a large scale and sets the overall framework within which product and consumption decisions are set. The key changes in agricultural policy are:

- The 1992 CAP Reform, based on the MacSharry proposals, aimed to reduce over-production and budgetary pressures by introducing set-aside and direct compensation payments for farmers rather than price support measures. Accompanying measures were introduced including the Agri-environment Regulation (2078/92/EEC); and

- The Agenda 2000 reform of the CAP, agreed in May 1999, continued this shift away from price support and towards direct payments to farmers and will place greater emphasis than before on agri-environment measures and other forms of support within the new Rural Development Regulation.

A number of other regulatory measures contribute to the integration of environmental actions related to biodiversity and water quality in the agricultural sector. These are outlined below:

- The Nitrates Directive which requires Member States to designate Nitrate Vulnerable Zones and to develop and disseminate codes of good agricultural practice in those areas. A recent assessment by DG Environment of the European Commission shows a high overall level of compliance with the Directive, but with some Member States taking a more active role in disseminating good farming practices to farmers and dealing with wider issues than simply nitrates management.

- The Habitats and Birds Directives which protects areas designated on the basis of their high conservation value;

- Extensive legislation for pesticides in relation to their registration, use, and allowable levels of residue in treated agricultural products and the environment.

- Regulation (EEC) No 2092/91 sets up a harmonised framework for the labelling, production and control of agricultural products bearing or intended to bear indications referring to organic production methods. The regulation lays down minimum standards which must be complied with for the produce to be legitimately labelled as organic.

- A comprehensive set of legislation relating to the conservation and sustainable utilisation of plant genetic resources for food and agriculture. The legislation relates to phyto-sanitary protection, marketing of seed and plant propagating material and Community plant variety rights.

A1.3.2 Danish Context

The action plans developed in the 1980s have contributed to a reduction of the negative impacts of agriculture on the aquatic environment and nature, but improvements are still needed. A number of recent policy initiatives have created a long-term basis for the improvement of groundwater quality in Denmark, including the Aquatic Environment Plan II, the results of the Bichel Committee's work and the Act on Contaminated Soil. Efforts are concentrated on further reducing the use of pesticides and fertiliser, as well as the spreading of sludge containing heavy metals *etc*.

A national action plan on biological diversity and nature protection will also be developed, with the existing action plans and strategies as the basis. It is intended that the plan will promote the development of networks of interconnected protected areas, and help to ensure that biological diversity is respected by sectors including agriculture. The government will promote local practice which meets special protection requirements in particularly sensitive agricultural areas, nitrate-sensitive water catchment areas and in riparian zones along aquatic environments.

The Aquatic Environment Plan II adopted in 1998 aims to achieve the target 50% reduction in discharges of nitrogen from agriculture through reduced application to fields and better exploitation of the applied fertiliser. It also aims to promote environmentally beneficial agricultural practices and to establish more forests and wetlands to protect groundwater sources and flora and fauna.

In relation to pesticides, a tax has been imposed and, since 1994 220 pesticides have been removed from the market. Although the use of pesticides has decreased in terms of the quantity of active substances applied, the frequency of application has not significantly decreased. The Bichel committee

concluded that phase-out was not practically feasible but that pesticide use could be cut significantly. Following the committee's recommendations, a draft plan has recently been produced by the government on reducing the use of pesticides. This aim is to achieve a general reduction in the use of pesticides on treated areas, a reduction in the exposure of endangered areas and an increase in the area farmed organically, thereby reducing use by a fifth by 2002. The draft plan will cut spraying frequency, create ten metre wide no-spray zones around all significant water courses and triple the area of organic farmland, taking the overall share of organic agriculture in Denmark to 10%.

Since the beginning of 1996, the County Councils have assumed responsibility for administering and negotiating contracts under agri-environment schemes with farmers. The agri-environment schemes are drawn up by the Ministry of Agriculture, in consultation with an advisory committee comprising central, regional and local government representatives, farming organisations, land-owning associations, nature and recreation interests, and forestry interests, to comment on the plans. The schemes are then submitted by the Ministry to the Commission. Commission approval for the County Councils' New Environment Support Programme was given in February of this year. The following measures are eligible for payments:

- upkeep of permanent grasslands;
- promotion of public access;
- increase in water levels in lowland areas;
- maintenance of the countryside and landscape; and
- long-term set aside.

The Danish Government is also currently preparing a major revision to the contents of the national programme. The changes will focus on promoting measures addressing specific local issues developed through negotiations between County Councils and the farmers. It is anticipated that the measures will extend beyond groundwater protection to enhancement of landscapes and nature value.

A1.4 DECISION FLOW ANALYSIS

Decision flow analyses for the agriculture sector, for households, farmers and municipalities in relation the issues of water quality and biodiversity are presented in *Tables 1.2-1.4*. The analyses highlight that farmers are the most significant decision-makers in influencing both water quality and biodiversity, more so than either households or municipalities, although both of these others can have an important role.

It emerged that recurring parameters in the decisions made by farmers were:

- **profitability and financial risk**;
- **awareness of environmental impacts and perception of their significance**.

There are a range of tools used by various actors to affect these parameters, although with limited effect to date. For example, financial support schemes to make agri-environment measures more viable and attractive to farmers are implemented across the European Union, although for many farmers the balance of financial incentives does not favour the take-up of these schemes. Information and advice for farmers on environmentally-friendly farming techniques is also provided across the EU by a variety of organisations, and in Denmark a particularly effective scheme for advising farmers is in operation (the Danish Agricultural Advisory Council), and interesting examples exist in most other EU member states. However, many farmers still remain to be convinced of the significance of the impacts of their activities.

These parameters are also significant framework conditions for successful operation of the policy tools, and therefore it may be important not only to investigate where there are gaps in the use of tools but also to revisit the parameters where tools already exist to see how they may be made more effective or influential.

Table A1.2 Households

Parameters	Tools / Mechanisms	Examples
Which product shall I buy?		
Quality	Eco-labelling • organic labelling	
	Product information • quality marks • labelling on production methods (*eg* traditional)	
Price	Financial grants/subsidies • schemes to promote/support organic farming • agri-environment schemes	
	Taxes and charges • pesticide/fertiliser taxes • abstraction charges	
	Industry collaboration • farmers' networks/co-operative schemes to reduce costs	
Perceived attributes of product	Education and awareness raising • information/publicity on health risks/benefits • information/publicity on environmental impacts	
Availability of alternatives	Retailer policies • policy on product ranges	
	Marketing • farmers markets • organic 'box' schemes	

Table A1.3 Farmers and Biodiversity

Parameters	Tools / Mechanisms	Examples
Should agro-chemicals be used?		
Type of crop/produce/activity and possibilities for substitution	Advice • information on fertility requirements of crops/produce/activities • information on management of soil fertility R&D • knowledge of crop-pest interaction/resistance • development of pest-resistant crops Financial incentives • agri-environment schemes Industry Collaboration • farmers' networks for shared ownership/ use of specialised equipment	*Denmark:* grants for land taken out of agricultural production
Profitability of crop/produce/activity	Financial incentives • agri-environment subsidies Marketing • promotion of organic produce	*Greece:* grants to promote pesticide-free cultivation of cereals and grain *Switzerland:* grants for farmers not farming intensively adjacent to wetlands
Awareness of alternatives	Education/ advice • information/advice services on integrated crop/pest management	*Denmark:* Agricultural Advisory Centre recommending conversation to alternatives
Type of farming (*eg* organic, extensive, integrated crop management, rotation)	Financial incentives • agri-environment schemes • organic conversion assistance • preferential loans Advice • information/advice services on farm management and methods	*Denmark:* grants for organic production *UK:* financial assistance for conversion to organic farming *Switzerland:* grants for farmers not farming intensively adjacent to wetlands
Perception of risk (financial, market strength/reliability)	Financial incentives • availability of farm insurance	

Parameters	Tools / Mechanisms	Examples
	• availability of government support/price guarantees • preferential loans Industry Collaboration • producer organisation/co-operatives for joint marketing/distribution Marketing • producer organisations/co-operatives • organic certification • quality labelling	
Location (*eg* distance from water courses)	Guidance • codes of practice on application of manure	*EU:* Member State codes of practice to implement Nitrates Directive
Awareness of environmental impacts	Education/advice • information on environmental impacts of agrochemical use Environmental management systems • EMAS/ISO/farm audits	
Perception of significance of environmental impacts	Education/advice • information on environmental and health impacts of agrochemical use	
Regulations	Regulation • regulations governing use of pesticides	
Which agrochemical?		
Type of farming (*eg* organic, mixed, extensive), allowing use of organic fertilisers	Financial incentives • agri-environment schemes • conversion assistance • preferential loans Advice • information/advice services on farm management methods	
Cost versus effect on yield/profitability	Financial incentives • fertiliser/pesticide taxes • agri-environment schemes	*UK:* grants to compensate for changes required to protect nitrate sensitive areas and drinking water sources

Parameters	Tools / Mechanisms	Examples
	Marketing • premium price for organic products	*Finland:* fixed for pesticide market entrance, plus 35% of price (excl. VAT)
Perception of risk (financial, markets)	Financial incentives • availability of farm insurance • availability of government support/price guarantees Industry Collaboration • producer organisation/co-operatives for joint marketing/distribution Marketing • organic certification • quality labelling • promotion of organic produce	
Requirements of crop/produce	Advice • information on fertility requirements of crops/produce/activity R&D • development of new crop strains • development of new pesticides	
Convenience (*eg* is animal manure available on farm, *ie* mixed/integrated farming?)	Advice • promotion of mixed farming/integrated crop management	
Availability	Regulation/standards • restriction/ban on use of certain types of agrochemicals • government/industry agreements on content R&D • development of new pesticides	*Sweden:* targets for limits on toxic substances in digested sludge *Belgium:* agreement between government and fertiliser companies to limit cadmium in fertilisers
Awareness of environmental effects	Advice/education • information on environmental/health effects of agrochemicals Environmental management systems • EMAS/ISO/farm audits Product information	

Parameters	Tools / Mechanisms	Examples
	• product labelling/information	
Perception of significance of environmental effects	Education/advice • information on environmental/health effects of agrochemical use	
How will agrochemical be used?		
Awareness of environmental impacts	Education • information/education on use and impacts of agrochemicals Product information • product labelling, product information Environmental management systems • EMAS/ISO/farm audits	*UK:* farm visits to advise/train on pesticide management, by Farming and Wildlife Advisory Group
Perception of significance of environmental effects	Education/advice • information on environmental/health effects of agrochemical use	
Location (*eg* distance from water courses)	Regulation • regulations governing application Guidance • codes of practice on application	
Local conditions (*eg* slope, rainfall, timing)	Guidance • codes of practice on application (timing and quantities) Regulations • regulations on use of agrochemicals	*UK:* local environmental risk assessment procedures for guidance on pesticide application
Characteristics of agrochemical product	Product information • product labelling/information on use of product	
Cost versus impact on yields/profitability	Financial incentives • fertiliser/pesticide taxes • agri-environment subsidies	*Finland:* fixed fee for pesticide market entrance, plus 35% of price (excl. VAT)
Perception of risk	Financial incentives • availability of farm insurance	

Parameters	Tools / Mechanisms	Examples
	• availability of government support/price guarantees	
Regulation	Regulation/standards • regulations on pesticide residues in produce	
How will unused agrochemicals be disposed of?		
Awareness of environmental effects	Guidance • codes of practice on disposal • information on regulatory requirements Education • information/education on environmental impacts of agrochemicals Product information • Product labelling/information giving guidance on disposal Environmental management systems • EMAS/ISO/farm audits	
Available and convenient facilities	Infrastructure provision • provision of adequate and convenient facilities and services	*UK:* National Pesticide Retrieval Scheme, run by British Agrochemical Association - fee charged to farmers per kg of pesticide
Regulation	Regulation • regulations on disposal of agrochemicals	
Cost of disposal	Financial incentives • charges for waste disposal • taxes on waste disposal	
How will livestock be managed (extensively or intensively)?		
Productivity	Advice • information on increasing productivity of extensive farming	
Profitability	Financial incentives • agri-environment schemes Advice • information/advice on profitable management	*Switzerland:* subsidy for extensive agricultural acreage

Parameters	Tools / Mechanisms	Examples
Perception of risk	Financial incentives • availability of farm insurance • availability of government support/price guarantees Marketing • promotion/marketing of quality products • quality labelling of produce	
Awareness of environmental effects	Education • information/education on environmental impacts of intensive farming	
Regulation	Planning • EIA of intensive livestock units • planning restrictions on type of farming activity	*EU:* EIA required by EU directive
How will livestock waste be managed?		
Awareness of environmental impacts	Guidance • codes of practice on farm waste management Advice/education • information/education on environmental impacts of animal waste Environmental management systems • EMAS/ISO/farm audits	
Perception of significance of environmental effects	Education/advice • information on environmental impacts of animal waste	
Regulation	Regulation • regulations on handling and disposal of waste	
Standard of farm facilities	Regulation • regulations on minimum standards for on-farm waste handling facilities Financial incentives • grants and other financial support for improvement of on-farm waste handling facilities	*Greece:* partial compensation for installation of waste facilities for protection of water quality

Parameters	Tools / Mechanisms	Examples
Availability of disposal routes	Regulation • regulations on spreading of manure Guidance • codes of practice on spreading of animal waste Education/advice • information/education/advice on environmental impacts of animal waste Infrastructure provision • provision of disposal facilities	
Cost of disposal	Financial incentives • taxes on waste disposal • charges for waste disposal •	
Will crop be irrigated?		
Availability of water resources	Planning • SEA of water resource management plans • EIA of water management schemes • catchment management planning Regulation • abstraction permits • regulations governing abstraction/use	*EU:* EIA required by EU directive for water management schemes
Choice of crop and possibilities for substitution	R&D/advice • information/advice on water requirements for certain crops/low-water crops	
Cost of water versus impact on productivity	Economic incentives • full-cost pricing of water	*France:* charge for water use to be introduced in 2000.
Risk	Economic instruments • availability of farm insurance against low yields	
Weather		

Parameters	Tools / Mechanisms	Examples
Which method of irrigation?		
Knowledge/awareness of options	Education • information/advice/help on low-use systems	
Awareness of environmental impacts	Education/advice • information on environmental impacts of water resource use	
Installation costs	Financial incentives • subsidies/grants for equipment and infrastructure installation	
Operating costs	Financial incentives • full-cost pricing of water	
Quantity of available water resource	Planning • SEA of water resource management plans • EIA of water management schemes • catchment management planning Regulation • abstraction permits • regulations governing abstraction/use	*EU:* EIA required by EU directive
Choice of practices and methods		
Knowledge of methods	Education • information on beneficial practices	*UK:* Farming and Wildlife Advisory Group is a network of farmers and conservationists which gives advice on practices of benefit to wildlife without compromising productivity or economic performance
Awareness of environmental effects	Education/advice • information on effects of damaging practices and methods Environmental management systems • EMAS/ISO/farm audits	
Perception of significance of environmental effects	Education/advice • information on environmental impacts of practices	

Parameters	Tools / Mechanisms	Examples
Effect on profitability	Financial incentives • agri-environment schemes • organic conversion assistance • less-favoured area payments • preferential loans Advice • information/advice on profitable management	
Regulation	Regulation/standards • regulations on required or prohibited practices within protected areas • designated areas	*EU:* Natura 2000, Special Protection Areas
Retention, protection or reinstatement of features (*eg* hedges, ponds, wetlands)		
Knowledge	Education • information on management of features	
Awareness of environmental effects	Education/advice • information on environmental benefits or harmful effects	
Perception of significance of environmental effects	Education/advice • information on importance of features for biodiversity	
Effect on profitability	Financial incentives • agri-environment schemes • organic conversion assistance • preferential loans Advice • information/advice on profitable management	*Sweden:* compensation for farmers for additional cost of protection of biodiversity, habitats, landscape, cultural heritage *Norway:* grant for agricultural landscape protection
Regulation	Regulation/standards • regulations on protected features • designated areas	
Choice of crop/produce		
Knowledge of alternatives	Education/advice	

Parameters	**Tools / Mechanisms**	**Examples**
	• information about alternative activities/breeds/varieties	
Profitability/market security	Financial incentives	*Sweden:* licence fee for exploitation of peat
	• agri-environment schemes	
	• less-favoured area payments	
	• charges for environmentally damaging activities	
	Industry Collaboration	
	• Producer organisations/co-operatives for joint marketing/distribution	
	Marketing	
	• quality labelling	
	• GMO labelling	
Perception of value/significance	Education/advice	
	• information on significance for biodiversity	

Table 1.3 Farmers and Water Quality

Parameters	Tools / Mechanisms	Examples
Should agro-chemicals be used?		
Type of crop/produce/activity and possibilities for substitution	Advice • information on fertility requirements of crops/produce/activities • information on management of soil fertility R&D • knowledge of crop-pest interaction/resistance • development of pest-resistant crops Financial incentives • agri-environment schemes Industry Collaboration • farmers' networks for shared ownership/ use of specialised equipment	*Denmark:* grants for land taken out of agricultural production
Profitability of crop/produce/activity	Financial incentives • agri-environment subsidies Marketing • promotion of organic produce	*Greece:* grants to promote pesticide-free cultivation of cereals and grain *Switzerland:* grants for farmers not farming intensively adjacent to wetlands
Awareness of alternatives	Education/ advice • information/advice services on integrated crop/pest management	*Denmark:* Agricultural Advisory Centre recommending conversation to alternatives
Type of farming (*eg* organic, extensive, integrated crop management, rotation)	Financial incentives • agri-environment schemes • organic conversion assistance • preferential loans Advice • information/advice services on farm management and methods	*Denmark:* grants for organic production *UK:* financial assistance for conversion to organic farming *Switzerland:* grants for farmers not farming intensively adjacent to wetlands
Perception of risk (financial, market strength/reliability)	Financial incentives • availability of farm insurance	

Parameters	Tools / Mechanisms	Examples
	• availability of government support/price guarantees • preferential loans Industry Collaboration • producer organisation/co-operatives for joint marketing/distribution Marketing • producer organisations/co-operatives • organic certification • quality labelling	
Location (*eg* distance from water courses)	Guidance • codes of practice on application of manure	*EU:* Member State codes of practice to implement Nitrates Directive
Awareness of environmental impacts	Education/advice • information on environmental impacts of agrochemical use Environmental management systems • EMAS/ISO/farm audits	
Perception of significance of environmental impacts	Education/advice • information on environmental and health impacts of agrochemical use	
Regulations	Regulation • regulations governing use of pesticides	
Which agrochemical?		
Type of farming (*eg* organic, mixed, extensive), allowing use of organic fertilisers	Financial incentives • agri-environment schemes • conversion assistance • preferential loans Advice • information/advice services on farm management methods	
Cost versus effect on yield/profitability	Financial incentives • fertiliser/pesticide taxes • agri-environment schemes	*UK:* grants to compensate for changes required to protect nitrate sensitive areas and drinking water sources

Parameters	Tools / Mechanisms	Examples
	Marketing • premium price for organic products	*Finland:* fixed for pesticide market entrance, plus 35% of price (excl. VAT)
Perception of risk (financial, markets)	Financial incentives • availability of farm insurance • availability of government support/price guarantees Industry Collaboration • producer organisation/co-operatives for joint marketing/distribution Marketing • organic certification • quality labelling • promotion of organic produce	
Requirements of crop/produce	Advice • information on fertility requirements of crops/produce/activity R&D • development of new crop strains • development of new pesticides	
Convenience (*eg* is animal manure available on farm, *ie* mixed/integrated farming?)	Advice • promotion of mixed farming/integrated crop management	
Availability	Regulation/standards • restriction/ban on use of certain types of agrochemicals • government/industry agreements on content R&D • development of new pesticides	*Sweden:* targets for limits on toxic substances in digested sludge *Belgium:* agreement between government and fertiliser companies to limit cadmium in fertilisers
Awareness of environmental effects	Advice/education • information on environmental/health effects of agrochemicals Environmental management systems • EMAS/ISO/farm audits Product information	

Parameters	Tools / Mechanisms	Examples
	• product labelling/information	
Perception of significance of environmental effects	Education/advice • information on environmental/health effects of agrochemical use	
How will agrochemical be used?		
Awareness of environmental impacts	Education • information/education on use and impacts of agrochemicals Product information • product labelling, product information Environmental management systems • EMAS/ISO/farm audits	*UK:* farm visits to advise/train on pesticide management, by Farming and Wildlife Advisory Group
Perception of significance of environmental effects	Education/advice • information on environmental/health effects of agrochemical use	
Location (*eg* distance from water courses)	Regulation • regulations governing application Guidance • codes of practice on application	
Local conditions (*eg* slope, rainfall, timing)	Guidance • codes of practice on application (timing and quantities) Regulations • regulations on use of agrochemicals	*UK:* local environmental risk assessment procedures for guidance on pesticide application
Characteristics of agrochemical product	Product information • product labelling/information on use of product	
Cost versus impact on yields/profitability	Financial incentives • fertiliser/pesticide taxes • agri-environment subsidies	*Finland:* fixed fee for pesticide market entrance, plus 35% of price (excl. VAT)
Perception of risk	Financial incentives • availability of farm insurance	

Parameters	Tools / Mechanisms	Examples
	• availability of government support/price guarantees	
Regulation	Regulation/standards • regulations on pesticide residues in produce	
How will unused agrochemicals be disposed of?		
Awareness of environmental effects	Guidance • codes of practice on disposal • information on regulatory requirements Education • information/education on environmental impacts of agrochemicals Product information • Product labelling/information giving guidance on disposal Environmental management systems • EMAS/ISO/farm audits	
Available and convenient facilities	Infrastructure provision • provision of adequate and convenient facilities and services	*UK:* National Pesticide Retrieval Scheme, run by British Agrochemical Association - fee charged to farmers per kg of pesticide
Regulation	Regulation • regulations on disposal of agrochemicals	
Cost of disposal	Financial incentives • charges for waste disposal • taxes on waste disposal	
How will livestock be managed (extensively or intensively)?		
Productivity	Advice • information on increasing productivity of extensive farming	
Profitability	Financial incentives • agri-environment schemes Advice • information/advice on profitable management	*Switzerland:* subsidy for extensive agricultural acreage

Parameters	Tools / Mechanisms	Examples
Perception of risk	Financial incentives • availability of farm insurance • availability of government support/price guarantees Marketing • promotion/marketing of quality products • quality labelling of produce	
Awareness of environmental effects	Education • information/education on environmental impacts of intensive farming	
Regulation	Planning • EIA of intensive livestock units • planning restrictions on type of farming activity	*EU:* EIA required by EU directive
How will livestock waste be managed?		
Awareness of environmental impacts	Guidance • codes of practice on farm waste management Advice/education • information/education on environmental impacts of animal waste Environmental management systems • EMAS/ISO/farm audits	
Perception of significance of environmental effects	Education/advice • information on environmental impacts of animal waste	
Regulation	Regulation • regulations on handling and disposal of waste	
Standard of farm facilities	Regulation • regulations on minimum standards for on-farm waste handling facilities Financial incentives • grants and other financial support for improvement of on-farm waste handling facilities	*Greece:* partial compensation for installation of waste facilities for protection of water quality

Parameters	Tools / Mechanisms	Examples
Availability of disposal routes	Regulation • regulations on spreading of manure Guidance • codes of practice on spreading of animal waste Education/advice • information/education/advice on environmental impacts of animal waste Infrastructure provision • provision of disposal facilities	
Cost of disposal	Financial incentives • taxes on waste disposal • charges for waste disposal •	
Will crop be irrigated?		
Availability of water resources	Planning • SEA of water resource management plans • EIA of water management schemes • catchment management planning Regulation • abstraction permits • regulations governing abstraction/use	*EU:* EIA required by EU directive for water management schemes
Choice of crop and possibilities for substitution	R&D/advice • information/advice on water requirements for certain crops/low-water crops	
Cost of water versus impact on productivity	Economic incentives • full-cost pricing of water	*France:* charge for water use to be introduced in 2000.
Risk	Economic instruments • availability of farm insurance against low yields	
Weather		

Parameters	**Tools / Mechanisms**	**Examples**
Which method of irrigation?		
Knowledge/awareness of options	Education • information/advice/help on low-use systems	
Awareness of environmental impacts	Education/advice • information on environmental impacts of water resource use	
Installation costs	Financial incentives • subsidies/grants for equipment and infrastructure installation	
Operating costs	Financial incentives • full-cost pricing of water	
Quantity of available water resource	Planning • SEA of water resource management plans • EIA of water management schemes • catchment management planning Regulation • abstraction permits • regulations governing abstraction/use	*EU:* EIA required by EU directive

Table A1.4 Municipalities as Regulators

Parameters	Tools / Mechanisms	Examples
Rural development policy choices		
Regional environmental quality (assets/hotspots)	Planning • environmental assessment	
Regional potential/priorities for rural economic activity	Widening involvement • stakeholder consultation processes, including public participation • Planning • SEA • catchment management planning	
Regional environmental priorities	Planning • water quality targets • local Biodiversity Action Plans Widening involvement • stakeholder consultation processes, including public participation	
National/European policy priorities	Planning • SEA Best practice • integrated rural development policy • diversification of rural economy Regulation/standards • water quality targets • landscape/nature conservation designations	
Availability of financial resources	Financial incentives • agri-environment schemes • organic conversion assistance • regional development funding • less-favoured area payments	*Denmark:* grants for organic production *UK:* financial assistance for conversion to organic farming *Switzerland:* grants for farmers not farming intensively adjacent to wetlands

Parameters	Tools / Mechanisms	Examples
Availability of financial resources	Financial instruments • agri-environment schemes • hypothecation of funds from charges/fees/fines	
Policy instruments	Planning • land-use planning policy • catchment management planning • planning permission • local/national Biodiversity Action Plans Regulation/standards • local water quality targets • site designations Monitoring • indicators of environmental quality/impacts/drivers	
Availability of staff resources/expertise	Training • training/recruitment of staff with required skills/knowledge/expertise	
Raising awareness of farmers	Advice • farm business support schemes • information/advice to farmers on regulations • information on agri-environment schemes • advice/support on environmental management systems	
Regulation of agricultural activities		
Regulation	Regulation • nature conservation designation • nitrate-sensitive area designation • abstraction licensing • licensing of activities • permission/licensing of drainage works Planning	

Parameters	Tools / Mechanisms	Examples
	• land-use plans	
Raising awareness of farmers	Education and awareness-raising • information to farmers on regulatory requirements and their legal obligations • codes of practice	
Local conditions	Monitoring • assessment of local water quality	
Availability of resources	Financial instruments • hypothecation of funds from charges/fees/fines Training • training/recruitment of staff with required skills/knowledge/expertise	

Annex B

Energy Sector

B1 ENERGY

B1.1 STAKEHOLDER ANALYSIS

The Energy Sector in its narrowest sense may be defined as including: public electricity and heat production and distribution; production of oil and gas; petroleum refining; the manufacture of solid fuels-coke; and other energy industries which include specific auto-production of electricity and heat. Of these public electricity and heat production is by far the most important.

Energy production and consumption falls into two main types:

- electricity - generated from fossil fuels (gas, coal) and renewables. This is used as a factor of production in all economic sectors, residential and transport users;

- heat - mainly produced from natural gas or fuel oil and used for many purposes (e.g. space heating, heating water, industrial processes) by domestic users, industry and commercial. 85% of heat is produced in combination with power (combined heat and power - CHP).

At the macro level the key government actor is the Danish Energy Agency which sets the policy framework and targets at the national level and provides fiscal incentives for sustainable energy production and consumption.

At the meso level key actors include the Council for Sustainable Energy which is an independent advisory body to the government and the Parliament, and a consultative body on the national level with responsibility for promotion of energy conservation and efficiency and the use of renewable energy, and launching new ideas and debate. Other meso level actors are the Electricity Saving Trust (established in 1997) which aims to encourage the substitution of electrical heating by district heating or heating with natural gas in households and the public sector and the 'regulator' of the newly de-regulated energy companies. Municipalities and housing associations may also be considered meso level actors in the energy sector since they are actively involved in setting procurement policies for energy efficient products and for the fuel mix of energy supply to new developments. They also have a role as energy consumers.

At the micro level the market based actors are the utilities and consumers. The current ownership structure of the Danish electricity sector is complex with heat and power generators being partly owned by municipalities and partly by the consumers. All distribution companies have a so called public service 'obligation to supply', to supply consumers that do not have the possibility to choose their own supplies. This consists of a minimum package of services at a set price' overseen by a 'public regulator'. On the other hand,

distribution companies have the obligation to buy the cheapest electricity. Deregulation of the sector as a result of the 1999 Electricity Reform will see a concentration of productive capacity in the hands of two commercial producers. The Danish electricity market is too small to contain additional producers. Competition in the Danish electricity sector will come from abroad.

Consumers of energy comprise all economic actors including industry, transport and other service providers and households. The latter includes both individual homeowners and owners of apartments who may take decisions more collectively through housing associations. The motivation of individual households also reflects the age of the housing, type of housing (with very different incentives for individual houses and apartments) and the age and income level of the residents (with pensioners singled out as a group requiring particular financial support to make energy efficient choices). Individual investors are also becoming an important target group in Denmark for raising finance for developing renewables, particularly wind turbines.

B1.2 KEY ENVIRONMENTAL ISSUES

The key drivers determining levels of energy use are:

- economic growth;
- the growth in passenger and freight distances travelled, especially by road;
- structural economic changes between sectors of different energy intensity in the economy (ie energy consumed per unit of output);
- fuel type and efficiency of use for power generation and heating;
- social behaviour in relation to energy savings.

The key environmental issues associated with energy production, transmission, distribution and consumption are:

- climate change and acidification - mainly associated with fossil fuel use in electricity generation, process heat and transport and their impacts on human health, materials, crop and ecosystem productivity;

- fugitive emissions including: emissions from oil transport, storage, refining, transmission and distribution of oil products, venting and flaring;

- waste generation from coal fired power generation;

- land use and landscape issues principally associated with production and transmission of conventional power and with renewable energy sources such as energy coppicing, biofuels and wind turbines; and

- water pollution and abstraction due to power generation.

For the decision analysis described in *Section B1.4* we have focused on two inter-related sustainability decisions for this sector:

- ***Increasing production and supply of renewables by energy companies***
- ***Reducing household emissions of Green House Gases by reducing overall energy consumption***

B1.3 *FRAMEWORK FOR MARKET BASED DECISIONS*

Danish energy policy, as set out in Energy 21, aims to stabilise energy consumption and increase the use of renewable energy sources and combined heat and power production. Key drivers behind Danish energy policy are energy security, the EU electricity and natural gas directives and environmental objectives. Goals outlined in *Energy 21* are:

- to reduce CO_2 emissions by 20 % compared to the 1988 level by 2005.

- renewables should contribute to around 35 % of total primary energy supply in 2030 (235 PJ). (1) Currently renewables accounts for about 9 % of the total energy demand, coming mainly from wind and biomass. The implied target is a 1 % per year increase to 2030. *Energy 21* stresses renewable energy as a priority research area. The Danish programme for the Development of Renewable Energy (DPRE), established in 1991, aims to provide support for the development and implementation of renewable energy technologies. In 1996 grant payments under the programme amounted to DKK 65 million. (2)DPRE is supplementary to the Danish Energy Research Programme (ERP). The framework for renewables is also set by the *Electricity Reform Agreement, 1999* which provides for substantial modification of the support for renewable energy from subsidies to a market based scheme.

- a greater use of biomass and 2-300,000 ha of energy crops (3) are expected to contribute 145 PJ annually by 2030.(4) This is expected to lower Denmark's total CO_2 emissions by around 12.5 %. The *Biomass Agreement* outlines the future use of biomass. Electricity utilities are obliged to use 1.2 Mt of straw, 200,000 tonnes of wood chips and 200,000 tonnes of either straw, wood chips or willow chips annually by 2000. (5) This represents 6 % of the total consumption of coal.

- CHP is a key element of the CO_2 emissions reduction strategy. By 1998, 50 % of the electricity generated for domestic supply was produced as CHP. The bulk of the country's future heat demand and electricity consumption

(1)International Energy Agency, 1998

(2) Danish Energy Agency Brochure: 'Energy Research and Development in Denmark'. 1996

(3)Current wood resources are likely to be exhausted in 2000, but a programme of afforestation is taking place. Increased production of bioenergy, including energy crops, will be required to meet demand for biomass after 2005.

(4) European Energy Crops interNetwork: http://www.btg.ct.uwente.nl/eeci/archive/biobase/B10101.html

(5)Danish Energy Agency, 1999

is expected to be covered by CHP, including district heating plants running on biomass.

Other policy tools which currently set the framework for decision making in relation to reducing demand for conventional energy sources and increasing supply of renewables are summarised in *Table B1.1* and *Table B1.2* respectively.

Table B1.1 Tools which provide the macro framework for demand reduction decisions in the energy sector in Denmark

Tool	Aims and description
Regulation	• Inspection of oil burners used in central heating systems by authorised firms since 1997; the initiative is supported by an information campaign with the objective of increasing energy efficiency in new buildings by 50% by 2005. • Since 1992 energy management and annual reporting on energy consumption have been mandatory in every government building. • Local energy managers must be appointed by every institution. • Mandatory individual metering of all buildings since 1997.
Energy Labelling Schemes	• Energy labelling for domestic appliances (fridges, freezers, washing machines, dishwashers, office equipment, lighting, electric motors, process ventilation, pumps, boilers and technical insulation) in line with EU programme. • Energy arrows inform consumers of electricity consumption of different appliances (developed by utilities). • Voluntary scheme for other products gives a label to the best products on the market, updated on an annual basis
Energy labelling of buildings	• Since 1997 mandatory audits and labelling of small buildings (1,500 m2) by the vendor prior to sale.
Guidance	• Building Code 1995 sets limits for heating and ventilation systems. • Future changes aimed at ambitious energy efficiency targets (45 kWh per m2) are expected to enter into force by 2005
Subsidies	• Grants for energy saving investments in central government buildings financed from a tax of 5% on government energy consumption. The annual yield of this tax is around DKK 50 million. • subsidies for energy savings in pensioners dwellings • compulsory energy conservation pool financed by contributions based on consumption at county and municipal level being considered. • Subsidies for installation of water borne central heating in housing erected before 1950. Some 65000 dwellings to be connected over 10 years. • Electricity Conservation scheme: investment grants for heat saving or support for development of supplementary sources of energy, with a particular focus on switching electric heating in areas with district heating and natural gas supply. Financed for fixed amount levy on household and public sector energy consumption. Annual total of DKK 100 million.
Reporting	• Introduction of green accounts at county and municipal level is being considered. • More detailed, frequent and graphic reporting of individual household consumption on electricity bills.
CO_2 quota system	• Power companies will be allocated a specific emissions cap within the framework of a total cap of 23 million tonnes of CO_2 for 2000, falling to 20

Tool	Aims and description
	million tons in 2003. Over the following three years the total will drop by 1 million tons annually. For each ton of CO_2 by which a company exceeds its quota it will penalised $5.60. Unused amounts may be banked and applied to the following year. The quotas will be tradable within Denmark only but the government hopes that over the next few years the system can be expanded at least to the Baltic region. The measure aims to support combined heat and power (co-generation) which is widespread in Denmark by taking account of the amount of heat produced when calculating a plant's CO_2 emissions.
Energy efficiency subsidies	• Subsidies are granted for the development and implementation of energy efficiency appliances and products with a focus on dwellings and the public sector. Subsidies will also be granted for marketing and procurement of energy efficiency products.
Negotiated Agreements	• Voluntary agreements on energy efficiency will be negotiated with trade organisations, housing associations etc for specific products and technologies.
Purchasing policies	• 'Buying clubs' are drawing up stringent requirements related to energy efficiency, price, materials for products and then guaranteeing contracts to the best performing manufactures. • From 1997 housing associations have been encouraged to take this route on energy efficiency.

Table B1.2 ***Tools which provide the macro framework for promotion of renewables in the energy sector in Denmark***

Tool	Aims and operation
Regulation	• The Heat Supply Act requires municipalities to draw up heating plans including district heating. Renewable local energy sources (straw, biogas, forestry residues, waste incineration etc) have to be considered.
Green electricity certificates	• An important new development in the electricity reform of 1999 is the development of a market in green certificates, which represent the production of green energy. Utilities have an obligation to purchase green certificates. The most efficient (competitive) renewable energies are encouraged to develop through the price system. If the consumer/distribution companies of electricity do not fulfil their quota, a penalty of 0.27 DKK/kWh is levied.
Green taxes	• Taxes and tax concessions on different sources of energy aim to restore the price imbalance between fossil fuels and non-fossil fuel energy.
Subsidies	• Subsidies are paid to generators of electricity from renewables which act as compensation for the automatic levying of the CO_2 tax on all electricity. For a period still to be specified, the following fixed tariffs apply to power generated from biomass: • Biogas plants: 0.33 DKK/kWh • Local biomass plants: 0.27-0.33 DKK/kWh • For biogas and biomass plants erected during 2000,2001 and 2002, a fixed tariff of 0.5 DKK/kWh will apply for 10 years. • In addition an electricity production subsidy of 0.17 DKK/kWh is available. In 1996 support in subsidies amounted to DKK 276 million for wind power and DKK 122 million for biomass.
Obligation to purchase green energy	• The current system of state subsidies for wind power is to be replaced by an obligation on consumers and energy distributors to obtain up to 20% of the energy they use from renewable sources. The only exception will be large

Tool	Aims and operation
	users who will face this obligation for only up to 100 GW of electricity. The Danish Energy Agency does not expect it to be fully functional until 2003.
Buy-back rates for wind generated electricity	• Fixed prices have been set in the electricity reform in 1999, for wind energy sold to the grid
Reporting and awareness raising	• Council for Sustainable Energy responsible for major awareness raising campaigns and events
Subsidies for households	• Subsidies are offered to replace an oil boiler with a biomass boiler. The subsidy for the biomass boiler varies from 10 to 30% of the investment. In 1996 the Danish Energy board granted a total of 128 million DKK.
Danish Programme for Development of Renewable Energy	• Established in 1991, it aims to provide support for the development and implementation of renewable energy technologies to fulfil national energy plans. In 1996 grant payments under the programme amounted to DKK 65 million. Support is given to development of technologies, dissemination of information and investment subsidies are granted for the purchase of straw and wood pellet boilers, small scale biogas plants, solar panels, heat pumps etc. DPRE is supplementary to the Danish Energy Research Programme.
Development and Demonstration Programme for Renewable Energy	• Investment subsidies are offered to spur the dissemination of commercially available technologies. The subsidy varies between 15-30% of the construction costs. In 1996 a total of 71 million DKK was spent on investment subsidies. Subsidies for demonstration of pre-commercial technologies amounted to 56 million DKK.
Renewable Energy Island	• The island of Samsoe with 4,400 inhabitants will have its entire energy supply based on renewable energy, including the transport sector. The programme will be financed from the existing grant schemes.

B1.4 DECISION FLOW ANALYSIS

Decision flow analyses were completed for the energy sector for individual households and energy generators in relation to climate change and demand management, specifically reducing energy demand and greenhouse gas emissions. The results are presented in *Tables 1.3 and 1.4* and discussed below.

A key question for households is what type of property to buy, whether to buy or rent a house or apartment, old or new, energy efficient or not. The key parameters in making this decision are:

- The **availability** of old and new energy efficient houses and apartments on the market. This will reflect building regulations and guidelines for new housing, the energy efficiency policies of builders, architects and housing associations. The average life span of the housing stock and the frequency with which housing is renovated and refurbished and how building codes apply to older buildings.

- **Awareness** of energy issues by house buyers, renters, vendors and landlords. This will depend on the extent that everyone involved in the

housing chain understands energy conservation, its relation to climate change and to the costs of building, refurbishing and heating a dwelling. The extent to which individual apartments in blocks are separately metered and billed according to energy usage is also important.

- **Affordability**. When comparing the potentially high costs of undertaking energy conservation measures, households will take into consideration the capital costs of the works, the tenure (whether they own or rent the property) and how long they expect to be there. They will then consider the likely pay back time and the expected impact on the sale price and ease of sale. The cost of capital works can be influenced by the availability of grants and tax breaks for carrying out the works and offering EcoMortgages and other financial incentives for the purchase of energy efficient housing.

Another key decision for households is what type of fuel or electricity to use. This is affected by the following parameters:

- **Availability** of green fuels or district heating. This will be affected by infrastructure for producing and distributing renewable electricity and district heating and ease of connection in a given area. This is likely to be a major framework condition for the success of integrating environmental considerations into energy choices.

- **Awareness** of energy choices, which will be affected both by wider awareness raising of energy issues and the extent to which municipal and commercial energy providers make their customers aware of the options.

- **Cost**. If green electricity is available its price will depend on the source of energy (with only energy from waste and biomass being comparable in price to conventional sources), the pricing policies of the energy providers and any government subsidies for the production of renewables energy or price support to consumers . In the US and UK a small niche market is developing of consumers who are prepared to pay a 5-10 % premium over the normal tariff for the purchase of renewables.

- **Reliability** of supply. Renewable sources are less likely to suffer from negative perceptions of poor quality or reliability than some other environmentally preferred goods or services (such as public transport or low energy appliances).

- **Habit**. An important parameter affecting environmentally sound purchasing decisions where consumers have the necessary knowledge, access to products or services and the correct pricing incentives may be inertia and a lack of willingness to change established behaviour. This is less likely to be a factor for renewables or district heating than for other 'green' consumables where for many the market and acceptability of products has yet to be firmly established.

Having made the decisions about the energy efficiency of housing and the type of energy supply householders are also faced with the decision of what type of household appliances to buy. Their choices will reflect the following parameters:

- **Availability**. The availability of low energy appliances on the market. This will be affected by legislative requirements on producers, wholesalers and retailers of appliances.

- **Cost**. This will be affected by the market conditions on the supply side, the additional costs of producing energy efficient products and whether any higher costs are passed on to the consumer. Consumer choice will reflect the actual price differential, how long the appliance is expected to last and the expected pay back time.

- **Perceived quality**. This will depend on consumer's awareness of energy saving as an issue, and the extent of knowledge about the attributes of the appliance relative to conventional ones. This parameter can be impacted by awareness raising campaigns, eco labelling or energy consumption labelling of products and provision of point of sale advice and advice helplines.

Decisions about how much energy to use reflect the type of property and appliances and lifestyle decisions about how much heating, lighting and space heating is required. These choices are affected by all of the same parameters as above and in particular price, awareness and information about energy use and opportunities for sharing of some facilities (eg washing machines and dryers in apartment blocks).

The key framework conditions affecting how households integrate environment into their day to day decisions are probably the availability of green power and products, the price differential between these and conventional products and their general awareness. The major instruments which have been used to affect these decisions to date include economic instruments (mainly subsidies for the domestic sector), ecolabelling of household appliances (fridges, freezers, washing machines etc) and energy efficiency advice to homeowners supported by a legal requirement to undertake an energy audit and subsidies to undertake the necessary works to make houses energy efficient .

Table B1.3 Households

Parameters	Tools / Mechanisms	Examples
What Type of house is purchased (energy efficient or not)?		
• Availability of energy efficient old and new housing	• Targets for Energy efficiency/m2 of housing • R&D on energy efficient materials • Building standards regulations	• Danish Building Code 1995
	• Collaborative industry efforts -	• industry codes for energy efficiency
• Awareness of energy efficiency issues.	• Educating houseowners, renters, building managers • Energy audits of housing before sale • Energy labelling of new housing	• Since 1981 a scheme requiring home owners to audit existing buildings and identify measures with <8-10 years pay back and implement them and gain a green certificate before selling their home has operated. Audits are undertaken by special state authorised energy consultants. Heating inspection is a subsidised option. The provision of heating inspection report or an energy certificate has been mandatory when a building changes hands (although no sanctions were implied.)Audits and labelling
• Affordability	• Cheaper mortgages for energy efficient housing • Grants or tax breaks for insulation materials; offsets against income or property taxes; financing against savings in bills • Information on cost benefit ratio between insulation costs and operational savings	• Subsidies for pensioners and also for government offices in Denmark • More clearly itemised energy bills for households
What type of fuel or electricity is used?		
• Availability (infrastructure for renewables, district heating etc)	• Targets for market share of renewables and CHP • Energy Company environmental policies • Green Electricity labelling	• Policy targets set for renewables, CHP and district heating • Utility financing of energy efficiency measures • Municipal Green Accounts, Denmark • US and UK examples of labelling, Danish scheme
• Awareness	• Targets for market penetration supported by indicators • Investor incentives for renewables (eg tax free investment) • Subsidised interest rates for renewables	• Energy awareness days, Council for Sustainable Energy, Denmark • energy nutrition labels on electricity bills, California • Tax breaks for private investors in windturbines, Denmark

Parameters	Tools / Mechanisms	Examples
	• Green investment trusts • sustainability ratings • consumer organisation reports • Energy company environmental reporting requirements • Housebuilder/energy company marketing and awareness raising initiatives	• EcoFunds UK and US energy companies • Ecoratings, UK energy companies • FOE green ratings reports, UK • Municipalities, Denmark; reporting to regulator Holland and UK • FOE Climate savers programme UK aiming at these actors
• Cost	• Fossil fuel taxes, Carbon energy tax • Subsidised tariffs for green electricity • Government watchdog re price fixing • Market guarantees for market share of renewables and CHP	• Carbon Energy taxes in operation or proposed across Europe • California Energy Commission subsidies • Obligations to buy at fixed prices operate in many EU Member States
• Reliability of supply	• Minimum Service standards • Certification of green electricity - labelling • Requirement for electricity companies to offer green electricity	• Dutch Quotas and Groenlabel tradeable certificates for renewables production • Labelling of most energy efficient products awarded on annual basis for consumer products, Denmark • Minimum quality and performance standards
• Habit/Established behaviour/Inertia	• Product information - provision and promotion • Marketing - producer and/or retailer • NGO campaigns/organised boycotts • Public environmental awareness campaigns encouraging individual responsibility and action	• Product information • Consumer advice • Marketing • Education
Which type of appliance to buy (low energy products)?		
• Availability	• Retailer environmental policies • Retailer incentives to develop energy efficient products • Regulations: prohibition/restriction of high energy use products	• Ecolabel standards becoming minimum standards over time • Minimum energy efficiency standards for some products (boilers, air conditioning, freezer and fridges etc)

Parameters	Tools / Mechanisms	Examples
• Cost	• Incentives (green taxes, tax breaks, price subsidies etc) • Taxes on high energy products	• Special offers (rebates for low energy products offered by Danish Government 1999)
• Perceived product attributes eg value added, environmental benefits	• Green marketing (producer & retailer) • Retail staff advice / training • Eco-labels, Energy labelling • Consumer organisation reports/product tests • Public environmental awareness campaigns/education • Green procurement	• procurement policies to favour energy efficient appliances, light bulbs etc Danish housing Associations, local authorities etc
How much energy is used?		
• Awareness and appliance information	• Labelling • Leaflets and Articles • helplines • In-store demonstrations	• Energy use labels
• Opportunities for sharing facilities	• Pooled appliances in apartment blocks/tenants associations etc	
• Cost	• VAT on fuel, carbon energy taxes • rebates for energy efficient households	• Carbon energy taxes

Table B1.4 Energy generators

Parameter	Tool/mechanism		Examples
How Much Renewable Energy to produce and how to sell it			
Compliance	• Government targets	• Targets for renewables, CHP GHG reductions	• EU and Danish quantified targets for renewables and CHP at national level
		• Quotas for individual companies	• Company production capacity targets for renewables being considered in UK. Supply capacity, with sale of excess production or buying additional requirements (as in Netherlands) also being considered. • In the Netherlands Utilities entered a negotiated agreement on supply capacity with the Ministry of Economic Affairs in 1997 to supply 1.7 thousand million kWh of green electricity by 2000. This is translated into a quota for individual companies equivalent to 3.2% of their 1995 total supply. If they are unable to produce this themselves they must by green certificates on the market or pay a penalty of DFL 0.50 per kWh (ie more than 600%) above the going market rate. In addition an ecotax of DFL 0.05/kWh on all conventionally produced energy makes renewable .
	• Fiscal mechanisms to support compliance	• Tradeable permits	• Under the Dutch Green Label (Groenlabel) scheme bundles of 10,000 kWh produced from renewable sources obtain a label which confirms that that amount of energy was supplied to the national grid in a particular month. which is discrete from the electrical energy. The producer sells the electricity to the local utility which is forced, by law, to accept all electricity against a standard remittance fee.
Technological possibilities	• Funding for private R&D	• Grants	• Funding for small scale embedded PV in various countries
		• Tax breaks	• Tax breaks for investment in renewables, various
		• Price premiums	• Eco funds for green electricity eg Eastern Electricity in UK, 5-10% premium on bill matched by utility up to £1mn over 2 years to support wind, wave & solar research
	• Government research	• Research programmes and councils	• Various
Availability of investment funds	• Fiscal measures	• Subsidies, grants etc	• Government subsidies for renewables investment eg California Energy Commission

Parameter	Tool/mechanism		Examples
		• Tax breaks for investors	• Dutch tax free investment scheme for renewables, Rabbobank
Shareholder attitude (to capital investment and higher operating costs)	• Information, education and advice	• Reporting	• Sustainability indicators in annual reports eg Green electricity share of total mix; performance against government targets
		• Environmental Rating	• In the UK the FOE's Green Energy League Table rates and ranks all utilities for greenness based on existence of a renewables tariff, environmental policies and reporting
Price of buying in	• Fiscal measures	• Renewables 'buy down' programmes	• Guaranteed prices for supply to the grid eg NFFO in UK and in many other EU member states
How to sell it?			
Compliance	• Targets • Regulations	• Purchasing policy of government or grid	• Requirement for grid to purchase all renewables, Netherlands
Availability of infrastructure			
Customer awareness	• Green marketing	• Reporting on overall energy mix for company or particular product	• Power Content label operated by the California Energy Commission. a 'nutrition label' which shows the mix and emissions for each energy product compared to the average California Power Mix (based on 1995). This information is sent to each customer with their bill and prior to Green-e was seen as a means for green companies to highlight greener credentials.
		• Certification of green products	• Green-e label in the US and Renewable Energy Accreditation Scheme in the UK • Energy Company contributions to NGO campaigns (eg Cumbria electricity in UK)
	• Advice	• Point of sale and bill advice	• NGO run energy efficiency campaigns (Council for Sustainable Energy in Denmark) • Itemised billing providing details of climate impacts of energy supply for green tariff customers. •
Cost	• Fiscal measures	• Subsidies to customers	• California Energy Commission provide a customer credit of 1.5 cent/kWh on a declining basis to support higher priced renewable prices up to a total of $81 mn of the state's overall $540 mn renewables support programme.
		• Renewables tariffs for customers	• More than 10 UK and 13 US companies operate a 5-10% premium tariff on standard charges for environmentally aware customers who wish to purchase renewables.

Parameter	Tool/mechanism		Examples
		• Green points schemes	• Green electricity customers gain green points that they can choose to allocate to local projects with NGOs, Schools etc which might include energy audits, embedded PV generation, educational resources, green appliances etc • OR to be redeemed against 'green' products from green producers or for energy efficient household appliances.
		• EcoMortgages	• Links between utilities and mortgage companies to provide EcoMortgages for energy efficient homes. Would be enhanced by energy company financed energy efficiency measures
Consumer Awareness	• Education and general awareness raising	• Energy audits for house sellers	• Danish regulations requiring sellers of houses to undertake energy audits and show energy certificates detailing efficiency measures which have been undertaken to the buyer.
		• publicity gifts	• Free energy efficient light bulbs for renewables tariff customers.

Annex C

Transport Sector

C1 TRANSPORT

C1.1 STAKEHOLDER ANALYSIS

The transport sector encompasses all those involved in the movement of goods and people. This includes both public and private transport and the different modes for passenger and freight. The definition can also be extended to include manufacturers, wholesalers and retailers of cars, aeroplanes and other vehicles, and the construction and maintenance of transport infrastructure.

The transport sector is mainly demand driven, as influenced by economic growth and transport pricing. The long standing trend for rising demand shows no sign of changing and is reflected in an increase, with few exceptions, in the environmental problems associated with the sector.

The seemingly irreversible growth of passenger and freight transport demand poses the biggest challenge to the European and national government's attempts to reduce transport's environmental impacts. At the EU level passenger transport is expected to grow by 30% between 1995 and 2010, and the current patterns of growth favouring air and road are expected to continue. Freight transport is expected to grow by around 50% between 1994 and 2010, mainly due to an increase in international movements. Overall at the EU level road transport is expected to grow by 50%, rail by 55% (1) .

Road transport is also the dominant mode in Denmark; a situation that is unlikely to change in the near future in line with economic development. Denmark has a well developed road network including 71,000 km of public roads, of which 880 km are motorways (2) . The rail network is also well developed, in total there are 2,349 km serving almost all towns with a population greater than 10,000.

At the macro level the key government actor is the Ministry of Transport. DEPA has some responsibilities for the transport sector, such as environmental licensing of air transport and ferries and provides input to the Ministry of Transport on environmental aspects of transport. The Spatial Planning Department within the Ministry of Environment and Energy is responsible for spatial planning at the national level including certain aspects of transport infrastructure planning.

Spatial planning at the regional level and county roads are the responsibility of the Counties. The Municipalities are responsible for municipal and local planning, including traffic planning, local safety and roads.

The state is also the main provider of public transport services. The Counties are responsible for most regional and local public services but Municipalities

(1) EEA 98
(2) EUROSTAT 1999

also play a role. In addition, the state provides substantial financial support for private transport providers.

Micro level market based actors consist of transport users and providers. Transport users include both individuals and businesses. In terms of individual users the old, disabled and those living outside major cities without good public transport provision are particular areas of concern for access to mobility.

The micro level also incorporates vehicle manufacturers however there is no such sub-sector in Denmark since all cars are imported. The passenger car fleet is slightly smaller than in neighbouring countries due to the high purchase tax placed on cars. Despite this and the provision of an efficient public transport system in larger towns, car travel is still the most common form of travel, accounting for 63,500 million passenger kms compared to 1,000 by bus and 4,900 by rail in 1996. Likewise, in the business sector, national goods transport is almost exclusively undertaken by lorry (greater than 75% volume). By 2005, passenger traffic is expected to rise by 25% and goods transport by 40% in line with estimates of economic growth.

C1.2 KEY ENVIRONMENTAL ISSUES

The main drivers within the transport sector are:

- economic growth including rising income levels, increased private car ownership and goods production and distribution;
- individual transport behaviour due to changing lifestyle patterns such as longer commuting distances, greater travel in leisure time, greater reliance on road transport due to the poor perception of public transport;
- decreasing cost of transport in absolute and relative terms, in particular decreased cost of road transport compared to public transport; and
- changing logistic patterns eg 'just in time deliveries', all year round supply of goods.

As a result, transport volumes and related impacts are on the increase. The key environmental problems linked to transport are: contribution to global climate change, adverse impacts on air quality, ozone levels and acidification; significant consumption of energy and other resources; a major contribution to Europe's waste streams through the disposal of vehicles, batteries etc.; noise pollution and health impacts; threats to biodiversity, fragmentation of landscapes and consumption of raw materials linked to the construction and maintenance of infrastructure.

The fall in lead emissions from road transport (70% since 1990) is perhaps the best example of successful intervention to address environmental impacts. However the overwhelming majority of negative trends (eg CO_2 emissions, local impacts of infrastructure on land and biodiversity, energy consumption) are on the increase as a result of continuing growth in traffic volume. The

transport sector accounts for 20% of Danish energy consumption and 20% of CO_2 emissions.

The decision flow analysis in *Section C1.4* focuses on two interrelated decisions:

- ***Reducing emissions of greenhouse gases from transport use by household and businesses***
- ***Reducing transport demand***

The two decisions have been addressed as one since reduction of transport demand is an integral measure for reduction of greenhouse gases.

C1.3 FRAMEWORK FOR MARKET BASED DECISION MAKING

C1.3.1 EU Context

The EU and the Member States have developed policies that attempt to address some of the key impacts of the transport sector, as well as some of their causes. The action programme "Sustainable Mobility: Perspectives for the Future" adopted December 1, 1998, by the Commission, sets out the initiatives it intends to encourage the development of efficient and environmentally friendly transport systems that are safe and socially acceptable (so called 'sustainable mobility').

The action programme includes, as priorities up to 2004, initiatives to strengthen its environmental assessments of policy initiatives with important environmental effects, especially in light of CO_2 emissions and climatic change. The Commission will also support the Council of Ministers in setting up a strategy for the integration of environmental issues into transport systems. It should however be noted that, although some progress has been made over the past years in the framework of the common transport policy, overall this has been slower than expected (for example, plans to increase the transport of freight by rail).

An overview of the principal initiatives to integrate environmental concerns into the sector was presented by the Transport Council at the Vienna European Council (December 1998) which identified transport pricing and environmental costs, the revitalisation of rail transport and the promotion of inland waterways, maritime transport and combined transport as priority issues requiring action. In October 1999 the Council adopted a Transport Strategy for short-term action (1999-2001) which recognised transport demand management, climate change implications and better coordination of inter-modal transport as critical issues for integration.

Most EU countries have so far focused on addressing the more prominent environmental impacts (especially air and noise pollution) associated with transport while some (eg Sweden and the Netherlands) have started to look at mechanisms for promoting public transport and shift from road to rail. Several others have begun to address issues of efficiency (e.g. energy

efficiency, cleaner fuels, vehicle occupancy, load factors for freight), but almost none have yet started to address the complex issue of promoting access through integrated land-use and transport planning, with a final aim to reduce demand for mobility.

C1.3.2 Danish Context

The 1990 White Paper 'Transport Action Plan' forms the basis for Danish transport policy. The main driver for future development of the sector is viewed as continued operation of an efficient and flexible transport infrastructure, and at the same time attaining the objective of sustainable transport. The White Paper established environmental goals for transport, including a target for stabilisation of total transport CO_2 emissions at the 1988 level by the year 2005, and a 25% reduction by the year 2030.

In response to the White Paper, the Government developed a traffic plan 'Traffik 2000' setting out public works and investments to the year 2005. The plan addresses three main areas :

- a traditional transport policy;
- environmental, energy and road safety issues;
- investments.

Within this framework, five main strategies are defined for future development of the sector:

- influencing the volume of traffic and transport tasks as well as the distribution of modes of transport;
- promoting alternatives to car transport;
- curbing environmental problems;
- setting new priorities for traffic investment; and
- upgrading traffic planning and research.

This is the first time that addressing transport demand has been included as an explicit transport policy objective. This is particularly important for achieving the CO_2 emissions reduction target for the sector.

Taxes are a key tool for regulating transport demand in Denmark. In comparison to the rest of Europe, Denmark imposes high taxes on the purchase of passenger cars (up to 200%). Fuel taxes have been gradually increased since 1994 and are expected to increase further to 2005 to achieve the CO_2 emissions reduction target.

The Government has endorsed the EU scheme for road charging for heavy commercial vehicles on certain roads, as established by the 'Eurovignette' Directive. An agreement will be signed between Denmark, Germany, the Netherlands, Belgium and Luxembourg concerning regional co-operation to establish common payment of road-user charges in all five countries.

Options for goods transport include the promotion of railway and sea freight including combined transport. However, the scope for national transportation of goods by non-road freight is limited due to the nature of demand (distances are generally short ; 60% of goods consignment volumes are hauled less than 50km and only 20% more than 100 km). The most likely transfer of goods transport will be from road to railway, based on promotion and support of railway services in areas where it will be most competitive such as long distance goods transport. The rail system will also be developed for high speed passenger transport over medium to long distances and in metropolitan areas.

Government funding to support development of a sustainable transport system is focused on several areas:

- subsidies for experiments with alternative forms of public transport;
- investment grants for the promotion of environmentally sound bus technology;
- funds to address specific traffic and the related environmental problems in urban areas; and
- support of public transport services for the disabled.

Another focus of transport policy is the establishment of fixed, land based transport links across the Great Belt and the Sound, to link different areas within Denmark, and Denmark to its neighbours.

C1.4 DECISION FLOW ANALYSIS

Decision flow analyses for the transport sector for households and businesses in relation to climate change are presented in *Tables 1.1 - 1.3* Traffic volume is also a major problem for the sector but has not been dealt with as a separate issue since demand management is an integral part of measures to address the climate change issue.

The decisions made by households and businesses, both in terms of passenger and goods transport, are generally the same for both actors:

- *Is the journey necessary*?
- If yes, *what mode of transport should be chosen*?
- If road transport is to be used, *what make and model of vehicle should be purchased for personal use or for a company fleet*?
- Finally, *how should the vehicle be driven in terms of speed and technique*?

The key parameter for determining whether individual transport is necessary either for personal or businesses travel is the **availability** of alternatives to travel, currently largely determined by telecommunications technology for teleworking and the recent development of e-commerce facilities. Land use and urban planning also play a role in supporting mixed and high density development that reduce the need to travel long distances. For businesses

involved in the transport of goods, the availability of resources and demands for supply arising from the transport of goods is also a key parameter. This will reflect the efficiency of production processes, logistics and the distances involved and will be largely influenced by **costs**.

The choice of which transport mode is based on the following key parameters:

- **Affordability**. For passenger travel this is the cost difference between private road transport and public transport, reflecting purchase cost, fuel prices, road user and parking costs. For goods transport the comparison is between road and non road freight transport.

- **Availability** of the different transport options determined by infrastructure requirements, operator costs and regulation of services.

- **Suitability** of different transport options. Whether public transport services and rail freight services are designed to include the necessary facilities for different user groups and the capacity and capability of carrying different goods. Suitability also encompasses timetabling, reflecting frequency of services and journey duration, and considerations of convenience as an option may be suitable but requires more thought or planning compared to getting into a car.

- **Reliability**. A major issue for all users which can be addressed through improved transport planning, regulation of services, collaboration between operators and provision of real time information to operators and users.

- **Perception/habit**. This is an important factor for reducing private car use by households. Despite an awareness of problems associated with public car use and access to other options, a poor perception of public transport and a dominant 'car culture' can lead to users being unwilling to change their reliance on car use.

The key parameters for choice of vehicle make and model are again generally the same for households and businesses. If cars are the chosen form of transport then a key decision is which car to purchase in terms of energy efficiency or even alternative technologies? The key parameters are:

- **Availability and affordability**. At present alternative technologies are not generally available but energy efficiency is being addressed by most manufacturers. Research and development is key to providing affordable technologies but the use of fiscal instruments can support market penetration of low energy use vehicles.

- **Suitability**. Basic vehicle design is unlikely to change drastically for either more efficient vehicles or those based on alternative technologies. However, the introduction of alternative technologies will need to be supported by the provision of the necessary fuelling infrastructure.

Driver behaviour is emerging as an increasingly important issue for reducing CO_2 emissions from road transport. This has mainly been influenced by safety concerns and enforcement of speed limits but now energy efficiency is being highlighted through driver education.

Decision making by transport service operators, such as which service to provide, timetabling and route planning, are largely based on considerations of **demand**, as set out above. Other parameters are capital and operating **costs** and the availability of suitable infrastructure.

The key framework conditions for the transport sector are the *availability* and *affordability* of efficient public transport services and non road freight services. This includes the availability of the necessary infrastructure and a fair and efficient pricing system for the transport sector. The key instruments used to address these decisions include economic incentives, land use planning, and integrating transport services in terms of transport planning, timetabling, planning of intermodal transfer and network co-ordination.

The importance of *willingness to act* is increasing in importance as a consideration in household transport decision making in some countries. Despite a general awareness of transport related environmental problems and the major role played by private car use it appears that motorists are unwilling to use public transport. The tools currently in place do not overcome the 'car culture' that predominates in many countries. A recent survey in the UK revealed that motorists are most concerned with price, fuel economy, safety and reliability. Few support the idea of higher fuel prices, electric cars or fitting cars with speed limiters. In the Netherlands, the advisory council VROMraad has stated that the government should shift policy from reducing mobility to cutting its negative effects through technology improvements, since 'forcing' people to use public transport is not succeeding.

Table C1.1 Households (3)

PARAMETERS	TOOLS/MECHANISMS	EXAMPLES
Is this journey necessary?		

Availability of alternatives to travel	• R & D
	  • new technology for telecommunications
	  • demonstration projects to encourage walking
	  • information systems
		• Demonstration projects for teleworking villages in the UK

	• Communications technology	• eg teleworking, Internet shopping and banking
	• Community networking/co-ordination of local services)	• community internet services • support for local shops and facilities

	• Land use planning guidance and regulations
	  • to reduce the need for travel through encouraging higher densities and mixed development
	  • planning that encourages walking and cycling
		• eg UK Planning Policy Guidance 13 A Guide to Better Practice: Reducing the nee to travel through land use and transport (currently being revised)

	• Corporate policy	• Employer policies in support of teleworking • development of company transport plans to reduce need for travel
Awareness/information	• Education and awareness • Consumer advice	eg UK Are you doing your bit? - Government led campaign
What mode of transport should I use?		
Availability of different transport options to required location	• Regulation • regulation of public transport services	• standards for public transport coverage and frequency
	• R & D • to develop alternative technologies and improve transport planning and public transport services	

(3) This includes decisions made by households in the role of an employee

PARAMETERS	TOOLS/MECHANISMS	EXAMPLES

	• Land use planning regulation and guidance
	  • encourage development in areas with good public transport or that facilitates the use of public transport
	  • support for integrated transport planning
		• eg Netherlands: Amsterdam Transferium - facility for 2,500 vehicles to direct transfer to public transport

	• Corporate policy:	
	• Employer policy	• eg use of company transport plans, providing interest free loans for public transport season tickets, provision of special buses for large employers
	• Operator policy	• support for development and introduction of alternative technology vehicles • co-operation with large employers to ensure adequate public transport services
	• Economic incentives • Incentives/subsidies for transport operators to ensure provision of public transport	• eg UK Quality Contracts for buses to ensure exclusive operation of certain routes with financial support
	• Collaboration	
	• industry collaboration to improve public transport services	• development of integrated transport services
	• commuter plans	• eg UK: Nottingham Commuter planners club bringing together 33 organisations actively involved in the development of commuter plans
	• car share schemes	• car pooling • operator and employer collaboration to provide special bus services or ensure public transport services for employees
Price	• Economic incentives	
	• fuel tax	• NL: variabilisation strategy - higher fuel excise taxes leading to increased fuel prices
	• road user charging	• introduction of road pricing for heavily used roads or for heavy goods vehicles
	• parking charges	• Spain: restriction on long duration parking in many cities
	• subsidised public transport services	• government support for certain public transport routes to ensure services

PARAMETERS	TOOLS/MECHANISMS	EXAMPLES
	• employer subsidised public transport travel or interest free loans	• abolition of fiscal incentives for company cars
	• Collaboration	• eg multi modal travel cards
	• Regulation	
	• regulation of public transport charges	
	• Marketing	• special ticketing offers by public transport operators
Suitability - timetabling/facilities	• Service design	
	• improving the design of public transport services to encourage use	• low access buses, luggage facilities, bicycle storage areas on trains, easier cleaning
	• urban planning to increase reliability of public transport and high occupancy vehicles on roads	• NL: high occupancy vehicle lanes - dedicated road lanes for buses, car poolers
		• traffic calming
	• Collaboration	
	• integrated transport services both in terms of timetabling and facilitating interchanges	• multi modal information systems
		• integrated timetabling
		• NL: Amsterdam transferium
	• R & D	
	• development of IT systems to provide better information	• tracking systems to provide real time information to passengers and to provide feedback to operators to improve the scheduling
		• UK: 'Countdown' real time electronic information displays at main bus stops in London
	• Widening involvement	• passenger consultation programmes
	• Regulation of public transport services	• standards for service provision with financial penalties for poor performance
Reliability	• Service design	
	• improved infrastructure and urban planning to support public transport	• bus lanes, zoning for restricting access in urban areas to favour public transport
	• Regulation, monitoring and enforcement of public transport services	• standards for service provision with financial penalties for poor performance

PARAMETERS	TOOLS/MECHANISMS	EXAMPLES
	• Collaboration • integrated transport services both in terms of timetabling and facilitating interchanges	• multi modal real time information systems • effective integrated timetabling • co-ordinated interchanges

	• Service information
	  • provision of information on service quality
	  • self imposed service standards for operators
		• operator performance reporting
		• passenger charters

	• R & D • development of IT systems to provide better information	• tracking systems to provide real time information to passengers and to provide feedback to operators to improve scheduling and service provision

Safety	• Standards
	  • Design and operating standards
	Regulation
	  • design and operating standards with monitoring and reporting	

	• Service information • provision of information on safety performance	• operator performance reporting
Perceived attributes eg status/comfort/convenience	• Marketing • improving perception of public transport services and to highlight environmental benefits	
	Education/public awareness raising	• Government led promotions and campaigns
	• Service design • improving perception and status of public transport	• provision of better facilities for all users on public transport, business or family carriages on trains

	• Service information
	  • Operator reporting
	  • better information systems
		• information systems, travel information helplines

	• Regulation, monitoring and enforcement of public transport services	• standards for service provision with financial penalties for poor performance

PARAMETERS	TOOLS/MECHANISMS	EXAMPLES
Should I choose to use a car, what make/model should I buy?		

Availability of different models/ technologies	• Economic incentives
	  • Manufacturer/retailer incentives to produce/supply energy efficient models
	• R & D to develop to improve energy efficiency and new technologies
	• Corporate policy
	  • Manufacturer/retailer environmental policy to develop and support alternative and energy efficient technologies
	• Regulation of vehicle energy efficiency
		• market support
		
		• Agreement between EU and European car manufacturers (ACEA) to reduce CO2 emissions
		• prohibition of high energy use cars or energy efficiency standards

Cost - purchase and running	• Economic incentives:
	  • differential/increased purchase tax, road or parking charges for smaller/more energy efficient vehicles
	  • subsidies for energy efficient vehicles
	• R & D
	  • development of alternative and energy efficient technologies
	Regulation
	• regulation of vehicle pricing in favour of energy efficient vehicles
	• Collaboration
		
		• Dk:: high vehicle purchase tax
		• UK: annual increases in fuel duty of at least 6% above the rate of inflation (no longer in place)
		• NL: variabilisation strategy
		
		• decreasing production costs of alternative technologies
		
		• industry collaboration on R & D

Suitability	• Product design • Widening involvement • Collaboration	• vehicle design that incorporates new technologies but is also meet the users everyday needs • consultation and participation of all stakeholders in development of new technologies • industry collaboration for provision of fuelling infrastructure to support alternative technologies

PARAMETERS	TOOLS/MECHANISMS	EXAMPLES
Quality/safety	• R & D	
	• Product design	• improved safety of new designs
	• Quality/safety standards	
	• Regulation, monitoring and enforcement in relation to vehicle safety	
	• Product information	• inclusion of safety information in product information
		• manufacturer HSE reports to include product safety information
• Perceived product attributes and awareness	• Green marketing to highlight energy efficiency and other environmental attributes	
	• Ecolabelling	• eg fuel efficiency rating
		• Volvo V70 Environmental Declaration
	• Corporate policy	
	• Retailer policy for staff training in environmental attributes	• staff training to provide environmental information in sales
	• promotion of environmental benefits of products	
	• Standards	
	• Product performance standards for new technologies	
	• Advice	
	• Producer helplines for consumers and retailers	
	• Public awareness campaigns and education	
	• Product information	• Manufacturer corporate environmental reporting
How do I drive my car?		
Safety	• Regulation and enforcement	
	• reducing speed limits especially in residential and urban areas	
	• enforcement of speed limits	
	• Urban planning	
	• traffic calming schemes in urban areas	
	• Education	
	• Environmentally friendly driving	• Finland and Sweden: Eco Driving scheme to teach safe and environmentally friendly driving
	• public information campaign to increase awareness of road safety	

PARAMETERS	TOOLS/MECHANISMS	EXAMPLES

Fuel costs	• Enforcement of speed limits
	• Collaboration
	  • to promote and support environmentally friendly driving
	• Economic incentives
	  • government support of eco-driving schemes
		• NL: Highway speed limit enforcement programme
		• Sweden: Eco Driving collaboration between National Road Administration and the Swedish Association of Driving Schools

Table C1.2 Businesses as users of transport (4)

Load	Parameters	Tools/mechanisms	Examples
Goods	Is this journey required?		

	Availability/location of suppliers/customers	• Land use planning guidance and regulation
		  • to encourage mixed developments and optimise transport distances between suppliers and customers in particular for commercial developments
		  • integrated transport planning
		• Collaboration
		  • industry collaboration to reduce the need for transport in the supply chain
		• Corporate policy
		  • Retailer/supplier policy to reduce transport demand
			• eg UK PPG13
			• eg use of company transport plans and green procurement systems to optimise sourcing of goods

	Resource use (do I or my customers need supplies)	• Product design to reduce materials use
		• Corporate policy
		  • support for use of LCA/EMS to increase resource use efficiency
		• Economic incentives
		  • for more efficient production processes and packaging
		• Best practice information dissemination for efficient production processes
		• R & D
		  • Use of IT tracking systems to improve transport logistics and load optimisation
			• tax on raw materials use

	Cost	• Economic incentives: fuel taxes vehicle purchase tax road user charging	
Goods	What mode of transport?		

(4) The transport decisions made by employees are covered in the decision flow analysis for households (Table 1.1)

Load	Parameters	Tools/mechanisms	Examples
	Availability of different transport options to required location	Land use planning guidance and regulation	

		• Collaboration and design of transport services
		  • Development of logistics centres for combined transport
		• Corporate policy
		  • use of corporate transport plans to determine optimum/favoured transport options
		• Industry collaboration
		  • integrated transport services both in terms of timetabling, interchanges and network planning
			• eg freight villages, nodal centres, urban distribution centres

	Cost	• Economic incentives
		  • fuel tax
		  • vehicle purchase tax
		  • road use charges
		• Regulation
		• regulation of freight transport charges
		• Collaboration
		  • co-ordination of intermodal charging
		• R & D
		  • Use of IT tracking systems to increase efficiency of non road/intermodal fright transport
			• NL: variabilisation strategy
			
			• EU Enurovignette
			
			• eg NL: TRACE traffic control system for railways transmits data to and from rolling stock with real time information on location and availability

	Reliability	• Collaboration • integrated transport services - timetabling, interchanges and network planning • Product design • Regulation	• freight villages, nodal centres, urban distribution centres • optimising trailer design to facilitate transfer between different modes • regulation of non road freight services including financial penalties for poor performance

Load	Parameters	Tools/mechanisms	Examples
		• R & D • Use of IT tracking systems for tracking and monitoring freight to improve transport logistics and providing real time information	eg NL TRACE system
		• Service information • Operator performance reporting	
	Suitability - freight capacity, timetabling etc	• Product design • design of freight services for load optimisation	
		• Land use planning guidance and regulation • to favour non road freight	
		• Collaboration • integrated transport services - timetabling, interchanges and network planning	• freight villages, etc
		• R & D • Use of IT tracking systems for tracking and monitoring freight to improve transport logistics and providing real time information	• eg NL TRACE system
		• Wider involvement	• consultation with freight customers and other operators to optimise the freight network
	HSE Risk	• Regulation, monitoring and enforcement • Design and operation standards • Operator and customer HSE policy to improve performance • HSE corporate reporting to include transport of goods	
	Perceived product attributes	• Green marketing to encourage uptake of non-road freight transport	
		• Education and awareness raising campaigns focused at business users	
		• Service design • improving design of freight services to facilitate non road freight	
		• Service information • Operator performance reporting and HSE reporting	

Load	Parameters	Tools/mechanisms	Examples
People/ goods	What fleet should we use?		
	Availability of different models/ technologies	• Economic incentives • Manufacturer/retailer incentives to produce/supply energy efficient models	• market support

		• Corporate policy
		  • Manufacturer/retailer environmental policy to develop and support alternative and energy efficient technologies
		  • to require environmental attributes to be a factor in choosing a fleet
			• Agreement between EU and European car manufacturers (ACEA) to reduce CO2 emissions

		Regulation of vehicle energy efficiency	• prohibition of high energy use cars or energy efficiency standards
		• R & D to develop to improve energy efficiency and new technologies	

	Cost - purchase and running	Economic incentives:
		  • differential/increased purchase tax, road or parking charges for smaller/more energy efficient vehicles
		  • subsidies for energy efficient vehicles
			• Dk:: high vehicle purchase tax
			• UK: annual increases in fuel duty of at least 6% above the rate of inflation (no longer in place)
			• NL: variabilisation strategy

		• R & D
		  • to reduce production costs of alternative technologies
		  • use of IT tracking systems to provide feedback and improve efficiency of goods transport
		•
			• NL TRACE
			• Norway: 'electronic road' a database of the entire road system to provide information to industry to optimise route planning

		• Regulation • regulation of vehicle pricing in favour of energy efficient vehicles	
		• Product design to improve capacity of freight systems	• industry collaboration for provision of fuelling infrastructure to support alternative technologies
	Suitability	• Product design • Widening involvement	• eg trailer design to increase capacity • consultation with business users and freight groups

Load	Parameters	Tools/mechanisms	Examples
		• Collaboration • industry collaboration for provision of fuelling infrastructure to support alternative technologies	
		• Corporate policy	• eg to require environmental attributes to be a factor in choice of fleet
	Perceived product status	• Green marketing aimed at business users	
		• Ecolabelling	• fuel efficiency rating

		• Corporate policy
		  • Retailer policy for staff training in environmental attributes
		  • promotion of environmental benefits of products
		  • manufacturer policy to promote environmental attributes of products
		  • Manufacturer HSE reporting to include product environmental performance
			• staff training to provide environmental information in sales

		• Product quality standards for new technologies	
		• Education and public awareness campaigns	
		• Advice	Producer helplines
	Quality/safety	• R & D	
		• Product design	• improved safety of new designs
		• Quality/safety standards	
		• Regulation, monitoring and enforcement in relation to vehicle safety	
		• Product information	• inclusion of safety information in product information • manufacturer HSE reports to include product safety information
People/ goods	How do I drive my car/lorry?		

	Safety	• Regulation and enforcement
		  • reducing speed limits especially in residential and urban areas
		  • enforcement of speed limits	

		• Urban planning • traffic calming schemes in urban areas	

Load	Parameters	Tools/mechanisms	Examples
		• Corporate policy • employer health and safety policy promoting safe driving	
	Fuel costs	• Enforcement of speed limits	• NL: Highway speed limit enforcement programme
		• Collaboration • to promote and support environmentally friendly driving	• Sweden: Eco Driving collaboration between National Road Administration , Swedish Association of Driving Schools, public and private sectors
		• Economic incentives • government support of eco-driving schemes	
	Driver delivery schedule	• R & D • Use of IT systems for tracking and monitoring to increase efficiency of logistics and load optimisation	• eg Swedish Timber Industry

Table C1.3 Businesses as providers of transport services

Parameters	Tools/mechanisms	Examples
Which mode of transport do I offer?		
Demand	• Education and awareness raising campaigns to encourage greater use of non road transport	
	• Service information	• eg NL TRACE and UK Countdown
	• Provision of real time passenger information systems	
	• Land use/urban planning guidance and regulation	
	• to encourage development in areas with public transport services	
	• Industry collaboration	
	• Integrated transport services in terms of timetabling, interchange and network planning	• nodal centres, public transport transfer centres • multi- modal information system
	• Regulation	• to support public transport services on certain routes
	• requirements for service provision both coverage and frequency	
	• Marketing to encourage greater use of public transport and overcome poor perception	•
	• Widening involvement	• Passenger and business consultation
Cost	• Economic incentives to encourage use of public transport	
	• fuel tax	• NL: variabilisation strategy
	• vehicle purchase tax	
	• road use charges	• EU Enurovignette
	• parking charges	• increased charges for retail and work place parking
	• Collaboration	• Provision of mulitmodal travel cards
		• collaboration between operators and large employers to ensure public transport services are available for staff
Existing transport infrastructure	• Land use planning guidance and regulation	• eg reducing bottlenecks, provision of transfer facilities, encouraging development in areas with public transport services
	• to maximise the use of existing infrastructure and encourage public transport services,	
	• Service design	• eg provision of bus lanes, extension of rail network
	• Collaboration	
	• Integrating transport services to maximise use of existing infrastructure	

Parameters	Tools/mechanisms	Examples

Competition	• Collaboration
	  • Integrated transport services in terms of timetabling, interchange and network planning to improve all public transport services
	• Regulation
	  • restriction on monopolies of public transport services	

Compliance	• Regulation including facilitation of future compliance:
	  • voluntary agreements
	  • widening involvement - participation of operators in development of regulations
	  • advice services to operators	

Corporate culture/ethics/ reputation	• Corporate policy • support of environmentally friendly transport services	
What price should I charge?		
Demand	• Education and awareness raising campaigns to encourage greater use of non road transport	
	• Service information • Provision of real time passenger information systems	• eg NL TRACE and UK Countdown
	• Land use/urban planning guidance and regulation • to encourage development in areas with public transport services	
	• Industry collaboration • Integrated transport services in terms of timetabling, interchange and network planning	• nodal centres, public transport transfer centres • multi- modal information system
	• Regulation • requirements for service provision both coverage and frequency	• to support public transport services on certain routes
	• Marketing to encourage greater use of public transport and overcome poor perception	•
	• Widening involvement	• Passenger and business consultation
	• Modelling	
Competitor price charging	• Regulation of public transport charging and restrictions on monopolies • Collaboration • Mulitmodal/operator ticketing	
Planned investment	• Land use/urban planning • to determine need for extension of transport networks to meet needs of new development	

Parameters	Tools/mechanisms	Examples
	• Regulation	• minimum service requirements for coverage and frequency
	• Widening involvement	• Passenger consultation in planning public transport services
	• Economic incentives	• subsidisation of public transport network
What route and timetable should I provide?		

Operating cost	• Economic incentives
	  • fuel tax
	  • road user charging
	  • subsidisation/financial support
		• fuel support for public transport services

	• Collaboration	• Provision of mulitmodal travel cards
	• R & D • Use of IT systems for logistical planning to improve service efficiency and match demand	
Demand	• Education and awareness raising campaigns to encourage greater use of non road transport	
	• Service information • Provision of real time passenger information systems	• eg NL TRACE and UK Countdown
	• Land use/urban planning guidance and regulation • to encourage development in areas with public transport services	
	• Industry collaboration • Integrated transport services in terms of timetabling, interchange and network planning	• nodal centres, public transport transfer centres • multi- modal information system
	• Regulation • requirements for service provision both coverage and frequency	• to support public transport services on certain routes
	• Marketing to encourage greater use of public transport and overcome poor perception	•
	• Widening involvement	• Passenger and business consultation
	• Modelling	
Competition	• Collaboration • Integrated transport services- timetabling, interchange and network planning	
	• Regulation of public transport charging and restrictions on monopolies	

Parameters	Tools/mechanisms	Examples
Safety	• R & D • Use of IT systems for monitoring and tracking of transport networks • Regulation, monitoring and enforcement • Service/product operation and design standards	

Compliance	• Regulation including facilitation of future compliance:
	  • voluntary agreements
	  • widening involvement - participation of operators in development of regulations
	  • advice services to operators	

What stock/fleet should we use?		

Availability of different models/ technologies	• Economic incentives
	  • Manufacturer/retailer incentives to produce/supply energy efficient models
	• Corporate policy
	  • Manufacturer/retailer environmental policy to develop and support alternative and energy efficient technologies
	  • to require environmental attributes to be a factor in choosing a fleet
	• Regulation of vehicle energy efficiency
	• R & D to develop to improve energy efficiency and new technologies
		• market support
		• Agreement between EU and European car manufacturers (ACEA) to reduce CO2 emissions
		• prohibition of high energy use cars or energy efficiency standards

Cost - purchase and running	• Economic incentives:
	  • differential/increased purchase tax, road or parking charges for smaller/more energy efficient vehicles
	  • subsidies for energy efficient vehicles
	• R & D
	  • to reduce production costs of alternative technologies
	• Regulation
	  • regulation of vehicle pricing in favour of energy efficient vehicles
	• Product design to improve capacity
		• NL TRACE
		• industry collaboration for provision of fuelling infrastructure to support alternative technologies

Suitability	• Product design • Widening involvement	• eg low access • consultation with passenger groups

Parameters	Tools/mechanisms	Examples
	• Collaboration • industry collaboration for provision of fuelling infrastructure to support alternative technologies	
	• Corporate policy	• eg to require environmental attributes to be a factor in choice of fleet
Perceived product status	• Green marketing	
	• Ecolabelling	• fuel efficiency rating

	• Corporate policy
	  • Retailer policy for staff training in environmental attributes
	  • promotion of environmental benefits of products
	  • manufacturer policy to promote environmental attributes of products
	  • Manufacturer HSE reporting to include product environmental performance
	  • operator policy to support purchase of energy efficient /alternative technologies
		• staff training to provide environmental information in sales

	• Product quality standards for new technologies	
	• Education and public awareness campaigns	
	• Advice	Producer helplines
Quality/safety	• R & D	
	• Product design	• improved safety of new designs
	• Quality/safety standards	
	• Regulation, monitoring and enforcement in relation to vehicle safety	
	• Product information	• inclusion of safety information in product information • manufacturer HSE reports to include product safety information
How do I drive the fleet/stock?		
Safety	• Urban planning • traffic calming schemes in urban areas	
	• Corporate policy • employer health and safety policy promoting safe driving	
Fuel costs	• Collaboration • to promote and support environmentally friendly driving	• Sweden: Eco Driving collaboration between National Road Administration , Swedish Association of Driving Schools, public and private sectors

Parameters	Tools/mechanisms	Examples

Driver delivery schedule	• Economic incentives
	  • government support of eco-driving schemes for transport operators
	• R & D
	  • Use of IT systems for tracking and monitoring to increase efficiency of logistics and load optimisation	

Annex D

Industry Sector

D1 INDUSTRY

D1.1 STAKEHOLDER ANALYSIS

The industry sector includes a wide range of actors involved in manufacturing and services [(1)] . Industry activities include:

- raw material sourcing eg mining;
- primary manufacture /processing eg chemicals;
- end product manufacturing eg electronic goods;
- service provisions (e.g. dry cleaning, catering);
- waste management.

In recent decades, services emerged as the dominant industry sub-sector in place of manufacturing, aided by the development of information technology.

Macro level actors include the European Commission, Ministry of Environment and Energy and the Danish Environmental Protection Agency. Historically, their influence has largely been implemented through the setting and enforcement of a policy framework based on a 'command and control' approach.

International NGOs such as Greenpeace also have a major influence on the environmental performance. Confrontational name and shame approaches have now been replaced by constructive dialogue between NGOs and industry. Similarly, the policy framework has changed to incorporate a more flexible and co-operative element, using tools to encourage improvements rather than requiring them in the first instance, and thus placing increased responsibility on meso and micro level actors in terms of environmental decision-making.

Elements of both approaches are now, the emphasis depending on the severity of the environmental impact and framework conditions such as industry composition and willingness to act by both industry and consumers. Hence consideration for the environment is integrated into industry activities both via regulation and numerous other policy and market-based tools.

Meso level actors include:

- *municipalities* - undertake monitoring and enforcement, implement macro level policy;
- *environmental and consumer NGOs* eg Danish Consumer Council, Danish Ecological Council, Danish Society for the Conservation of Nature, European Environmental Bureau - these organisations undertake public

(1) Services are categorised as part of the industry sector in this report due to the need to consider service provision as an option for reducing the environmental impact of products.

awareness campaigns, provide guidance and bring pressure to bear on industry [2]

- *industry organisations* eg Confederation of Danish Industries, CEFIC - encourage and oversee industry collaborative efforts, establish sector environmental policies and guidelines, negotiate voluntary agreements.

In addition, meso level actors represent the views of their members in policy discussion forums and consultations at all levels. For example, the Danish Consumer Council represents consumers on more than 200 committees, boards and councils and has an extensive dialogue with the business community [3] .

The micro level actors are businesses and households. Businesses have a dual-role as producers and consumers. Businesses are extremely diverse, ranging from Small and Medium sized Enterprises (SMEs) [4] to major multinationals. Key features of Danish industry include the dominance of SMEs (70-80%) and the service sector, and the importance of export markets. These will all affect which approaches and tools can most effectively address industry's environmental impacts.

Table D1.1 Danish GDP composition by sector, 1997 [1]

Sector	%
Services (private and public)	69
Manufacturing industry	19
Building, construction	6
Agriculture	4
Other	2

Key manufacturing industries in Denmark include food processing, chemical products, electronics, metal processing and products. The most expansive industrial sectors are biotechnology, information technology and software, and food and beverages. On the service side, tourism is building on its already strong position and is likely to become an important sub-sector in the next decade. *Table D1.1* illustrates the importance of the industry sector in terms of contribution to GDP.

Households take key decisions in terms of the products they buy, how they use and finally dispose of them. Depending on household composition and the nature of the product or service, these decisions may be taken individually or collectively. Households as consumers have a strong influence on industry via demand for products or services, and particular aspects of those products or services. The influence and impacts of household decisions are escalating as consumerism continues to grow and as the number of households increases.

(2) The Danish Society for the Conservation of Nature, Denmark's principal environmental NGO, also undertakes a 'monitoring' role due to its ability to bring an appeal to the Danish EPA if it considers a pollutant to be having an unacceptable impact on the surrounding environment or a permit to be less stringent that is possible suing the best environmental technology

(3) Danish Consumer Council, http://www.fdb.dk

(4) An SME is defined as an enterprise with less than 250 employees. This can be further broken down into small enterprises with <50 employees and micro enterprise with <10.

D1.2 KEY ENVIRONMENTAL ISSUES

Industry has been identified as the cause of many environmental problems including pollution, resource use and waste issues. Environmental impacts will vary across EU member states depending on the past and present composition of national industry sectors, and those of neighbouring countries since industrial pollution is often transboundary. Key environmental impacts include:

Long term:

- use of non-renewable resources, most notably oil, aggregates, metal ores and minerals;
- waste generation and disposal;
- contaminated land as a legacy of heavy industry ;
- groundwater and marine pollution by heavy metals and persistent synthetic chemicals;
- contribution to climate change through the release of a range of greenhouse gases, most notably CO_2; and
- ozone layer depletion caused primarily by the release of chlorofluorocarbons (CFCs) used as a refrigerants but now banned. The use of HCFCs remains a concern.

Short or medium term:

- surface water pollution e.g. discharges from food processing installations;
- air pollution e.g. SO_2 emissions

Table D1.2 Identification of main Danish industries and their environmental impacts

Main industry sub-sectors	Key Impacts
Food products and beverages	Water use Waste water (high BOD effluent) Waste – packaging Transportation Agriculture
Chemicals and chemical products	Direct health hazards esp. vulnerable groups Air pollution - combination of chemicals Water pollution - groundwater and marine Land pollution - contaminated land
Iron, metal processing, foundries, metal products	Air pollution - SO_2 etc. Water pollution - groundwater and marine Land pollution - contaminated land Resources – ore Energy use Noise
Construction	Noise Air pollution – dust Resources – aggregates Energy use
Electrical, electronic and optical equipment	Use of hazardous substances End-of-life product disposal

Main industry sub-sectors	Key Impacts
	Energy use
Biotechnology	GMO impacts on wildlife/biodiversity GM impacts on health e.g. resistance
Textiles, clothing and leather	Water pollution - surface, groundwater and marine
Paper, wood products, furniture	Resource depletion Wildlife/Biodiversity impacts Energy use
Services	Transport Resource Use - e.g. by tourists Energy use

The decision flow analysis in *Section D1.4* considers a key environmental issue for both the EC and Denmark:

- ***Manufacture, purchase, use and disposal of chemicals***

Eight million tonnes of chemicals, comprising 20 000 different substances, are used by industry and consumers in Denmark each year (5). The long term environmental and health impacts of many chemicals are unknown. This is of particular concern due to the potential for damage caused by non-biodegradable, persistent, bio-accumulative chemicals entering groundwater, which is an important source of drinking water in Denmark and once contaminated, extremely difficult to treat.

D1.3 FRAMEWORK FOR MARKET BASED DECISION MAKING

Macro level policy actors set a framework which consists of a mix of regulatory and 'softer' tools. Tools used by macro level actors may target industry directly (eg prohibitions, discharge consents, fiscal incentives, voluntary agreements) or indirectly via increasing pressure from other actors (eg public awareness campaigns, 'green' public procurement, granting legal standing to NGOs and local communities).

Across the member states, the majority of environmental regulations are formulated at the EU level due to the transboundary nature of environmental issues, trade interactions and need for a level playing-field in terms of competition. However, certain key Member States lead the policy debate with the implementation of more stringent national regulations and development of innovative policy tools and concepts, some of which are later adopted at EU level. This can be seen for chemicals policy aimed at reducing adverse environmental impacts.

In Denmark, legislation and action plans are in place for specific media and issues such as:

- waste (Waste 21);

(5) The Environment in Denmark: selected indicators (Danish Environmental Protection Agency)

- the aquatic environment (Aquatic Environment Plan II); and
- contaminated land (Act on Contaminated Soil).

In addition, key policies and legislation specifically addressing chemicals are: (6):

- *Danish Chemical Act* - translates certain EU directives into national law. It regulates notification, classification and labelling of substances and preparations. It also regulates safe handling, producer and manufacturer responsibility and provides for restrictions on dangerous substances and products.
- *Danish Environmental Protection Act* - enforces substitution of harmful substances with less harmful substances, the principle of best available technology and the use of cleaner technologies and products based on LCA. The act provides for national guidelines to establish principles for assessment of chemical risk and set limit values for the chemical content of drinking water, groundwater, air and soil.
- *Danish Chemicals Strategy* - in January 1999, the Danish Minister for Environment and Energy issued a strategy aimed at reducing the production and use of substances hazardous (or potentially hazardous) to health and/or the environment. It contains a list of 'undesirable' chemicals which may be the subject of further research and future legislation, and identified actions which needed to be taken at the national, EU and international level. These included:
    - making industry responsible for the chemicals they produce;
    - improved enforcement of current controls; and
    - increasing research to remedy the lack of knowledge about the effects of numerous common chemicals on humans and the environment. (7)

The focus on chemicals policy in Denmark has been driven by pressure from NGOs and concerned citizens. Regulations are traditionally viewed by industry as restricting innovation and growth, however this view is gradually changing as companies with good environmental performance recognise the potential to gain competitive advantage. In addition, opinions are moving towards favouring the use of regulations to set minimum standards, accompanied by more flexible, voluntary tools and public/consumer pressure to encourage further improvements. Specific initiatives have been established to encourage industry actors to produce cleaner products and to increase consumer interest in purchasing less environmentally damaging products.

D1.4 DECISION FLOW ANALYSIS

Decision flow analyses for the industry sector for households, businesses and municipalities in relation to chemical are presented in *Tables 1.3 - 1.6*.

(6) 'Denmark - Implementation of Agenda 21: information provided by the Government of Denmark to the United Nations Commission on Sustainable Development' (1997)
(7) Danish Nature and Environment Policy, 1999

Although the questions facing industry and household consumers are the same and they share many similar parameters, the **key** parameters and drivers are sufficiently different to warrant separate decision flow analyses.

The decision flow begins with a question which is of fundamental importance for sustainable consumption, namely *is the product required/needed*? The key parameters for this decision are:

- For households, **societal aspirations/expectations** and **personal awareness and attitudes** have a significant influence. This parameter can manifest itself in several forms. Households will often fail to make a conscious decision regarding whether a product is needed, especially if the product is low cost, if behaviour patterns and/or societal norms which view the product as a necessity, have become so established that the decision is subconscious. Alternatively, society may regard the product as something to aspire to, and hence desirable. Consumer awareness and concern over the environmental impacts of the product acts against this, and if high will lead consumers to consciously decide whether the product is necessary.

- The equivalent parameter for industry is **cost**. Industry is more likely to question whether products that represent large spends (high unit cost and high volume) are needed, making those products less attractive. This parameter can be influenced by fiscal measures set by government eg 'green' taxation.

These two parameters will drive other parameters identified such as **availability** and **suitability** of alternatives. Subsequent questions (*which product is purchased, how is it used* and *how is the product, or contaminated product packaging, disposed of?*) follow, and although they are presented in sequence there are interlinkages and feedback loops between all questions.

The complementary consideration is sustainable production, which addresses the problem at source rather than the process-focused or end-of-pipe approach. Hence the key question is *which product/service is produced*?

Apart from market opportunities, the main parameter influencing this decision is **compliance**, although corporate culture, ethics and company reputation are increasingly important. Regulations may prohibit or restrict the production and use of chemicals which have unacceptable environmental or health impacts. Certain tools have been developed which facilitate compliance by industry and improve the effectiveness of regulations. For example, providing clear signals of the direction of future environmental policy and legislation enables industry to prepare in advance and may reduce the cost of compliance for leaders and fast followers. Voluntary agreements can play a similar role if uptake rates are high and they are backed up by the possibility of legislation. Compliance by SMEs requires particular framework conditions in order to succeed, namely awareness, guidance and support.

Table D1.3 Household Consumers

Parameters	Tools / Mechanisms	Examples
Is this product needed?		
• Availability of alternatives to meet objectives e.g. service, process.	• R&D • Industry collaboration • Economic Incentives • Price/green taxes/support schemes for cleaner products	
• Requirements of existing infrastructure e.g. washing machine, car.	• R&D • Economic Incentives • Industry Collaboration • Supplier relationships/partnerships	Domestic appliance & detergent manufacturers
• Societal aspirations / expectations • Personal awareness & attitudes	• Marketing • Education / Public Debate • Consumer advice • Information provision to raise awareness of environmental impacts	
Which product is purchased?		

• Availability	• Regulation
	  • Checks against producer monopolies
	  • Prohibition/Restriction of products/substances
	• Retailer environmental policies
	• Retailer incentives to stock less environmentally damaging products
	• Supply side/chain alternatives
	  • Development/use/promotion of alternative consumer purchasing channels	

• Cost	• Regulation
	  • Government watchdog re price fixing
	• Economic Incentives
	  • Green taxes/tax breaks on raw materials &/or products
		Consumer incentive schemes e.g. in Belgium electricity companies offer financial rebate on more energy efficient appliances. Water companies and other negatively affected parties could give partial rebate for alternatives

Parameters	Tools / Mechanisms	Examples

	• Marketing
	  • Consumer incentive schemes
	  • Special offers
		to products which contain problematic chemicals, ideally based on LCA to ensure no impact displacement.

• Quality	• Business Advice
	• Management Systems
	• Product design
	• Eco-labels
	  • Minimum quality standards for eco-labelled products
	  • Indication of product life-span
	• Minimum product standards	

• Suitability / 'Fit for Purpose'	• Marketing
	  • Market research
	• Product design
	• Eco-labels
	  • Minimum performance standards for eco-labelled products
		EC Eco label criteria for washing machines include a performance requirement

• Perceived product attributes eg value added, environmental benefits	• Product design
	• Green marketing (producer & retailer)
	• Retailer policy: Retail staff training
	• Eco-labels, Energy labelling
	• Consumer advice
	  • Government/NGO helpline
	• Education
	  • Public environmental awareness campaigns/education
	• Product information
	  • Risk / Hazard labelling
	  • Producer helpline
	  • Retail staff advice
	  • Consumer organisation reports/product tests
		EC legislation under development to regulate green marketing.
		Labelling: B&Q in the UK have developed a label for paint & varnish which classifies VOC content & is accompanied by explanatory leaflets.

Parameters	Tools / Mechanisms	Examples

• Habit/Established behaviour/Inertia	• Product information: provision and promotion
	• Marketing: producer and/or retailer
	• Consumer advice
	  • NGO campaigns/organised boycotts
	• Education
	  • Public environmental awareness campaigns encouraging individual responsibility and action
		Campaigns using examples of where individual actions *can* be effective.

How to use the product?		

• Product (use) information	• Product information
	  • Labelling
	  • Advertisements
	  • In-store demonstrations
	• Consumer advice
	  • Articles
	  • Helplines
	  • Leaflets
		Certain detergent manufacturers provide detailed dosage information according to soiling and water type, and a telephone helpline service informing consumers of their local water type, thus preventing excessive dosage.

• Requirements of existing infrastructure	• R&D • Economic Incentives • Industry Collaboration: • Supplier relationships/partnerships	Development of upgradable infrastructure e.g. Siemens dishwashers can be reprogrammed to enable increased water/energy/detergent efficiency
• Habit/Established behaviour/Inertia	• Product information: provision and promotion • Marketing • Consumer advice • NGO campaigns • Education • Public environmental awareness campaigns encouraging individual responsibility and action	
• Cost	• Economic Incentives: Green taxes/tax breaks on products	

Parameters	Tools / Mechanisms	Examples
How dispose of product (or contaminated product packaging)?		
• Convenience	• Best practice: identification and dissemination • Minimum requirements/standards for infrastructure provision • Widening involvement • Stakeholder consultation to identify convenience factors • Supplier/Retailer policies	Belgium: box scheme comprises free doorstep collection of unwanted household chemicals

• Cost	• Best practice
	• Product design
	• Corporate policies
	  • Supplier/Retailer take-back policy
	• Industry collaboration
	  • Take-back schemes
	• Regulation
	  • Producer responsibility legislation
	• Economic Incentives
	  • Green taxation
	  • Consumer incentive schemes
		Consumer incentive schemes eg: $ back, $ off next purchase, *x* free products for *y* used products returned, pre-paid return envelopes etc.

• Compliance	• Advice • Consumer awareness raising regarding regulations • Monitoring/enforcement	Eg UK: public often not aware that it is prohibited to pour motor oil down drain. Increased potential for municipalities to raise awareness of regulations.

• Availability	• Development of suitable disposal methods and facilities and subsequent dissemination of findings to those actors identified via
	  • R&D
	  • Industry collaboration
	  • Widening involvement
	  • Best Practice	

Parameters	Tools / Mechanisms	Examples

• Awareness	• Consumer advice & Product Information:
	  • Information provision regarding dangers/impacts of incorrect disposal
	  • Information provision regarding correct disposal method, location of disposal facilities etc
		Scope for negatively affected parties to be much more involved in prevention via raising consumer awareness e.g. water companies could inform their customers which household chemicals cannot be safely disposed of down the drain

Table D1.4 Business as Providers/Producers

Parameters	Tools / Mechanisms	Examples
Which product/service is produced?		

• Compliance	• Regulation
	  • Prohibitions/Restrictions
	  • IPP (Integrated Product Policy)
	  • Producer responsibility
	  • Product standards
	• Monitoring and Enforcement
	• Facilitation of future compliance via
	  • Indicators of future legislation
	  • Clear signals re direction of environmental policy
	  • Voluntary agreements
	• Advice
	• Awareness raising and information regarding regulations, partic. for SMEs
		DK list of 'undesirable' chemicals
		
		EC Energy label voluntary agreement

• Liability	• Widening involvement
	• Regulation
	  • Degree of liability, level of fines
	• Monitoring and Enforcement
	  • Availability of legal aid/resources to bring actions
		Investors/Banks act as a driver on companies due to liability legislation.

• Corporate culture/ethics • Company reputation	• Corporate policies • Environmental/Sustainability/Ethical corporate policy and subsequent incorporation tools e.g. training, reporting • Tools to encourage corporate citizenship/responsibility e.g. award schemes, media exposure, watchdogs, public debate	Future improvements to EMAS, ISO 14001 to ensure that policy is implemented company-wide and not just paper exercise ACCA/CERES Environmental Reporting awards

• Design process	• Product Design
	  • EMS applied to design
	  • DfE (Design for Environment)
		e.g. Philips

Parameters	Tools / Mechanisms	Examples
	• LCA (Life Cycle Assessment) • H&S assessment • Environmental awareness raising/training of employees involved in design procedure e.g. re product vs service implications • Linking of environmental aspects and innovation - tools/training to encourage 'out of box'/creative thinking	E-Co Challenge, UK: exploring novel approaches to product development via university/company collaboration
• Technology	• R&D and associated Economic incentives • government, investor, NGO support/commissioned R&D into development of clean technology/products and their acceptability	

• Cost
• investment costs vs expected profits, payback time
	• Economic Incentives
	  • Rebates for clean/sustainable products
	  • Favourable start-up schemes for new 'sustainable' businesses esp. SMEs
	  • Preferential lending criteria, interest rates for 'sustainable' products/services
	  • Ethical/environmental investment funds
	  • Sustainability Index Ratings
		e.g. Tridos Bank
		
		e.g. Friends Provident
		e.g. Dow Jones/SAM

• Market opportunity
• Market demand
• Competitors activity
	• Education
	  • Public environmental awareness campaigns/education
	• Marketing
	  • 'Green' marketing
	  • Market analysis and research
	• Regulation
	  • Restrictions on monopolies of producers and retailers
		Education: Societal attitudes are an important determinant of market opportunity for cleaner products and services.
		Market analysis: combine environmental awareness with innovative business tools e.g. Porter's model. Need 'out of box' thinking re diversification, new markets, new applications.

• NGO/Citizen/Employee pressure • Civil Society	• Widening involvement • Consumer advice • Product information • Product Registers e.g. re chemicals	

Parameters	Tools / Mechanisms	Examples
	• Education • Public environmental awareness campaigns/education	
• Existing Infrastructure	• Industry collaboration • Supply chain networks/co-operation	e.g. domestic appliance and detergent manufacturers; automobile companies and service stations regarding fuel provision for LPG vehicles.
How is the product/service produced?		

• Compliance	• Regulation
	  • IPC (Integrated Pollution Control)
	  • IPP (Integrated Product Policy)
	• Monitoring and Enforcement
	• Corporate Policies
	  • Environmental Management Systems
	• Advice
	  • Awareness raising and information regarding regulations, partic. for SMEs
	• Facilitation of future compliance via
	  • Indicators of future legislation
	  • Clear signals re direction of environmental policy
	  • Voluntary agreements
		Role of regulators/municipalities as facilitators offering guidance and assistance (particularly for SMEs) rather than simply enforcement.

• Liability	• Widening involvement
	• Regulation
	  • Degree of liability, level of fines
	• Monitoring and Enforcement
	  • Availability of legal aid/resources to bring actions
		Investors/Banks act as a driver on companies due to liability legislation.

• Corporate culture/ethics • Company reputation	• Corporate policies • Environmental/Sustainability/Ethical corporate policy and subsequent incorporation tools e.g. training, reporting	

Parameters	Tools / Mechanisms	Examples
	• Tools to encourage corporate citizenship/responsibility e.g. award schemes, reporting, watchdogs, media exposure, NGO campaigns, public debate	

• Existing production procedures (design and application)	• Production design and Product design (has implications for production process e.g. materials used)
	  • EMS applied to design
	  • DfE (Design for Environment)
	  • LCA (Life Cycle Assessment)
	  • H&S assessment
	• Corporate Policy:
	  • Environmental awareness raising/training of employees involved in design and implementation of production process	

• Technology	• R&D and associated Economic incentives • Government, investor, NGO support/commissioned R&D into development of clean technologies	

• Cost	• Economic Incentives
	  • Rebates for clean production
	  • Preferential lending criteria, interest rates for 'sustainable' production
	  • Ethical/environmental investment funds
	  • Sustainability Index Ratings	

• NGO/Citizen pressure
• Civil Society
	• Consumer advice
	• Regulation
	  • Freedom of Information:
	  • Pollution Registers
	• Education
	  • Public environmental awareness campaigns/education
	• Widening involvement
	  • Report procedures for citizens, NGOs
	• Regulation
	  • Legal rights i.e. granting of 'standing' for citizens and NGOs to enable them to bring court actions
		e.g. DK Chemical Awareness Campaign
		
		e.g. DK telephone hotline
		
		e.g. DK, standing granted to Danish Society for Nature Conservation, Greenpeace.

Parameters	Tools / Mechanisms	Examples

• Employee pressure	• Widening Involvement
	  • Team decisions/employee input/involvement in decision making
	• Corporate Policy
	  • Environmental awareness training for employees	

• Customer/supply chain pressure	• Product information
	• Corporate policies
	  • Green procurement policies
	• Education
	  • Public environmental awareness campaigns/education
	• Eco-labels
	  • Based on LCA
	  • Labelling covering production processes
	  • Bans on use of specific substances e.g. brominated flame retardants
		e.g. Volvo Environmental Statement on S80 car

• Existing Infrastructure	• Economic Incentives
	  • Rebates for clean production
	  • Preferential lending criteria, interest rates for 'sustainable' production
	  • Set environmental criteria for grants available for updating machinery	

Table D1.5 Business Consumers

Parameters	Tools / Mechanisms	Examples
Is product required/needed?		

• Design of end product and production process	• Product and process design
	  • DfE (Design for Environment)
	  • LCA (Life Cycle Assessment)
	  • EMS applied to design process	

• Technology	• R&D and associated Economic incentive/support schemes	

• Cost	• Economic Incentives
	  • Green taxation
	• Regulation
	  • Government watchdog re price fixing	

• Availability of alternatives to meet objectives e.g. service.	• R&D • Economic incentive/support schemes for cleaner products/services • Industry Collaboration	
Which product is purchased?		
• Availability of alternatives (choice of products)	• R&D and associated Economic incentive/support schemes for cleaner products • Industry Collaboration	

• Availability and consistency of supply	• Advice
	  • Business advice for supplier companies and for purchasing company regarding supply chain management
	• Regulation
	  • Prohibition/restrictions	

• Price	• Regulation • Government watchdog re price fixing • Economic Incentives	

Parameters	Tools / Mechanisms	Examples
	• Green taxation	

• Quality: level and consistency	• Advice
	  • Business advice for supplier companies
	• Corporate Policy
	  • Quality management systems (ISO 9000)
	• Product design
	• Minimum product standards
	• Eco-labels
	  • Minimum quality standards for eco-labelled products
		General business advice to SMEs developing cleaner products/technology

• Risk: environmental and H&S attributes	• Product information
	  • Labelling
	  • Kitemarks e.g. British Standards Institute (BSI)
	  • Safety data sheets
	• Corporate Policy
	  • Green procurement policy
	• R&D
	Risk Assessments
		E.g. The European Green Purchasing Network.

How to use product?		

• Compliance	• Advice
	  • Regulatory awareness schemes
	• Corporate Policy
	  • Environmental Management Systems
	• Economic Incentives
	  • Tax breaks for SME investments enabling compliance
	• Monitoring and Enforcement
	  • Reporting requirements
		e.g. Provision of advice/support to SMEs from regulators.

• Liability	• Regulation • Degree of liability, level of fines	

Parameters	Tools / Mechanisms	Examples
	• Monitoring and Enforcement • Availability of legal aid/resources to bring actions	
• Knowledge (existence of)	• R&D • Monitoring	

• Information provision	• Product information
	  • labelling
	  • safety data sheets	

• Technology	• Industry collaboration • Supply chain co-operation	Collaborative efforts and increased communication between machinery producers, input producers and end-product manufacturers.

• Habit/established behaviour	• Product information
	  • Provision & promotion by suppliers
	• Corporate Policy
	  • Management systems - use and frequent update/ reappraisal
	  • Employee training/awareness	

• Cost	• Economic Incentives Green taxation	
How to dispose of product (or contaminated product packaging)?		

• Convenience	• Best practice - identification and dissemination
	• Minimum standards/requirements for infrastructure provision
	• Widening involvement
	  • Employee consultation to identify convenience factors
	• Corporate policies
	  • Supplier/Retailer Policies re take-back
		Provision of suitable disposal facilities which are nearby, frequent collection, easily implemented requiring few resources such as time, effort etc.

• Cost	• Regulation	Incentive schemes - e.g. money

Parameters	Tools / Mechanisms	Examples

	• Producer responsibility legislation
	• Economic Incentives
	  • Green taxation
	  • Tradeable permits
	  • Incentive schemes e.g. $ back
	• Industry collaboration
	• Corporate policies
	  • Supplier/Retailer Policies re take-back
		back/off, x free product for y used products returned, pre-paid return envelopes etc.

• Compliance	• Regulation
	  • Producer responsibility and waste disposal legislation.
	• Monitoring and Enforcement
	  • Regulatory awareness schemes
	• Economic Incentives
	  • Tax breaks for SME investments enabling compliance
		Advice/Support from regulators.
		
		Finland: support for pollution control in SMEs

• Availability	• Development and provision of suitable disposal/treatment methods and facilities via
	  • R&D
	  • Industry collaboration
	  • Best Practice	

• Awareness	• Advice
	  • Information provision to companies on correct disposal method and facilities.
	• Corporate policy
	  • Education of employees regarding dangers of incorrect disposal	

Table D1.6 Municipalities as Regulators

Parameters	Tools / Mechanisms	Examples
Should chemical(s) be regulated/monitored?		
• Compliance / Liability	• Regulation • Regulations setting out role and responsibilities of municipalities, together with provisions for resources, enforcement and liability in cases of negligence	

• Pressure from Local Community, NGOs, Citizens	• Widening involvement
	  • Participatory/discursive forums
	• Regulation
	  • Legal rights i.e. granting 'standing' to citizens, NGOs to bring court action
	  • Freedom of Information
	  • Pollution Registers	

• Potential ecological and health damage	• R&D
	  • Scientific knowledge/research into chemical, health and environmental effects
	• Regulation/Policy
	  • Precautionary Principle
		Risk Assessments of chemicals (especially persistent, bioaccumulative, high volume) by industry and/or government

• Company co-operation, track record and behaviour	• Corporate Policy
	  • Effective EMS with compliance as a minimum plus more ambitious targets
	  • In-house monitoring
	  • Verified environmental reporting
	• Monitoring and enforcement
	  • records of company environmental performance
		EC EMAS scheme

How should chemical(s) be regulated/monitored?		
• Availability and effectiveness of alternatives to traditional regulation procedure	• Tools to encourage company co-operation/action - see previous • R&D • R&D into alternative methods • Advice	Research into conditions for success of voluntary

Parameters	Tools / Mechanisms	Examples
	• Work on prevention not cure via raising awareness of regulations amongst SMEs, offering advice/ guidance/ information / workshops	agreements

	• Regulation
	  • Mandatory reporting on certain aspects e.g. for pollution register
	  • Report procedures for citizens and NGOs
	  • Legal standing of citizens and NGOs
		Environment Agency in GB moving towards facilitation approach

• Effectiveness and efficiency of existing tools	• Regulation
	  • Discharge, emission, abstraction consents
	  • Fines (level determines deterrent effect but due consideration needed for SMEs)
	• Monitoring and Enforcement	

• Resources	• Regulation • Recycling/hypothecation of funds from successful court cases.	GB regulation enables funds from certain fines to be allocated to the Environment Agency for enforcement activities
• Technology	• R&D into 'intelligent' monitoring equipment e.g. automatic/non-staffed, tamper proof, cost-effective	