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**The Integrated Product Policy
and the Innovation Process:
An Overview**

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The Integrated Product Policy and the Innovation Process: An Overview

Bernard Sinclair-Desgagné^{}, Dina Feigenbaum[†], Émilie Pawlak[‡]*

Résumé / Abstract

Dans un premier temps, cette étude présente les grandes discussions entourant la mise en place d'une Politique Intégrée de Produits (PIP) en Europe. Elle insiste sur l'importance d'adopter une approche systémique afin de minimiser les impacts environnementaux dommageables des produits, et ce tout au long de leur cycle de vie. L'étude précise par ailleurs le caractère singulier de la PIP dans le traitement qu'elle apporte à la réduction des préjudices environnementaux. Le cadre dans lequel les gouvernements, les autorités locales et les organisations interagissent, afin de mettre en place cette politique encourageant une offre et une demande plus 'vertes', sera alors présenté. La dernière partie de la section s'attache enfin à introduire et à discuter les instruments nécessaires à la construction et à l'implantation de cette stratégie

Dans un second temps, cette étude s'intéresse à l'examen d'un aspect fondamental de la PIP, à savoir le processus d'innovation en tant que déterminant majeur dans la transformation des marchés. Il s'agira alors d'identifier les spécificités de l'innovation environnementale afin de révéler l'utilité d'une approche systématique et coordonnée. Enfin, les limites relatives à l'approche conceptuelle de l'innovation dans la PIP sont évoquées et discutées.

Mots clés : Politique Intégrée des Produits (**PIP**), analyse de cycle de vie (**ACV**), pérennité, développement durable, innovation, gestion environnementale..

The first part of this report presents the main debates concerning a proposal for establishing an Integrated Product Policy (IPP) in Europe. It shows the importance of applying a systemic approach in order to minimize the negative environmental impacts of products throughout their life cycle and how this policy differs from the traditional ways of dealing with this question. It presents a framework in which governments, local authorities, businesses and non-governmental organisations interact to adopt green product policies and to promote a greener demand. The main instruments necessary to put forward such a strategy are introduced and discussed.

The second part of the report concentrates on a central issue of the IPP, namely the process of innovation as a key determinant in the greening of markets. This second section intends to (1) identify the specificities of innovation in an environmental context in order to acknowledge the need for a holistic and coordinated policy and (2) to present some limits of the IPP in its conceptual approach.

Keywords: *Integrated Product Policy (IPP), life cycle analysis (LCA), innovation, sustainability, environmental management..*

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Introduction

The growing concern towards achieving sustainable consumption and production patterns has led the public and private sectors to look for a coordinated policy that could reflect their interest. Up to the present, environmental policies have often dealt with specific topics such as industrial emissions and waste management what has been associated very frequently with additional costs to firms. The challenge has become to incite firms, consumers and other agents involved in the product life-cycle to adopt strategies and behaviour that integrate environmental concerns.

The Integrated Product Policy (**IPP**) represents a shift in the way the society deal with environmental problems, being established with the inherent objective of greening the market.

In this paper, our intention is to review the basic issues surrounding the IPP from its beginning, embodied by the publication of the Green Paper, to more current considerations such as the effective implementation of the IPP.

In the first part of the report, we will present the basic principles and the strategy underlying the IPP. We will then examine the instruments supporting the implementation of the IPP. We will conclude this descriptive part by a review of the major limits and criticisms regarding the IPP policy and its execution.

In a second part, we will further analyze the inherent dynamic of the IPP by introducing the driving force of any transformation process i.e. innovation. We will discuss the nature and the role of innovation in product-oriented policy in order to identify possibilities of further improvements.

1. Integrated Product Policy: principles, mechanisms and criticisms

1.1. *Integrated Product Policy: Overview*

Integrated Product Policy (IPP) is an approach that is being developed in order to minimize the environmental degradation caused by products - by goods and services, during their entire life, that is, since their development up to their disposal. This policy takes into consideration the impacts of products throughout their life cycle as well as the integration of the economic, societal, and ecological aspects into this cycle.

1.1.1. *IPP Scope*

IPP deals with a variety of areas of a product life, starting with the extraction of natural resources, its design, manufacture, assembly, marketing, distribution, sale, and eventual disposal as waste, attempting to stimulate each part of each individual phase to improve its environmental performance.

Due to this holistic character, an IPP involves many different actors such as designers, industry, marketing people, retailers, policy makers and consumers.

With so many different products and players there is not a ready policy measure for the whole range. Instead there is a variety of tools – both voluntary and mandatory – that can be used to achieve the established objectives. This includes economic instruments, substance bans, voluntary agreements, environmental labelling and product design guidelines. The right balance between them all and the overall objectives for the policy is currently being developed at European level, stimulated by the publication of the Green Paper on Integrated Product Policy (Commission of the European Communities, 2001).

Shortly, IPP combines knowledge about Life Cycle Assessment (LCA) with a strategy that involves policy on development, trade, purchasing, environment, and several other areas. In this

way, specific instruments are introduced, serving as guidelines for conduct in the industry and in the public sector.

1.1.2. History

In the beginning of the 1990s, in the Netherlands, started the formulation of a product-related environmental policy. (The European Union, 2001)

Since then, representatives of environmental ministries who have responsibilities for products have met several times to develop and establish such a policy, at first informally, but from 1997 within the OECD framework. In that year a review of current practices in EU states and in individual companies was carried out for the Commission by accountants Ernst & Young and the University of Sussex in the UK. This study examined the major issues related to IPP, developed a framework for future developments and provided an overview of recent initiatives in selected Member States. In addition, it examined the role of all the major actors who are currently involved in IPP, such as industry, retailers and consumers. (European Commission, 1998)

On 8 December 1998, the Commission organised a Workshop on Integrated Product Policy that took place in Brussels. The event attracted participants from public authorities, industries, consumers and environmental organisations. The aim of the workshop was to initiate a brainstorming discussion on the definitions, objectives and priorities for the development of an Integrated Product Policy in the European Union.

The workshop was seen as a positive step by all stakeholders, allowing their integration at an early stage in the policy making process. Those are some of the preliminary conclusions:

- The European Commission needs to communicate further and explain the added value of IPP;
- IPP should be a framework under the umbrella of sustainable development with long term objectives based on existing environmental priorities (e.g. climate change, fifth action programme, etc);

- the root of IPP is the Life Cycle Approach or Life Cycle Thinking (as opposed to Life Cycle Assessment, which is only one of the tools that may be used to implement IPP);
- the role of stakeholders is fundamental: the approach should be clearly communicated, stakeholders should participate from the early stages and the responsibilities of stakeholders should be clear;
- the instruments used to implement IPP should be flexible and chosen on a case by case basis;
- the greening of products standards is an important issue;
- labelling approaches should be broadened to include Type I, II and III labels in a complementary system;
- IPP should be linked to sustainable consumption, in particular addressing consumption pattern;
- services need to be considered in IPP (Summary of the Workshop on IPP, 1998).

In May 1999, EU environment ministers agreed on the need to develop an environment policy that would “concentrate more on developing and implementing an integrated approach that would deal with the entire life-cycle of products”. They welcomed the Commission's proposal to draft a Green Paper, or a consultation document, on IPP (Ernst & Young , 2000).

1.1.3. The IPP Green Paper

On 7th February 2001, the European Commission presents a Green Paper on IPP with the objective of launching a debate on the role and possible measures that could be taken on a European Union level. (Commission of the European Communities, 2001; Commission Press Release, 2001)

The Green Paper main objective is to promote the development of a market for greener products, mainly by using the economic forces and interests of the different actors to find eco-efficient solutions. It proposes a strategy to strengthen and refocus the existing product-related environmental policies having as ultimate objective the improvement of the environmental performance of products throughout their life cycle.

The Green Paper emphasises the role of economic instruments and public procurement support in promoting the development of environmentally sound products. It indicates the way to develop product-related environmental policies, and suggests some possible mechanisms that might be used. Consultation on the 32-page document ended in June 2001, Council conclusions were reached at the Environment Council on June 7th 2001. (Council of the European Union Press Release, 2001; European Communities, 2000)

For the sake of illustration, part of the conclusion is presented below (Council of the European Union Press Release, 2001; European Communities, 2000).

“There is a need to address unsustainable trends such as depletion of natural resources and changes in the climate as well as diffuse emissions of hazardous chemicals and increased quantities of waste.

Some of the biggest challenges for sustainable development relate to production and consumption patterns and the environmental impact from the different stages of the life cycle of products. Traditional approaches of environmental policy are not sufficient to deal with these challenges as the products are becoming more complex and are made available through more complicated supply chains as a result of globalization and of increasing trade and economic activities as well as rising consumption.

An Integrated Product Policy should be an overall policy that can help to fill the gaps in existing policies by using a life-cycle approach when addressing impacts on environment and health from products and services and can deliver results by engaging all stakeholders in the development of a coherent and effective range of responses and measures.

IPP will be an essential contribution to the EU strategy for sustainable development and to all the three dimensions – the environmental, social and economical – of sustainable development by:

- stimulating a general greening of the market by improving the signals and incentives given to the market;
- addressing unsustainable trends by applying a coherent set of instruments to address the environmental impact of products, throughout their entire lifecycle, including transport;
- promoting innovation of environmentally sound products and stimulating markets for environmental technology and environmentally driven business development, contributing to a

well functioning internal market and a strengthening of the international competitiveness of European industry;

- raising the level of consumer protection by reducing the negative impact on health as well as improving environmental awareness among consumers and their ability to choose sustainable products based on reliable product information and to use products in an environmentally sound way;

- providing a link between social, economical and environmental aspects of production and consumption patterns, which are part of the IPP.

An IPP needs to be a long-term and dynamic policy that should be reflected in other policies. IPP should also supplement, support and strengthen other strategies by optimizing their programmes, actions and implementation, with a view to achieving the objectives of EU environmental policy. An IPP can also be an important contribution to strategies that aim at the integration of environmental concerns into other sectors (the Cardiff-process).

An IPP should aim for a continuous improvement of the environmental and health performance of products throughout the entire lifecycle. The long-term aim should be products that are highly efficient in terms of materials and energy and that do not contain nor require the use of substances that may give rise to adverse effects during the life cycle of these products on human health and the environment. As well as improving the performance of each product unit, IPP should aim for significant reductions in the total environmental burden generated by the quantity of products in circulation. To these ends, specific objectives for improvement, taking account of those set in the 6th Environmental Action Programme and its thematic strategies, as well as monitoring mechanisms, should be established as part of the IPP.

An IPP should embrace all environmental aspects, processes and stakeholders in order to avoid the transfer of environmental impacts and costs from one life-cycle phase or stakeholder to another and to stimulate preventive measures at an early stage of the product life cycle.

An IPP should promote the use of the price mechanism and efforts to include external cost in prices, in particular at the early stages of the product chain, in order to create effective economic incentives for all stakeholders.

An IPP should make use of an efficient and co-ordinated set of instruments and measures and ensure that these are improved and that new instruments are developed when necessary. The focus should be on market-based and voluntary instruments but the application of IPP should also ensure that, where regulation is required, it is designed to achieve optimal improvements in environmental effectiveness and in the market.

An IPP should create incentives to foster creativity and innovation for reaching environmental targets beyond the minimum secured by regulation and thereby bring about cost-effective environmental improvement.

INVITES the Commission to develop the general IPP approach set out in the Green Paper into a common vision, with specific and prioritised implementation measures, which clearly outlines the added value of the IPP approach.

WELCOMES the Commission's intention to work out in close co-operation with the stakeholders a Communication/White Paper on the IPP during the second half of 2001."

The discussions continued in the European Parliament and the Council of Ministers. On the basis of the Council's conclusions stated above, a White Paper outlining the Commission's strategy for implementing IPP was expected to be published in the middle of 2002, but it has not had been published yet.

1.2. *Instruments for Achieving IPP*

IPP contemplates both environmental and economic measures. In order to exercise an IPP some instruments should be put in practice to cope with the principles of sustainable development, without reducing the wealth-creation capacity.

The success of such an initiative depends to a large extent on the correct identification and use of the main instruments. On one hand, it is necessary to provide a framework in which State, local authorities, businesses and non-governmental organisations may be able to adopt green product policies; on the other hand, initiatives should be designed to foster green consumerism.

The Green Paper stresses that no single measure in isolation is likely to achieve the desired result and that a mixture of many different actions would be needed.

In order to improve the environmental performance of products through their life cycle, it is proposed a strategy to promote the development of a market of green products: the products should use fewer resources, lower their impacts and risks to the environment and prevent waste generation already in the conception stage.

For an effective IPP implementation, as stated in the communication *Commission adopts green paper on integrated product policy (2001)*, it is required to “overarching three goals of fundamental principles.” (Commission Press Release, 2001)

- ***Influencing price mechanism*** to develop market for greener products - through instruments that could differentiate taxation such as reduced VAT rates on eco-labelled products, or state subsidies, or an extension of the 'producer responsibility' concept to new areas.
- ***Stimulating demand for greener products*** - giving consumers easily accessible, understandable and credible information about the products they buy. The main instrument to achieve this goal is the use of eco-labelling, and encouraging large, public-sector organisations to adopt green procurement strategies.
- ***Promoting green supply of green products*** - by the use of instruments encouraging eco-design guidelines, promoting the generation and flows of life-cycle information about products, and integrating environmental considerations into European product standards.

In other words, among several measures, the Commission stressed that the following objectives and mixture of instruments should be put into practice:

- **Getting the Prices Right**

The use of **price mechanisms** would be necessary in order to stimulate and develop markets for greener products. Instruments here could include the differentiated taxation such as reduced VAT rates on eco-labelled products and the promotion of state aid policy within the New Guidelines on State Aid for Environmental Protection. (Commission of the European Communities, 2001; European Communities, 2000)

The aim is to ensure that the prices of products should more accurately reflect the external costs of those products. Prices would thus give a signal to the market regarding the environmental impact of products and so help to channel demand.

As one of the basic principles of an IPP is market respect, every measure must be put forward on solid basis to enhance competitiveness without producing any undesired effects. If the **internalisation of external costs** is not carried out on a sound base it may create market distortions, particularly if it is not universally accepted at international level.

- **Strengthening Green Production**

Several measures are necessary to stimulate business leadership in the **supply** of green products, such as improving the generation and flow of life-cycle information, environmental product declaration (EPD), eco-design guidelines and the integration of environmental aspects into standardisation.

According to the European Commission definition, "the Integrated Product Policy (IPP) is an approach that begins by asking how the environmental performance of products can be improved most cost-effectively. It is founded on the consideration of the impacts of products throughout their life cycle, from the natural resources from which they come, through their use and marketing to their eventual disposal as waste. It is also a relatively new approach to environmental policy¹" (European Commission, 2001b).

By considering the environmental impact of a product along its whole life cycle (and not only on the sources of pollution), this holistic approach of this product-oriented policy differs from traditional environmental policies

In such a systemic approach indeed, data and information from the whole life-cycle and from all the stakeholders need to be gathered and processed. The role of the Life-Cycle Assessment then becomes obvious as it enables the IPP to be supported by a broad base of knowledge.

¹http://www.ecobilan.com/uk_policy.php

Box 1 - The Role of Life Cycle Assessment and Eco-design in Strengthening Green Production
(Source: European Commission, 2001a,c,d)

Life Cycle Assessment (LCA) should include all significant environmental impacts during the entire life of a product. Hence, it is an indispensable tool for any Integrated Product Policy. Analyses using this method contribute to deepen integrated thinking in business, in the government and in the consumer sectors. Life Cycle Assessments coupled up with IPP help ecological optimization, making it possible to find the most favourable relationship between economic expenditure and ecological benefit.

LCAs contribute to each phase of the product life. They play an important part in supplying basic data during the product development phase, contributing immensely for the success of an eco-design.

LCA is a key tool for supporting eco-label design and hence, for facilitating the “greener products” marketing and public purchasing.

Within the ISO framework an *Environmental Product Declaration* (EPD) contains a variety of information about the composition and environmental characteristics of a product based on life cycle assessment (LCA). The exact type of information is specific to a particular type of product group and is determined in *product specific requirements* (PSR). These are drawn up by industry in full consultation with stakeholders and competitors. They do not contain limit values, although they can contain thresholds below which the presence of certain LCA data does not have to be declared, as it is not cost effective to collect.

Eco-design is considered a very powerful tool for any Integrated Product Policy, since once a product is put on the market, it is difficult to reduce its impacts. By focusing on their environmentally friendly design, several environmental impacts could be prevented. Possible ways to improve eco-design include:

- improving the generation and flow of life-cycle information;
- encouraging eco-design guidelines;
- integrating environmental considerations into the standardisation process;
- reviewing the approach of so-called "New Approach" legislation, such as the Packaging Directive and the planned Directive on Electrical and Electronic Equipment.

Yet, the stimulation of green product development needs to be complemented by a greener demand to be effective.

- **Stimulating Demand for Greener Products:**

In order to stimulate **demand** for greener products consumers need information that is easily accessible, understandable, relevant and credible. This can only be achieved through various types of eco-labelling. The Green Paper suggests an examination of the existing types of **eco-labelling** and consideration of whether the Commission should draw up a strategy on wider labelling.

Greening public procurement is a measure that is extremely emphasized for stimulating demand and a true success of any IPP. The importance of greening public procurement for IPP was made clear in the Green Paper itself. The workshop was called to consider the particular issues of awareness rising and exchange of best practice in the greening of public procurement. It was discussed the public procurement directives, legal issues surrounding public procurement and political issues. However, the Green Paper recognises the need to examine more deeply the public procurement law and its possibilities for giving preference to environmentally friendly products. (Charter and al., 2001)

1.3. Some Problems in Establishing the Integrated Product Policy

Promoting an Integrated Product Policy means to apply the principles of Sustainable Development in every area concerned with products; for this, measures have to be taken by the State to promote the supply and demand of products, ensuring social and economic prosperity and environmental protection. In other words, federal policies influencing manufacture, distribution and disposal of products have to be implemented. The public and private sectors should be encouraged as well, in order to demand products that meet specific economic, ecological and social standards.

Such broad policy has some difficulties in being established as stated in the Report on the IPP Green Paper Workshop: *“Launching the stakeholder debate”*. First, this policy implies a transition from direct intervention on local sites to the assessment of a global scope. This means that many stakeholders from a wide range of places and countries should be brought together.

Second, the recognition of products as a key focus for environmental policy is far from being completely pervasive in EU or in wider international policy making circles. Third, there is an issue of trade-off between promoting the internal market and securing high levels of environmental protection. An alliance needs to be struck between members allowing market forces to grow, and to secure that such growth is sustainable. (European Commission, 2001a)

It is agreed that IPP is not a simple case of passing legislation. The main driver behind the growth of green consumerism should be the market force, with the help of levers such as price reductions and better consumer information. The Commission points at the great importance of eliminating 'market failures' by ensuring that the price of products accurately reflects their full cost, including environmental impact costs. Environmental impacts have a cost that should be paid for by applying the 'polluter pays' principle.

Those measures to stimulate demand for 'green' goods must be supplemented by action on the supply side. This might include new design standards and information campaigns, backed up by easy-to-use tools for checking the life-cycle impact of a product.

Standardization and the use of 'product panels' are considered important instruments of supporting the IPP approach and for achieving sustainable development. Expert groups of stakeholders drawn together to develop new standards for particular products or product groups play a key role when it comes to enhancement of competition and the free movement of goods. The major environmental benefit of standards is that they facilitate the design and production of products to fulfil their purpose in an efficient way; however, responsibilities should be clarified between policy makers and standardisation bodies. Essential requirements have to be presented in a comprehensible way, which is a prerequisite for clear standardisation mandates. The use of innovative approaches in standards should be possible and encouraged (not just pass/fail criteria) in order to enhance the design and production of innovative products. (European Commission, 2001d). However, there are also critics pointing out to the fact that no further norms should be imposed to the industries; it should, on the contrary, aim at making the existing legislation more consistent.

Discussions showed that eco-design guidelines and lifecycle assessment (LCA) are important parts of any IPP. Prior to the workshop it was clear that an overview of existing LCA data is still missing and that the diffusion of existing data to the public and the business community has to be improved. Similarly, the use of eco-design guidelines needs to be promoted.

The European Parliament adopted its report on 17 January 2002 and demanded the insertion of the following measures to establish clear environmental objectives and timetables for IPP, as well as more explicit methods and monitoring tools be included:

- precise and uniform parameters for life-cycle analysis;
- proposals for how to reduce costs and efforts for SMEs;
- use of price mechanisms as financial assistance and tax incentives to internalize external costs;
- an analysis of the implications the IPP legislation would have on the EU's trade relationship with WTO members;
- proposals for changes of the public procurement rules, so that environmental criteria can be taken into consideration.

Environmental organisations such as the **European Environmental Bureau** (EEB) agree that IPP should cover a broad range of instruments, including taxation, fiscal incentives and low VAT on environmentally friendly products, the promotion of criteria led eco-labels and green public procurement. However, the commitment to apply them should be subject to further scrutiny and feasibility studies. The EEB feels there may be a risk that only the voluntary, informational and consensual instruments will survive. (European Environmental Bureau, 2001)

Industry federations like the **American Chamber of Commerce** in Belgium welcome the Green Paper but at the same time, are concerned that only environmental aspects are considered. Industry argues that the paper is moving from what in its origin was a product policy to achieve sustainable development supported equally by the economic, environmental and social pillars, to a purely environmental policy. They anticipate important WTO compatibility problems with

some of the proposed measures, such as VAT reductions for products that display the much-questioned European eco-label.

The main demands of the Industry federations are that regulation is avoided, costs are not increased, administrative burden is not increased and that true incentives are introduced.

The European Community of Consumer Co-operatives (Euro Coop) welcomes the European Commission's Green Paper on Integrated Product Policy, however, “Euro Coop urges the Commission to follow up the Green Paper with initiatives and legislative proposals in order to ensure that the IPP approach is properly implemented. Otherwise, the Green Paper ends up being a paper of good intentions but with no real value to the environment and to the society.” (Euro Coop, Position Paper 2001)

Euro Coop calls for the following to be included in an IPP:

- Introduction of a price policy making ecological products more competitive on the market.
- Providing the consumer with full information about products and possibilities of choice.
- Information about products could be given through labels on products, information on web-sites, educational measures, leaflets in shops etc. Euro Coop would like to see a strong support of the EU Eco-label as one way to submit environmental information in an easy manner.
- Member States should be obliged to do "green" public procurement being a role model for other stakeholders.
- Using practical and simple Life Cycle Analysis models to measure the environmental impact of products.
- Eco-design guidelines for products, which are profitable to use for companies in order for them to be effective.
- The body of standardisation must consist of all relevant stakeholders in order to reflect the various interests of society and to secure that the necessary environmental aspects are included in each product standard.
- Creation of stakeholder groups to work on how environmental goals can be achieved or obstacles overcome in relation to their particular product group.
- To support the IPP approach through research and development programs.

- To increase visibility and openness on producers' efforts to "green" their products through environmental management and audit systems, and financial reporting systems.
- Drafting of Guidelines on how to incorporate environmental costs and benefits into a company's annual account, based on the outcome of the Commission's study, in order to have a standard way of presenting environmental information in Annual/Financial Reports. (Euro Coop, Position Paper, 2001)

1.4. Main Criticisms

1.4.1. IPP and Costs Internalisation - "Right Price"

This means that price mechanisms should be introduced making ecological products more competitive on the market. In this way, a product, which is not environmentally sound, should lead to a cost-internalisation, so that the final price includes the product's damaging impact on the environment. This instrument could provide true price transparency for the consumer when choosing between similar products, but it is strongly criticized.

Some arguments from the Paper and Board Manufacturing and Converting Industry about the **Internalisation of Costs and Market Mechanisms** are presented bellow:

- The internalisation of external costs, if not totally exhaustive, is bound to create market distortions, especially if it is not internationally accepted;
- Demand must be driven by consumers and users; consumers should be educated, not made to buy given products through artificial subsidies;
- The perverse effect of economic instruments like differentiated taxation, for example, in a Community market in terms of breach of the principle of harmonisation of fiscal measures and hence of the internal market are not easy to assess but can in any case be expected to be detrimental as a whole. Industry strongly believes that economic instruments like taxation will not provide the appropriate incentives to green products.

- The paper industry is subject to intense competition from non EU countries and is concerned that IPP could intensify the gaps between countries as to how they address environmental protection;
- State aids would distort the free market of goods and services with very likely unexpected and undesirable implications.

1.4.2. Product Responsibility

Product Responsibility is viewed as a tool to support an IPP. There is a widespread support for Shared Responsibility between the industry and the consumers, since “industry is quite naturally suspicious of efforts by policy makers to manage the environmental performance of products.” In this circumstance, the role of consumers in determining broader environmental frameworks through their patterns of consumption is crucial. (European Commission, 2001a). However, the principle of Product Responsibility is criticized in the following aspects:

- IPP should be based on the principle of shared responsibility along the production and distribution chain. Actual users should be responsible for the proper use and disposal of used products – be them intermediate or final products.
- The appropriate allocation of responsibility – in line with the polluter pays principle - to the actors involved in the production, consumption and disposal of a used product is an essential incentive to improve the impact of products along their life cycle. Financial responsibility is that of those who put the product on the markets. Producers cannot be made responsible for decisions over which they have no influence.
- Consumers too have to be taken as responsible partners along the chain and share the “product” responsibility. Users also have a major role to play in deciding how they use the product and how it is disposed of.

1.4.3. IPP framework must respect existing market forces.

The stimulation of demand for green products by “greening public procurement” was pointed out as a market distortion. The Voice of Business in Europe – UNICE stated the following: “In every product market, there is continuous interaction between companies and consumers that results in complex, dynamic equilibriums. Authorities should not intervene in a way that creates market distortions. Nor should they try to artificially create markets for “greener products”. Consumers make their decisions taking into account a whole set of performance criteria, such as price, safety, quality, environmental performance etc. They are not demanding “greener products”, but rather better developed products. Therefore, any attempt to focus on only one of those components disregards the reality of consumer behaviour. Instead, IPP should aim at continuous improvement of a whole set of performance criteria, including the environmental dimension, and leave industry the choice of environmental aspects/impacts which offer the best opportunity for environmental improvement.” (UNICE, 2001)

1.4.4. IPP, Life Cycle Analysis and Eco-labelling

Eco-design guidelines and Life Cycle Analysis are important parts of any IPP; however, those methods should be practical and simple. A too ambitious model would be difficult to work with in practice and extremely costly. Companies should be able to decide which instruments are most suitable for them to improve their products.

In the Report on the IPP Green Paper Workshop “Launching the stakeholder debate”, it was agreed that: “presently, it is not possible to have a clear overview of already existing LCA data. Data on certain aspects e.g. on consumer behaviour is still missing or not available in a form considered sufficient. Furthermore existing data has to be made available to the public and the business community. Transparency of data is a precondition for an increase of public awareness. The greening of the economy is also a demand driven process; policy should then acknowledge the pivotal role of the consumers in the transformation of markets. If those parties are provided

with the necessary information, including LCA data or selected indicators they will be able to make more informed choices and influence the type, quality and availability of products. There was general agreement that a deeper understanding of LCA issues was necessary. This observation was considered valid for consumers as well as for the business community. Life cycle analysis data should not be used as a standard or as a justification to ban products but rather as a benchmark against which continuous improvement could be measured. In addition it was stated that LCA data has its limitations since they depend on certain premises.” (European Commission, 2001a)

LCA are perceived as too complex to be a basis for environmental product declaration.

Eco-labels are an area, which could be given an enhanced function. The paper states that the scope of eco-labels should be extended to cover as many products as possible and that further funding should be made available to boost the schemes on national and international levels. Nevertheless, this statement is largely criticized. It is believed that eco-labels are voluntary instruments and should remain so. They are meant to provide end consumers with information on the end product, not on production processes. The Confederation of European paper Industries - CEPI is very concerned that the IPP strives to make voluntary instruments such as eco-labels compulsory either through their reference in public procurement, economic instruments like differentiated taxation or more directly. Consumers should be educated, not forced to buy given products. The demand for greener products should not be created artificially possibly to the detriment of their fitness for use.

Criticisms suggesting that such a general framework would not bring the expected results made the Commission decide to identify some product groups to serve as examples of how to apply the Integrated Product Policy. In its upcoming Communication, the Commission is expected to select a small number of products, which cause environmental problems, for which concrete proposals - legislative and non-legislative will be made in order to show that this policy can work. (25)

1.4.5. Not Innovative enough

On May 2001, the European Environmental Bureau (EEB) published the "EEB Response to the Commission Green Paper on Integrated Product Policy, based on its experience with regard to product related environmental policies, namely in the field of waste related issues, chemicals policy, ecolabels, public procurement, standardisation, environmental management systems, and legislation addressing motor vehicles. The EEB strongly feels that “the Green Paper fails to address the key challenges of ecological product policy.” (European Environmental Bureau, 2001b)

The EEB publication starts by outlining the Green Paper's five major shortcomings followed by the EEB's responses. Its first point of criticism is the **Green Paper's failure to tell exactly which environmental objectives the IPP should achieve**. The EEB suggests a policy approach, aiming at increasing market shares for innovative products with third party verified ecolabels and the formulation of mandatory minimum performance conditions for the worst performing products. The Green Paper is also criticized for failing to make a systematic assessment of past experiences with product policies, the state of EU product policy, new policy trends with ramifications on products. The EEB suggests starting the IPP with a fair assessment of what has been achieved and which attempts have already failed.

"The EEB is very disappointed that the Commission does not properly address the lack of integration of environmental interests into the EU's privatized standardisation process", states John Hontelez, Secretary General of the EEB. "On many occasions we have underlined the need for a comprehensive strategy to green standardisation and we do it again in our response to the Green Paper on IPP. Standardisation must be made compatible with the environmental policy integration requirements of the Amsterdam Treaty."

The EEB welcomes that the IPP shall cover a broad range of instruments, such as taxation, fiscal incentives and low VAT on environmentally friendly products, the promotion of criteria led ecolabels and green public procurements. However, it suggests adding new initiatives for product liability and extended producer responsibility.” (European Environmental Bureau, 2001a; European Environmental Bureau, 2001b)

1.5. Conclusions

Integrated Product Policy (IPP) is based on the principles of Sustainable Development, aiming at the promotion of goods and services that, throughout their life cycle, will support social, economic and ecological improvement. The traditional way of dealing with environmental impacts is no longer appropriate and it is giving place to a new paradigm taking into account an integrated approach. “IPP implies a transition from intervening directly in local sites to assessing a global scope” (European Commission, 1998)

Environmental policy on products should be part of a set of policies, linking social and economical development with environmental protection. The execution of an IPP is only possible by promoting a body of thoughts in the public and industry sectors. Thus, an Integrated Product Policy means the coordination of various different instruments for promoting the development of environmental sound products, acting in areas such as education, public purchasing, trade, price, etc.

Product policy should have a holistic approach, considering the impacts on the environment in the products whole life cycle. For this, it is necessary to introduce a range of different instruments including Life Cycle Analysis, greener public purchasing, eco-design, eco-labelling, etc.

Due to this holistic character, Life Cycle Assessment is considered as an essential tool for any Integrated Product Policy. The Life Cycle Thinking Approach permits the improvement of the existing methods as well as the emergence of new procedures such as eco-design in the planning stage and eco-labelling in the marketing of the product.

Public Purchasing and the introduction of a price policy are considered essential measures taken by the State to promote supply and demand for greener products. Public Purchasing is even considered an innovative aspect if compared with the current policy. This instrument is also very important because “it connects a wide variety of different sectors of the administration, e.g. the treasury, construction and logistics, foreign trade, domestic trade, the environment; it also connects their major actors, e.g. Federal Department of Finance (DF), Department of the Environment, Transport, Energy and Communications (DETEC), Department of Defence, Civil Protection and Sports (DDPS). A substantial amount of money is also at stake. These conditions

are excellent for bringing the environmental sector into contact with others, and to exert real influence on the markets, in terms of the political objectives...”(SAEFL, 2001)

The implementation of those mechanisms has been criticized by the business and industrial sectors. Although recognizing the potential value of defining an integrated product oriented policy approach, they emphasize that:

- 1) IPP should be driven by industry and business;
- 2) IPP should not be seen by public authorities as a way to impose new regulation;
- 3) IPP should set objectives but not prescribe the means for achieving them;
- 4) Any IPP framework must respect existing market forces;
- 5) IPP should be based on the principle of shared responsibility (UNICE, 2001)

The Integrated Product Policy concerns the whole society. Market-based instruments should be used for changing consumer behavior and encouraging environmental friendly product demand. Eco-design is crucial for the success of a policy that takes into account the burdens from cradle to grave. LCA is a basic tool for providing information related to the product’s life it is a very important instrument for benchmarking and for showing the environmental implications of different choices. For the accomplishment of such a broad policy, the principle of shared responsibility, involving all stakeholders (government, industry, distributors and consumers) should be respected. The Government role should be of setting the framework, defining the objectives for the IPP implementation.

So far, we have addresses the major issues surrounding the IPP, that is the basic principles, the strategy, the objectives, the actors involved, the instruments (supportive or operational) and the criticisms it may have engendered. The open-stated goal of the IPP is to green demand and supply on a life-cycle basis. Innovation is thus inherent to this transformation process. Yet, it has not been addressed as a central issue in the IPP project. Therefore, we would like to discuss the role and the importance of the innovation process as we consider the later as a key success factor of the IPP. We have noted that the framework of the IPP per se as can be envisaged as an organizational innovation. However, the following will rather concentrate on the analysis of the major issues regarding innovation in an environmental perspective.

2. Integrated Product Policy: (Eco-) Innovation as a central issue

“The voyage of discovery is not in seeking new landscapes but in having new eyes.”

Marcel Proust

The IPP relies on three main issues, namely eco-design of products, information and incentives. More precisely, these building-blocks are divided between general themes (shared responsibility and information/communication) and more specific objectives (managing waste, creating markets, green products innovation, allocating responsibility and transmitting environmental information) (Ernst & Young, 1998)

LCA supports the IPP by offering the data and information it needs to be developed. In our particular perspective, LCA will have a bounding role; putting differently, LCA will draw the boundaries of our analysis framework. Afterwards, we will analyze the internal functioning system of this framework, and particularly the role played by innovation along the life-cycle.

Though acknowledging the importance of innovation in the greening of markets, the IPP may however contain some shortcomings in its analysis. It is clear that most of environmental problems (and even the minor arrangements decided in Kyoto) require innovative solutions, and sometimes radical ones. Indeed, the opportunities of improvement in terms of environmental performance have already reached or will reach a maximum for a number of products or processes. The underlying assumption is that it may not be possible to improve eco-efficiency without changing the whole system i.e. opportunities are bounded by the technological paradigm embedding these products and processes. This leads a growing number of authors to consider systemic innovation as the engine of the green transformation of the markets. We believe as well that such market transformation cannot be considered apart from innovation. Yet, we intend to restore incremental innovation as an essential issue in the IPP and generally speaking in the greening of markets.

To discuss this topic, we will analyse the relationship between innovation and environmental performance in a different perspective. Innovation Economics may bring new insights and constitute an interesting analysis framework of the dynamic of innovation. Several assumptions,

which we will develop later, have led us to adopt an innovation economic lens to discuss the IPP proposals, and particularly how these can stimulate and lead to an actual greening of markets. The specificity of environmental innovation (as a *non self-enforcing activity*) and the complex distinction between radical and incremental innovation constitute the central axis of our argument. We will try to demonstrate that these issues have a considerable impact on how the IPP should be framed and implemented if it aims at an actual greening of markets.

After a short outline about innovation and technological change, we will examine the specificities of innovation in an IPP perspective. This first definition of eco-innovation will then enable us to identify the determinants of eco-innovation as well as the opportunities and the justifications for an intervention.

2.1. Innovation and technological change: a background

An innovation is an invention that has found a useful and commercially viable application. Usual distinctions are radical/incremental, product/process, technical/organizational or social/financial innovations.

The OECD identifies three types of innovations:

- process innovations consist in producing the same output with less input;
- product innovations include improvements of an existing product or service and new products or services;
- organizational innovations basically define new management systems.

Being the source of technological change, innovation is a driving force of economic evolution and economists generally agree on the positive impacts that an increase in the stock of knowledge can have on economy and welfare. However, its consequences may appear to be inconsistent with a sustainability goal. We will address the topic of sustainable innovation in the following sections but we first want to examine the basic issues concerning technical change as they determine the role assigned to policies.

According to endogenous growth theories (ref), technological change stems from an *identifiable and cumulative process* (Dosi, 1988, Pearce, 2002) impelled by economic and technological trade-offs. In this perspective, the economic and legal framework will shape the scale, the patterns and the orientation of innovation, thus giving a significant role to governments and policies.

One way to analyse the process of technological change is to adopt a paradigmatic perspective: in that case, scientific progress results largely from technological *paradigms*, that is “a pattern of solution of selected techno-economic problems, [or] both an exemplar and a set of heuristics” (Dosi, 1988, p.1127). Technological *trajectories* (Nelson and Winter, 1977; Saviotti and Metcalfe, 1984) define the development path followed by technology in a given paradigm. The characteristics of technological change have 5 major determinants (Dosi, 1988, Dosi and Orsenigo, 1988)

- the appropriability of innovation i.e. the opportunities to obtain and maintain monopoly rents;
- the opportunities of expansion (sector-specific);
- the nature of knowledge involved in the innovation i.e. tacit or codified, universal or specific, public or private;
- the scope of the knowledge base;
- the degrees of uncertainty, irreversibility and endogeneity of market structures.

This concept enables us to identify different types of innovation. A common distinction is between:

- radical innovation: innovation that leads to the creation of new product, process or organizational form
- incremental (or adaptative) innovation: innovation that leads to the improvement of an existing product, product or organizational form.

Though useful and appealing, the line drawn between radical and incremental innovation is not as well-defined as it may seem. We would put forward two arguments:

- The cumulateness of the process: innovation process is subject to path-dependencies and learning effects. One can see radical innovations as the product or the outcome of several incremental innovations. In other words, an incremental innovation can be interpreted as radical considering its impact on technological system.
- The uncertainty inherent to the nature of innovation: the nature of the innovation is often impossible to anticipate, that is, a seemingly minor innovation can turn into a radical one as a result of the series of related innovations and revealed potential applications (laser technology is a good illustration).

However, we need to go further and examine innovation in relation with technological paradigm. Some innovations can lead to a new paradigm, and hence to a shift in the trajectory. Illustrations of these innovations include the internal combustion engine, oil-based synthetic industry or semiconductors.

By introducing the system change, we can now refine the traditional classification and differentiate between four categories:

- product improvement
- product redesign
- function innovation: new function of an existing product or service
- system innovation: new products and services (components, function, value) that lead to a new (technological) system

As we will see in the following, some authors emphasize on the last two categories, arguing that only these deserve to be considered in fostering sustainable development. We believe however that this assertion leads to an underestimation of the (essential) role of product redesign. Function and system innovation are appealing concepts and have indeed a high eco-efficiency potential (the development is also driven by environmental considerations). Still, this argument omits:

- the limits inherent to radical change (function or system innovation):
 - o agents might be resistant to change
 - o radical innovations might generate other risks for environment (ex: fuel cells...)

- long time horizons and uncertainty
- the considerable potential of product redesign (ex: auto catalyts...)

We will see in the next section that this distinction plays an important role in environmental considerations in as much as innovations do not have the same impact in term of eco-efficiency.

2.2. Environmental innovation

2.2.1. Innovation and eco-efficiency

As stated before, innovations differ in their environmental benefits. Let us recall the distinction made earlier between product improvement, product redesign, function innovation and system innovation.

A product improvement will have a modest impact on eco-efficiency because it only involves partial changes in existing products, letting the function and the production techniques unchanged.

Redesign usually goes along with replacement or improvement of the constituents with an environmental concern.

Though higher than product improvement, its positive impact on the environment may remain limited.

If so oriented, function and system innovations are likely to show a greater performance in terms of sustainable development. In the first case, eco-efficiency can be set as a criterion and becomes a function of the product or the service. In system innovations, the whole structure is renewed (product, service, production methods, infrastructure...), potentially in a goal of environmental performance.

This distinction is central to our purpose i.e. to examine the role that innovation could or should play in IPP. In an article published in 2001, Robert Nuij wondered if eco-innovation was “helped or hindered by IPP”. According to him, eco-innovation is “not based on redesign or incremental

changes to existing products”. He advocates that only function and system innovations are consistent with sustainable product development. By focusing IPP on product improvement and product redesign, he adds that the “EU risks missing out on the enormous potential for innovation and development [and] on sustainable development”.

This strong statement calls for an explanation. To do so, we aim to identify the specificities of innovation in an environmental perspective and see why IPP should acknowledge a greater importance to innovation in order to reach its primary goal.

2.2.2. Eco-innovation: a definition and the need of a specific policy support

First, it is worth signalling that OECD classification of innovation does not refer to the characteristics of change. According to Rennings (2000), “the general definition (...) is open to all senses”. The definition should acknowledge “the additional attribute of innovation towards sustainability” that is, reducing the environmental burden.

2.2.2.1. A three point-definition

- **Object:** reduce environmental burden, achieve specific environmental performance objectives
- **Actors:** there is a multiplicity of actors; innovations can arise from private or public firms, from governments, NGO, associations, consumers, unions, etc.
- **Nature:**
 - Technological: products, processes...
 - Social: behaviour, consumption habits...
 - Organizational: eco-audits, green R&D...
 - Institutional: local, national and international agencies and/or networks introduced to address environmental issues.

Though we will not extend on this topic in the present paper, there is a need to clarify this definition to prevent it from being too broad. Indeed, it is necessary to define clear boundaries between what can be considered as eco-innovation and what cannot. Does any environmental-

friendly product constitute an eco-innovation? Which, between the product and the process leading to the reduction of environmental burden, is the “real” (or effective) eco-innovation?

In the present paper, we refer to an innovation (whatever its nature) that intentionally aims at reducing the environmental burdens. In other words, its introduction specifically intends to achieve a given environmental performance objective.

If diversity is a significant peculiarity of eco-innovation, it is also the wellsprings of its complexity. A common mistake made about eco-innovation is to envisage it mostly from a technological point of view that is, to associate it to end-of-pipe technology. However, social, organizational and institutional innovations appear to be supporting and even enabling elements of a technological innovation. In other words, **the close interrelation of these aspects calls for an integrated policy and a *co-evolution* of incentives, regulations, management instruments, lifestyles, agencies and regimes of governance with technologies.**

2.2.2.2. Eco-innovation: determinants of the systemic failure

First, and if necessary to signal, environmental innovation is a costly and complex activity. In fact, it is usually associated with:

- considerable investments: R&D, equipments, compliance procedure (with standards), transaction costs (due to the multiplicity of actors involved) and so on
- a complex organization: environmental innovation involves a wide range of disciplines and a high number of actors from diverse fields. We can therefore expect coordination problems, coordination costs and information costs to be important;
- the necessity of a clear understanding and/or vision of future needs: given the relative lack of visibility in environmental issues and the informational problems (transparency, asymmetries, diffusion...), engaging in an eco-innovation process might appear too uncertain (hence too risky) for the different parties.

Second, environmental considerations are usually marginal in firms' strategy; the former being mainly driven by markets and technology factors e.g. costs reduction, market shares, market creation, quality, production efficiency or image. If commercial and financial benefits are not

evident in the short term, the importance of investments will hinder environmental innovation because of its negative impact on growth and competitiveness.

In summary, we suggest that eco-innovation is not a self-enforcing activity and that the resources devoted to it are suboptimal. Markets failures generate a bias towards market and technology driven innovations.

Measures elaborated in environmental policies seek to achieve specific goals e.g. reduction and management of waste, internalization of environmental costs, information or development of greener production techniques. Economic instruments (taxes, permits...), regulations, voluntary agreements and subsidies are an example of the most employed approaches.

However environmental policies can have a negative impact on eco-innovation. By generating positive spillovers in both the phase of innovation and the phase of diffusion, eco-innovation tends to lower the incentives to invest into future eco-innovation. If environmental policy is not complemented by a specific innovation policy, it may discourage eco-innovation because of the diminution of external environmental costs (Kennings, 2000).

If the deterioration of environment is not subject to sanction (internalization of external costs), hence competition between ecological and non-ecological products will be distorted and incentives to invest into eco-innovation will be lower. In the absence of an integrated innovation and environmental policy, extra-costs of eco-innovation will induce a bias into the innovation process towards more profitable but non-environmental concerns.

As we have noticed, many factors contribute to the orientation, the intensity and the scope of eco-innovation. These determinants are distributed into four major categories (Rennings, 2000), among which three are subject to policy.

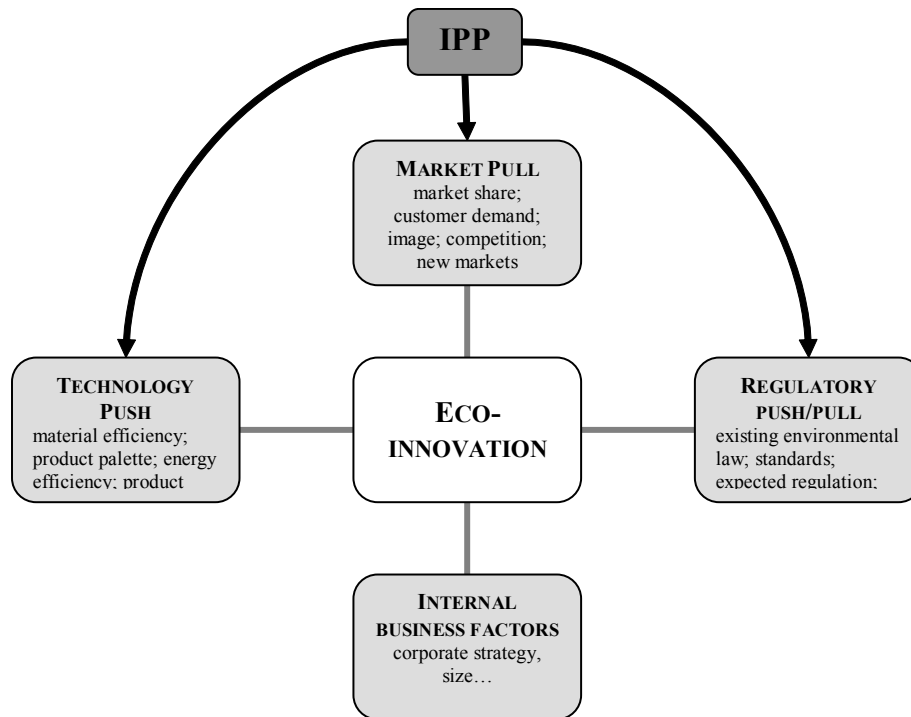


Figure 1 - The determinants of eco-innovation

Through the seven building-blocks enounced at the beginning of the section, IPP can affect the three classes of determinants, with a close link between early (late) stages and supply-side (demand-side) oriented blocks.

Given the complexity underlying IPP, regulation should be limited and public policy should insist on facilitating and stimulating (Fukasaku, 1999, 2000; Kemp, 2000). Such a framework will then affect the innovation climate and direct each actor's activities towards eco-efficiency and sustainable development.

Integrating life-cycle, actors, tools and information is a challenge of IPP and it does require a radical innovation, a paradigm shift in policy making. Seeking a general market transformation (green mass markets), IPP should stimulate functional and system innovations. However, it should not be seen as the only way to achieve sustainable product development as stated by Nuij (2001): diffusion of existing green products or services or widespread incremental changes for

instance can help IPP to reach its goal. LCA can support this process by revealing opportunities for optimisation (particularly at the firm level), providing information to consumer or evaluating policies' efficiency. By the way, it may be a more realistic approach of IPP given the time horizons and the uncertainty associated with system change.

2.3. Conclusions and Further remarks

The purpose of this section was to identify the diverse specificities of innovations that specifically intend to reduce environmental burdens. Our assumption was that eco-innovation does not fully fall into the traditional analysis of innovation process in economics. First, environmental considerations as a determinant of the firms' strategy are still minor if compared to technology and market forces. Given that eco-innovation is not a self-enforcing activity and that it suffers from markets failures, the creation of a policy that can facilitate and stimulate the innovation process can help governments to achieve sustainability and environmental performance.

An interesting feature lies in the very nature of eco-innovation. In our introduction we have noted that the IPP itself could be envisaged as an innovation, a new system of governance in which other environmental innovations develops. Organizational, institutional, technological and social innovations interact at every level of the system and at every stage of the life cycle. Particularly, eco-innovation fosters eco-innovation, e.g. institutional innovation can stimulate or facilitate technological and social innovation and so on. In other words, an eco-innovation can instigate a spiral of innovation, to which all stakeholders can contribute.

There is a place for intervention that is a policy that would coordinate the system and would create a stimulating framework designed to benefit from the positive externalities generated by eco-innovation and to limit the occurrence of markets failures.

As we have mentioned it before, LCA constitutes a promising and sound basis to start-off a consistent and ordered innovation process. Indeed, LCA helps to fill in the gaps related to what is needed to improve eco-efficiency. Moreover, the scope of LCA will enable a broader and better integrated policy if supported by a sound network of agents from the diverse implicated fields.

The data and information provided by LCA in the matter of production, consumption or management of waste can contribute to map out the path to improve existing position (products, services, institutions, habits...) and to develop new solutions. Conversely, eco-innovations can provide new “tools” to improve LCA procedures and achieve a broader and more accurate analysis.

Besides, our belief is that the emergence of such benefits is conditional to the actual integration of each party’s role and action into a coherent and broad network. The intuition is that a network including the key participating actors of IPP can enhance its efficiency by generating numerous positive externalities (learning effects, accurate coordination, reduction of information asymmetries, lowering of transaction costs, etc.). Programs (LCM, Eco-design, supply-chain management...) and the associated tools will benefit from this integrated system and strategy; they will also be fuelled by more comprehensive data and information, generated by the network (spillovers).

Finally, we would like to highlights some issues in which further research is needed. After having drawn the boundaries of the analysis framework on LCA, it is necessary to assess and to understand the mechanisms underlying the dynamic of the system. To do so, we believe Economics to be a powerful and sound approach in that economics of networks, evolutionist and neo-institutional theories among others can help understand the functioning and the driving forces of the system.

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