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**Working Party on National Environmental Policy**

**TOWARDS SUSTAINABLE CONSUMPTION:  
AN ECONOMIC CONCEPTUAL FRAMEWORK**

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## **FOREWORD**

This report was prepared as part of the OECD project on Sustainable Consumption. It drafted by Dan Biller under the supervision of the Working Party on Economic and Environmental Policy Integration. It benefited from extensive comments provided by Jean-Philippe Barde, Elaine Geyer-Allely, Adriana Zacarias Farah (OECD Secretariat), Zmarak Shalizi, Gunnar S. Eskeland, Kenneth M. Chomitz (The World Bank), and Karoline Rogge (consultant). It also benefited from editorial comments by Melissa Izquierdo. The paper is published under the responsibility of the Secretary-General of the OECD.

### **The OECD Programme on Sustainable Consumption**

The OECD 1999-2001 Work Programme on Sustainable Consumption provided new data and analysis to help OECD member countries reduce the environmental impacts from household consumption patterns. The Programme combined empirical studies of consumption trends in OECD Member countries with conceptual and policy analysis. Programme elements included: development of an economic conceptual framework to set out boundaries of analysis and policy to influence household decisions; sector case studies documenting trends, environmental impacts, and policy options in five key areas of household decision-making; policy case studies to deepen analysis of policy instruments that influence household consumption of final goods and services; and refinement of a body of indicators to assess progress towards more sustainable consumption patterns. The results of these 8 elements of work are published separately and drawn together in a Synthesis Report (see below). For more information contact the OECD Environment Directorate: [www.oecd.org/env/consumption](http://www.oecd.org/env/consumption).

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

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## EXECUTIVE SUMMARY

Economic forces seem to be behind what is perceived as unsustainable consumption patterns. For example, issues such as ozone depletion, global warming, biodiversity loss and habitat destruction, among the many that make the environmental agenda, are directly linked to the way that society uses earth's assets. Choosing fossil fuel as opposed to alternative sources of energy, more rather than less energy are clearly economic based decisions. Land changes are also driven by economic forces, as planting cash crops are viewed as more profitable than conserving habitats. At least in part, this is closely linked to the final consumption of goods and services. If the desire of acquiring goods and services that at current practises generate waste and promote unsustainable use of the earth's resources was not present in society, sustainability would not be an issue.

This implies that to change unsustainable behaviour requires developing an economic environment where this behaviour is no longer attractive. It is thus important to understand the factors behind individuals' and societies' decisions on consumption in the first place. These decisions are formed by factors that range from personal preferences and tastes, to ways individuals and countries balance their accounts. It involves both marketed and non-marketed goods and services. It is influenced and influences information and technological development. Above all, it is dynamic, which means it is subject to change with time, for the better – more sustainable – or for the worse. This dynamic aspect is in fact fundamental to policy, since it provides the basis for policy measures to work over time.

OECD has been exploring the issue of sustainable consumption and unsustainable behaviour. The first phase (1995-1998) of the OECD's work on Sustainable Consumption explored consumption patterns and policy responses in the areas of paper and water consumption, individual transport, and government consumption. It also examined the concepts frequently employed in the international debate on consumption, and began to explore different policy instruments for promoting more sustainable patterns. This body of work took a sectoral approach and began to isolate key considerations for the analysis and development of policies to promote sustainable consumption. For the second phase of work (1999-2001) the decision was made to consolidate and expand these findings in one document, in order to provide a general frame of reference, or *conceptual framework*, to guide new analysis. The document is presented here.

Sustainable consumption covers not only a number of disciplines but also a number of fields within economics. While recognising that the study of consumption patterns is not exclusive to economics, the document draws primarily on economic theory for examining the factors that determine household final consumption of goods and services. The conceptual framework identifies and characterises the main driving forces influencing consumption patterns, and briefly suggests directions for the development of policy instruments that address the causes of unsustainable consumption. OECD has a substantial body of work discussing policy instruments to address market failures including those linked to consumption. The document also provides a basis for the specific components of the Sustainable Consumption Project, its sector case studies, and its overview of policy instruments. The conceptual framework places OECD's Sustainable Consumption Project into context under a coherent economic and analytical framework.

The paper is divided in four parts. It covers key factors influencing consumer decision making, the general market failures associated with consumption, and the main actors influencing it. These actors are potential regulators and take advantage of available policy instruments to achieve sustainable consumption. The last part of the paper contains the concluding remarks indicating how the sustainable consumption project fits in the framework presented and where gaps remain. The conclusion also contains suggestions where future work may be undertaken.

## 1. INTRODUCTION

Economic forces seem to be behind what is perceived as unsustainable consumption patterns. For example, issues such as ozone depletion, global warming, biodiversity loss and habitat destruction, among the many that make the environmental agenda, are directly linked to the way that society uses earth's assets. Choosing fossil fuel as opposed to alternative sources of energy, more rather than less energy are clearly economic based decisions. Land changes are also driven by economic forces, as planting cash crops are viewed as more profitable than conserving habitats. At least in part, this is closely linked to the final consumption of goods and services. If the desire of acquiring goods and services that at current practises generate waste and promote unsustainable use of the earth's resources was not present in society, sustainability would not be an issue. As pointed out by Heal (1998):

*“We will not significantly change the potentially unsustainable aspects of human activity unless we can develop an economic environment within which they are no longer attractive. In other words, we need to change the rules of the economic game so that it becomes economically rational to pursue sustainable alternatives.”*

Changing “the rules of the economic game” implies creating the right environment and stimulus in the quest for sustainability. Yet, prior to engaging in changes, it is important to understand the factors behind individuals' and societies' decisions on consumption in the first place. These decisions are formed by factors that range from personal preferences and tastes, to ways individuals and countries balance their accounts. It involves both marketed and non-marketed goods and services. It is influenced and influences information and technological development. Above all, it is dynamic, which means it is subject to change with time, for the better – more sustainable – or for the worse. This dynamic aspect is in fact fundamental to policy, since it provides the basis for policy measures to work over time.

It should also be noted that the study of consumption patterns is not exclusive to economics, nor consumption itself is restricted to the whims of markets. As pointed out by OECD (2000), other social sciences are also deeply involved in analysing consumption patterns. This extends beyond academic exercises to for example marketing tools of assessing what people want and how much they are willing to pay. Further, people are not only interested in consuming marketable goods. While the subject is not exclusive to economics, this social science may be able to offer a theoretical basis for explaining key factors leading to the final consumption of goods and services (marketed and non-marketed). Policy instruments, on the other hand, should extend beyond this theoretical basis when attempting to influence social behaviour.

In a broad topic such as sustainable consumption, it should be expected that a number of alternative paths might be taken in the detail analysis of the issues. Moreover, none of the paths by themselves can cover all aspects of sustainable consumption. The first phase (1995-1998) of the OECD's work on Sustainable Consumption explored consumption patterns and policy responses in the areas of paper and water consumption, individual transport, and government consumption. It also examined the concepts frequently employed in the international debate on consumption, and began to explore different

policy instruments for promoting more sustainable patterns.<sup>1</sup> This body of work took a sectoral path and began to isolate key considerations for the analysis and development of policies to promote sustainable consumption. For the second phase of work (1998-2000) the decision was made to consolidate and expand these findings in one document, in order to provide a general frame of reference, or *conceptual framework*, to guide new analysis.

The present document puts into context work already done, by placing it in a coherent economic and analytical framework. Yet, it is clearly focused on an economic analysis of sustainable consumption. As a conceptual framework, the document attempts to display at least some of the different paths that may be chosen when analysing sustainable consumption. It also illustrates the fact that sustainable consumption covers not only a number of disciplines but also a number of fields within economics. Each field provides a certain insight on sustainable consumption and work is currently underway attempting to integrate these insights. This brief coverage of different paths also serves to highlight areas where work may be undertaken in the future; thereby assisting in this integration which is still incipient. The document does not, however, attempt to detail all the different paths and insights presented.

The document draws primarily on economic theory for examining the factors that determine household final consumption of goods and services. The conceptual framework identifies and characterises the main driving forces influencing consumption patterns, and briefly suggests directions for the development of policy instruments that address the causes of unsustainable consumption. OECD has a substantial body of work discussing policy instruments to address market failures including those linked to consumption. The document also provides a basis for the specific components of the Sustainable Consumption Project, its sector case studies, and its overview of policy instruments. The conceptual framework places OECD's Sustainable Consumption Project into context under a coherent economic and analytical framework.

The paper is divided in four parts and Figure 1 illustrates its rationale. The solid ellipse contains the key factors influencing consumer decision making. These are all inter-related but the three linked by the dotted triangle share a specific characteristic. The dotted triangle joins the well-known causes of market failures. These are prime targets for public policy and corrective policy instruments. Part two discusses these key factors, deriving first a working definition of sustainable consumption in the section on sustainability and growth. This definition is based on the broader definition of sustainable development and the findings of the recent literature. It facilitates implementing the definition provided in OECD (1997), that cites the work undertaken by the Norwegian Ministry of Environment. This definition stated that sustainable consumption involves:

*“The use of services and related products which respond to basic needs and bring a better quality of life while minimising the use of natural resources and toxic materials as well as the emissions of waste and pollutants over the life-cycle of the service or product so as not to jeopardise the needs of future generations.”*

As it is shown in the paper, the working definition of sustainable consumption is a function of how societies view current endowments of different forms of capital which ultimately are to be used and their degree of substitutability. The basis for the discussion lies in the concepts of weak and strong sustainability, which in turn may have significant policy consequences. With weak sustainability and subject to the constraint that overall capital stock increases or remains constant, sustainable consumption can be achieved by equating the marginal rates of return on different forms of capital so as to maximise

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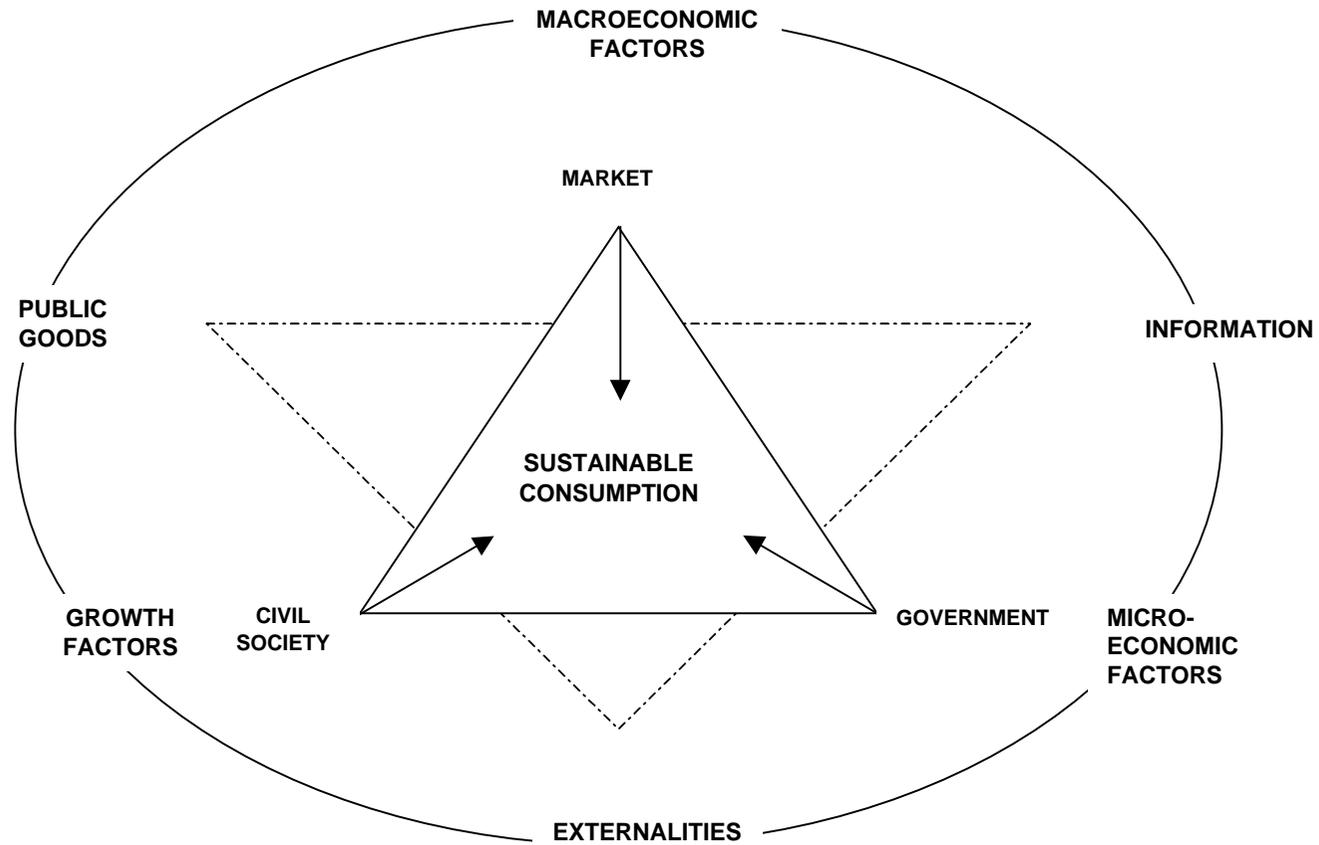
1. For a review of the results of the 1995-1997 Programme of Work see *Sustainable Consumption and Production* (OECD, 1997), and *Towards Sustainable Consumption Patterns: A Progress Report on Member Country Initiatives* (OECD, 1998).

consumption. With strong sustainability, consumption has to be diverted to build or maintain capital, especially natural capital, to its original level.

The solid triangle in the centre of the ellipse links the main actors influencing consumption. They are potential regulators and take advantage of available policy instruments to achieve sustainable consumption. Part three briefly discusses these actors and their policy options.

Finally, part four contains the concluding remarks indicating where the project fits in the framework presented and where gaps remain. The conclusion also contains suggestions where future work may be undertaken.

Figure 1. Conceptual Framework of Sustainable Consumption in a Snapshot



## 2. THE FUNDAMENTALS OF CONSUMPTION

The study of consumption and its change over time has been one of the pillars of socio-economic fields, especially economics. As one of the key variables determining individual welfare and quality of life, consumption has dominated much of the microeconomic debate dating back to John Stuart Mills and the classical economists of the 18<sup>th</sup> and 19<sup>th</sup> centuries. As one of the fundamental components of the gross national product (GNP) and gross domestic product (GDP), the main variables for measuring economic growth, consumer expenditure and the nature of the consumption function have directed much of the macroeconomic debate of the 20<sup>th</sup> century at least related to the demand side.<sup>2</sup> Throughout this time, substantial progress has been made in understanding both the micro and macro economic determinants of consumption, resulting on more accurate policy instruments and thus better policy making. Yet, as the knowledge increased, it has become apparent that the information set related to the sustainability aspect of consumption is far from complete. While the quest for sustainable consumption has been in the core of the economic debate, environmental considerations among others have recently added significant challenges on both its theoretical and policy making sides. These factors include knowledge of public goods, externalities and on the role of information as well as the dynamics embedded in economic growth.

Economics is not the only social science that discusses consumption. As raised by OECD (2000), in sociology consumption encompasses a variety of activities including selection, purchase, use, maintenance, repair and disposal of any product service. Further, differentiating between consumption expenditure and consumption is also important, for the use of durables and non-durable goods may have significantly different environmental impacts. Yet, as highlighted by Pearce (1986), a broad definition of consumption refers to the “*act of using goods and services to satisfy current wants.*” This definition not only encompasses most others, but also indicates the importance of consumption in welfare. In effect, welfare economics views consumption not only through marketed goods, but also through non-marketed ones. This is closely linked to traditional market failures such as public goods and externalities.

### 2.1 Sustainability and Growth

As implied by Pearce’s definition, consumption by itself is a static concept. When discussing changes in consumption patterns over time, especially for the long run, policy makers must pay attention to how sustainable these changes may be. Otherwise, they may risk addressing issues that would have been affected by factors beyond their control. Moreover, policy measures undertaken elsewhere in the economy may render their efforts fruitless.

Both in theory and in practice, finding out the meaning of sustainability is not simple. Pezzey (1989) identifies more than forty-five definitions of sustainability in the literature. A commonly used definition focusing on sustainable development is the one provided by the Brundtland Commission:

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2. Consumption includes the purchases of non-durable goods and services and only the “use” of durables measured by depreciation and interest cost. Consumer expenditures include the purchase of durable goods, non-durable goods and services. For a brief discussion of consumption expenditures in national accounts, see OECD (2000).

*“development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs.”*

While easy to understand and powerfully simple, the Commission’s definition is difficult to implement. The needs of both present and future generations are uncertain, and while the former can at least express its needs, the latter has to rely on decisions made for them today. In attempting to narrow the Commission’s definition, Pearce and Atkinson (1998) equates “development” with “increased utility.” This brings the Brundtland definition closer to consumption via the relationship between utility and preferences. This is specially the case in early neo-classical growth models where utility depends only on consumption. It should be noted, however, that in these models no environmental or natural resource constraints are in place. According to Pearce and Atkinson, sustainable development can thus be equated with “*a development path that ensures non-declining per capita utility over some time horizon.*”<sup>3</sup> It should be further noted that ultimately sustainable development should be viewed as an enabling concept – as a process – rather than just a path of change.

## **2.2 Economic versus Environmental Sustainable Consumption**

In the past, economics and economic policy displayed little concern about environmental assets. For example, early economic models tended to view pure air as a non-scarce resource and arable land as non-depletable. Real economic growth, especially fuelled by consumption and as measured by increase in output, did not necessarily jeopardise the consumption prospects of future generations. Intra-generation equity issues remained, but inter-generation “taxation” was largely absent in these models. A metaphoric extreme example would be a country highly dependent on an exhaustible resource – for instance oil – with a low reserve to production ratio. It could pump as much oil out of the ground as technically possible, transform it in consumption, and expect that no ill impact of this action on future generation’s well-being would ensue.

Over time, it became increasingly recognised that resource and pollution-intensive growth may be getting closer to its limits, as natural resource depletion and environmental pollution take their toll. Global focus is turning more to the growing pressures caused by environmentally intensive consumption, as depicted in Box 1.

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3. It should be noted that this definition also includes another common form of defining intergenerational justice. Rawls (1972) defines a just society as one capable of promoting to the greatest extent the wellbeing of the least well off group.

**Box 1. Some Pressures on the Environment linked to Consumption**

- Across OECD countries between 1980 and 1995 CO<sub>2</sub> emissions from fossil fuel consumption and cement manufacturing increased by 7.3%, an average annual growth rate of .5%. World CO<sub>2</sub> emissions were 23% over this same period, with an accelerating average annual growth rate. Road traffic volumes increased by 86%.
- Over the last 25 years, freshwater withdrawals have risen in the OECD region from approximately 830 billion m<sup>3</sup>/year, to a current level of just under 1000 billion m<sup>3</sup>/year. Water withdrawals in each of the major sectors (agriculture, industry, commercial and residential) are expected to continue to increase. While the majority of OECD countries are not facing constant supply crises, even those countries with historically abundant water resources are increasingly facing at least seasonal or local water supply problems (droughts, shrinking groundwater reserves, lowering of groundwater tables; pollution levels) (OECD, 1998a).
- The consumption of fish rose by 30% in OECD countries (although fish production fell by 9%). 11 of the world's 15 major fishing areas, and 69% of the world's major fish species are in decline.
- In OECD countries, 23% of mammal species, 16% of birds, 6% of fish and 14% of reptiles are classified as 'threatened' as a result of land use, habitat alteration, pollution and biological pressures. (OECD, 1997c). More than one out of every ten plant species worldwide is at risk of extinction. (IUCN, 1997).
- Municipal waste was up 39% between 1980 and 1996 (incomes grew by 47% over the same period) (OECD 1997c).
- WWF's Living Planet Index (LPI) indicates a loss of nearly 30% of the world's natural wealth over the last 30 years. WWF also indicates that consumption pressure is growing rapidly (51% per year) and "is likely to exceeds sustainable levels, at least for fish consumption, meat consumption and CO<sub>2</sub> emissions if indeed they have not been exceeded already".<sup>1</sup>
- Between 1970 and 1995 world product increased by 133%. Over this period consumption as a proportion of GDP increased from 73% to 77%. The saving ratio is decreasing in some OECD countries, while household debt, especially from consumer credit is on the rise.

1. LPI uses data on resource consumption and pollution from 152 countries to indicate the relative pressure on the global environment. LPI is based on six measures: consumption of cereals, fish and wood; fresh water abstractions; CO<sub>2</sub> emissions; and cement consumption as a proxy to land take. Apparent consumption (domestic production + import-exports) is calculated on aggregate and per capita basis. (WWF, 1998)

Economic models were quick to adapt, as it became apparent that man-made capital and labour availability were not the only constraints to growth. The importance of other forms of capital has been taking centre stage. Moreover, while the quantitative aspects of consumption – its growth – has always been targeted through for example macro-economic policies, the qualitative aspects – how environmentally efficient this growth is - have often remained at large. Both clearly have a stake in the sustainable consumption debate; yet, curtailing overall consumption growth for the sake of future generations and environmental concerns is not easily justified on the political side. Recent events (September/October 2000) related to fuel price increases are anecdotal examples of how politically sensitive high fuel prices can be, regardless of their environmental benefits. In terms of policy, it may thus be more acceptable to focus on making consumption “cleaner”.

In effect, increase in income and final consumption does not necessarily translate into increase in environmental degradation and natural resource depletion. The relationship between income and environmental degradation, known as the “environmental Kuznetz curve”<sup>4</sup> is likely to depend on the type of pollution. For example, as illustrated in The World Bank (1992) for a cross-section of countries, sulphur dioxide concentration (micrograms per cubic meter of air) for 1986 peaked between 45 and 55 corresponding to incomes per capita between US \$ 1,000 and US \$ 10,000 in an inverted U shaped curve. Between US \$ 100 and US \$ 1,000 the lowest concentration was around 30 micrograms per cubic meter of air. Beyond US \$ 10,000, the lowest concentration was approximately 10 micrograms per cubic meter of air. Comparing data of 1976 to 1986, concentration of sulphur dioxide decreased across income levels. Alternatively, if one looks at municipal wastes per capita or carbon dioxide emissions from fossil fuels per capita, the picture is radically different; implying that as per capita income grows so does pollution. Yet, the exact opposite may occur, if the chosen parameter is urban population without adequate sanitation<sup>5</sup>.

Consumption of different goods and services provoke a variety of environmental impacts with substantially different intensities. Qualitative changes in consumption patterns can thus assist in mitigating overall environmental degradation without necessarily curtailing economic growth. In a sense, the notions of “economically” sustainable consumption and “environmentally” sustainable consumption become two sides of the same coin, where a more efficient way of consuming does not necessarily translate in a decrease in output. Ultimately, this means that, within limits, consumption of more environmentally friendly goods can even increase due to efficiency gains. This in turn would avoid policy measures that entail adjusting consumption translating into decreased well-being.

### **2.2.1 Weak Sustainability versus Strong Sustainability**

Recognition of the different constraints affecting economic growth and consumption facilitates achieving sustainability through better knowledge. Yet, it also adds substantial challenges to policy makers

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4. It should be noted that the work of Simon Kuznetz was not necessarily directed to environmental issues, but it is conceptually applicable. The World Bank (2000) explains: “Kuznets proposed that income inequalities grow as development proceeds, falling only after rewards of growth accumulate. Similarly, some researchers have claimed to identify an environmental Kuznets curve, in which pollution from industry, motor vehicles, and households increases until development generates enough wealth to promote significant pollution control.” The Environmental Kuznets curve is also subject to a number of criticisms, such as it may mask local/regional issues of importance and it does not take into account different pressures of political nature (e.g. lobbying).
  5. The discussion does not imply that there is an inevitable relationship between per capita income and specific types of pollution. Environmental policy can significantly influence the level of environmental degradation in countries of similar per capita income. Moreover, technological progress may shift the curves across years, allowing us to be more efficient for all levels of per capita income.

in the design of optimal instruments. For a long time, it has been clear to development practitioners, academics and policy makers that improving the well-being of individuals and societies depended on the quality and quantity of available capital. Yet, only recently it has been realised that what was perceived as capital in the past is only a subset of a more accurate definition of capital.<sup>6</sup> With at least four different forms of capital now accepted, the question of substitutability among them becomes even more relevant, especially since at current levels of technology and knowledge, this may still be limited.

Two major views form the basis of the substitutability debate and may have profound impact directing policies. Weak sustainability refers to the assumption that one form of capital can be used up if its proceeds are reinvested in the other forms. As indicated by Pearce and Atkinson (1998), this definition does not imply that substitution is cheap or easy. Further, it should be noted that weak sustainability does not allow for using up the proceeds on final consumption, securing that the example of the oil dependent country provided previously does not hold. Yet, it does admit that substitutability among the forms of capital is feasible in one way or another.

Alternatively, strong sustainability states that some forms of capital do not have substitutes, regardless of the technological level. This is particularly the case for natural capital. As a consequence, the preservation of natural capital has to be imposed if the goal is to attain a sustainable system. This implies a command and control type policy instrument.<sup>7</sup> Translating this into the consumption discussion:

- a. With weak sustainability, marginal rates of return on different forms of capital would be equated to maximise consumption. The constraint of the overall capital stock being constant or rising remains.
- b. With strong sustainability, one would need to divert consumption to build or maintain natural capital to its original level.

### 2.2.2 *Time Dimension*

Whether weak or strong sustainability is favoured, there is an overall concern for the long-run impacts of the natural capital constraint on patterns of consumption and the well-being of future generations. As pointed out by Heal (1998):

*“Sustainability is above all about what happens in the long term: about whether we continue “forever” as we are, and whether the economic rules of the game lead us to make choices that are viable in the long term. Here the ‘long term’ denotes a period much longer than that normally considered in economic analyses, typically at least half a century and sometimes as long as several centuries. These time periods pose a particular challenge for the economists’ traditional practice of discounting...”*

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6. Capital (K) equals man-made capital ( $K_M$ ) plus human capital ( $K_H$ ) plus natural capital ( $K_N$ ) plus social capital ( $K_S$ ).  $K_M$  includes machinery and other produced goods.  $K_H$  refers to skills and knowledge embodied by humans.  $K_N$  is the traditional natural capital, including natural resources and the environment’s assimilation capacity.  $K_S$  constitutes social capital defined as the interaction between individuals, between institutions, and among them.
  7. Policy instruments are briefly discussed in the next part. In theory, a policy maker could design an economic instrument so stringent that the total preservation of the natural capital would follow (e.g. an infinite tax). In reality, preservation rather than conservation is usually attempted through command and control. Naturally, the distinction becomes irrelevant if enforcement capacity is lacking.

This emphasis in the very long run, which often dominates natural processes, renders a problem with traditional economic analysis based on discounted utility. As further indicated by Heal (1998):

*“A positive utility discount rate forces a fundamental asymmetry between the treatment of, and the implicit evaluation of, present and future generations, particularly those very far into the future.”*

Some of the key questions facing policy makers today regarding environmental issues - e.g. climate change, biodiversity extinction, nuclear waste disposal - will have consequences felt mostly in the distant future; therefore, they often fail traditional project analysis. Heal (1998) provides a simple illustrative example of the problem:

*“if one discounts present world GNP over two hundred years at 5% per annum, it is worth only a few hundred thousand dollars, the price of a good apartment. Discounted at 10%, it is equivalent to a used car.”(all at New York prices)*

Even utilitarian growth models that attempt to capture altruism and bequests fail to fully address the nature of environmental problems. Overlapping generation models (OLG) usually analyse previous, current and next generations over a time span of thirty years per generation (overlapping), which is clearly inadequate to the nexus of sustainable consumption in the context of some environmental issues.<sup>8</sup> Moreover, as raised by Pearce and Atkinson (1998), part of the problem lies in the uncertainties related to bequests:

*“The fact is that current generations cannot provide any guarantee that the next generation will in fact utilise its inheritance in such a way that it leaves the right bequest to the following generation. We can only say that past generations behaved this way, and that we need to ensure that current generations behave this way also. No-one can bind the next generation.”*

This raises yet another intergenerational policy issue that can only be avoided through an intergenerational regulator, who should provide disincentives for inconsiderate behaviour.

### 2.2.3 *Technology*

Many regulations on environmental issues require companies to use “the best available technology”. Often, bids for government contracts use the same term. This implies a certain stock of technology at a given point in time. Yet, the rate of technological change has significantly increased, especially after World War II. The best available technology today may be quite different from the one a year from now, when a particular project is ready to be implemented. Over the very long run, this difference is likely to be enormous. How will the world be in a century’s time? Technological change is a major source of uncertainty when discussing sustainable consumption, for it may ultimately change inefficient and unsustainable practices to the point of making them extinct. This in turn is crucial for policy making, because it may make some policy instruments completely obsolete. As pointed out by Pearce and Atkinson (1998), “*technological progress offers the opportunity to augment consumption opportunities for a given stock of wealth.*”

Little is known about the nature of technological change and its relationship with weak and strong sustainability (i.e. environmental assets). For example, studies such as Nordhaus (1995), considering

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8. For a brief discussion on OLG models, see Barro and Sala-i-Martin (1995).

technological change exogenous, argue that consumption has been well below sustainable income. Exogenous technological change renders accounting for changes in natural assets unnecessary. Yet, it should be pointed out that exogenous technological progress, though possible and occurring in reality, might be more of an exception rather than a rule. As pointed out by Barro and Sala-i-Martin (1995), governments, universities, research institutions and firms invest in research and development (R&D). They invest scarce resources in R&D because the fruits of R&D might be translated in improvements of society well-being and increase in companies' future profits. While this investment often depends on economic conditions, overall it definitely generates returns.

Technological progress can thus occur endogenously, and take away resources that could otherwise be used in production. Alternatively, developing new technologies carries an opportunity cost, which may dampen optimistic claims on sustainable income. While investigation on the endogenous aspects of technological change is still in its infancy, not much has been written on its relationship with natural capital use. Theoretical research available seem to indicate that endogenous technological change may overcome resource scarcity, but this is highly dependent on constraints imposed by resource availability on the generation of innovation.<sup>9</sup>

#### **2.2.4 Policy Relevance**

The debate between exogenous and endogenous technological progress in the context of sustainable consumption is still in its infancy. Yet, the policy issues related to this debate may be significant. Since sustainable consumption implies a very long time horizon as previously discussed, changes in technology which are likely to be many in the future will add significant uncertainties in the workings of policy instruments. If these changes are primarily exogenous, there seems to be little scope for public policy. In effect, recent research seems to indicate that we are consuming less than we actually can, making policy instruments unnecessary. Yet, if technological progress is primarily endogenous, public policy will likely play a major role in steering sustainable consumption. It will do so directly through the investment in R&D and indirectly through the implementation of policy instruments that foster sustainable consumption and discourage behaviour that over depreciates the different forms of capital.

### **2.3 The Macroeconomic Approach**

The section above contains a brief discussion on consumption change over time, and some of the key factors affecting sustainability. It differentiates between the quantitative and qualitative aspects of consumption but does not detail them. Quantitative aspects of consumption have been central to the macroeconomic debate. They focus primarily on the aggregate amount of consumption rather than the type of consumed goods and services. Aggregate consumption often dominates short-run macroeconomic policy due to its impact on inflation and other variables. Yet, in our case, aggregate consumption is equally important since it affects the different forms of capital previously discussed. Aggregate consumption is thus a key variable for long-run policy due to its relationship with sustainability.

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9. See Barbier (1999).

### 2.3.1 *Aggregate Consumer Expenditure*

In a simple form, real (discounted for inflation) consumer expenditure should be a function of real income subtracted by real taxes, themselves a function of income.<sup>10</sup> Yet, this simple form tells very little about the nature of consumption and how consumers use their income over time. In addition, it reveals little about savings and potential wealth effects on consumption itself. Nonetheless, these are clearly important when discussing sustainable consumption, and are dominant in the macroeconomic debate. After all, consumer expenditure corresponds to over 60% of the GDP of OECD countries (OECD, 1999).

As statistical information on consumer behaviour became available in the middle of the 20<sup>th</sup> century, it became clear that at least in the short-run as income increases people tend to spend a decreasing percentage of income on consumption (or the marginal propensity to consume - MPC - decreases). Moreover, there is a lag within the business cycle; that is, people protect their consumption patterns as income falls by not cutting consumption proportionally to income. Yet, as income rises consumption does not rise proportionally.<sup>11</sup> Overall, this means that the marginal propensity to consume is less than the average propensity to consume (APC) in the short-run, but in the long run the data showed that they are equal as indicated by the work of Simon Kuznets.

### 2.3.2 *Income*

As indicated by the section on consumer expenditure, consumption is being derived out of income. This implies the need to understand in more detail what is income and how it relates to sustainable consumption. These questions are by no means new in economics, dating back at least to the first half of the 20<sup>th</sup> century.<sup>12</sup> Nordhaus (1995) offers an interesting interpretation of one of Hicks definitions of income; that is, income is “*the maximum amount that can be consumed while leaving capital intact*”. Yet as Nordhaus (1995) raises, this is almost a technique for measuring income rather than an actual definition. It is perhaps an initial attempt at translating the previous discussion of strong versus weak sustainability and its view on capital into measurable outcomes.

Hicks (1939) offers another definition of income centred primarily on consumption itself: “*the maximum amount that could be spent without reducing real consumption in the future*”. As indicated by Heal (1998), income is thus defined as sustainable consumption. Yet as Heal (1998) also indicates, for this identity to be true, the definition of income has to include all sorts of income, both tangible such as monetary and non tangible such as psychic, from environmental assets and adjusting monetary income for environmental degradation. Further, this does not allow for saving or dis-saving. Society would be consuming precisely its income without being able to adjust for inter-temporal preferences or when to consume. As indicated earlier, this static problem was tackled by growth models in the search of a “golden rule” for economic growth: “*the highest indefinitely maintainable level of consumption per capita*” (Heal, 1998). Yet, these do not take into account environmental considerations. If these are incorporated, then a “green golden rule” can at least in principle be derived.

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10. Mathematically, this would be written as  $c = c(y - t(y))$ ; that is, real consumption expenditure would be a function of real disposable personal income.

11. Much of this analysis, which also explains why rich people save proportionally more, is due to Keynes.

12. Much of the early findings were attributed to Hicks, yet as pointed out by Nordhaus (1995) and Heal (1998) other economists such as Fisher and Lindahl also contributed significantly to the discussion.

### 2.3.3 *Genuine Savings*

One attempt to deal with the relationship between sustainable consumption and income in the context of national accounts is the genuine savings approach. The genuine savings approach adjusts national income accounts to explicitly consider the different forms of capital previously discussed. This can be easily derived with minimal algebraic manipulations of national accounts. The result is that genuine savings (Sg) equals conventional savings less depreciation on capital stocks plus appreciation on capital stocks (Pearce, 2000). It should be noted that in our broader definition of capital, some forms such as human capital could appreciate.<sup>13</sup>

Pearce (2000) underscores that Sg is a measure of weak sustainability. If Sg is positive, savings more than compensate capital depreciation. If Sg is negative, society is consuming its capital stock, which is unsustainable over a period of time. Hamilton and Clemens (1999) calculate the genuine savings of most countries in the world for a period between 1970-93 taking into account resource depletion and carbon dioxide emissions. Poor countries and mineral producing countries, as expected, are the ones with the lowest genuine savings. Table 1 below summarises the values for most OECD countries and selected large oil exporters.

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13.  $Sg = GNP - C + (aK_H + bK_N + cK_S + dK_M)$ . GNP is the gross national product, C is consumption, K is capital that take different forms, and a, b, c, d are parameters indicating appreciation (+) or depreciation (-).

**Table 1. Genuine Savings as a Percentage of GNP (Available OECD Countries and Selected Petroleum Exporters)**

<i>Countries</i>	<i>Average</i>		<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>
	<i>1970s</i>	<i>1980s</i>				
Australia	11.8	7.5	6.1	6.9	7.2	5.5
Austria	18.3	13.4	18.8	20.2	19.2	16.2
Belgium	17.9	9.3	18.3	15.6	15.9	16.7
Canada	16.1	9.8	10.3	6.7	6.2	7.4
Denmark	16.0	8.4	17.4	14.9	15.5	14.2
Finland	15.4	13.9	18.5	9.4	7.0	5.5
France	19.3	12.8	18.6	16.0	15.4	13.5
Germany	--	--	--	11.1	10.8	10.0
Germany, former Federal Rep.	19.9	13.5	14.3	15.0	13.8	12.2
Greece	15.8	4.6	7.6	9.1	8.0	8.0
Iran, Islamic Rep. Of	--	-2.7	-11.3	-5.8	-3.3	--
Ireland	9.5	9.3	15.9	18.5	16.9	17.4
Italy	17.3	13.3	16.9	12.9	11.8	12.3
Japan	26.5	21.7	31.2	28.7	28.3	26.2
Luxembourg	10.1	9.7	15.8	14.6	12.8	13.9
Mexico	9.1	-3.0	0.9	2.0	1.9	3.6
Netherlands	21.0	13.8	20.8	17.8	16.9	15.6
New Zealand	16.3	9.2	9.1	7.4	9.7	13.6
Nigeria	3.3	-25.3	-46.4	-33.9	-30.2	-37.1
Norway	14.5	8.7	11.1	15.6	14.2	7.0
Portugal	15.2	12.6	23.4	19.7	20.4	18.1
Saudi Arabia	-27.6	-25.5	-27.3	-41.8	-33.0	-20.2
Spain	16.2	11.0	18.8	14.3	12.5	12.3
Sweden	18.3	12.1	16.1	10.8	7.5	5.6
Switzerland	17.1	19.1	25.7	24.0	22.0	19.9
Turkey	16.3	12.3	18.9	13.1	11.9	15.4
United Kingdom	11.0	8.4	11.4	7.0	6.7	6.6
United States	11.0	9.0	8.2	8.8	8.3	9.6
Venezuela	1.9	-17.6	-29.2	-17.6	-16.1	-14.5

-- Not available

Note: Values include current education expenditures.

Source: Hamilton and Clemens (1999).

Sg equals to zero in weak sustainability provides the maximum sustainable level of consumption. This maximum level is lower with strong sustainability because some consumption is diverted to keep natural capital at least constant.

It should be noted that the maximum does not necessarily mean the optimal level of consumption. To find the optimal level of consumption, one needs to place consumption in a welfare framework. The derivation of the maximum sustainable level of consumption comes from adjusting the national accounts framework. It simply indicates in the macroeconomic sense whether society as a whole could consume more or should consume less. If one considers as an objective non-declining per capita consumption, the maximum sustainable level of consumption could clearly be sub-optimal since population growth is not

accounted. Further, technological change is absent from the discussion, and the problem is not set up in the context of maximising discounted future flows of consumption (Pearce 2000).

Optimal consumption has been addressed by the literature through theories analysing the consumption function. These are well known in the macroeconomic debate and are based primarily on the microeconomic theory of consumer choice.<sup>14</sup> They generally assume that observed patterns of consumer behaviour are attempts by rational consumers to allocate their preferences so as to maximise their individual welfare. In addition, they assume that consumption today is a function of the present value of current and future income streams at the present.<sup>15</sup> Empirically it is still unclear which theory prevails. Moreover, linking optimal consumption with sustainable consumption seems to be incipient in the literature, particularly when the different forms of capital are involved. Two key theories analysing the consumption function and income (the Life Cycle Income Hypothesis and the Permanent Income Approach) are discussed in the Annex.

#### 2.3.4 *Wealth Effects on Consumption*

Wealth effects also influence consumption, though this relationship is still not fully understood. This is especially important now, when the US economy experiences a sustained boom with considerable wealth gains from stock markets. For example, from January 1990 to September 2000 the US stock market as measured through the Dow Jones index, the technology rich NASDAQ index, and the blue-chip S&P 500 index, grew 311%, 783% and 337%, respectively. It is reasonable to expect that at least part of these gains will be transformed in consumption, and not all of this consumption will be neutral in terms of environmental issues.

This is primarily because a persistent increase in the wealth stock is often perceived as an increase in permanent income, thereby allowing households to spend more on consumption. The actual size of this wealth effect is subject to debate. Some studies indicate that a US\$1 increase in the wealth of the median household leads to a five cents increase in its annual consumption. Other studies argue that this wealth effect on yearly consumption can be as low as one cent. Yet, even with the lowest estimates the wealth effect would translate in an increase of US\$ 96 billion in consumer spending this year when compared to 1989 for the US alone (The Economist, August 12<sup>th</sup>, 2000).

The workings of how the wealth effect influences consumption are still unclear. For example, the speed through which it happens is uncertain. While in theory this should occur instantaneously, consumption is a matter of habit and habits are slow to change. Moreover, the wealth effect could be asymmetric: falls in share prices may decrease consumption by more than rising prices increase it. Nonetheless, as indicated by Boone et. al. (1998), stock market wealth effects for the United States are statistically significant with an impact on consumption in the range of 4 to 7%. For other G-7 countries, this is likely to be lower due to smaller stock distribution, less equal distribution and financial regulations.

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14. Consumer choice is discussed in more detail in the section on the microeconomic approach.

15. Mathematically, this would be written as  $c_t = f(PV_t); \frac{df}{dPV_t} > 0$ . That is, individual's consumption in time t is an increasing function of the present value of his or her income in time t. This assumes that over a life time the present value of his or her total consumption cannot exceed the income counter-part

$$\sum_0^T \frac{y_t}{(1+r)^t} = \sum_0^T \frac{c_t}{(1+r)^t}$$

### 2.3.5 *Policy Relevance*

The analysis above is primarily based on macroeconomic aspects of consumption. It discusses income and its relation to sustainable consumption via genuine savings. It also shows that in the macroeconomic sense one could have significant influence on consumption expenditure, not only from income but also through wealth effects. Further, it differentiates between sustainable and optimal consumption. At least three policy questions emerge:

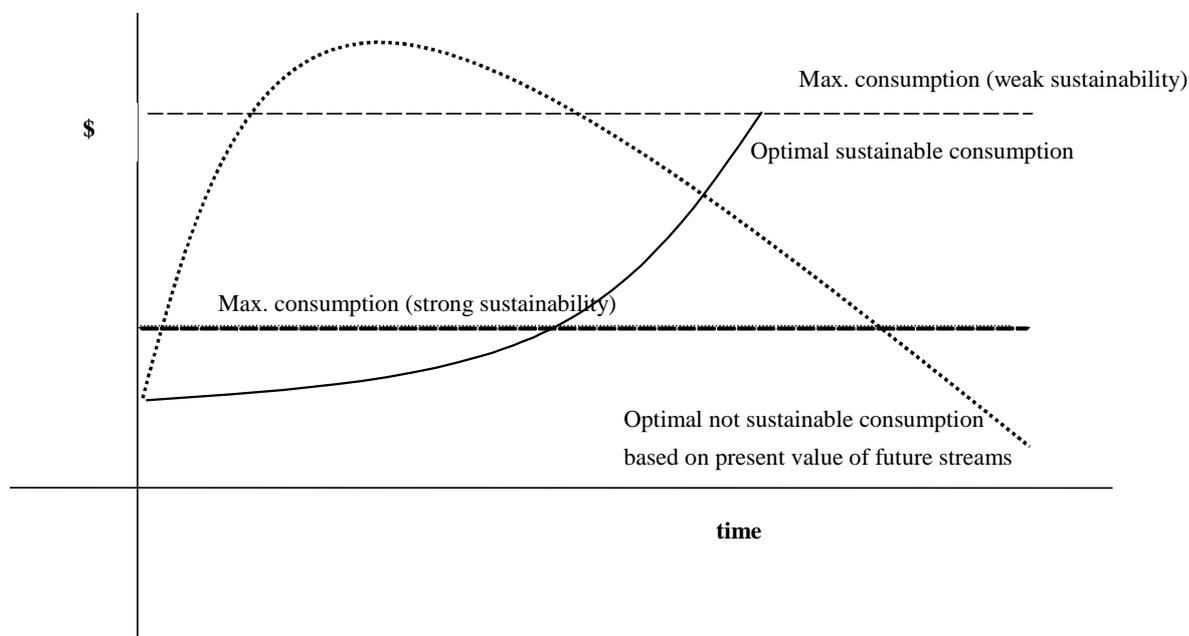
- a. Is income (and the wealth effect) so important that policy targeting sustainability, especially regarding environmental issues (e.g. natural capital degradation), would be seriously hampered or doomed to failure as long as they do not affect it?
- b. If the answer to “a” is positive, then how could sustainable consumption policies take income (and wealth) into account?
- c. Since ultimately policy making is about fostering the improvement of society’s well-being, how can it assist in equating sustainable and optimal consumption?

The provision of definite answers to these questions is beyond the scope of this paper. Neither theoretical nor empirical research has yet succeeded in this task. The information provided here places these questions in a conceptual framework and indicates why they are relevant in sustainable consumption.

In this sense, question “a” may be easiest to provide at least an approximate response. By all indications, income and the wealth effect should be significant in the discussion of sustainable consumption. Even when the size of the wealth effect can be debated, especially as it is analysed in the context of a stock market boom and per household, by all accounts it is likely to be large. One can provide an anecdotal example to this just looking at demand for luxury goods, some of them like Sport Utility Vehicles (SUVs) quite harmful to the environment. Throughout the 1990s, SUVs became very popular, selling at a significant premium, prompting all major car companies to have a variety of models. Attempting to achieve sustainable consumption ignoring income and the wealth effect is likely to be at least more difficult.

Question “b” is more difficult to answer. Even if some policy instruments explicitly or implicitly take into account income and wealth effects, calibrating them to achieve the policy goals may be quite challenging. Part III of this paper briefly discusses the policy options, yet this is clearly an area where the sustainable consumption project can provide more guidance. Question “c” is even more complicated as it necessarily combines both quantitative and qualitative aspects of consumption.

The different time paths of the “types” of consumption discussed in this section are illustrated in Figure 2 below. As explained, the maximum consumption levels with weak and strong sustainability are sustainable, not necessarily optimal and constant. The level for weak sustainability has to be greater than for strong sustainability, since part of the consumption need not be diverted to build natural capital to its original level. The traditional consumption path, resulting from maximising the present value of future consumption takes an inverted U shape due to the existence of positive discount rates for preferences. This may be optimal under certain conditions but it is clearly not sustainable. The upward sloping curve combines sustainability and optimality, and as raised by Pearce (2000), it implies that technological progress compensate for population growth and depreciation of broadly defined capital.

**Figure 2. Consumption paths**

Heal (1998) builds on the sustainability/optimality issue by providing three axioms that should be the basis of models and policies addressing a sustainable optimal level of consumption and well-being:

- *“A treatment of the present and the future that places a positive value on the very long run.*
- *Recognition of all the ways in which environmental assets contribute to economic well-being.*
- *Recognition of the constraints implied by the dynamics of environmental assets.”*

Detailed discussion of these axioms are beyond the scope of this paper, but according to Heal (1998) the first bullet is captured in an encompassing definition of sustainability.<sup>16</sup> The second and third bullets are intuitively easier to understand. The second bullet implies that we recognise all dimensions of the value of environmental assets as they contribute to our well-being (e.g. they are part of our preference statement). The third recognises that they are also part of constraints placed on the search for improved well-being.

## 2.4 The Microeconomic Approach

The macroeconomic approach targets consumption as a whole, which we call the quantitative aspects. We now turn to the qualitative aspects; that is, within this aggregate consumption, how the consumption of different goods and services, marketed or non-marketed, interact with each other. This is important for the design of policies that foster consumption of a more “benign” form. Alternatively, we look for ways of using the different forms of capital in a more environmentally efficient manner and we

16. This definition is derived from a generalised form of welfare proposed by Chichilnisky (1996), and an adapted golden rule that accounts for environmental issues (a “green golden rule”), among other theories.

have to consider that their existence also directly contribute to our well-being. In a sense, we now turn to microeconomic questions of how individual and societal preferences are formed and shaped, and how they interact.

### 2.4.1 Preference Formation<sup>17</sup>

Preferences are the basis from which individuals make choices. While this does not directly translate into consumption, it allows individuals to at least express a desire to attain specific goods and services whether marketed or non-marketed. Whereas in the past the main determinants of preferences may have been the basic biological needs for food, drink and shelter, it is clear that this does not dominate preference formation in most groups in OECD countries. Even in very poor countries where up to 75% of income may be spent on food and shelter, leisure and other components of preference also play an important role.

The average individual's choice of consumption in modern economies has in fact little to do with his or her basic biological needs, even when it addresses food and shelter. The individual choices of housing, food, leisure, and many others are more linked to past experiences, social interactions and cultural influences. As highlighted by Becker (1998), standard economic analysis of individual behaviour generally assume for the sake of simplification that an individual maximises his or her well-being with preferences that depend at any moment on consumption at that particular time. As Becker (1998) shows, this framework can be extended to incorporate the effects of experiences and social forces without losing its simplicity.

Becker does this extension by incorporating in one's well-being what he calls "personal capital" and "social capital". Personal capital includes the relevant past consumption in general and other personal experiences that affect current and future well-being. Social capital incorporates the influence of previous actions by others in one's social network. In fact, what Becker calls personal capital, Pearce and Atkinson (1998) and this paper refer as human capital. The term social capital is used in the same manner by these authors.<sup>18</sup>

Becker's approach is both flexible and powerful. Both human capital and social capital can be easily placed in a dynamic context. Future level of human capital depends on the amount invested (measured in the unit of choice) in it today plus an undepreciated portion of the capital from this period. Future social capital of an individual is equal to the effect of choices made by others in its social network plus the undepreciated portion of his or hers current social capital.<sup>19</sup>

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17. This is mainly based on Becker (1998), Varian (1984), Kreps (1990) and The Economist (December 18<sup>th</sup>, 1999).

18. Whilst the terminology is similar, Becker (1998) clearly takes a micro-economic approach. He is interested in the interactions of these variables as part of the wellbeing itself. While accounting for some non-marketed goods (e.g. social capital), his analysis unfortunately fails to recognise the importance of environmental assets.

19. Mathematically:  $K_{H_{t+1}} = x_t + (1 - d_{K_H})K_{H_t}$  and  $K_{S_{t+1}}^i = B^i + (1 - d_{K_S})K_{S_t}^i$ , where  $K_H$  and  $K_S$  are human and social capitals respectively.  $t$  represents time (period).  $x_t$  is the current investment on human capital and  $B^i (= \sum b^j)$  is the total effect of choices by the  $j$  members of  $i$ 's social network on  $i$ 's social capital.  $d_{K_H}$  and  $d_{K_S}$  are constant depreciation rates.

Investments in human capital increase its accumulation, yet changes in human capital also affect the demand for activities that feed these investments. This feedback loop or reinforcement occurs if human capital and its investments are complements in the extended notion of well-being. Reinforcement simply means that past and present consumption are complements. As Becker (1998) underscores, this framework can explain several patterns in consumer behaviour. These are analysed by other social sciences, but the analysis is often restricted to categorising the behaviour (see for example Assael 1998). Becker (1998) offers some interesting examples that illustrate the reinforcement described:

*“Complementarities and reinforcement in habitual behaviour help explain why, for example, the desire to smoke is greater when a person has been smoking heavily for a while, why eating corn flakes regularly for breakfast increases the future demand for this cereal, why telling lies and acting violently increases the tendency to lie and commit violence, why saving becomes habitual, even when people become old and have few years to spend their wealth, why growing up in a religious family greatly increases the likelihood that a person is religious as an adult, or why living with a wife for many years generates such strong dependencies that the husband may experience a mental and physical breakdown after she dies.”*

An increase in social capital can raise or lower one’s well-being. Becker (1998) provides two clear examples:

*“The peer pressure on a teenager to smoke or join a violent gang may lower his utility, whereas a family’s utility is higher when neighbours help if a burglar tries to break into its house.”<sup>20</sup>*

It should be expected, however, that most social capital should raise well-being. While most people may not directly influence social capital, in many cases they choose their social networks.

Incentives provided to one person in the social network may have few impacts on social capital. His or her investment in the social capital may also change little. For example, if one person takes early retirement, he or she may have more leisure time to go hunting. Yet, if this person enjoys hunting in a group and others do not have more leisure time, he or she may actually not increase the amount of hunting. This occurs even if his or her investments and the social capital are complements in the well-being. Yet, as people retire hunting may increase, prompting others in the social network that enjoy hunting to retire early. Behaviour dependent on social forces is likely to be “unstable” and sensitive to even small shocks to the social groups. For example, a rise in the price of cigarettes may decrease demand for them a little within a group to collapse overtime as people stop smoking. The exact opposite may be equally true.

#### 2.4.1.a Culture and Collective Behaviour

Part of collective behaviour is explained through habit and the social capital discussed above. Part can also be explained by culture and traditions where individuals have much less control than in other forms of social capital. Culture and traditions are passed through generations and depend on ethnicity, race, family history, and religion, among other factors and are largely “given” to individuals over their lifetime.

Culture and traditions are hard to change but may have significant influence over preferences and behaviour. Yet, one’s preferences and behaviour have little impact on culture and tradition. Becker (1998)

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20. As the example indicates, there are significant externalities associated with social capital. Externalities are discussed in a later section.

offers a well-known example that can be easily extrapolated to include environmental considerations. Religious Jews and Moslems do not eat pork since their scriptures passed through generations forbid the consumption of pork meat. Pig farms are a major source of waste in agriculture. Since pork meat consumption should be lower in Jewish and Moslem communities, it would be reasonable to expect that waste from pig farms should largely be absent in the Middle East.

The interaction of culture and individual habits provides an interesting feedback loop. As Becker (1998) describes:

*“... Co-operation can be sustained more easily without sanctions against uncooperative behaviour when individual behaviour is habitual. For if individuals are habitual, and if they were co-operative in the past, they might continue to be co-operative even if they could gain an advantage from uncooperative behaviour.”*

The use of the nexus between co-operation and habit may be a powerful tool in policy making for sustainable consumption. It may facilitate in the design, monitoring and enforcement of specific policy instruments, for societies with a long tradition of co-operation may find it easier to accept the need to alter some individual behaviour for the common good. This may, at least in part, explain why some instruments such as restrictions on car driving based on license plate numbers, bike-riding incentives among others, may have some success in one country and be disastrous in others.

#### 2.4.1.b *The Endogeneity of Preferences*

While many economic models consider preferences to be exogenous, the extended notion of well-being facilitates accounting for the fact that preferences are endogenous to the growth process. This means that preferences both influence economic outcomes and are in turn influenced by the economy. As explained by Becker (1998):

*“initial stocks of personal and social capital, along with technologies and government policies, do help determine economic outcomes. But the economy also changes tastes and preferences by changing personal and social capital.”*

This interaction impacts the consumption of marketed and non-marketed goods, durables and non-durables, goods and services, and influences from basic daily decisions to lifetime actions. The interaction also makes it difficult to separate preferences from opportunities in the process of sustainable consumption and economic growth.

Endogeneity of preferences is a key phenomenon for government policies affecting welfare in general, and sustainable consumption specifically. Taking preferences as given in public policy may actually lead to dire mistakes. As raised by Sunstein (1993) quoted in Becker (1998):

*“If legal rules have inevitable effects on preferences, it is hard to see how a government might even attempt to take preferences ‘as given’.”*

Once again, command and control attempts to curb air pollution from private car use may offer an interesting example. In some cities, restrictions on car use based on license plate numbers completely backfired because some households responded by purchasing more cars. Air pollution increased because the environmental gains of restricting trips through the regulation from households that responded positively were surpassed by the environmental losses caused by those households that purchased and used

older more polluting cars.<sup>21</sup> In other cities, the response to such instrument was provided through the polls by not electing officials that promoted the regulation.<sup>22</sup>

Through the endogeneity of preferences, preferences and constraints no longer have independent influences on behaviour. Key constraints such as the different forms of capital operate through the extended notion of well-being. Choices between generating a good called income or having additional spare time to enjoy a good called leisure is accounted for as an integral part of one's welfare. This explains our search for efficiency while trying to make more money (even if working less) and having more time to spend on leisure and enhancing human and social capital.

#### 2.4.1.c *The Rationality of Preferences*

When analysing consumer choices, most economists depart from the assumption that individuals behave rationally, following a number of well-defined axioms, in this search for well-being. This allows for stylised models based on the concept of utility, which is a functional form representing preferences. The result of maximising utility subject to a certain budget constraint ultimately leads to demand functions. The endogenous preference approach allows for the same type of analysis normally associated with the exogenous preference approach. Further, as with the exogenous approach, it allows for aggregation across individuals without precluding the fact that some individuals do not behave rationally. Yet, the endogenous approach is superior in its description of the real world, and it incorporates in a more realistic way the impact of policy instruments. The underlying assumptions of endogenous preference formation are still that individuals maximise well-being in a consistent way and that they are forward looking, considering the effects of their actions in future as well as present well-being. As Becker (1998) indicates, this may not always be the case:

*“... they may have imperfect memories, they may discount the future ‘excessively’, they make erroneous calculations and be influenced by how questions are framed, and their perceptions may be distorted by drugs, anaesthesia, or Ulysses’ sirens.”*

Psychologists have long accepted cognitive limits on individual “rationality”. Even economists are accepting that irrational behaviour occurs and a growing school of behaviourists is developing. This school draws on psychology to explain some observed irrational behaviour such as feeling regret (thereby forgoing benefits), holding beliefs which contradict evidence, being susceptible to outside suggestions regardless of the information available, and taking bigger gambles to maintain rather than to acquire a certain status-quo. Further, psychology indicates that people tend to “compartmentalise” when making decisions rather than look at the bigger picture as suggested by the utility approach. Related to this, individuals may be continuously over-confident when assessing likelihoods, see patterns where there are none, attribute cause and effect where this is absent, have hindsight and memory biases, and of course become emotional settling for losses where there could be gains. Much of this new school is based on controlled experiments, which may lead to unique results. Nonetheless, evidence from the real world exists too. For example, many New York taxi drivers set daily income targets, stopping work earlier in a busy day when the hourly wage rate can be higher, and working longer in a slow day. If they derive satisfaction

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21. People purchased second hand cars, which in turn were older, not well maintained and thus more polluting cars. The result was a larger, older and more polluting car fleet rather than the reduction of the total number of trips. See Eskeland and Devarajan (1996) for an economic analysis of the issue.

22. Personal communication with the politician.

from receiving income, they should do the opposite. Yet, failing to achieve the target feels like a loss, which may explain putting longer hours to avoid it.<sup>23</sup>

Part of the behaviour described above can be explained by the introduction of human and social capitals in endogenous preferences. In addition, as raised by Becker (1998):

*“Such cognitive imperfections are sometimes important, but in recent years they may have received excessive attention at the expense of more significant weakness in standard models of rational choice for explaining behaviour in real, as opposed to experimental, situations. These models typically assume that preferences do not directly depend on either past experiences or social interactions. But childhood and other experiences, and the attitudes and behaviour of others, frequently place more far-reaching constraints on choices than do mistakes and distortions in cognitive perceptions.”*

#### 2.4.1.d The Relationships among Goods and Services

Across societies, people are accustomed to equate trade-offs as they make their daily consumption decisions and future consumption plans. Yet, the manner in which these trade-offs are equated, and the importance that individuals and societies attach to different goods and services whether marketed or non-marketed may differ significantly. This is at least one of the fundamental reasons why policies targeting sustainable consumption have to take into account local, regional, national and even global peculiarities. They have to be fine-tuned according to the potential response of individuals and societies and according to the problems they are actually addressing.

Whichever way preferences are formed, understanding the potential relationship among goods, services, and income is crucial information to design policy instruments as closely as possible to their optimal. For example, increases in income are increasing the demand for long distance air travel related to leisure in OECD countries – a *normal good* in this case – but probably reducing the demand for long distance leisure bus travel – an *inferior good*. The former increases direct carbon dioxide emissions in the stratosphere meaning that, other factors remaining the same, greenhouse gas emissions related to tourism travel are expected to rise.

Moreover, differently than bus stations, airports are often located outside urban centres with fewer alternatives that provide timely service to fulfil early arrival requirements with passenger comfort. The consumption of leisure air travel may thus be positively associated with the consumption of taxi trips to the airport, making them *complements*. If the former increases, the latter tends to rise as well, specially on days prior to the commencement of the holiday season<sup>24</sup>. This in turn may increase air contamination in urban centres, if the net effect caused by a rise in taxi trips versus a fall in the urban journeys by inter-city buses translates in more pollution. On the other hand, leisure air travel may be negatively associated with the roadside commerce, making them *substitutes*. An increase in the former may mean a decrease in the latter, which may for instance represent a reduction in solid waste disposal at roadsides.

This is what is often referred to in sociological literature as the infrastructure of consumption. For example, getting from home to work requires an entire system of physical goods (roads, sidewalks, petrol

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23. The Economist (December 18<sup>th</sup>, 1999) offers an interesting discussion on the nascent school of behaviourist economists and the traditional rationalists. Yet, as it underscores, “... even New York taxi drivers seem to become less irrational over time: with experience, they learn to do more work on busy days and less when things are slow.”

24. Examples include the day preceding Thanksgiving in the United States, days preceding school holidays etc.

stations, toll booths) and services (e.g. traffic control) that build up and around the consumption of mobility. The depth and extent of the development of these complementary goods and services can be an important consideration for policy initiatives, because of the inertia inherent in such systems and special interests that develop around the system itself even beyond the actual good (the car). This suggests a need for medium- and long-term strategies regarding land-use planning and infrastructure development along side economic and regulatory measures to shift behaviour of different actors in the system.

Clear cut effects of policies are seldom available since there are many parameters that cannot be held constant in reality. Information thus also plays an important role, if policy makers aim at increasing the chances of policies to work. Since non-marketed goods are affected by the consumption of marketed ones, a key piece of information is the so-called elasticity. Elasticity is basically an index measuring the percentage change in one variable in respect of a percentage change in another variable. At least three types of elasticity are key for appropriate instrument design:

- *Elasticity of Demand or Price Elasticity of Demand* is a measure of how sensitive quantity demanded is to a change in the price of a product. It provides a quantitative measure of the price responsiveness of quantity demanded along a demand curve. The higher the numerical value of the price elasticity of demand, the larger the effect of a price change on quantity demanded.
- *Income elasticity* is a measure of how responsive consumption of a good or service is to a change in income. The sign of the income elasticity indicates whether the good is normal or inferior. If the income elasticity is positive, the good must be normal. Negative income elasticity thus indicates that the good is inferior.
- *Cross-Price Elasticity of Demand* is a measure of how responsive consumption of one good is to a change in the price of a different good. Cross-price elasticity is positive when the goods are substitutes and negative when they are complements.

Price elasticities reflect the willingness and ability of people to change their consumption patterns. The more substitutes there are for some good or service, the higher the quality of substitutes, the greater the elasticity - the more elastic the demand - for this good or service. Moreover, the longer the time period involved, the fuller the adjustment consumers can make to a price change. Demand for a good or service tends to be more elastic in the long run. Both factors can have significant impact in the quest for sustainable consumption via policy instruments. For example, other things constant, gasoline tax increases may yield less air pollution when good public transportation is available, as it may stimulate the use of alternative forms of transportation. The sharp fall of petroleum prices in the late 1980s can at least be partly explained by the fact that following the petroleum crisis of the 1970s, consumers adjusted to price increases by changing over time to smaller more fuel efficient cars.

#### **2.4.2 Policy Relevance**

The extended notion of well-being to include endogenous preferences is quite successful in uniting a wide class of behaviour, including habitual, social, and political under a single framework. The extension does not preclude the use of standard microeconomic tools like elasticities, which are fundamental in the design of policy instruments. On the contrary, the extended notion of well-being facilitates a more realistic description of how consumers make choices without losing much of the simplicity contained in previous approaches. As Becker (1998) indicates, it is unlikely that alternative approaches from other fields come close to providing comparable insights and explanatory power.

## 2.5 The Role of Information

While discussing how preferences and choices are formed, the sections above do not detail the importance of information. Whether following rationalists or any other approach to preference formation, it is assumed that consumers are well informed about their choices. In fact, endogenous preferences partly address the role of information via human and social capital formation. For example, one of the ways of increasing human capital is by investing in the gathering and understanding of information. As raised by Becker (1998), companies in the United States spend over US\$ 100 billion annually on advertisements, trying to influence this process. Schools and governments also participate in the process of human capital formation. Yet, consumers are often not so well informed, which is natural since gathering information is costly. In fact, certain types of information although short lived have a burgeoning market. For example, to get real time quotes on stock prices, investors pay significant sums to specialised firms. The same information is available free of charge in the Internet, with a 15 to 20 minutes' delay.

Not all information is efficiently allocated via markets, in which case market interventions may be justified. There is for example asymmetry of information, where the seller may know more than the buyer may when trading a particular good. The market for used cars is often a good example, but examples related to environmental issues are also possible. For instance, consumers may purchase organic produces without knowing that in fact these are not organic at all. As the market for insurance illustrates, the reverse may also be true, leading to adverse selection.<sup>25</sup> Once again, examples from environmental issues are feasible. A firm may know more about its potential environmental liabilities than an insurance company hired to provide insurance against an environmental disaster caused by its production line. Moreover, there is the moral hazard problem, in which individuals, firms or even governments may take extra risks once they are somehow insured.<sup>26</sup>

The environmental area provides a number of examples that attempt to mitigate market failures related to information regarding environmental issues. In recent years, several instruments have been designed with the aim of indicating to consumers whether their consumption pattern is becoming more sustainable or not. These include a variety of tools ranging from the use of instruments via markets (labels, advertisements, retailers and corporate environmental reports), the mass media (television, radio, newspapers, magazines, and the internet), to governmental and social organisations interventions providing environmental information ("green" publications, manuals and brochures, environmental campaigns). Eco-labels are practical schemes indicating whether produces are organic, free of killing particular species, sustainably harvested, among others. While the number of instruments attempting to label environmental friendly products are increasing, their complexity also seems to be growing. Although efforts have been made at the international (ISO), regional (EC) and national levels to provide standards and guidelines for environmental claims, the effectiveness of environmental labels ultimately depends on the extent to which consumers perceive and assimilate the information it conveys and then act on it. The excess number of labels in the market challenges and confuses even the most environmentally aware consumer when making a consumption decision. Yet, while single-labels may have the advantage of clarity, they may fail to capture the cross-sectoral nature that characterise environmental issues. The confusion surrounding environmental labels may even discourage environmentally friendly consumption (OECD 2001a). Consumers may find it difficult to differentiate their messages and as indicated above these instruments may themselves carry misleading information. To avoid a general discredit of labelling schemes, some kind of regulatory instruments may be needed to signal to consumers that certain schemes are more

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25. Of course, insurance companies try to avoid it by setting premiums commensurate with risk classes. Yet, residually adverse selection is still likely to occur.

26. Insurance companies avoid the problem via deductibles. Through them, they make customers exercise some care. Yet, since care is hard to observe, consumers end up worse off from the policy if compared to a theoretically fully observable level of care.

appropriate for certain issues than others. It should be noted, however, that these regulatory instruments do not need to come solely from governments.

### **2.5.1 Policy Relevance**

The role of information is to provide knowledge to individuals, firms and societies in their decision making process. This knowledge is generally related to the quality rather than quantity of goods, for the latter is often readily recognised. Quality variations within a particular good are quite common and part of our daily decision making. We use a combination of signals, including prices, to reduce the risk of acquiring a so-called “lemon”.<sup>27</sup> Yet, perfect information is virtually impossible and information asymmetries or even misinformation are way too common. In this case, some kind of market intervention may be acceptable. The market may take too long to signal socially efficient solutions or it may not signal them at all.

## **2.6 Additional Sources of Market Failures**

Information lies in the borderline among markets, market imperfections and market failures. In certain cases, it is clear that markets are quite efficient in allocating information to those that value it the most. In other cases, uncertainty about the future precludes market participants from engaging in perfect markets. Yet, lack of information may also constitute a market failure as depicted above; that is, at times a private market cannot provide it in sufficient quantities to ensure a social optimum. While markets can in many cases allocate resources in a socially efficient manner, even regarding information they may fail to equate private and social costs.

Four examples are generally identified with market failures, and thus with potential public policies aimed at correcting them<sup>28</sup>. As indicated, information is one of them. The existence of natural monopolies is another example. Though widely studied in economics and important in terms of regulations and market structure, the topic is beyond the scope of this discussion. Externalities and public goods are the remaining examples and are particularly relevant to the discussion of sustainable consumption.

### **2.6.1 Externalities**

Externalities were briefly discussed above in the context of social capital in preference formation. Externalities are defined as costs or benefits resulting from one activity done by one or more economic agents, but accruing to others than those undertaking it. Externalities are by definition not self inflicted, but actual perpetrators are often difficult to isolate. For example, a smoker enjoying a cigarette in a room may be generating a negative externality on non-smokers. The direction of the externality is clear and a possible solution is a policy instrument such as a smoke ban in the room, among other possibilities. Households generating sewage affecting the quality of a beach entails more complications. The negative externality can be clearly characterised, but actual perpetrators are more difficult to find. Further, what may be a negative externality to some may be positive to others. While honey producers can enjoy having flower farms in the neighbourhood for it attracts bees; hikers stung by bees may find them a real nuisance. It should be noted, as implied in a previous section, that externalities are not only associated with environmental issues. Yet, a complete discussion on externalities would constitute a paper by itself.

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27. A “lemon” is a term commonly used to refer to faulty merchandise, for which the buyer is unaware of the defects that the seller knows at the time of purchase.

28. See *The Economist* (February 17, 1996) for an interesting discussion on market failures.

As an economic activity, consumption of final goods and services may have strong externalities associated with it. Yet, singling out consumers that are particularly responsible for generating the negative externality, accounting for the welfare loss generated by it, and designing enforceable instruments to correct it is the major challenge faced by policy makers. Often, measures attempting to address negative externalities can be unpopular with large groups who are the perpetrators. While the targeted problem may actually be addressed, the instrument itself may generate additional problems in terms of welfare. Finally, politicians are also quick in using externalities as justification for policy instruments whose function is primarily to generate government revenues.

The recent controversies surrounding fuel taxes may offer an interesting example applicable to both developed and developing countries. With the increase of petroleum prices in international markets, fuel prices in many countries became prohibitively high for some groups. Increase in fuel prices through taxes or otherwise may be regressive in terms of income, affecting the poor who may be spending larger portions of their income on fuel purchases more than the rich. This may be further aggravated by the fact that poorer people generally drive older less fuel-efficient automobiles<sup>29</sup>. Despite the potential environmental benefits associated with higher fuel prices, i.e. a decrease in air pollution, these groups were expectedly vocal in demanding a decrease in fuel taxes. Some governments chose to comply with the demand and forgo part of the revenues brought by the fuel taxes, which in turn may have created a moral hazard problem by signalling to the same groups in different countries that protests can be successful in decreasing fuel taxes.

Brazil offers an interesting example of the reverse situation. In the country, alternative home-grown fuels such as ethanol derived from sugarcane are still widely used. There is ample evidence that ethanol use is less contaminating than gasoline in regards to air pollution at a vehicle tailpipe. While it is also known that this may in fact be transferring pollution from urban areas to rural areas by changing the location of the polluting activity and its recipient mean in nature, some sectors of society, particularly the sugarcane growers and their lobby, were quick to praise a gasoline tax as a “green” economic instrument. They cited the tax as a potential source of revenue to continue subsidising alcohol as a cleaner fuel. Yet, they fail to mention that by itself the gasoline tax could in principle improve air quality. The choice of where its revenues should be allocated is really a societal decision. By choosing to allocate the revenues to the alcohol program, the government could be forgoing for example slum improvements or investing in the rural poor<sup>30</sup>.

### **2.6.2 Public Goods**

As also indicated by previous sections, the extended notion of well-being should be able to incorporate both marketed and non-marketed goods and services. While in his discussion Becker does not attempt to incorporate environmental assets as part of individual preferences, the endogenous approach should be able to take these assets into account. As discussed previously, Heal (1998) starts to engage in this exercise at least at a theoretical level.

Many environmental assets are in fact non-marketed goods as they correspond to public goods. Pure public goods display two characteristics. They must be non-excludable; that is, no one can be excluded from consuming the particular public good. Good examples of non-excludable public goods are open access resources such as international fisheries, clean air and some ecosystem services. Public

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29. This discussion is provided as an illustration. The regressivity of fuel taxes will likely vary according to countries and the type of their reliance on transportation means.

30. The debate is still going on at different intensities. Yet, it appears that the Ministry of Finance is not inclined to support a gasoline tax for it may affect inflation.

infrastructures such as storm water systems may also be considered a non-excludable local public good, since one cannot exclude others from enjoying the benefits of a diminished likelihood of flooding.

Pure public goods must also be non-rival in consumption; that is consuming the public good does not diminish the supply available for others to consume it. A good example of a non-rival public good is a nature conservation park. In many countries, it is common to charge entry fees to these parks thereby making them excludable. Yet, once in the park the amount of enjoyment one derives from it does not diminish the supply available to others. Public infrastructures such as off-site sewage systems and sewage treatment plants are also often non-rival but excludable. The public goods that are non-rival but excludable are also known as club goods.

Examples of pure public goods displaying both non-excludable and non-rivalry characteristics are difficult to find. Some goods that are often given as examples of pure public goods include sunshine, the existence of biodiversity, national defence, among others. Moreover, it should be noted that the characteristics inherent to public goods generate problems in their own right. For example, problems such as congestion among others are typically associated with the provision of public goods, illustrating the failure of markets to efficiently allocate them. These are commonly associated with public infrastructure such as roads but may happen in nature parks as well. Anyone who has gone to popular nature parks, whether private or government run, in the high tourist season has likely experienced the effects of congestion. To a large extent, as indicated by Feldman (1982) and Kreps (1990) public goods or public bads<sup>31</sup> are the logical extreme examples of externalities.

### 2.6.3 *Policy Relevance*

Externalities and public goods, as market failures with ample examples in the environmental agenda, are likely the essence of public policies targeting environmental issues. Since consumption has its peculiarities causing specific externalities and depleting particular public goods, policy instruments have to be adapted to take this into account. Yet, as depicted in some of the above examples, well-being is not only composed by environment related public goods nor solely affected by environment related externalities. A comprehensive public policy addressing environmental externalities and the degradation of environmental assets cannot be devised in isolation from the rest of the economy.

Since externalities and public goods are key examples of market failures but also an integral part of an extended notion of well-being, governments and quasi-government agencies play an important role in their provision. This in turn will likely determine the set of goods, specially non-marketed ones, available for consumers. Controversy here may lie not so much on the importance of an adequate institutional framework, but on what constitutes a public good and an externality that require some kind of government intervention and how this intervention can be made as efficient as possible. This in turn adds an important political dimension to the equation, for ultimately democratically elected governments are subject to judgement at the election polls. Their success is definitely related to the quantity and quality of public goods made available to their people.

Yet, what happens if consumption of marketed goods and services implies degradation of environmental assets? Both are integral part of well-being and their relationship as complements or substitutes may signal clues for more appropriate policy instruments. A policy maker in the environment field may be prompted to curtail aggregate consumption of marketed goods to “benefit” non-marketed

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31. The term *bad* here is used in opposition of a good in economic sense. While for goods the more one has the better, bads would have the exact opposite effect. Pollution serves as a good example of a “bad”.

ones. While this may help achieving sustainable aggregate consumption, it may not be optimal. As raised by Pearce (2000):

*“...while it is theoretically possible to achieve maximum sustainable consumption through policies designed to reduce aggregate consumption (assuming that was required), this is at best an inefficient approach and at worst a socially disastrous one. A more sensible approach is to change the ratio of consumption to natural capital, i.e. to decouple the economy and natural resources. All kinds of indicators exist for checking what these ratios are (although they are usually express in terms of ratios of inputs to GNP rather than consumption). The most famous are energy/GDP ratios and, more recently, materials-intensity ratios.”*

The next part briefly discusses the policy options available to achieve sustainable consumption, including for completeness those affecting aggregate consumption.

### 3. POLICY OPTIONS FOR SUSTAINABLE CONSUMPTION

In the previous section, the paper analyses the fundamental forces behind consumption, establishing the principles from which policy makers can depart in the quest for best policy instruments. The paper provides both macroeconomic and microeconomic perspectives. The former provides clues on how to address consumption as a whole irrespective of what it is actually consumed. The latter indicates how to affect choices within consumption towards more sustainable patterns. The paper also provides alternative perspectives based more on behavioural foundations rather than traditional microeconomics. Some borrow from psychology to explain consumer behaviour thereby explaining consumption itself. These perspectives may also be important when attempting to affect choices.

Yet, the rationale for affecting choices and consumption as a whole lies in market failures. The existence of market failures within a period and across periods justifies market interventions, increasing the importance of well-designed policy instruments. These instruments are the mechanisms, which allows for society to move closer to sustainable and optimal consumption. Surely, this is done with a high degree of uncertainty. After all, sustainable optimal consumption though theoretically feasible, ethically desirable and philosophically definable, remains an illusive goal in the operational sense. It is a moving target since societal preferences are constantly evolving. Through a process of trial and error, the best that a policy maker can aim at is improving the situation using common sense and the available information.

The paper provides below a brief policy options framework available to decision-makers in their attempts to attain a more sustainable pattern of consumption. While the paper does not detail particular policy instruments – a subject to be undertaken by other reports of the programme, it illustrates the policy options framework with examples from both member and non-member countries. As it will become clear to the reader, the policy options discussed for sustainable consumption overlap with other policies being pursued by decision-makers. For example, the framework presented below has components from macroeconomic policies and environmental policies, among others. This overlap is not surprising, given that all of these concerns tend to cut across sectors and disciplines. Indeed, in order to attain more sustainable patterns of consumption, a general equilibrium approach though more complex may prove more successful. Nonetheless, the emphasis on household consumption of final goods and services is maintained to clearly differentiate between consumption and production.

#### 3.1 Government<sup>32</sup>

The most important role played by governments in affecting choice is its function as traditional regulators. As traditional regulators, governments have in general two types of instruments that they can use. They can attempt to steer consumption towards more sustainable patterns via market-based instruments (MBI), or command and control (CAC), and typically, governments use a combination of both.

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32. The literature on this topic is quite extensive and continues to grow. This section is mainly based on The World Bank (2000), OECD (1994, 1999c and 1999d), Biller and Quintero (1995), Cropper and Oates (1992).

These instruments can affect outcomes directly or indirectly. When dealing with production, this differentiation can be clearly made. For example, governments may affect the use of a public good or a negative externality caused by a factory discharging effluents in a river by imposing an effluent charge, which in turn is expected to alter effluent levels. Yet, in the case of effluent levels it may also be easier to achieve the goal via an indirect instrument such as a tax on a particular input like water<sup>33</sup>. When discussing specifically macroeconomic policy impacts on the overall consumption levels, this distinction can also be clearly made. For example, governments may directly decrease consumer expenditure by increasing income taxes. They can also affect consumption indirectly by charging interest rates.

Yet, when considering the nuances of negative externalities caused by consumption, direct instruments of the type described above are more complicated to design. Consumers are many and behaviour in terms of generating negative externalities fairly varied. In addition, the effects of the negative externalities may be geographically diverse. It would be virtually impossible for any regulation to be able to directly capture the effect caused by each consumer. Moreover, the concealment costs for consumers is low, which further complicates penalising culprits.<sup>34</sup> Table 2 below summarises the options available in terms of traditional regulations. It presents options typically associated with environmental policy and those from macroeconomic policies. The former targets primarily specific negative externalities or public goods and may potentially be used to improve ratios of pollution to GNP of some inputs and outputs such as energy and other materials.

The latter addresses consumption as a whole without differentiating for the type of consumption. In a sense, it is placed here for completeness. While it should be expected that by diminishing overall consumption levels, at least in developed countries, overuse of public goods and generation of negative externalities could in effect decrease, the policy is subject to over controversy and drawbacks. Firstly, the policy penalises all inputs and outputs regardless of whether they can potentially generate a negative externality or not. Secondly, other things constant by curtailing consumption the policy curtails growth. While this is often used for short-term macroeconomic objectives, it is difficult to justify for long-run sustainable consumption at least in the current level of knowledge. Alternatively, there may be less costly policies to current generations that attain consumption goals without jeopardising future generations. Finally, while ultimately changing consumption levels may be necessary, as in the case of short-term macroeconomic policies this is likely to be a highly unpopular measure. Policy makers only fiddle with consumption levels if they are independent of political influences or if the situation reaches a point where sustainable economic growth is clearly jeopardised.

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33. Water in this case being an input in the production process.

34. The notion of concealment costs, or the costs incurred for avoiding regulations, is particularly valid when many agents are present. Though this has been applied for the informal sector [see Biller and Quintero (1995)], it seems valid when analysing regulatory efficiency in controlling negative effects of consumption.

**Table 2. Some Traditional Instruments used in Sustainable Consumption and Production**

Type Of Instrument	Variable Affected						
	Consumption			Production			Aggregate Consumption
	Price	Quantity	Technology	Price	Quantity	Technology	
<b>MBI</b>							
Direct	▪ Deposit-Refund schemes	▪ Tradable Development Rights		▪ Effluent charges ▪ Stumpage Fees	▪ Tradable Emissions Permits ▪ Tradable Fishing Quotas	▪ Taxes based on Presumed Emissions	▪ Income Tax ▪ Expenditure or Consumption Tax
Indirect	▪ Fuel tax ▪ Product tax (VAT, Sales Tax)		▪ Subsidies for fuel efficiency (household level)	▪ Input or Output Tax ▪ Performance Bonds	▪ Tradable Input or Output Schemes	▪ Subsidies for R&D and fuel efficiency (firm level)	▪ Interest Rate Policy
<b>CAC</b>							
Direct		▪ Mandated emission standards			▪ Emission standards	▪ Mandated technical standards	▪ Import bans ▪ Restrictions on consumption
Indirect					▪ Bans and quotas on inputs	▪ Efficiency standards for processes and inputs	▪ Restrictions on access to credit and funds

Source: Author adapted from Biller and Quintero (1995) and Eskeland and Jimenez (1991).

As it is clear from Table 2, a direct instrument aims at changing the levels of potential damages directly, whereas indirect instruments affect potential damages caused by consumption via other variables. A number of examples can be found in OECD countries as described in OECD (1998) and The World Bank (1995). Table 2 is also set in such a way to assist in the distinction between production and consumption.

While this is at least one point where differentiating the effects of instruments targeting production and those targeting consumption can be simplified, in reality these effects are often closely associated. If producers can pass on costs to consumers, an instrument targeting production will affect consumption as well through increases in the price of the final good or service. This is clearly related to different elasticities associated with the particular good or service.

Moreover, it should be noted that a policy maker should try to target a “bad” rather than a “good”. This has been discussed in the context of production (for example in Eskeland and Devarajan [1996]), but may be equally important in the context of consumption. This also provides important links to the recent attempts of some OECD countries to have fiscally neutral taxation.

### 3.2 Civil Society

Civil society is generally equated with Non-Governmental Organisations (NGOs) and public participation. These would include not only traditional NGOs but also community groups such as religious institutions, social organisations, unions, citizen’s movements, politicians and even individuals. These groups often act as effective informal regulators, and though clearly active on the production side, they potentially play an important role on the consumption side as well.<sup>35</sup>

Yet, private sector and governments should also be considered part of civil society in as much as they provide public information for consumers to make decisions. This is part of broader concept where traditional cohesive regulations play less of a role. In a sense, this could be considered part of a Coasian solution to problems related to externalities. As noted by Coase (1960), when the parties involved perceive that the benefits of internalising the externality outweigh the cost, there is little need for traditional regulation. These costs stem from the need to gather and analyse information, enforce solutions and negotiate settlements. The Coasian solution may also occur when the perpetrator of the negative externality depends directly on the constituency interested in addressing the externality, when transaction costs of reaching the social optimum are negligible and when agents do not engage on strategic behaviour.

The instruments available to the civil society as regulators are thus based primarily on information. Environmental and some consumer’s organisations have worked to stimulate governments, corporations, international governmental organisations (IGOs) and people to change their behaviour in order to protect the environment. Their roles and activities vary from organisation to organisation, but it is possible to identify four ways in which NGOs are channels of information: Generation and dissemination of information, information campaigns, social mobilisation and boycotts, and the development of eco-labels (OECD 2001a). Through information, civil society can be better prepared for imposing social norms and negotiating outcomes. As The World Bank (2000) indicates this is very effective even in developing countries, but most measurable examples are derived from the production rather than the consumption side. Moreover, these instruments seem to be more successful when local and concentrated benefits can be derived. For example, it is easier to stop a factory from spewing smoke in a neighbourhood

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35. There is an extensive literature on the function of NGOs and public participation in advancing environmental concerns. See Meyer (1999) and The World Bank (2000) for recent examples.

through the civil society acting as regulators (e.g. a neighbourhood association) than to diminish car use in the same neighbourhood, even if car use generates more air pollution than the factory itself.

The mechanisms through which this level of public information is passed on to the consumer are very diverse. It ranges from public campaigns to environmental education. It involves public hearing and individual behavioural change. Both the Policy Case Study on Trends and Issues in Participatory Decision Makings for Sustainable Consumption and the Policy Case Study on Information and Consumer Decision Makings for Sustainable Consumption discuss in detail mechanisms that facilitate civil society involvement (OECD2001b and OECD2001c).

### 3.3 Markets

While difficulties in attaining a more sustainable consumption pattern are closely linked to market failures, markets still play an important role in mitigating them. As discussed previously, markets can be used to assist in the application of quantity based instruments like tradable permit systems. Further, industries specially linked to services have developed throughout the world stimulated by the enforcement of environmental regulations. Yet, these developments are highly dependent on governments doing their function as regulators.<sup>36</sup>

Markets are also means through which consumers and investors can express their preferences for “greener” or more sustainable products and services. In this sense, the final consumption of goods and services may be pivotal for stimulating changes throughout the production chain. For example, final consumption may foster the use of clean technologies, sustainable forest harvesting, and other sustainable production mechanisms. Moreover, capital markets are increasingly sensitive to environmental news. Good news on environmental performance may enhance a firm’s expected profits and thus its share price. The opposite may also be expected in case of bad news. Reputation, credit and profits are key elements on the market’s success as regulator (The World Bank 2000). Not surprisingly, once again information plays a major role in achieving effective market regulation. Well-informed consumers are able to demand better products and may be willing to pay a premium for them. On the side of firms, in order to attract consumers, especially those with higher income, it often pays to engage in advertising or even in certification schemes. This topic is further elaborated in the policy case study discussing information and consumer decision making (OECD2001b and OECD2001c).

Finally, as previously discussed technology is a subject of great importance that in effect belongs to all three types of regulators. It is placed under markets, for markets seem to have been particularly important in driving technological change that supports more sustainable consumption patterns. Yet, governments, universities and NGOs are often fundamental actors in directly promoting technological change. In essence, the key difference may be that while markets prompt technological change in the search for profits and efficiency, government and civil society may in fact be providing a public good or public information which may ultimately change consumer behaviour towards more sustainable consumption patterns. This was the case for earlier consumer products (pesticides, detergents, CFC’s sprays, lead paint) for which the full environmental or health impacts were unknown (e.g. soil and water pollution, biodiversity loss, depletion of the ozone layer, human intoxication). Consumers, on the other hand, by demanding better products are in fact indirectly stimulating technological change. As the search for efficiency, increase in productivity, and better quality goods coincide with diminishing externalities and overuse of resources, sustainable consumption patterns are more likely to be achieved. Yet, at times there are also trade-offs to be equated among these factors. For example, personal computers replacing

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36. See Biller (1998).

typewriters were at earlier stages viewed as an effective way to save paper. Soon it became clear that the opposite was true. The costs of typos had substantially decreased.

### 3.4 Perverse Incentives

Perverse incentives are present throughout the economy. They take form of direct budgetary transfers, monetary transfers based on special mechanisms, inefficient taxation structures, among others. Typically, incentives that are particularly pervasive for sustainable consumption include explicit or implicit subsidies to polluting final goods and services and their inputs. Moreover, they encompass under-pricing of infrastructures such as roads, water and sanitation which encourages congestion and overuse.

The elimination or reduction of perverse incentives improve efficiency and can help achieving sustainable consumption patterns. Yet, it is not a sufficient condition for it. While it may approximate the economy towards market equilibrium, it does not address actual market failures. Nonetheless, it should be viewed as a key policy component that makes both economic and environmental sense. Table 3 below provides rough estimates for the global value of environmentally perverse subsidies by sector, which stands in the neighbourhood of a trillion dollars per year. As indicated, major recipients include agriculture, transport, and energy. Overall, three quarters of government subsidies occur in OECD countries, and this corresponds to approximately 3.6% of their gross national product (CBD, forthcoming)<sup>37</sup>.

**Table 3. Annual global perverse subsidies (US\$ billions)**

Sector	van Beers & de Moor	Myers & Kent
Agriculture	325	325
Transport	225	558
Energy	205	145
Water	60	60
Manufacturing	55	...
Forestry	35	...
Mining	25	...
Fisheries	20	22
Total	950	1,110

Source: CBD (2000).

37. It should be noted that these estimates do not discriminate between consumption and production. While the precise figures are questionable and are sensitive to methodologies, the overall message remains. Perverse incentives are significant and generally are responsible for welfare losses to society as a whole.

## 4. CONCLUDING REMARKS

The preceding discussion identifies and characterises a wide set of influences, or driving forces, which influence the formation and change of household consumption patterns. Quantitative aspects of consumption are discussed in dynamic and static contexts. Including a wider definition of capital proves fundamental for the analysis, and differentiating between weak and strong sustainability is key in establishing different levels of sustainable consumption. Both are linked to policy instruments and may imply different policy results. Technology as indicated is likely to play a major role, especially since we are dealing with the very long run. Yet, the incorporation of technological progress is still not fully understood. The quantitative aspects of consumption are often associated with macroeconomic issues as macroeconomic policies often attempt to control consumption expenditure. The paper also highlights the difference between sustainable and optimal consumption.

To attain a closer link between sustainable and optimal consumption, the discussion includes a section on the qualitative aspects. These are mainly associated with a microeconomic approach involving decision at the level of individuals. A detailed analysis about preference formation and decision-making geared to the policy instrument design is provided. Preferences along with technologies and government policies determine economic outcomes, including consumption and its rate of growth. Through its endogeneity, economic outcomes also affect tastes regarding marketed goods, leisure, income, and environmental assets, among others.

Other issues such as information, externalities and public goods complete the solid ellipse of Figure 1. These influence and are influenced by macroeconomic, microeconomic and growth factors as implied by the shape of Figure 1. Yet, as the dotted triangle in Figure 1 indicates, information, externalities and public goods show a common characteristic. They are market failures often associated with environmental issues, thus offering important justifications for environmental policies to correct inappropriate market outcomes. These policies, however, are better designed taking into account their potential impacts outside the environmental agenda as well. Since ultimately the over-arching goal of policymaking is to improve the well-being of society in a time period and across periods, policy makers have to consider the interactions between marketed and non-marketed goods in the formation of preferences. Part two of the paper provides a brief analysis of policy instruments that may address sustainable consumption and may assist in diminishing the gap between sustainable and optimal consumption.

### 4.1 The Sustainable Consumption Project

On the basis of this discussion, it can be seen that the development of policies to promote more environmentally sustainable consumption patterns must consider not only a multiplicity of actors, and their respective areas of influence, but also grasp the direction and strength of relationships among the different driving forces. At the current stage, the Sustainable Consumption Project addresses primarily the microeconomic aspects discussed, some aspects of the market failures described to different degrees, and different policy instruments briefly analysed in this paper. By engaging primarily in the analysis of

qualitative aspects, the project first “deconstructs” environmentally damaging consumption trends into their defining characteristics, and examines both the static conditions and dynamic relationships that account for change, or the lack of it. This analysis must take account not only of the dynamics within households, but also between the household and the wider economic and social context. This “unpacking” leads to a second level of analysis to isolate important areas of potential change, or paralysis, and to identify those actors who could bring the greatest leverage to bear to shift consumption patterns in more sustainable directions. Once the relative roles of the various actors are established the analysis can turn to the particular role of government. Here, the interest is in identifying whether governments have a role to play, and if so, through which particular combination of policies and actions. This analysis should consider government measures with both direct impacts on consumption patterns, and those that have an indirect impact via the behaviour of other actors. It should also consider major barriers to the implementation of government policy. As a practical example of such conceptual framework discussed here, the projects engages on a number of sector case studies (OECD 2001d, OECD 2001f, and OECD 2001g).

#### **4.1.1 Guidance for Research on Household Consumption Patterns**

The following questions are drawn from the conceptual framework and earlier sectoral work in the Sustainable Consumption programme. They form the basic line of inquiry for the sector case studies, and to ensure a level of comparability between the different sectoral analyses. The final set of questions addressed in each sector case study varies to some degree because each will address a different set of issues (e.g. the case study on food consumption has a trade component).

##### *Describing Consumption Trends and their Environmental Significance*

Each case study should describe current and, where possible, short-term future household consumption trends and should indicate their environmental significance. This discussion should indicate the relative importance for environmental sustainability of consumption at the household level (versus commercial and public sector consumption). This is key to assist in the association between sustainable and optimal consumption.

- What are the general consumption trends at the household level? What indicators are available to measure trends?
- What is the relative contribution of household final consumption compared to commercial and public sector consumption?
- What are the general environmental impacts along the life cycle of the product or service (product design/development, production, delivery, purchase, use, maintenance/repair, and disposal)?
- Which of these are directly attributable to households? How well can these be measured?
- What is the relative importance for the environment of the structure (technical, product, sectoral effects) and scale (per capita impact) of consumption?

##### *Characterising Household Demand*

The case studies provide a description of influences (forces and actors) on demand formation at the household level, relate these influences to each other, and describe the direction and strength of

relationships between them. In other words, the sectoral studies indicate how preferences are influenced and influence the demand for the particular products and their associated market failures under consideration. Further, they discuss how different policy instruments interact with these preferences in the sector. The full list of questions may not be applicable to each of the four case studies, and/or additional questions may be required to account for differences between sectors in how consumption patterns take shape.

A. Market Influences

- What are the market characteristics for the good or service: level of competition; productive structure; price trends and demand elasticity; relative prices and sectoral shifts; impacts of globalisation?
- What are the key characteristics of the good or service related to consumption patterns: service provision; durability; innovation; specialisation?
- What is the evolution of household spending patterns on this good or service? (e.g. relationship to income changes)
- Are there market externalities related to consumption decisions for this good or service?

B. Socio-Cultural Influences

- Demographic trends relevant to consumption: population growth; age structure of the population; average household composition; labour trends (women; unemployment; youth); urbanisation; evolution of work/home location; household time management.
- What are the composition and coverage of different information flows to the consumer in this sector:
  - coverage (e.g. positive/negative press on food-related health or environmental concerns)
  - media advertising
  - public service information
  - education (formal, non-formal, professional)
- What are the cultural attributes (social meanings) of this good or service?

C. Technological, Infrastructure and Institutional Influences

- What are the key technological and design influences on this good or service: trends in material intensity; production and use efficiency; innovation?
- What influence do existing land-use patterns and infrastructure have on the consumption of this good or service: (e.g. transport and storage infrastructure for the agrofood industry; land-use and transport infrastructure for tourism).
- What institutional influences are relevant to the consumption of this good or service: regulatory framework; institutional structures of the labour market; sectoral institutional arrangements; technical/commercial/political/civic networks.

### *Identifying Potential Policy Responses*

The case studies identify where the structure and/or composition of consumption patterns can be changed with maintained or increased well-being (including welfare derived from consumption) compatible with environmental considerations. Each of the sector case studies considers the role of various actors (consumers, government, private sector, and civic groups) in shaping consumption patterns and in promoting more sustainable trends. Where governments have a role, the case studies identify the range of possible policy interventions to determine which combination of policies would be most effective in reducing associated environmental impacts, including those that might come higher in the production-consumption chain.

#### A. Multiple Influences on Demand -- Multiple Responses to Promote Sustainability

- Where are the most susceptible points of change: market failures; product/service design; consumer choice and behaviour; framework conditions (technology, infrastructure, and institutions)?
- Where would changes provide the greatest environmental gains?
- Which actors would have the most leverage in driving change?

#### B. Government Policy Responses

- What is the role for governments through direct and indirect measures to affect both the range of options open to the consumer and consumer choice:
- *Economic instruments*: product taxes, environmental taxes, waste generation fees, subsidy removal, incentives for environmentally preferable products/technology/use.
- *Social (information) instruments*: information and awareness raising: (advertising, eco-labelling, consumer information, public-right-to know, public service information, media); education (professional training, formal and non-formal); participatory decision-making; pilot projects.
- *Regulation (command and control)*: minimum product standards, minimum performance standards, bans/restrictions of the production, sale or use of products, extended producer responsibility, regulatory reform to promote innovation, building standards.
- *Influencing framework conditions*: capital investment, land-use planning, institutional arrangements.
- *Motivating action by other actors*: voluntary agreements.

## **4.2 Scope for Future Research**

The project covers primarily the microeconomic aspects contained in the conceptual framework associated with market failures related to specific sectors. This is beneficial for it provides very clear examples of at least part of the conceptual framework. Yet, as indicated by the conceptual framework this

is part of the total picture. The bullets below suggest some of the possible lines for future research identified in previous sections, currently not covered by the project:

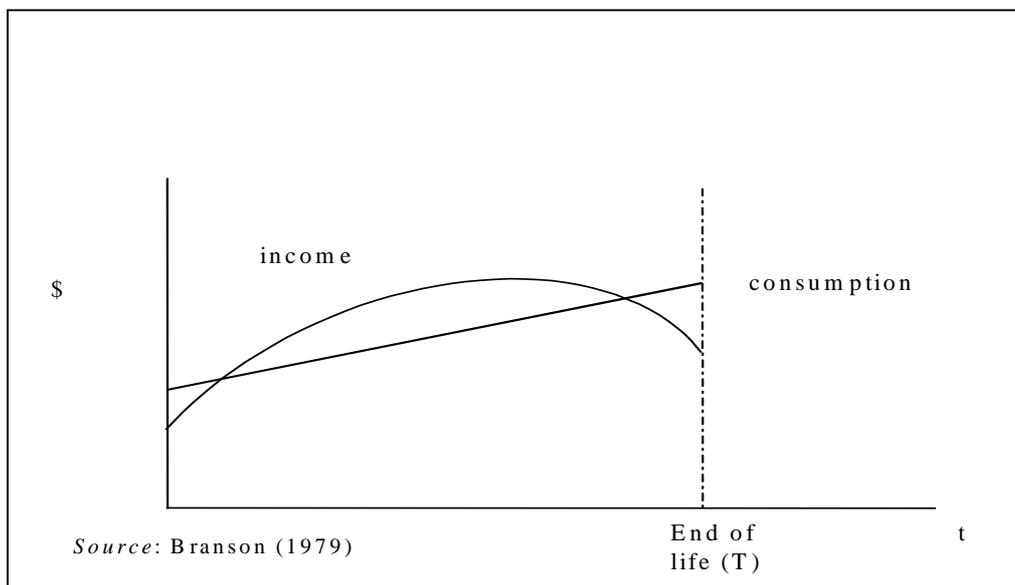
- Quantitative aspects of consumption: The project could analyse aggregate consumption and economy wide policies addressing it in the context of sustainability (the macroeconomic approach), including the impact of macroeconomic policies on environmental issues related to sustainable consumption.
- Technological progress: The project could review in detail the state of the art regarding how technological progress is accomplished and its impact on sustainable consumption.
- Sustainable and Optimal Consumption: The project could elaborate on the nexus between sustainable and optimal consumption detailing the ideas contained in the conceptual framework. This is important for it ultimately assists in determining how policymaking can improve well-being in a sustained manner.
- Sector case studies: The project could continue to expand the knowledge about qualitative aspects of consumption (microeconomic approach) and market failures by expanding to other sectors not yet covered.

## ANNEX. THE LIFE-CYCLE INCOME HYPOTHESIS AND THE PERMANENT INCOME APPROACH

### The Life-Cycle Hypothesis<sup>38</sup>

This hypothesis assumes that a typical individual has a relatively low-income stream at the beginning and end of his or her life while his productivity is low. During the middle of his or her life, his income is the highest. Consumption, on the other hand, may slightly increase over time. Therefore, in order to finance his or her consumption given an income constraint, the individual is a net borrower earlier, repaying and saving in the middle years, and finally dis-saving at the end of his or her life. Figure 3 below illustrates this discussion. If this hypothesis is correct, one should expect the ratio of consumption to income to be falling as income rises, explaining why  $MPC < APC$ . On the wealth side, one should also expect that consumption rises more or less proportionally to the present value of current and future income streams; that is,  $c_t = k(PV_t)$ , where  $0 < k < 1$ . Alternatively, if an increase in any income entry raises the consumer estimate of the present value, the individual will consume a fraction of the increase in the current period.

**Figure 3. Life-Cycle Perspectives of Consumption**



38. This was first postulated by Ando and Modigliani (1963).

### Permanent Income Approach<sup>39</sup>

While the permanent income approach has a similar foundation to the life-cycle model, its treatment of the present value term is different. The permanent income of an individual is simply the rate of return multiplied by the present value of the individual's labour income stream. Since consumers are assumed to want to smooth their income in a somewhat flat consumption pattern, the permanent consumption is simply proportional to the permanent income ( $\bar{c}_{pi} = \bar{k} \bar{y}_{pi}$  for all income classes  $i$ ). The permanent income approach also assumes that total income and total consumption are a sum of their respective permanent components and transitory components. These transitory components can be positive, zero, or negative deviations of the permanent levels. After making some reasonable assumptions that there is no correlation between the transitory and the permanent components of the respective total income and total consumption and between transitory consumption and transitory income, one can explain the phenomenon of  $MPC < APC$ .<sup>40</sup>

The permanent income and the life-cycle approaches are quite comparable in their analysis of MPC and APC. In effect, the different life stages illustrated by Figure 3 can be viewed as different phases of negative and positive transitory incomes. Yet, the life-cycle model is more explicit in its treatment of a persistent increase in the wealth stock.

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39. This was first postulated by Friedman (1957).

40. Mathematically, the assumptions translate into the covariances being equal to zero; that is,  $cov(y_p, y_t) = 0$ ,  $cov(c_p, c_t) = 0$  and  $cov(c_t, y_t) = 0$ . The last is explained by the difference between consumption and consumer expenditure discussed earlier.

## BIBLIOGRAPHY

- Ando A. and F. Modigliani (1963), "The Life-Cycle Hypothesis of Saving: Aggregate Implications and Tests", *American Economic Review* 53, pp. 55-84.
- Assael, H.(1998), *Consumer Behaviour and Marketing Action*, South-Western College Publishing, an International Thomson Publishing, Cincinnati, Ohio.
- Bale, M., Biller, D., Lopez, I. and Bastos, G. (1997), "Successful Natural Resource Management in Brazil", LATEN Dissemination Note #18, The World Bank.
- Barbier, E.B. (1999), "Endogenous Growth and Natural Resource Scarcity", *Environmental and Resource Economics*, 14:51-74.
- Barro, R.J. and Sala-i-Martin, X. (1995), *Economic Growth*, McGraw-Hill, New York.
- Becker, Gary S. (1998), *Accounting for Tastes*, Harvard University Press; Cambridge, Massachusetts; London, England.
- Biller, D. (1998), "Environmental Impact Assessment: The Brazilian Experience", *The World Congress of Environmental and Resource Economists*, Venice, Italy.
- Biller D. and Quintero, J.D. (1995), "Policy Options to Address Informal Sector Contamination in Urban Latin America: The Case of Leather Tanneries in Bogota, Colombia", LATEN Dissemination Note # 14, The World Bank.
- Boone, L., Gierno C. and P. Richardson (1998), "Stock Market Fluctuations and Consumption Behaviour: Some Recent Evidence", *Economics Department Working Papers* #208, OECD, Paris.
- Branson, W. (1979), *Macroeconomic Theory and Policy*, Harper & Row Publishers.
- Brown, P.M. and Cameron, L.D. (1999), "What can be done to reduce over-consumption?", *Ecological Economics* 32 (2000) 27-41.
- Chichilnisky, G. (1996), "An axiomatic approach to sustainable development", *Social Choice and Welfare*, 13(2): 219-248.
- Coase, R.H. (1960), "The Problem of Social Cost", *Journal of Law Economics*, Vol.3: 1-44 (October 1960).
- Convention on Biological Diversity (2000), "Further Analysis of the Design and Implementation of Incentive Measures", UNEP/CBD/COP/5/15.
- Cropper, M.L. and Oates, W.E. (June 1992), "Environmental Economics: A Survey", *Journal of Economic Literature*, Vol. 30, no. 2: 675-740.

- Eskeland, G.S. and Devarajan, S. (1996), *Taxing Bads by Taxing Goods, Pollution Control with Presumptive Charges*, The World Bank.
- Eskeland G.S. and Jimenez, E. (1991), "Curbing Pollution in Developing Countries", *The Environmental Challenge*, Finance & Development, A quarterly publication of the International Monetary Fund and the World Bank.
- Feldman, A.M. (1982), *Welfare Economics and Social Choice Theory*, Martinus Nijhoff Publishing.
- Friedman, M. (1957), *A Theory of the Consumption Function*, Princeton University Press.
- Geldrop, J.V. and Withagen, C. (2000), "Natural Capital and Sustainability", *Ecological Economics* 32 (2000) 445-455.
- Hamilton, K., Atkinson, G. and Pearce, D. (1997), "Genuine Savings as an Indicator of Sustainability". (Affiliations: Hamilton: Environment Department, the World Bank; Atkinson and Pearce: CSERGE, University College London and University of East Anglia.
- Hamilton, K. and Clemens, M. (1999), "Genuine Savings Rates in Developing Countries", *The World Bank Economic Review*, No. 2: 333, Vol. 13-56.
- Heal, G. (1998), *Valuing the Future: Economic Theory and Sustainability*, Columbia University Press.
- Hicks, J.R. (1939), *Value and Capital*, 2<sup>nd</sup> ed., Oxford University Press, New York.
- Huber, R., Ruintenbeek, J. and Serôa da Motta, R. (1998), "Market-Based Instruments for Environmental Policymaking in Latin America and the Caribbean, Lessons from Eleven Countries", *World Bank Discussion Paper* No. 381, The World Bank.
- Kreps, O. (1990), *Microeconomic Theory*, Princeton University Press.
- Meyer, C. (1999), *The Economics and Politics of NGOs in Latin America*, Praeger Publishers.
- Nordhaus, W.D. (1995), "How Should We Measure Sustainable Income?", *Discussion Paper*, Department of Economics, Yale University, New Haven, Connecticut.
- OECD (1994), *Applying Economic Instruments to Environmental Policies in OECD and Dynamic Non-member Economies*, OECD, Paris.
- OECD (1997a), OECD Proceedings, *Sustainable Consumption and Production, Clarifying the Concepts*, OECD, Paris.
- OECD (1997b), Report on the OECD Policy Meeting on "Sustainable Consumption and Individual Travel Behaviour", OCDE/GD(97)144, OECD, Paris.
- OECD (1997c), *Sustainable Consumption and Production*, OECD, Paris.
- OECD (1998), *Towards Sustainable Consumption Patterns, A Progress Report on Member Country Initiatives*, OECD, Paris.
- OECD (1999a), *Handbook of Incentive Measures for Biodiversity: Design and Implementation*, OECD, Paris.

- OECD (1999b), *OECD Environmental Data Compendium 1999*, OECD, Paris.
- OECD (1999c), *Environmental Taxes: Recent Developments in China and OECD Countries*, OECD, Paris.
- OECD (1999d), *Implementing Domestic Tradable Permits for Environmental Protection*, OECD, Paris.
- OECD (2000), *Consumption and The Environment: Exploring the Linkages with Economic Globalisation*, ENV/EPOC/GEEI(99)2/REV2, Working Party on Economic and Environmental Policy Integration, OECD, Paris.
- OECD (2001a), *OECD Workshop on Information and Consumer Decision-Making for Sustainable Consumption*. Background paper, OECD, Paris.
- OECD (2001b), *Information and Consumer Decision-Making for Sustainable Consumption*. General Distribution document ENV/EPOC/WPNEP(2001)16/FINAL, OECD, Paris.
- OECD (2001c), *Participatory Decision-Making Mechanism for Sustainable Consumption*. General Distribution document ENV/EPOC/WPNEP(2001)17/FINAL, OECD, Paris.
- OECD (2001d), *Household Food Consumption Patterns*, General Distribution document ENV/EPOC/WPNEP(2001)13/FINAL, OECD, Paris.
- OECD (2001f), *Household Tourism Travel Patterns*, General Distribution document ENV/EPOC/WPNEP(2001)14/FINAL, OECD, Paris.
- OECD (2001g), *Household Energy and Water Consumption and Waste Generation*, General Distribution document ENV/EPOC/WPNEP(2001)15/FINAL, OECD, Paris.
- OECD (2001h), *Policies to Promote Sustainable Consumption: An Overview*, General Distribution document ENV/EPOC/WPNEP(2001)18/FINAL, OECD, Paris.
- Pearce, D. W. (1986), *The MIT Dictionary of Modern Economics*, 3<sup>rd</sup> edition.
- Pearce, D.W. (2000), "Public Policy and Natural Resources Management: A framework for integrating concepts and methodologies for policy evaluation", mimeo, DGXI, European Commission.
- Pearce, D.W. and Atkinson, G. (1998), "The concept of sustainable development: An evaluation of its usefulness ten years after Brundtland", *Swiss Journal of Economics and Statistics*, Vol. 134 (3) 251-269.
- Pearce, D.W. and Warford, J.J. (1993), *World Without End, Economics, Environment, and Sustainable Development*, Oxford University Press.
- Pezzey, J. (1989), "Economic Analysis of Sustainable Growth and Sustainable Development", *Working Paper #15*, Environment Department, The World Bank.
- Proops, J.L.R., Atkinson, G., Schlotheim, B.F., and Simon, S. (1999), "International trade and the sustainability footprint: a practical criterion for its assessment", *Ecological Economics* 28 (1999) 75-97.
- Rawls, J. (1972), *A Theory of Justice*, Oxford, England.

- Schoser, F., Binswanger, H.C., Kurz, R., Dittmann, B., and Krause-Junk, G. (1998), *Reforma Tributária Ecológica*, Konrad-Adenauer-Stiftung, Centro de estudos, Papers ANO: 1998 N°33.
- Sunstein, C. (1993), “Endogenous Preferences, Environmental Law”, *Journal of Legal Studies*,22: 217-254.
- The Economist, “State and Market”, School Brief Series, February 17<sup>th</sup>, 1996.
- The Economist, “Rethinking thinking” Christmas Special, December 18<sup>th</sup>, 1999.
- The Economist, “Financial Indicators”, March 4<sup>th</sup>, 2000.
- Tlayie L. and Biller D. (1994), “Successful Environmental Institutions: Lessons From Colombia and Curitiba, Brazil”, LATEN Dissemination Note #12, The World Bank.
- The World Bank (1992), *World Development Report 1992*, Oxford University Press, Oxford, New York.
- The World Bank (1995), *National Environmental Strategies: Learning from Experience*, Environment Department, Toward Environmentally and Socially Sustainable Development.
- The World Bank (2000), *Greening Industry: New Roles for Communities, Markets, and Governments*, Oxford University Press.
- Varian, H. (1984), *Microeconomic Analysis*, 2<sup>nd</sup> edition, Norton & Company.