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Annex II to the
COMMUNICATION FORM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

A lead market initiative for Europe
Explanatory Paper on the European Lead Market Approach: Methodology and Rationale

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Methodology and Rationale

SUMMARY

Europe's competitiveness and ability to face global competition is hampered by a relative under-performance in innovation. Becoming an economic zone that could generate much more "lead markets" would bring a series of substantial economic advantages for the economy as a whole and for the citizens.

The present paper constitutes firstly an assessment confirming the above statement. Based on examples of successful lead markets, on the result of discussions with stakeholders and on the input from economic analysis, the paper indicates the positive impacts to be expected and analyses to which extend and in which form public intervention can best be conducive to such positive outcomes.

It notably details the potential economic advantages of the Lead Market Initiative (LMI) for Europe. Facilitating the growth of lead markets is an approach to bridge the gap between the generation of new technologies and the market success of innovations. The gains from closing the gap could include more rapid returns on investments and thus greater incentives for expanding private investment in R&D; location advantages for R&D and production facilities; higher productivity, increased exports, ultimately leading to higher levels of growth and employment. Given the areas identified, the approach would also generate substantial environmental and societal benefits.

This paper also recognises the well substantiated analysis that "lead markets" with a sustainable potential can not be artificially created but only facilitated by offering best possible conditions for transforming ideas into new products and services and therefore substantiate the policy choices made by the Commission in its LMI. Coordination of targeted policy measures that serve several policy objectives (health, environment, energy etc.) in a horizontal way could better foster innovation in specific areas, while avoiding creating burdens on innovative businesses and other organisations.

Finally, this paper complements the LMI communication in explaining the methodology that has been followed to identify some potential lead markets and to avoid possible negative side effects. Based on a set of prudent assumptions, the volume of each of these markets may double or triple over the period 2006-2020, for a total market value exceeding 300 billions euros and a total 3 million persons employed in 2020. Ten to fifty per cent of that growth might be attributed to the fact of being a lead market[1]. Applying a conservative average of 20% to these emerging markets[2] would attribute more than 60 billions euros of additional market volume (and close to half a million new jobs) to the lead market effect and related policy measures for Europe only.[3]

1 Based on past developments of lead markets.

2 70% for renewable energies, taken into account strong regulatory changes.

3 The cumulative effect is obviously much higher. For instance, the cumulated growth share of the increase in market volume that may be attributed to the LMI and related policies is expected to be higher than460 billion Euro.

TABLE OF CONTENTS

Introduction

The January 2006 Report of the Group chaired by Mr Aho on *"Creating an Innovative Europe"*[4] recommended the development of innovation-friendly markets in a more targeted way by creating conditions to facilitate the translation of technological and non-technological innovation into commercial products and services. The report calls for simultaneous and synchronous efforts at all levels and includes the recommendation to take steps to encourage 'lead markets'.

The Commission's Communication *"Putting knowledge into practice: A broad-based innovation strategy for the EU"*[5], defines a more integrated and coherent approach in support of innovation. An initiative for innovative "Lead Markets" is announced as part of this strategy.

The Council subsequently invited the Commission to present such a Lead Market Initiative (LMI) in 2007, based on a broad stakeholder consultation and targeting in particular markets with high economic and societal value[6]. The European Parliament (EP) welcomed in its report[7] the Commission's proposal to launch a LMI, aimed at facilitating the marketing of new innovative products and services in areas where the EU can become the world leader.

The Communication on the European Lead Market Initiative (LMI) presents this new instrument of the Innovation Policy. Its main message is that the available policy tools need to be better coordinated and timed to facilitate the emergence of lead markets in Europe and that such an effort, if adequately focussed and following an in-depth analysis, can bring substantial advantages for Europe's competitiveness.

The objective of the LMI is to develop a new approach, in addition to the horizontal innovation policy, to foster and accelerate the transformation of ideas into new products and services in Europe, with the ambition to promote in this way internationally successful innovation. This approach aims at facilitating demand-side potential of promising new innovative technologies or business models resulting in the early adoption of new business solutions in Europe. It is intended to create a virtuous circle of growing demand, reducing costs by economies of scale, rapid product and production improvements and a new cycle of innovation that will fuel further demand and a spinout into the global market. In other words, the aim is to trigger the positive effects of a lead market, as observed for instance in the case of the GSM standard for mobile telephony, CDs or ADSL .

The Community actions of the LMI would be implemented within the existing financial and human resource provisions by drawing on available resources and combining them in an optimal, mutually reinforcing manner. It thus does not generate any needs for extra Community funds or staff.

The LMI also comprises policy packages targeting six identified market areas with a possibility to expand to additional areas in the medium term. First five ambitious action plans

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4 Aho, Esko et al. (2006), Creating an Innovative Europe. Report of the Independent Expert Group on R&D and Innovation appointed following the Hampton Court Summit, January 2006. Luxembourg: Office for Official Publications of the European Communities. Available at http://ec.europa.eu/invest-in-research/pdf/download_en/aho_report.pdf

5 European Commission; Putting knowledge into practice: A broad-based innovation strategy for the EU, COM(2006) 502 final, 13.09.2006

6 2769th Competitiveness (Internal market, Industry and Research) Council meeting

7 Report of the Committee on Industry, Research and Energy (ITRE) on "Putting knowledge into practice: A broad-based innovation strategy for Europe; (2006/2274(INI))" FINAL A6-0159/2007

have already been developed and the packages are tailored to the conditions and problems of each of these areas.

The individual measures contained in the different action plans will be assessed according to the relevant impact assessment rules and will be subject to the relevant normal decision-making procedures.

The present paper therefore:

– describes the **consultation process** of interested parties;

– aims at demonstrating the **overall potential for economic, social and environmental benefits** that justify the administrative efforts needed to launch and implement the LMI and its specific initiatives;

– analyses the **economic nature of lead markets** in order to assess the main features of the LMI in order to avoiding risks of negative impact;

– assess the **relevance of the objective of the LMI** in respect of the economic theory and of the current economic situation of Europe and how it can be best achieved;

– identifies **very significant market prospects** for the first set of identified emerging markets, that confirm the high potential impact of the LMI implemented first in these domains.

The economic content builds, to a large extend, on the Commission Staff Working Document accompanying the 2006 Competitiveness Report[8] as well as on input from the industry during the stakeholders' consultations.

1. CONSULTATION OF INTERESTED PARTIES

The LMI builds upon various broad public consultations, as well as on continuous feedback received from Member States on innovation policy aspects in both formal and informal settings.

A first Europe INNOVA Thematic Workshop on "Lead Markets and Innovation" (June 29th and 30th, 2006, Munich, Germany) explored the concept of Lead Markets. The participants generally supported that concept. In particular, the role of the public sector was seen as instrumental in lifting obstacles to market development and as a facilitator for aggregating demand. Public procurement, standardisation and regulation were identified as suitable instruments to this end. Further consultations of the Europe INNOVA community were conducted in cooperation with the Europe INNOVA Innovation Panels that confirmed a generally strong interest in a possible policy initiative. However different opinions were expressed on the ideal "policy mix". For example, regulation is seen as a vital issue which can have mixed effects in lead markets, but can lead to success as in the case of mobile telephony.

[8] See Chapter 6 of SEC(2006) 1467/2, Commission Staff Working Document, Accompanying document to the Communication from the Commission: Economic reforms and competitiveness: key messages from the European Competitiveness Report 2006.

Another point raised was that industry engagement will be especially important in some sectors, such as in the greening of industries[9].

The European Technology Platforms (ETP) were in parallel consulted on the opportunities and conditions for a Lead Market approach in the potential market areas in which the outcome of the implementation of a strategic research agenda might be likely to introduce significant product or service innovations. In particular, the ETPs on textile, chemicals and construction signalled strong support for a LMI, which was taken into account when identifying areas for the LMI.[10]

In preparation of the individual roadmaps of the specific lead market initiatives, extensive consultations with relevant stakeholders were carried out by the Commission's Services. These consultations addressed issues such as the application of the Lead Market approach to specific areas, the economic and societal implications and the concrete actions to be considered for implementation. The consultations involved industry stakeholders, representatives of relevant national ministries and user groups. A detailed description of these stakeholder consultations can be found in the thematic preparatory documents to the Lead Market Initiative[93].

2. PROBLEM DEFINITION

2.1. Overall situation

Europe misses considerable growth and job opportunities if the current innovation gap isn't reduced more quickly.

The EU as a whole, and most of the EU countries[11], still lag significantly behind the top innovation performers in the world, such as the US and Japan[12]. There is no single explanation for this innovation gap. Frequently mentioned reasons refer to an underinvestment in R&D and the lack of market dynamics, including venture capital, regulatory barriers and a shortage of skilled workers in Europe.

Policy initiatives have responded to this challenge using, broadly speaking, two approaches: Firstly, by aiming at increasing R&D investment, and secondly by encouraging and facilitating the uptake of new ideas and their transformation into marketable products and services, especially by SMEs. So far, less attention has been paid to improve market conditions and to facilitate the realisation of the demand potential for innovative market solutions.

The first approach has dominated the European policy debate for some years. With impetus from the Lisbon strategy (2000), the Barcelona 3 % objective (2002) for more investment in research in Europe and the renewed Lisbon strategy (2005), R&D is increasingly considered to be a key contributing factor to economic growth and welfare. Meanwhile, almost all

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9 Reports of the 3rd set of Innovation Panels are available on the Europe INNOVA Web portal: www.europe-innova.eu

10 Proceedings of the seminars of industrial leaders of the ETPs in 2006 are available on the Web. See in particular: Seminar of the Industrial Leaders: Supporting Technology Platforms and the development of Lead Markets, 6 December 2006, http://cordis.europa.eu/technology-platforms/seminar7_en.html.

11 In particular if compared with the most innovative States of the USA.

12 See DG Enterprise and Industry (2007) European Innovation Scoreboard 2006, January 2007. Data for year 2004.

Member States have set targets for R&D investment. If these targets are met, the EU would reach an R&D level of 2.6 % of GDP in 2010 (up from 1.9 % in 2005)[13].

A number of Member States have significantly boosted their public investment in R&D in the past decade. EU-25 R&D expenditure grew by 2.7 % per year between 2001 and 2004 in nominal terms[14]. In 2005, 1.84 % of GDP was spent on R&D in EU-27, compared with 2.67 % in the USA and 3.17 % in Japan. If the current trend would continue, by 2010 Europe's R&D intensity will have declined to its mid-nineties level of less than 1.80 % of GDP[15].

Two thirds of the total investment in R&D of 3% of GDP should come from the private sector, according to the Barcelona goal. Yet the gap in business R&D expenditure of the Union relative to the USA and Japan continues to be higher than in public R&D expenditure[16].

Higher R&D spending, notably by companies, is in many cases a necessary, though not a sufficient condition for more innovation. What matters ultimately in this respect, is turning scientific discoveries and new ideas into new products and smart processes that create wealth and new job opportunities. More innovation-friendly market framework conditions are deemed to be necessary in Europe to reduce the time-to-market of new goods and services, thus better valorising R&D investments and creating a necessary incentive for business to invest in research and innovation. Public and private investment in R&D will only pay off, if firms can translate innovation inputs into innovation outputs and if they have sufficient market prospects to decide to make the necessary investment to achieve this goal. Without strengthening innovation dynamics, R&D investments and support to entrepreneurship activity may not be well valorised, hence diminishing the efficiency of the whole public effort in favour of a transition towards a European knowledge economy.

Innovation efficiency is the ability of firms to translate innovation inputs into innovation outputs. An indication of this ability is given by the ratio between the European Innovation Scoreboard (EIS) composite indices for inputs (education, investment in innovation, etc) and outputs (firm turnover coming from new products, employment in high tech sectors, patents, etc)[17]. A major issue is therefore to increase this ratio while at the same time creating the market conditions that will make it easier for firms to adapt to this new paradigm. **The development of lead markets could be instrumental to address that.**

2.2. Detailed analysis

Some countries (e.g. Germany, Finland and Italy) perform better on outputs than on inputs, suggesting that they are more efficient at transforming inputs into outputs than other countries (e.g. Belgium, Poland and Portugal), that have made relatively large investments but do not show yet a comparative performance on outputs. It should of course be taken into account that innovation is a long-term process and the progression of the output performance of the latter countries could improve in the coming years, as a result of ongoing investment in inputs.

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13 "Time to Move Up A Gear" The European Commission's 2006 Annual Progress Report on Growth and Jobs

14 EUROSTAT Science and Technology, 2006

15 Key figures 2007 on Science, Technology and Innovation: Towards a European Knowledge Area, European Commission, forthcoming

16 The forthcoming European Innovation Scoreboard 2007 indicates that the gap in business expenditure on R&D relative to Japan continues to increase.

17 TrendChart EUROPEAN INNOVATION SCOREBOARD 2005

On the demand-side, the openness to new products and services of a country's population might be one explanation for the fact that some countries perform relatively better on outputs and other countries on inputs.

While Europe plays a leading role in terms of its science and the provision of science and technology graduates[18], it seems less successful in converting science-based findings into commercially valuable innovations. For example, in relation to its population, Europe generates fewer patents with high economic value than the US or Japan. In 2003 the EU-27[19] had 34 so-called Triadic patents per million population versus 68 for the US and 106 for Japan.[20] The US also has a higher share of patent applications at the European Patent Office (27 %) than the EU has at the US Patent Office (16 %). In key areas such as biotechnology and information and communications technologies, Europe also lags behind in its share of patents. In biotechnology, EU-25 accounts for only 27 % of high-value "triadic" patents, compared with 55 % for the US. In ICT the shares are 25 % for the EU versus 37 % for the US[21].

The Community Innovation Survey of R&D Trends 2005[22] identifies **market demand for new products and services** as the most important factor influencing the level of private investment in R&D and innovation. The inventor and the early user are generally young innovating companies, who need to stay ahead of the competition. Such companies have to meet the high initial cost for placing products on the market and they run the risk of working with a technology that may not be fully developed.

Another issue is that existing market dynamics may not provide the right feeding ground for the **emergence and growth of fast growing SMEs**. In the re-vitalisation of Europe's markets, fast-growing SMEs play a key role. Even if the macro economic conditions have become more favourable, there is a risk that growth could not be sustained or would not generate sufficient jobs, unless enough new world class companies are created. The relative inability of the majority of European SMEs to grow rapidly may be a major handicap to growth in Europe[23].

These high-growth SMEs, so-called "gazelles", contribute to wealth through the creation of new business and jobs. These companies are said to provide high returns for investors, promote regional development, generate satisfaction for managers and employees, and make a significant contribution to job creation. Several empirical studies confirm the importance of high-growth firms for job creation. In the United Kingdom, 4 % of new start-up survivors were responsible for 50 % of jobs created by all new firms 10 years later. In the U.S., 3 % of the fastest growing firms generated over 70 % of the new jobs created by new firms between 1992 and 1996.

The first Global Entrepreneurship Monitor (GEM) report[24] on "high-expectation entrepreneurship" showed that high-aspiration entrepreneurs representing less than 10 % of

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18 European Trend Chart on Innovation, 2006 "Global Innovation Scoreboard" (GIS) Report

19 Except Bulgaria.

20 Key figures 2007 on Science, Technology and Innovation: Towards a European Knowledge Area, European Commission, forthcoming; p.47

21 SEC(2005) 430/3; Commission Staff Working Paper, Annex to the Proposal for the Council and European Parliament decisions on the 7th Framework Programme (EC and Euratom), Main Report: Overall summary, Impact Assessment and e-ante Evaluation {COM(2005) 119 final}

22 Community Innovation Survey (CIS): http://cordis.europa.eu/innovation-smes/src/cis.htm

23 "Putting Knowledge into practice. A broad-based innovation strategy for Europe" (COM(2006) 502 final) http://ec.europa.eu/enterprise/innovation/doc/com_2006_502_en.pdf

24 Autio, E. 2007. GEM 2007 Global Report on High-Growth Entrepreneurship. GERA: London.

the population of nascent and new entrepreneurs were responsible for up to 80 % of total expected job creation by all entrepreneurs. In addition, and contrary to popular perception, only around one-third of gazelles are 'high-tech' companies[25]. Fast-growing firms whose success comes from innovative approaches to marketing, organisation or distribution can be found across a wide range of activities, e.g. retail, services and manufacturing[26].

A recent OECD study using firm level data reveals that while firms' turnover is similar in Europe and the US, their post entry performance differs markedly[27]. Firms in the US are smaller than EU firms when they enter the market but, if they survive, they grow much faster and reach higher average sizes in terms of employment. The indicators of sales of products and services which are new-to-firms halved their performance from 2000 to 2004 and reached a worryingly low average level for EU-25[28]. The risk of not supporting these firms may be that the EU's economic recovery will slow down or not fully exploit opportunities, e.g. of lead markets, in terms of growth and job creation.

The CIS [17] also highlights that having a broad-based innovation strategy at EU or National levels increases significantly the efficiency of the innovation policy. A consensus is therefore emerging that a coherent and consistent policy approach requiring coordination across the different policy areas and policy levels (EU and Member States). The need for **increased interactions and better coherence between innovation-related policies**, both at the Member State and European levels, has therefore been stressed in the Lisbon Strategy[29]. The Commission's Communication on 'Putting knowledge into practice: A broad-based innovation strategy for the EU', the report of the Aho Group [4] and the BEPA Report on 'EU competitiveness and industrial location'[30] further support this new integrated approach. For example, the Commission's broad-based innovation strategy aims to improve the framework conditions for innovation by combining supply factors, such as research, workforce skills and access to finance, with measures strengthening the demand side.

Innovation has also been a central theme of the informal Competitiveness Council discussions during the Finnish EU Presidency in July 2006 with a focus on **demand as a driver of innovation**.[31] Similarly, the discussions during the Portuguese EU Presidency in July 2007 focussed on a sustainable industrial policy with the objective to 'speed-up innovation and

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25 OECD Study 'High Growth SMEs and Employment', 2003

26 ILP expert group report: Small and medium-sized enterprises (SMEs) are the backbone of all economies and are a key source of economic growth, dynamism and flexibility in advanced industrialized countries, as well as in emerging and developing economies. SMEs constitute the dominant form of business organization, accounting for over 95% and up to 99% of enterprises depending on the country. They are responsible for between 60-70% net job creation in OECD countries and in Europe, 65% of European GDP comes from small firms.

27 Bartelsman, E., S. Scarpetta and F. Schivardi (2006), "Comparative Analysis of Firm Demographics and Survival: Micro-Level Evidence for the OECD Countries", OECD working paper, no. 348. This study is based on firm level data for 1989 to 1994 for Canada, Denmark, Finland, Germany; France, Italy, the Netherlands, Portugal, United Kingdom, and US

28 European Commission; European Innovation Scoreboard 2006: Comparative Analysis of Innovation Performance. Luxembourg: 2007. < http://www.proinno-europe.eu/doc/EIS2006_final.pdf>.

29 Council recommendation of 12 July 2005 on the broad guidelines for the economic policies of the Member States and the Community (2005 to 2008) (2005/601/EC), in: Official Journal of the European Union, L205/28-37.

30 The Bureau of European Policy Advisers (2006), EU competitiveness and industrial location, available at http://ec.europa.eu/dgs/policy_advisers/publications/eu_comp_en.htm

31 Finish Ministry of Trade and Industry (2006), Demand as a driver of innovation – Towards a more effective European Innovation Policy, Discussion note to the informal meeting of the competitiveness ministers, Jyväskylä, Finland, July 10-11, 2006

develop lead markets for low carbon and energy and resource efficient technologies, products and services', naming low energy housing, energy efficiency in industry, low carbon emitting power generation, renewable raw materials and low emission cars as potential examples for lead markets.[32]

2.3. Summary

The weak innovation activity – i.e. decrease in new product innovation in 2000-2004 – and, more general, the lack of private investment in RDI, is very likely related to inadequate market conditions, insufficient market demand for innovative products and services and the lack of prospect for young innovative firms. Addressing this in a determined and focussed way might therefore contribute effectively to creating growth and jobs.

3. MAIN COMPONENTS OF THE ECONOMIC DEFINITION OF LEAD MARKETS

The analysis of the development of lead markets has received a great deal of attention from companies, scientists and policy makers. Lead markets may connect the development of new technologies, skills and knowledge with market success of innovations and lead markets could produce significant competitive benefits for a region or country. Lead markets could be a way of establishing a "virtuous cycle" that supports the market up-take and increases the interest in investment in a particular market and thus results in higher investment in R&D, skills and innovation.

The market-led approach could therefore constitute a particularly strong incentive for more private investments for research and innovation. This investment of the private sector would in turn promote its competitiveness. Moreover, the open innovation model supported by the LMI would favour the development of young innovative firms, facilitate the involvement of a broader scope of stakeholders and ultimately contribute to the development of highly competitive clusters that will sustain over time the competitive advantage provided by the lead market.

The first issue for a sound policy approach of lead markets is therefore to build on a clear definition of this concept, reflecting the current economic knowledge and observations. This should allow for a better identification of emerging markets that might become lead markets, as well as of the conditions favourable to their emergence

A lead market is the market of a product or service in a given geographical area, where the diffusion process of an internationally successful innovation (technological or non-technological) first took off and is sustained and expanded through a wide range of different services[33].

While the concept of lead markets implies that an innovation has gained the affection of a whole market, denoted by a high or rapidly increasingly penetration rate, the other concepts (such as innovating lead users, pilot or launch customers for innovations, pioneer companies) focus on the actors that are the first to generate, adopt or use a particular innovation.[8] The economic literature highlight that these other concepts, while able to provide advantages to an individual firm, generally do not foster the same level of macro-economic advantage to the

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32 Portuguese Ministry for the Economy and Innovation (2007), Towards a Sustainable Industrial Policy, Presidency discussion paper, Informal Meeting of Ministers for Competitiveness (SME and Industrial Policy), Lisbon, 20-21 July 2007

33 COM 2005 "Industry Policy" http://ec.europa.eu/enterprise/enterprise_policy/industry/index_en.htm and Mid-term review of industrial policy.

National or continental level concerned. Therefore, the lead market concept is more suitable for a public policy in order to maximise the positive externalities derived from the development of such markets.

This definition should therefore not be confused with various other meanings for the term that appear in the literature. For instance, most importantly, a 'lead market' is *not* necessarily the country or market where the innovation was first developed, or even used for the first time.[8] To elaborate, the economic definition that has been used for the Commission's policy purposes is based on the following four key notions. [34]

Notion 1: "take off" (or "potential of the market")

This is clearly different from the "first to invent" or "first to use". A lead market implies economy of scale and ability to respond to the need of a large number of users. This is needed to derive a competitive advantage on an international scale and to create a sustainable international path.

Notion 2: "needs"

Technology is an important element but not systematic. The identification of needs is even more important. Fast-growing firms, whose success comes from innovative approaches to marketing, organisation or distribution, can be found across a wide range of activities (for example, distribution systems using internet developed new business models; productions and sales of customized products have developed at large scale; new design of the distribution chain have led to huge and lasting advantages for lead enterprises).

A particularly important condition for the successful development of a lead market is to meet the demand, rather than to try to create the market. Policies and regulation could strengthen the orientation of firms to meet the demand in the lead market area. Public procurement should be geared towards enabling local authorities to use criteria that encourage innovative approaches (use of life-cycle assessment for determining the advantage of a product, avoiding lock-in due to procurement processes, assessing risk, etc.) rather than to policies that aim at pushing specific technologies, products or services into the market. Inappropriate use of public procurement could actually be detrimental to the development of lead markets over the medium term if a technology-push approach is adopted that favours solutions that are not suitable for large scale demand or that are incompatible to broader market developments. For example, cases where the role of the US military as a crucial launch customer for new technologies led to civilian applications are relatively scarce. Thus, while there are several well known cases of government R&D procurements that have successfully spun off into widespread market developments (e.g. the Internet, GPS, Alzheimer treatments), procurement of R&D and or new technologies should be based upon user needs and open ended innovation processes.[35]

Notion 3: "internationally successful innovation"

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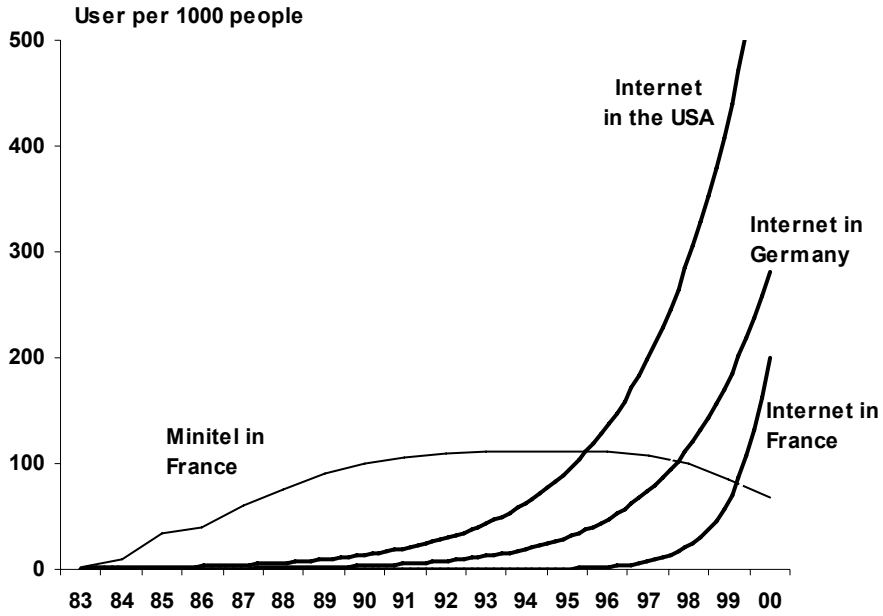
[34] The policy consequences of this definition have helped the Commission Services' WGLM to define the right set of policy instruments to propose to use and coordinate in support of a lead market initiative.

[35] An European Commission Communication on "Pre-Commercial Procurement: Driving innovation to ensure sustainable high quality public services in Europe" is envisaged to give guidance on the procurement of R&D services to meet public needs whilst maintaining openness and avoiding technological lock-in.

If other countries do not follow using the same innovation design, or technological trajectory, few exports may result, and ultimately the inward-looking development of the home market could be lagging behind and miss opportunities. One example is the success and subsequent decline of the commercial online service Minitel in France. Although the service was adopted earlier and more widely than the Internet in France, it lost the struggle to become the globally dominant design of a network protocol to the latter (see Figure 1 below). Another example is the effect that the success of the fax machine in Japan had on the rivalling telex system in Germany (see Figure 2 below).

The examples indicate that early adoption of a new technology by the market does not suffice as a competitive advantage. The openness to market trends thus appears to be an additional necessary condition for international competitiveness. This also implies that a country that lags behind scientifically but which domestic market is more willing to adopt new technology can not only catch up but also get ahead of the innovator.[8] Thus, it is not necessarily the inventions but the ability to turn inventions into commercially successful products, which determine international technology gaps. Consequently, lead markets must not necessarily be the most innovative markets[36].

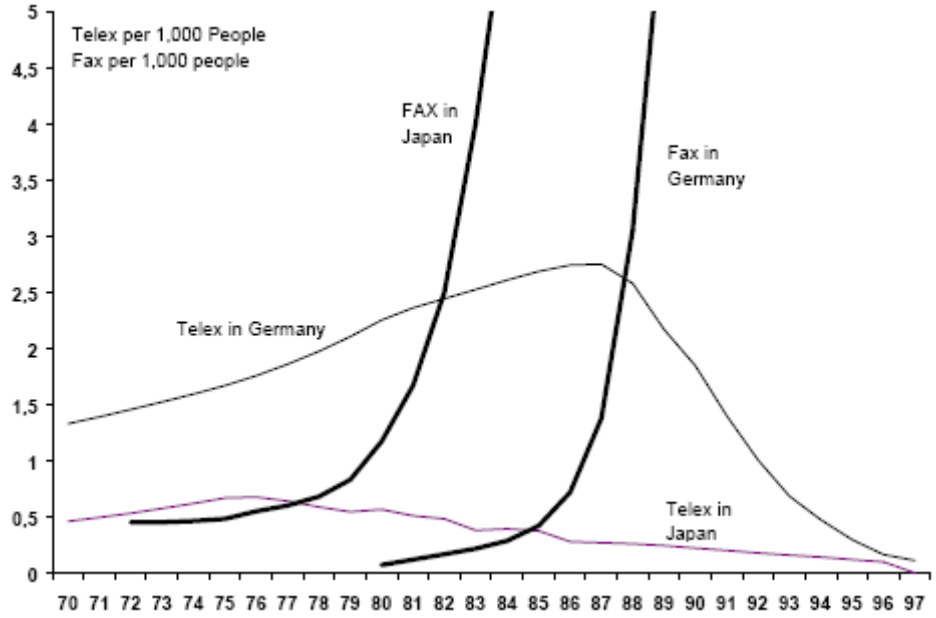
Figure 1: Minitel and Internet penetration rates in France, the US and Germany



Source: ITU, Beise (2001).

[36] Beise, M. and Rennings, K. (2005), Lead Markets for Environmental Innovations: A Framework for Innovation and Environmental Economics, Ecological Economics, vol. 52, pp. 5-17

Figure 2: The success of the fax and the demise of telex in Germany



Source: Estimations by Beise & Gemünden (2004) based on Scherer (1992), Yoffie (1997), ITU

Notion 4: "Open and competitive markets"

A European-wide lead market can reach the scale and competitiveness necessary to compete successfully world-wide only in open, competitive Internal Markets. The lead market approach builds on the legal framework related to the Internal Market and does not provide a rationale for derogations from this legal framework, e.g., in to the fields of competition, State Aid or public procurement. The size of the EU market (500 million people and 10,817[37] billion € GDP) will be a sufficient marketing springboard for a large number of products and services.

The Internal Market has contributed significantly to stimulate innovation. Market integration has a twofold impact on the incentives to innovate. Greater market size could increase profits and allows for more thinly spreading out of the costs of innovation over a larger volume of sales[38]. Secondly, firms that operate in a more integrated market are exposed to higher competition, so have stronger incentives to innovate in order to retain their market positions and stay ahead of their competitors[39]. Evidence however suggests that EU companies do not fully exploit the opportunities given by the Internal Market – about 60 % of the innovative companies tend to launch their new products on national markets while only 25 % achieve this in other Member States[40].

In order to improve our understanding of the economic obstacles preventing markets from functioning well, the Commission will conduct monitoring of product markets and sectors

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37 At current prices in 2005 for the EU-25.

38 Schmookler (1966):"The amount of invention is governed by the extent of the market".

39 Aghion, P., N. Bloom, R. Blundell, R. Griffith and P. Howitt, 2005, Competition and Innovation: An Inverted-U Relationship, Quarterly Journal of Economics, n. 120(2) ; Griffith, R., R. Harrison and H. Simpson (2006), "The link between product market reform, innovation and EU macroeconomic performance, European Commission economic papers, n. 243.

40 Innobarometer 2004 European Commission, Enterprise and Industry DG.

within the framework of the ongoing Internal Market Review. Information assembled this way will contribute to a better governance of Single Market policies. In the context of the LMI, the results of more systematic market monitoring exercises within the framework of a revised policy approach towards Internal Market could be seen as an important input to the identification of additional lead market areas in the future, by providing, *inter alia*, information on the market-based and policy-related causes of market malfunctioning in terms of innovation.

Notion 5: "Open innovation and clusters"

There are microeconomic decisive advantages to an open and cluster approach. For instance, both locally-owned and local affiliates of multinational firms may contribute to the creation of a lead market. On the one hand, an indigenous R&D capacity is essential to be able to master and assimilate innovative solutions and to exploit them to economic and societal advantage. On the other hand, some firms were not initially leaders in the respective technology but acquired the technological knowledge from abroad and a close interaction between market and production ensures a substantial manufacturing of several generations of products (cellular phones in the Nordic countries, cameras in Japan, computers in the US, wind energy in Denmark). Internationalisation is also good in terms of social welfare. Based on superior productivity or market intelligence, international competitiveness is often sustainable over time with a high degree of competition and lower prices for users. A cluster approach enables the pooling of resources needed to achieve the required degree of organisation and competencies as well as the amalgamation of innovators and users necessary to anticipate future trends of demand.

In lead markets that are characterised by a high degree of trans-disciplinarity and complex value chains, a trans-national cluster approach that links different disciplines and actors and facilitates cooperation may support the development of these lead markets

Therefore *policies supporting the excellence and openness of clusters* would contribute most efficiently to the success of a LM approach if on one hand they facilitate the ability of the European industrial structure to respond quickly to multidisciplinary challenges linked to the development and marketing of innovative products incorporating technologies and knowledge from diverse disciplines and sectors, and they also diminish the barriers between regional and national clusters, in order to facilitate transnational cooperation to attain a world-wide competitive scale, in particular in sectors related to the future lead markets.

4. THE ECONOMIC RATIONALE FOR A LEAD MARKET POLICY INITIATIVE

Well recognised object of the economic analysis, lead markets have only recently be analysed as a possible policy tool. Their place in innovation policy both at the EU level [4] and in some Member States (e.g. in Germany[41]) has however started to be recognised. The European mid-term review of industrial policy[42] concluded in that respect that a lead market initiative could contribute to effectively improve the competitive environment for business.

In the Commission Staff Working Document accompanying the 2006 Competitiveness Report, an extensive review was presented of the lead market concept, the potential role of public policy in the development of lead markets, the set of policy instruments and the

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41 BMWi (2002), Die innovative Gesellschaft: Nachfrage für die Lead-Märkte von morgen, Dokumentation 511, Berlin

42 Mid-term review of industrial policy COM(2007)374

problems arising from policy interventions. The present lead market approach as an additional and effective tool for innovation policy is largely based on this review.

The rationale is foremost based on two reasons, which are widely recognised by economists:

– favouring the emergence of a larger number of lead markets would entail a series of substantial economic advantages for Europe, well beyond the concerned sectors;

– public role can be effective in pursuing such a goal, provided it avoids certain factors of risks.

4.1. The economic advantages for Europe of encouraging the emergence of more lead markets

The identified economic advantages can be grouped in three categories:

4.1.1. Quantitative advantages

More lead markets will produce more growth and jobs, notably more qualified jobs. This would result of the combination of three components:

- Positive impact on GDP, due to faster market growth and a substantial rise of export where firms may profit from productivity gains that can be realised earlier than in other countries and therefore may become major players in the world market[43];

- More added value through increased innovative and knowledge content in the markets concerned, with a positive impact on qualified jobs. Incidentally, the approach contributes to bridge the gap between the generation of new technologies and market success of innovations notably by identifying factors that would make innovation policies, in particular market regulation, more anticipatory of global trends

- Better response to globalisation: the lead market can provide a certain protection from low-cost competition; since lead markets regularly keep larger manufacturing capacities at home in order to guarantee superior quality and allow for quick responses to varying local markets trends;

4.1.2. Better Adaptation to structural change

Not only more lead markets would provide quantitative advantages, but this would also constitute a structural gain for Europe, in terms of capacity to adapt over time to structural changes. Here again, three main components can be highlighted:

Prospect of gaining a sustainable advantage over several generations of products and innovation steps or even technologies (e.g. cellular phones in the Nordic countries, cameras in Japan, computers in the US, wind energy in Denmark)[44] due to the earlier adoption of an innovation, higher market share and market dynamics (i.e. virtuous cycle) that may enable to

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43 A lead market even has the potential to close an initial technological lag rapidly and turn into a technological lead based on superior productivity or market intelligence.

44 See also Blind, Knut; Bührlen, Bernhard; Menrad, Klaus; Hafner, Sabine; Walz, Rainer; and Klotz, Christian (2004) New Products and Services: Analysis of Regultions Shaping New Markets, Final Report of the study funded by the European Commission, February 2004, Karsruhe: Fraunhofer Institute Systems and Innovation Research

sustain the lead market 'premium' over some time. This creates confidence in the future and entails large cluster development linked to these markets.

Instilling structural change by offering opportunities to numerous high-growth start-ups and intra- and inter-sectoral dynamics as a result of innovations diffusing to other markets, as well as through the development of an entrepreneurial culture and changing societal attitudes towards innovations;

Inducing a virtuous investment cycle by stimulating investment by local firms as well as by attracting foreign direct investment and stimulating further investment in R&D and high-skilled knowledge (workers) as a result of rising market revenues[45].

4.1.3. Substantial benefits for the citizens and the society

Last but not least, public intervention to favour the emergence of lead markets could bring substantial benefits in terms of welfare. The following positive impacts have been identified by the theory and the stakeholders:

- positive impact in terms of employment and wealth as a result of the economic changes and growth;
- positive impact in terms of welfare as a result of more innovation made available sooner at reasonable pricing and responding better to users' needs and resulting of a high degree of competition;
- even more importantly, health and environmental advances through a wider application of technological innovations incorporating social preoccupations (the impact of most of the themes identified by the LMI are particularly illustrative in this respect);
- To a certain extend, global challenges might be more effectively tackled, by what the economic theory calls a transfer advantage: some countries successful in terms of lead markets, are characterised by their ability to influence or increase the incentives in other countries to adopt the same innovation. This can be instrumental in adopting earlier in a greater number of countries standards protective of the environment, or even in replacing obsolete products.

These lead markets advantages can be derived from the frequently observed pattern of the international diffusion of an innovation by countries (see Figure 3). The country where an internationally successful innovation first took off and is sustained and expanded is called a lead market; those that follow are lag markets. The time lag between the usually S-shaped curves of this **lead-lag pattern** illustrates the obvious potential benefits of being the lead market, in terms of growth, employment and wealth.

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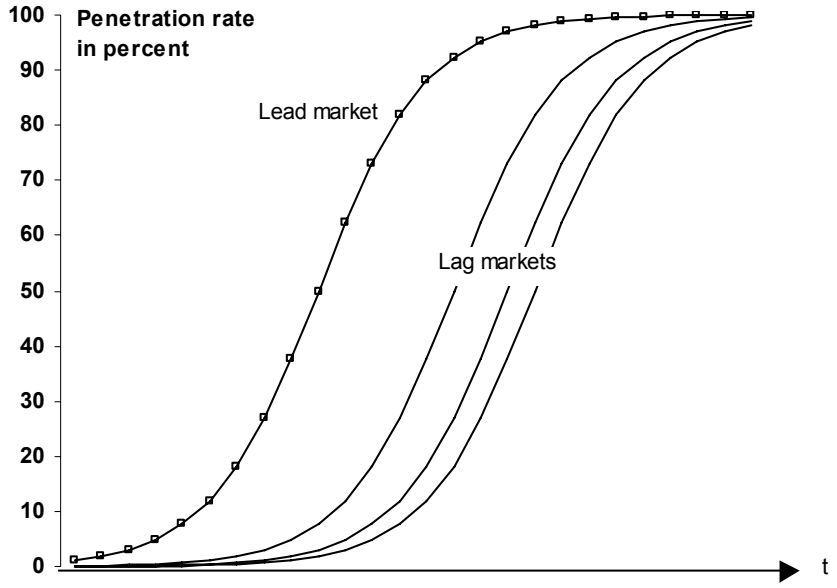
[45] For instance, a working paper by Tiwari et al. (2007) 'presents evidence that, controlling for traditional factors as size, market share, cooperative arrangement, and expected profitability, financial constraints affect a firm's decision of how much to invest in R&D activities. Apart from these constraints, other hampering factors as market uncertainty and institutional bottlenecks, regulations and organizational rigidities also affect R&D investment.' "

Figure 3: An international diffusion pattern of an innovation design



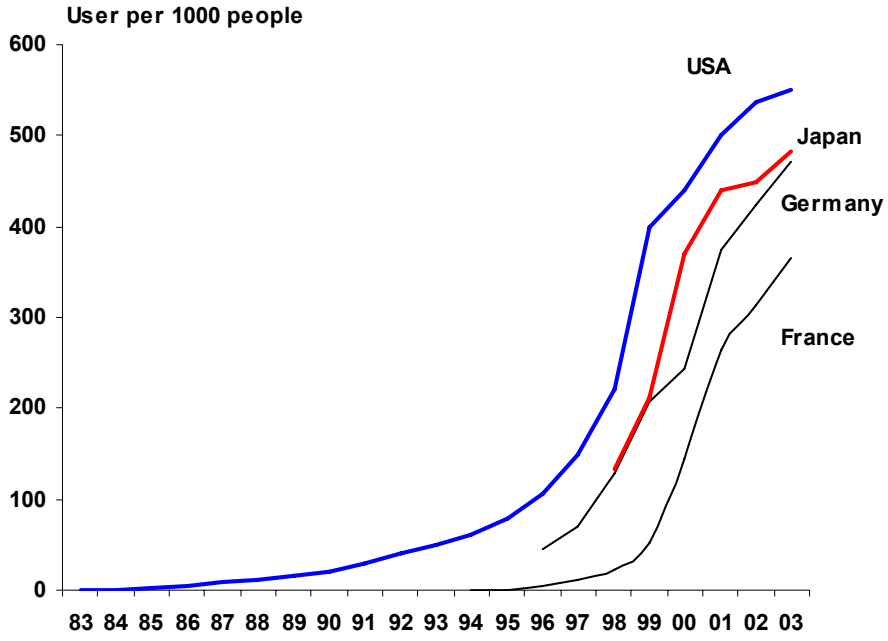
Source: ZEW, e.g. Beise & Gemünden (2004).

It should be stressed though that lag markets have often opted for a different, competing innovation design before the lead market, but later switched to the lead market design. As illustrated in Figures 1 and 2, the demise of Minitel in France and telex in Germany and the switch to competing designs as their own nation-specific designs are such examples. Therefore, importance has been placed far more on **anticipatory demand** (than on idiosyncratic innovation), which means that a country or market adopts a new technology early, which no other country finds worth adopting[46].

The following Figures 4 and 5 depict empirical evidence of this lead-lag market pattern in the diffusion of the Internet and the employment of robots in Japan, respectively. Comparing both figures also highlights that the gap between lead markets and lag markets can be of different magnitude.

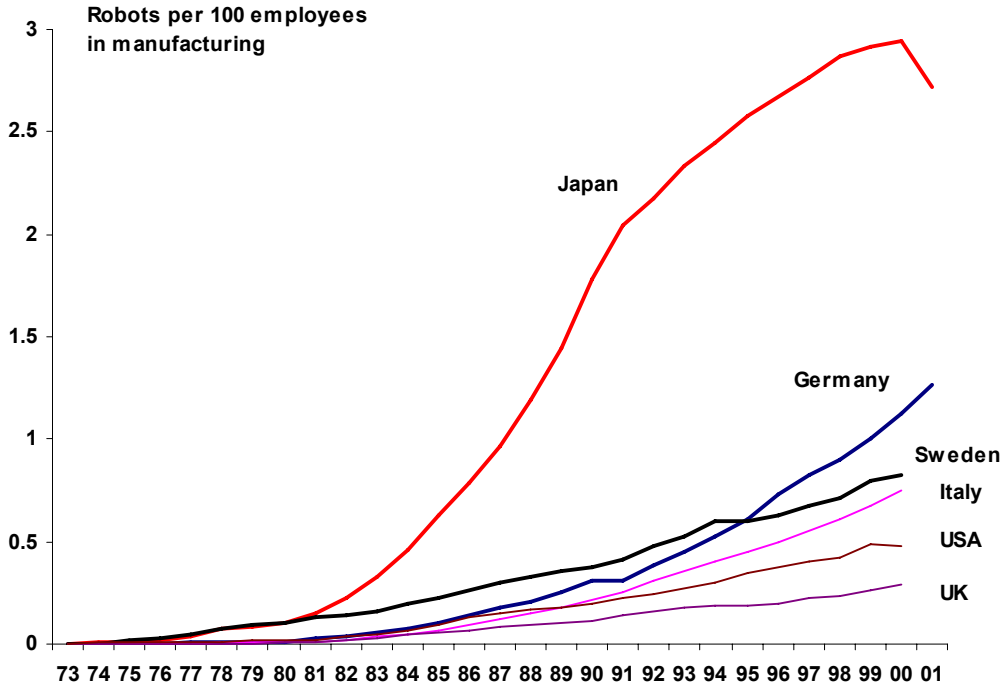
[46] Porter (1990) as elaborated by Beise, Marian and Gemünden, Hans Georg (2004) Lead Markets: A New Framework for the International Diffusion ofInnovation, Management International Review Vol 44 No 3 pp. 83-102.

Figure 4: Diffusion of Internet in selected countries



Source: ITU.

Figure 5: International adoption of robots in manufacturing



Source: IfR, OECD.

Further empirical examples of this lead-lag pattern of international diffusion of new technologies, for instance, are the classic rise of Japan as the steel-making nation following the adoption of the oxygen steel making process (Maddala and Knight 1967; Poznanski 1983; Lynn 1982; Papajohn 1991)[8], the leading PC usage of the United States with a prevailing IBM-Microsoft-Intel specification[47], and the success of Europe's GSM standard for digital cellular mobile telecommunication.

Quantifying ex-ante these three groups of advantages is difficult because the diffusion time lag can vary widely as can the added value in market volume. For instance, the advantages of the lead market over the lag market appear to be much stronger in the case of the adoption of robots in manufacturing (Figure 5) than for the diffusion of the Internet (Figures 4). However, even in cases where the gap between lead and lag market appear to be small, the benefits are still likely to be substantial as the advantages accumulate due to the sustainability of the lead-lag market pattern for some time.

Even in bad case scenario, where economic benefits cannot be reaped to the extent hoped, wider benefits for the economy and for the citizens may still be expected due to an increased responsiveness to emerging changes and consequent advances, e.g. in environmental and health aspects, as analysed in the second and third groups of economic advantages that have just been described. This alone should already justify the extra efforts needed for the policy coordination.

4.2. Public intervention can contribute to the emergence of lead markets

4.2.1. Favourable horizontal market conditions

Besides descriptive studies on the diffusion of globally successful innovations, the afore-mentioned Commission Staff Working Document accompanying the 2006 Competitiveness Report [8] also outlines further strands of literature that have analysed and tried to explain lead markets. These strands highlight some key general policy orientations that are favourable to the emergence of lead markets:

- Promotion of innovation and entrepreneurship in education and information of the consumer, which both make innovation more likely to be widely accepted

Statistical analyses of the international diffusion of innovations from a marketing perspective (e.g. Tellis, Stremersch and Yin, 2003) highlight the importance of 'the willingness of countries to adopt an innovation' with a focus on economic wealth and cultural dimensions as explanatory variables. Lehrer and Schlegelmilch (2006), highlight in this respect the role of markets that are able for cultural reasons to demand the highest performance.

- Ensure a lively competition climate and possibility of using alternative designs (hence the risks to choose standards depending on a single technology)

A high degree of *competition* raises the chances of local innovations becoming successful abroad as well (Nelson 1993; Porter 1990). In a country with a monopolistic producer or user, fewer alternative designs (or only one) are offered than in a country where several companies, including from abroad, compete. Competitive markets are, therefore, more likely to discover latent needs and innovation designs preferred by consumers.

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[47] Beise, M. and Rennings, K. (2005), Lead Markets for Environmental Innovations: A Framework for Innovation and Environmental Economics, Ecological Economics, vol. 52, pp. 5-17.

- Promotion of innovation systems and support to clusters and cluster cooperation that favour open innovation and user-driven innovation models

Co-operation has become increasingly necessary in order to cope with the rising complexity and multi-disciplinary nature of innovations and competencies needed to develop their applications in lead markets. Enright (1995), for instance, calls in this respect for an optimal mix of collaboration and competition. The role of local interaction between customers and innovators within 'national systems of innovation' is also emphasised by various studies (e.g. Lundvall, 1988; Fagerberg, 1992; Nelson, 1993).

4.2.2. Market failures

The most common rationale for public intervention is based upon the traditional market failure argument. Under-investment in R&D, for instance, occurs due to the public good character of knowledge (Nelson, 1959), positive externalities of new technologies due to knowledge spillovers (Arrow, 1962) and information asymmetries in financial markets that may lead to credit rationing for research projects. (Stiglitz and Weiss 1981; Goodacre and Tonks 1995)[48].

In essence, since the economic benefits of the lead markets for Europe will be maximised if the markets correspond to the conditions that are identified as favouring the emergence of lead markets, market failures need to be addressed in addition to favourable horizontal market conditions such as high competition in open Internal Markets.

Indeed, the benefits of innovation for society and for groups of enterprises in the long term are higher than the sum of benefits of individual firms due to the incomplete appropriation of innovation knowledge by companies. This gap between the societal benefits and the individual return on possible outcomes is even greater in the short term. As a matter of fact, the preference of firms for short term results limits also their investment in domains, whose development is difficult to quantify precisely. As a result, the level of investment of firms as well as their involvement in various lead-market related activities (such as participation in advanced clustering activities, or in the collective design and setting of open and interoperable standards) will be sub-optimal from the common welfare point of view. This justifies public intervention for instance to support clusters[49] or platforms to enhance cooperation between public and private stakeholders in the identification of the regulatory obstacles to market development.

However, if markets in new technology are indeed often burdened by information asymmetries and uncertainty, these problems affect all countries and generally do not explain the fact why certain markets emerge as lead markets and others don't. Market failure considerations do not therefore entirely explain the phenomenon. Conversely, *, policies that aim at making markets conducive to innovation, such as the LMI, to meet societal goals of economic, social and environmental nature through the a support to the emergence of lead markets need to go beyond addressing market failures to encompass other specific policy measures.*

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48 The following part is mainly based upon chapter 6 of SEC(2006) 1467/2 Commission Staff Working Document, Accompanying document to the Communication from the Commission: Economic reforms and competitiveness: key messages from the European Competitiveness Report 2006

49 In accordance with the COMMUNITY FRAMEWORK FOR STATE AID FOR RESEARCH AND DEVELOPMENT AND INNOVATION, Official Journal 2006/C 323/01

The need to address market failure in recycling

Areas such as the recycling of plastics and composite materials experience much greater difficulties for an economic perspective[50]. Plastics correspond to 40 million tonnes per annum in the EU, of which less than 39% is recovered in EU 15 (where recovery means incineration with energy recovery or recycling)[51]. In addition, the amounts of plastics going to landfill increased by 21% in the period 1990 to 2002. There are technical difficulties with the processing of plastic waste streams. This is because of the large range of different types of plastics available, most of which cannot be mixed if they are to produce high quality recycled material. Manufacturers in principle allow recyclates to be used in most components, provided that the specific quality requirements are met. The fact that dismantled plastics components are currently only available on a very small scale is because dismantling, sorting and logistics costs outweigh the possible returns. In comparison to metals such as steel, the situation can be regarded as a **market failure**. Furthermore, the plastics markets for both virgin and recycled materials are part of a global market, and subject to much greater volatility than markets for many other recycled materials. Plastics recycling and markets are heavily impacted by the export of plastics to the Pacific Rim. Thus there are many good reasons to focus **a lead market activity on plastics in particular**.

4.2.3. Other specific policy measures

In addition to addressing market failures, policies should also remedy to the possible unfavourable or sufficiently supportive market environment from a competitiveness point of view (regulatory and standardisation environment).

Lead market models suggest that policy-makers can indeed improve upon the factor that renders a local market a lead market. In addition to the general policy-mix aimed at encouraging innovation (see section 4.2.1), demand-orientated policy instruments seem to offer solutions for attempting to induce innovation, their diffusion and even a fast-following approach.

The objective of providing a more conducive environment for innovation and market development is already a justification in itself, especially since the focus of the LMI is on a more integrative co-ordination of mutually interdependent policy measures that do not require additional funding. Nevertheless, the possible substantial advantage that being a lead market holds for businesses, citizens and the environment is the core incentive for following this approach.

The section 4.1 has clearly outlined the potential strong economic advantages of lead markets, especially through its accelerated growth and increase in market volume and factor of structural change.

However, there are also **limitations and potential risks** of lead market oriented policies. Direct government interventions might improve a certain attribute of local demand but such interventions are at the same time prone to negatively affect other factors that constitute a lead market. A particular attention to the following risks seems needed in the implementation phase of the LMI:

- If government intervention in the standardisation process in product markets is premature, the lead market potential is weakened as the selection of a particular innovation design or a

[50] COM (1998) 463 final The Competitiveness of the Recycling Industries

[51] Assessment of the Environmental Advantages and drawbacks of existing and emerging Polymers recovery processes, Gaiker (2006)

technology by the government or other non-competitive agencies is normally a poor replacement for a competitive market solution.

- The same risk applies if public procurement or public support programs support an idiosyncratic innovation design that is not able to counter the competitive strength of the competing innovation design in the lead market, but keeps the domestic market away from the coming global standard, since domestic and foreign suppliers would respond to the specified design, even though it stands no chances on the world market.
- Public procurement as an instrument to generate early demand for innovations often also focuses too much on achieving quality criteria for new technologies (e.g. for military, space or health missions) that can lead to quality characteristics above the market and socially optimal levels, i.e. restricting cost-effectiveness and thus acceptance by private customers, effectively preventing the innovations to constitute a lead market.
- Strong support by a national government to promote the adoption of technologies can restrict exportability of innovations if national legislation and regulation tend to focus only on domestic needs and the local environmental context.

Avoiding these risks doesn't imply to have a zero policy change option. For instance, having an anticipatory approach of demand in standardisation or regulation, means to identify technology trends and new categories of products and services, that might need to enlarge or modify the scope for standardisation or regulation and address several issues related to interoperability, not only within a single market segment, but between various categories of products in previously unrelated markets. All these changes in approach can be achieved without pre-empting technology choices. Similarly, the fact to favour the search for innovative solutions in public procurement can be done in an open and transparent manner, based on a dialogue with the civil society and better information of various stakeholders. This can be very efficient in revealing the advantages of new solutions and therefore favour the quicker attainment of a critical mass for an emerging market, but can be done with a view to avoids the risks identified above.

On the basis of an extended discussion of these limitations, the Commission Staff Working Document accompanying the European Competitiveness Report 2006 has identified a number of *success factors* that lead market oriented policy should take into account [8:]

- Incorporate foreign market needs and preferences of customers from abroad;
- Transfer domestic market preferences abroad;
- Lower the cost of production to a level that is sufficient to make an innovation attractive in other countries;
- Be neutral with regard to the choice of technology, i.e. the policy should allow for competition between competing innovations;
- Shift the country to the forefront of a global demand trend;
- Be compatible with policies designed to support the innovation process, i.e. policies to protect intellectual property, correct for knowledge spill-over's, or combat credit market imperfections.

5. FEATURES OF A LEAD MARKET INITIATIVE

5.1. Main features

The principal characteristic of a lead market policy approach is tighter co-ordination in synergy and time between **policy measures which act on the demand-side factors**. This concentration of different efforts makes it possible to resolve interdependencies between various demand-side factors and thus lead to better outcomes. The aggregate impact in terms of the economic, social and environmental benefits is therefore likely to be higher than the sum of the impact of the individual actions. Various stakeholders have pointed out their general expectation that improved policy coordination would yield unprecedented benefits. In addition to coordinating a mix of policies aimed at encouraging innovation, the measures available to a lead market initiative are such that they supplement and reinforce synergistically the more supply-side oriented measures, notably the research policy. Features of an approach to innovation policy for lead markets:

An approach to innovation policy for lead markets should be applied notably to areas where coherent and coordinated policy-making by relevant public authorities can speed up market development, without interfering with competitive forces.

The *key features* of an approach to innovation policy for lead markets are as follows:

- It offers a policy framework for the prospective, concerted and focused application of relevant policy instruments, with the objective to help to bring new technologies and ideas faster to the market;

- To this end, a set of coordinated actions will have to be implemented in a consistent manner, all aiming at lifting obstacles that hinder the development of new markets or at providing incentives for their more rapid emergence. The mix of the actions will be determined by the scope of the market, by the legal basis of the policy instruments and by the public organisations that can implement them (i.e. EU, national, regional, local level and various regulatory organisations).

The lead market approach supplements the Union's industrial policy focus on creating conducive conditions for innovation by removing obstacles specific to new, emerging market areas in Europe that provide innovative solutions to societal needs, including concern for the environment, by a proactive, anticipatory and timely policy.

It does so by ensuring a more integrative co-ordination of mutually interdependent policy measures, which has nothing to do with directly creating new markets or technologies ("picking winners"). Instead, the objective is rather to develop and to test a policy concept that can be supportive to this end. The main added value of such an approach to innovation policy for lead markets would be to improve the efficiency of existing policy instruments and their impact on innovation. The present approach aims at applying the concept of concerted policy action in a short-medium term timeframe to a number of specific areas where, as a result, a strong impact on innovation can be expected. The present selection of the first six markets is in no way exclusive and the approach could be applied to further candidate lead markets.

The Aho Report pointed out that 'many elements for lead markets are already in place, including relatively high incomes and a willingness to purchase higher quality goods', yet that the following *key steps* need to be further taken to encourage the emergence of lead markets: [4]

- Provide a harmonised regulatory environment across the EU favourable to innovation and based on early anticipation of needs. The LMI calls indeed for an anticipatory approach that sufficiently takes into account new technological and market developments[52].This would be more effective if such an approach is developed in close cooperation with the Member States, in the same way as the "Action programme for reducing administrative burdens in the EU" outlines how the Commission intends to work with Member States to cut administrative burdens on businesses by a quarter by 2012[53].

- Use standards-setting powers to demand high-technical performance levels and reach agreement on new standards quickly and efficiently. Here again, the LMI calls for a more result oriented standardisation process that supports the market take up of new business solutions more effectively[54].

- Use public procurement to drive demand for innovative goods[55], while at the same time improving the level of public services; and

- Foster a cultural shift which celebrates innovation and a desire to possess innovative goods and experience innovative services; such that Europe develops as a natural home for innovators[56]. In this respect, education and skills could constitute in the future an additional element to a LM approach, with recommendations on how to adapt education and skills, taking into account the needs of the specific lead market The Commission identified the key competences necessary for living and working in a modern innovation-oriented society[57]. The Member States' education systems are instrumental in ensuring that there will be an adequate supply of key skills to support innovation.

In addition to the elements identified above, other elements identified by the stakeholders' consultations include:

- Business and innovation support services, training and communication: Launch of specific actions to develop European platforms that foster the further implementation of innovation policy for specific lead markets, by bringing together knowledge transfer, incubation and access to finance in support of innovative SMEs that contribute to the creation of new markets in strategic areas.

- Financial support and incentives: Recommendations for improving access to finance, taking into account the needs of policy development for lead markets in specific areas. A wide range of initiatives provide and stimulate access to finance in R&D and innovation; e.g. the Framework Programmes, Competitiveness and Innovation Programme, the

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52 For instance, a study by the Fraunhofer Insitute suggests coordinating the policies of regulatory bodies to foster innovation in such a way that they can 'exploit windows of opportunities' to establish lead markets, i.e. the combination of favourable supply and demand conditions.

53 Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions "Action programme for reducing administrative burdens in the EU" - COM(2007)23 final.

54 A specific consultation process on the horizontal issue of innovation and standards is foreseen by the Commission in 2007.

55 http://www.proinno-europe.eu/doc/procurement_manuscript.pdf

56 The 2005 Innobarometer showed that European citizens were evenly split between positive and negative attitudes towards innovative products and services.

57 Proposal for a Recommendation of the European Parliament and the Council on Key Competences for Lifelong Learning, European Commission - COM(2005) 548.

JEREMIE Initiative, Cohesion programmes and numerous national, regional and local initiatives[58].

The issue in the case of the LMI is to identify more precisely how such policies can be effectively coordinated for specific areas and how far they address clearly identified challenges in these markets. **Each specific lead market calls for a particular mix of policy instruments and actors**, thus raising the problem of consistency in terms of policy priorities and timing. The main challenge will be to define and implement the different policy agendas in a way that synergies can be expected.

This concern is reflected in the methodology used to identify appropriate market areas. The European Commission undertook intensive stakeholder consultations to identify a consistent set of criteria for the identification of the market areas. These consultations drew, in particular, on the very large industrial and thematic coverage of more than thirty industry-led European Technology Platforms (ETP)[59] and on the eight Europe INNOVA Panels[60] and led to the establishment of the criteria referred to in chapter 2.2 of the Communication:

– Demand pull instead of technology push:

– Broad market segment:

– Strategic societal and economic interest:

– Added value of prospective, concerted and targeted, but flexible policy instruments:

– No "picking of the winners"

These criteria were completed by an assessment of the feasibility of launching a lead market initiative in these various sectors in terms of availability of information, ongoing work in the Commission and its administrative capacity. Further detail on the identification process are provided in appendix 1 to the present document.

The appendix 2 analyses the questions about challenges and policy responses, based on the responses to questionnaires to stakeholders and on the analysis by the various services of the Commission involved in these policies.

5.2. Does the LMI approach take account of lessons learned from previous initiatives?

The lead market approach builds on and incorporates elements of previously established initiatives by R&D policy and by innovation policy in Europe. Generally, four types of policy to support R&D and innovation have been applied with greater and lesser degrees of success in the past.

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58 The recent Communication on "Financing SME Growth" pointed to further actions to improve access to finance, see http://www.eif.eu.int/jeremie, www.cordis.lu and www.ec.europa.eu/cip

59 See list at http://cordis.europa.eu/technology-platforms/individual_en.html

60 These sectors are: aerospace, automotive, biotechnology, ICT, textile, energy, eco-innovation, and gazelles (High Growth SMEs); see http://www.europe-innova.org/index.jsp

Looking back at the history of industrial and innovation policies, approaches fell mainly into the following categories:

– governments could support technologies in which governments have a strong interest or may play a role as a procurer, yet the risks of such approaches are high. The cases where public authorities been successful in fostering the emergence of new markets are rather special and relatively few in number, even if some are very important. In general, therefore, pro-innovation procurement should be based on open approaches that reduce the risk that public money is wasted on technologies that are not accepted in the market;

– governments could use subsidies to support the transfer of basic to applied research (by companies) and to promote the take-up of new goods and services, for example in the case of HDTV[61];

– variations on technology roadmaps and action plans have been used for more than two decades as a tool for providing frameworks for a more conscious integration of all aspects of technology into market development. In 1994, the so-called Bangemann report[62] and its accompanying action plan[63] on 'Europe and the global information society' proposed "ten applications to launch the information society" and measures to "stimulate markets so that they can rapidly attain critical mass";

– governments could try to "pick winners" in commercial applied R & D.

The analysis of the outcome of these approaches help to identify the reasons for success or failure. An important lesson is that **primarily top-down, centrally planned and technology-focused approaches to innovation policy are seldom effective.**

A more market-oriented view of innovation embraces the dual efforts of channelling public funding to support more effective industrial and public-sector R&D, of addressing weaknesses in the innovation system, for example by measures to remove barriers to innovation[64]. The 3 % Action Plan and the Commission's Communication "More Research and Innovation" of October 2005, were amongst others, important milestones in this respect.[6566]

Earlier efforts have attempted to improve efficiency and impact of innovation policy instruments on competitiveness and growth. In the past, innovation policy has confined itself to the identification of promising market perspectives offered by technologies and to the definition of supporting policy measures to foster market breakthroughs of innovative solutions. The **novelty of the approach to innovation policy for lead markets** is:

– first, how these different instruments shall now be **coordinated** and

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61 EU Commission Staff Working Paper on digital interactive television services COM(2004)541 final}

62 Europe and the global information society, Recommendations to the European Council, Brussels, 26 May 1994.

63 COM (1994)347: Vers la société de l'information en Europe: Un plan d'action

64 Dearing, A. Science 315, 344 (2007)

65 Communication from the Commission "Investing in research: an action plan for Europe", COM(2003) 226 final/2, 4.6.2003

66 Delivering on the Modernisation Agenda for Universities: Education, Research and Innovation' - COM(2006) 208, 10.5.2006.

– second, how to instil a new culture in the public administration at all levels on better integrating in the different functions (regulation, support, procurement, etc.) the goal to promote innovation.

Therefore, the challenge ahead is to practically implement such roadmaps in a strategic manner and not to lose sight or momentum over time.

6. SUMMARY OF MAIN ECONOMIC BENEFITS OF THE LMI IN SIX IDENTIFIED EMERGING MARKETS

Based on the economic analysis presented in the previous part 4 and in particular the section 4.1, it is clear that the actions suggested in the specific thematic Lead Market Initiatives, that follows the policy options described in part 5, will facilitate growth and strengthen demand in Europe.

The concrete quantitative impacts of the LMI on the GDP and on employment are difficult to calculate, given the large range of imponderability, externalities and intricate interaction of various factors, on which the development of these market segments depends. The present part constitutes therefore only a tentative to illustrate what could be, under certain assumptions, such a quantitative impact.

Taking into account these uncertainties, the choice has been made to systematically retain very prudent assumptions:

– The likely advantage in terms of exports that would result of a successful development of several lead markets is not integrated in the data of market development. Therefore the positive quantitative prospects for the market development tend to be minimised;

– When faced with several market development forecasts, we usually retained the lowest[67], also minimising the figures given for the prospects for the market development;

– In terms of impact on employment, we based our assumptions on a very high increase in labour productivity in these markets[68]. The resulting figures on the likely positive impact on employment are therefore also significantly minimised both because the market development estimate is very prudent, and because of these hypothesis on productivity forecast;

– Finally, among various hypothesis on the likely impact of the specific market segment becoming a lead market on market prospects, we retained here again a low hypothesis of 20%[69] of gain in market development, i.e. one third below the average gain of well document previous experiences.

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67 I.e. lowest in the case of the emergence a successful lead market. An exception is the case of the Renewable energies, for which the decisive role of regulation led to integrate prospects linked to these regulatory changes

68 Based on an analysis sector by sector, taking into account the structure of the industry and past experiences in emerging markets

69 Average for the five first identified emerging markets. A specific hypothesis being retained for the Renewable energy markets.

In spite of this prudent approach, as outlined below, the conclusion is that the LMI and related policy initiatives have a significant economic potential, if successful.

6.1. Overall market prospects and impact of the LMI and related policy activities

This section addresses two questions: first, the evaluation of overall market development and, secondly, the evaluation of overall impact of the LMI and related policies.

6.1.1. Market and employment perspectives

As regards to the first issue, the detailed analysis of market developments in section 6.2 below gives a scattered view, because values are given for different geographical markets and timings. Therefore, the following tables were prepared to provide a consolidated and comparable overview of the expected development of market growth and jobs for the first six identified potential lead markets, including the additional advantages related to their "lead market" position

As the available data set was based on forecasts of different sources and for different time frames, expected volume growth and jobs had to be computed by applying some prudent assumptions and methodologies.[70] Hence, these forecasts figures may at least provide a succinct indicative picture of the potential of the identified emerging markets. The figures are based on very cautious assumptions and do not reflect in particular the additional export potential that could be generated by a lead market position and which is very difficult to estimate in a reliable way.

On this basis the volume of the products and services in these emerging markets in the EU (see Table 1) is expected to rise by between 50% in eHealth and recycling, and a nearly doubling in protective textiles, to a triple increase or more in bio-based products, renewable energy and sustainable construction by 2020. Overall, the **total market volume** for all these six areas is expected to rise from 121 billion in 2006 to 304 billion Euro in 2020, representing an **increase of 182 billion Euro**.

Following the expectations of growth in these six markets, an increase in employment of more than a million jobs in the EU is anticipated (see Table 2). The increases range from a moderate rise of around 7-10% in recycling and protective textiles, and an around 50% increase in eHealth and sustainable construction, to a doubling and tripling in renewable energy and bio-based products respectively. Overall, total employment in the six markets may grow from 1,875 million in 2006 to 3,007 million in 2020, representing a **job rise of 1,132 million**. More details on the growth expectations can be found in appendix 3.

[70] For instance, the conservative estimations do not consider the positive effects of exports in the calculations.

Table 1 : Expected market growth of the identified emerging market areas (2006-2020)

Market areas [71]	**Volume** of the new markets products/ services in the EU in **2006** [million Euro]	**Volume** of the new markets products/ services in the EU in **2020** [million Euro]	**Growth in volume** resulting from market development and policy initiatives, 2006-2020 [million Euro]	**Growth share attributed to the Lead Market Initiative** and related policies in 2020 [million Euro][72, 73]	**Cumulated growth share attributed to Lead Market Initiative** and related policies, 2006-2020 [million Euro][74]
eHealth	21000	30000	9000	1800	12600
Bio-based Products	19000	57000	38000	7600	53200
Protective Textiles	8800	15200	6400	1280	8960
Sustainable Construction	24000	87000	63000	12600	88200
Recycling	24000	36000	12000	2400	16800
Renewable Energy	25000	79000	54000	38000	266000
TOTAL (six areas)	**121800**	**304200**	**182400**	**63680**	**445760**

Table 2 : Expected job creation in the identified emerging market areas (2006-2020)

Market areas [71]	**Jobs** dependent on the new products/services in the EU in **2006** [thousand jobs]	**Jobs** dependent on the new products/services in the EU in **2020** [thousand jobs]	**Growth in jobs** resulting from market development and policy initiatives, 2006-2020 [thousand jobs]	**Growth in jobs attributed to the Lead Market Initiative** and related policies, 2006-2020 [thousand jobs][72, 75]
eHealth	250	360	110	22
Bio-based Products	120	380	260	52
Protective Textiles	205	228	23	5
Sustainable Construction	500	870	370	74
Recycling	500	535	35	7
Renewable Energy	300	634	334	304
TOTAL (6 areas)	**1875**	**3007**	**1132**	**464**

71 For further information on the scope of the identified lead market areas please see appendix 3 below.

72 The benefits of lead markets (i.e. the premium) that contribute to the growth in volume are expected to range between 10-50% depending upon the area (e.g. see diffusion difference between robotics and the Internet) and an average of 20% is assumed for the calculation.

73 Regarding renewable energy, the growth share attributed to policies is computed differently. Here, the difference is calculated between the expected volume of 79 billion Euro when reaching the Commission's target of a 20% share of renewable energy sources by 2020 and the volume of 41 billion Euro that corresponds to a forecasted share of 10,4% of renewable energy sources by 2020 in absence of additional policy efforts on renewable energies. For latter forecast, see 'European Energy and Transport: Trends to 2030 – update 2005' published by the Directorate-General for Energy and Transport of the European Commission in 2006.

74 The calculation is based upon assuming a linear progression of growth curves, although in practice they are expected to display S-shaped curves.

75 Regarding renewable energy, the share of the created jobs that can be attributed to policies is computed differently. Here, the difference is calculated between the expected number of 634.000 jobs when reaching the Commission's target of a 20% share of renewable energy sources by 2020 and the number of 330.000 jobs in this market that corresponds to a forecasted share of 10,4% of renewable energy sources by 2020 in absence of additional policy efforts on renewable energies. For latter forecast, see 'European Energy and Transport: Trends to 2030 – update 2005' published by the Directorate-General for Energy and Transport of the European Commission in 2006.

6.1.2. Potential impact of the LMI and related policies an the first set of identified emerging markets

The second issue is the estimation of the potential quantitative impact of the LMI and of related policy initiatives. Not only is it difficult to estimate overall policy impact, but it is also very hard to differentiate between the impacts of different policy measures. Policies are often interlinked and influence each other. Thus, they have indirect impacts upon the objectives and success of related policies. For instance, the success of the LMI for the market area of renewable energies can obviously not be assessed without taking into account the expected intense policy initiatives to reduce greenhouse gasses (GHG).

The analysis in this paper however suggests that obtaining a lead market position without the type of coordinated action that is proposed in the LMI will be very difficult and that on average the benefits for Europe of the development of these emerging markets would be substantially lower. Indeed, the fact that in the majority of the cases, major recent lead markets have been developed in the USA or in Japan, even when Europe had strong scientific and industrial positions in the related domains, is largely explained by the difference between markets and policies, which are more homogeneous in large national markets (in the USA and in Japan) than in the EU. Therefore, an initiative to tackle this comparative disadvantage is crucial to create a balanced competitive situation for our industry in Europe. The estimates below attempt to give an indication of the importance of obtaining a lead market position and hence can be considered to put a quantitative value upon the effect of the proposed policy efforts. For the reasons indicated above, such a quantitative value must of course be considered with caution. This is why, as already mentioned, it is based on conservative assumptions and can be seen as only indicative. The calculations are made explicit in the 4th and 5th columns of the two previous tables.

Based upon the past experience of lead markets, a ten to fifty per cent of growth might be attributed to the fact of being a lead market. Applying a conservative average of 20% to these emerging markets[76] would **attribute more than 63 billions Euros of additional market volume and 464,000 new jobs in 2020 to the lead market effect and related policy measures** for Europe only.

The cumulative effect is obviously much higher. **The cumulated value of the annual increase in market volume that may be attributed to the LMI and related policies is expected to be in the excess of 445 billions Euro over the period 2007-2020**. Similarly, the cumulative effect of an annually higher amount of employment in terms of hours worked would also build up further wealth.

This would therefore constitute the basis for a **sustainable wealth effect** that might induce several positive effects in terms of balance in budget and social expenses and in terms of overall business activity in Europe.

6.1.3. Summary

The forecasts in this part 7 clearly show the potential for these emerging markets in terms of growth, jobs and consequent wealth. They also show that an important part of the calculated benefits will only be reaped by those home markets that gain a lead market position and therefore demonstrate the value of the Lead Market Initiative.

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[76] 70% for renewable energies, taken into account strong regulatory changes

The sum up the LMI and related policies are likely to have a very high positive impact in terms of:

- Growth and employment on the identified emerging markets;
- Overall growth in Europe based on a wealth effect, with therefore an impact beyond these markets;
- Europe's competitiveness in these markets;
- Europe's overall competitiveness by favouring structural change and generating a virtual circle of investment in the knowledge economy;
- Contribution to health and environment protection, as a result of the themes of the identified markets.

While this section has highlighted in quantitative terms the overall benefits in terms of growth and jobs for the potential lead markets and for a successful lead market initiative, the following section (see also appendix 3) provides a brief overview of the potential of the individual markets and details some of the assumptions and market prospects that have been used to establish the overview summarized in tables 1 and 2.

6.2. Detailed market prospects

According to a recent study[77] the 2006 volume of markets for **bio-based products** might more than triple until 2020 to an estimated 250 billion Euro globally, which could result in a similar increase in jobs (380,000). As of 2005, bio-based products already accounted for 7% of global sales and around 77 billion Euro in value within the chemical sector. The EU industry accounted for approximately 30% of this value. In addition, the increasing use of bioplastics that are usually better biodegradable (starch-based) than conventional plastic, for instance, could provide Greenhouse Gas (GHG) savings in the EU in 2020 of 9-27 million tons of CO2.

eHealth can help to deliver better care for less money within citizen-centred health delivery systems. It can thus alleviate the cost pressure on the largely public budgets for health. Without significant reforms, including the better use of eHealth, health expenditure is expected to increase from 9% of GDP at present to around 16% by 2020. In the area of eHealth a forecast expects an increase of 43% by 2020 bringing the total volume of the market to 30 billion Euro from currently 21 billion in 2006 within the EU-15.[78] If this materialises, there would be 360,000 jobs in Europe in this sector.

The economic relevance of the EU-27 **construction market** is undeniable with 10% of GDP (1305 billion €) and 7.3% of the total workforce (13.2 million persons). About one third of this GDP (for the new construction and renovation of buildings and civil engineering on-site) is attributable to construction materials and building products. [79]Buildings account for the

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77 McKinsey & Company 'Industrial Biotechnology – Turning Potential into Profits', Presentation at the 3rd annual World Congress on Industrial Biotechnology and Bioprocessing, Toronto, July 2006

78 Health Information Network Europe (HINE) estimate the 2006 eHealth market to be worth 21 billion Euro (HINE report 2006 - European eHealth forecast). Datamonitor's 2007 report on 'Trends to watch: Healthcare Technology' predicts an 11% increase by 2010. If such a rate continued until 2020 the market volume would reach over 30 billion.

79 CEPMC http://www.cepmc.org/overview.htm

largest share of the total EU final energy consumption (42%) and produces about 35% of all greenhouse emissions. The residential sector represents 46% of the total EU production, the non-residential sector 31% and civil engineering 23%[80]. The building sector is characterised by a long service life of several decades or even more, a slow replacement rate of the building stock (about 1% per year) and a much lower rate for building demolition (about 20 times less than new construction)[81]. This means that interventions on the existing buildings such as insulation works, double glazing, acoustic developments, etc. will have immediate effects on climate change, indoor air quality, re-use/recycling and other sustainability issues like safety and accessibility. New construction already incorporates more recent technical solutions and therefore will affect sustainability issues on the long term. In addition to the overall promising economic outlook of the construction sector in the next 2-3 years, initiatives linked to the sustainable development agenda provide good growth prospects for this market. Export opportunities may also arise in countries such as India and China where the global construction spending growth is actually more than 8% per year.[82]

Protective textiles comprise clothing and other textile-based systems whose main function is to protect the users from hazards and dangers in the conditions in which they operate. These products are needed in hazardous professional environments, civil and military emergency interventions or in hospitals and manufacturing environments that require insulation from bacterial and viral contamination, with a share of public procurement in some fields close to 100%. The current size of the personal protective equipment products (PPE) market segment in the EU is estimated at 9.5-10 billion Euro, when service operations related to PPE are included (8 billion Euro without)[83]. Around 200,000 jobs are directly or indirectly related to the PPE products and services. The fast growth forecasted in certain parts of the world suggests that EU exports of PPE could grow by about 50% over the next 5-10 years and nearly doubling their value by 2020.

Recycling is a broad and diverse area which addresses concerns of waste reduction and of consumption of natural resources. The market segment encompasses products and services related to the recycling process and products using the recycled material, so-called recyclates. The waste management and recycling sector in the EU has a turnover of over 24 billion Euro, and provides more than 500,000 jobs in over 60,000 companies in the EU, 69% of which are small (28% medium)[84].

A significant part of materials available on the market today are already recycled. For example 45% of steel comes from recycled steel; 43% of glass comes from recycled glass and more than 50% of paper comes from recycled sources. At the same time, demand for raw materials is increasing rapidly worldwide with corresponding price increases. For instance, it is estimated that the world aluminium consumption will grow by 30,4 % (annual average rate of 5,1 %) between 2004 and 2010. This means that the demand for recycling and the resulting secondary raw materials is *also* increasing, depending on different material classes.

Different materials have different recycling properties and thus different economic factors relating to them. The potential energy savings of recycling compared to primary production can vary for different materials, for example up to 95% for Aluminium; up to 74% for Steel;

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80 Source EUROCONSTRUCT 2004

81 Source: Housing statistics in the European Union 2004

82 Davis Langdon & Seah International – World Construction Review – Outlook 2004/5

83 Source: Euratex / European Safety Federation / Frost& Sullivan

84 Ernst & Young, Eco-industry, its size, employment, perspectives and barriers to growth in an enlarged EU, 2006

up to 64% for paper and up to 80% for plastics. From these figures it is clear that recycling helps reduce energy consumption and thus reduce costs of production.

There are clear signs of increasing demand and price for raw materials and markets are increasingly affected by global players: US, Russia, China, India and South America. Recycling is therefore an area of growing strategic importance, as it reduces dependency on raw material prices. Thus is further supported by the fact that international trade in recycled materials is on the increase. In 1995 international trade in recycled material was estimated to be 2 million tonnes; by 1999 this had increased to 4.5 Million tonnes. Figures also show that 5.8% of EU exports to the rest of the world were waste management goods, in the period 1994-2004. An important figure is that the EU has roughly a 50% share of the world market in the waste and recycling industries and that this sector is expected to grow in turnover at the rate of 3% in the period 2005-2020[85].

Renewable energy refers to energy that can be derived from regenerative resources like wind, sun, biomass and hydro and is transformed into electricity, heating/cooling or transport fuels (biofuels). Currently, the European renewable energy sector has an annual € 25 billion turnover and provides jobs to around 300.000 people while meeting approximately 8.5% of Europe's energy needs[86]. Assuming that policies for renewable energies are implemented, projections for wind power, for instance, forecast a growth from 12,000 to 18,000 installed wind power in Germany (50% growth) and from nearly 5,000 to 12,000 in the USA (150% growth) between 2002 and 2010[87].

7. GOVERNANCE, MONITORING AND EVALUATION

It is clear from the analysis developed in the present paper that the added value of the LMI in its coordination nature will notably depend on the interaction with stakeholders and on its anticipatory approach. This implies that the monitoring of the actions may yield valuable lessons that enable policy makers to refine the approach and adapt the actions plans over the period. The Commission's Communication on the LMI foresees various monitoring, evaluation and feed-back mechanisms.

The effectiveness of the implementation of the policy measures of each action plan will depend on the ability and commitment to coordinate the different actions of in the LMI in a mutually supportive manner. Operational interfaces (networking) should be developed between ongoing legislative activities that affect the implementation of these action plans. Proposals for organisational arrangements may include a well-defined mandate[88]; a clear notion of the scope, duration and the level of participation of the relevant Commission's Services in each specific action plan. Thematic inter-departmental task forces of the Commission's Services for each action plan may be instrumental to this end.

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85 Ecological Industrial Policy, German Federal Ministry for Environment, Nature Conservation and Nuclear Safety (2007).

86 European Renewable Energy Council

87 Blind et al. (2004) based upon the following sources: AWEA (2003): Record Growth for global wind power in 2002 (http://www.awea.org/news/news030303gbl.html); EWEA (2003): Europe 's Wind Capacity–June 2003 (http://www.ewea.org/documents/WIND_CAP_JUNE03.pdf).); PRETIR (2002): Implementation of Renewable Energy in the European Union Until 2010, Project executed within the ALTENER Programme, Utrecht/Brussels (http://www.ccsindia.org/Electricity/int_european.pdf).

88 OECD Governance of Innovation Systems, MONIT Project, Volume 1, OECD 2005

These task forces could also provide input to the Commission's Annual Legislative and Work Programme (CLWP), to the reporting on the progress of the Community Lisbon Programme and budget planning for relevant funding instruments (predominantly FP7 and CIP).

The overall development of the lead market initiatives may be reported to the Competitiveness Council Commissioners Group (CCCG), the Enterprise Policy Group and to the Competitiveness Council.

There may be opportunities in the CIP to fund networking activities of stakeholders (policy makers, finance, standards, clusters and industry) in the themes of the emerging markets, building on ongoing Europe INNOVA activities. Under the PRO INNO Europe umbrella, a network could be established that brings together regional and national policymakers with the aim of facilitating trans-national cooperation in areas of common interest[89]. In the context of Cohesion Policy, the Commission initiative "Regions for Economic Change"[90] implemented through the 2007-2013 INTERREG IVC and URBACT II programmes, focuses especially on networking between regions and stakeholders in various thematic networks of relevance to lead market areas.

8. CONCLUSIONS

This explanatory paper outlines a strong consensual support of stakeholders for a lead market policy initiative.

It outlines also **a solid theoretical economic rationale** for such a policy initiative, which may explain this consensus.

Lessons from the past indicate that such type of initiative isn't exempt of risks. The analysis provided here as well as the governance and monitoring aspects which are envisaged aim at avoiding to repeat such mistakes. The **methodology** that has been followed to identify emerging markets, to elaborate the policy tool box and to enumerate the recommended conditions favourable to its adequate implementation, all take into account such lessons and try to avoid the identified risks.

Economic gains to be expected appear to have a huge potential. The quantitative evaluation of these gains is an extremely difficult exercise that must be taken with caution. Nevertheless, based on prudent assumptions for the first set of six identified emerging markets, **more than 60 billions euros of additional market volume and close to half a million new jobs** could be attributed to the lead market effect and related policy measures for Europe only. The markets concerned might represent in total more than 300 billions euros and 3 million jobs in 2020.

More importantly, beyond the direct economic gains in these markets, the analysis points out at **credible and highly significant potential gains in Europe's overall competitiveness** by favouring structural change and generating a virtual circle of investment in the knowledge economy as well as to **a significant contribution to health and environment protection**, as a result of the themes of the identified market areas.

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89 See www.proinno-europe.eu

90 Commission Communication COM(2006) 675 of 08.11.2006

9. LIST OF ANNEXES

(1) Methodology followed to identify the six emerging markets

(2) The policy tool box in support of Lead markets

(3) Economic potential of each of the identified markets

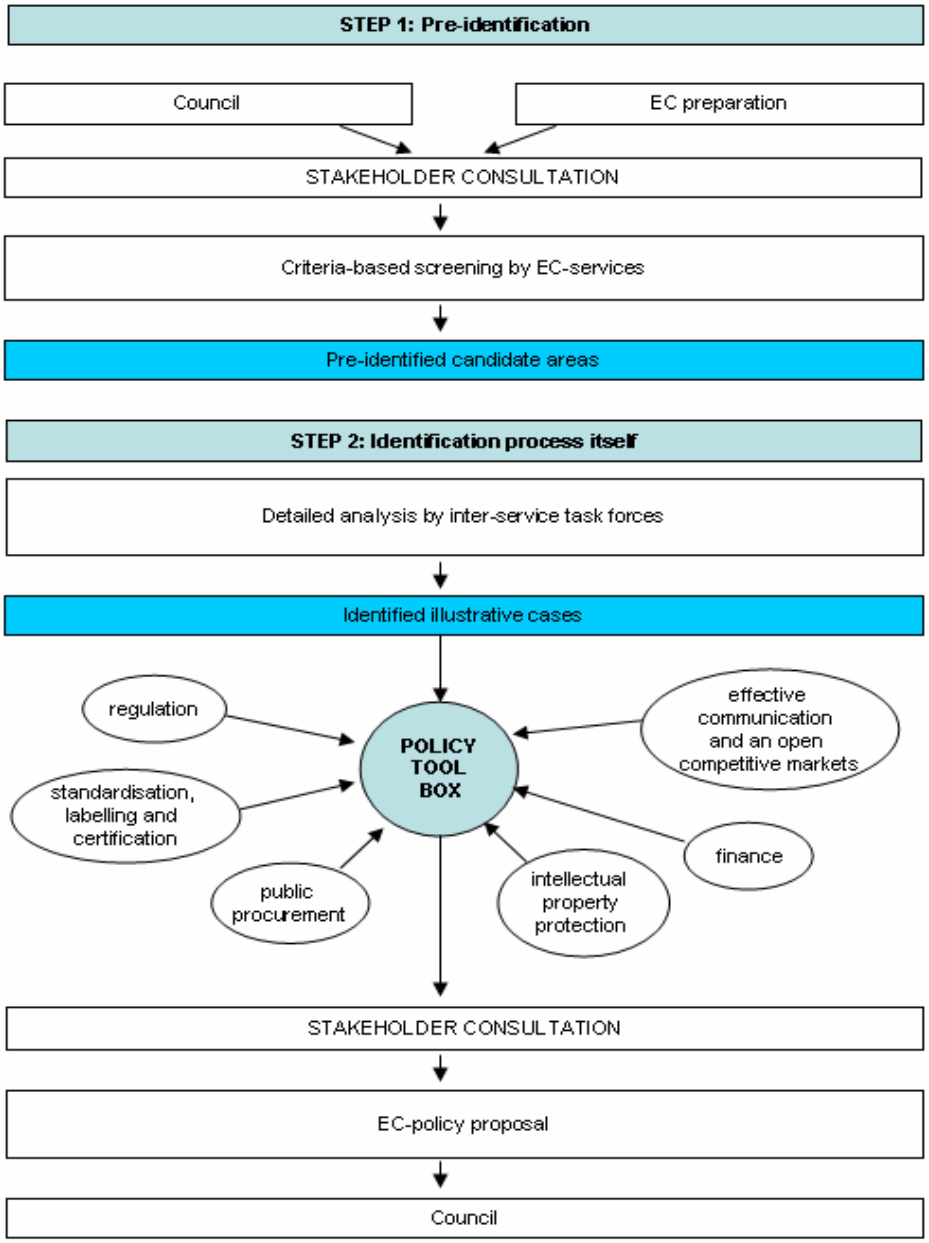
(4) References

APPENDIX 1 - METHODOLOGY FOLLOWED TO IDENTIFY THE SIX EMERGING MARKETS

The set of criteria used to assess the market areas refers mainly to the economic and societal impact, the European industry potential and the potential of innovation policy instruments to have a decisive impact on the growth of the emerging market areas. A significant outcome of the action plans in each market area should be expected in the time horizon of the Lisbon strategy.

For the identification of suitable lead market areas, an approach at the European level does not exist. An appropriate identification process was therefore developed, that is described at some length below. Figure 1 illustrates the logical sequence of the process in a simplified way, as the real process would be more interactive, involving possibly several loops or iterations among the steps.

Figure 1: Main steps to identify lead market areas



1 PRE-IDENTIFICATION

The pre-identification process was totally open, with no *a priori* restriction of the number of markets to be retained for a more in-depth screening. In line with the Council's conclusion, broad stakeholder consultations were instrumental to the identification of suitable candidate areas.

Stakeholder consultations played indeed a crucial role throughout the preparation of the initiative, including at this very early stage. Industry experts were consulted on the appropriateness of a lead market approach and the choice of the criteria to verify their relevance to the lead market approach[91]. The Europe INNOVA Innovation Panels and the European Technology Platforms (ETPs) were invited specifically to respond to a survey on the potential of lead markets according to the criteria[92].

The text of the Council conclusions and of the Commission's Communication on the broad-based innovation strategy that listed some possible domains, were widely distributed, in order to raise awareness. This notably concerned markets related to areas such as low carbon technologies, eco-innovation, e-health, intelligent transport systems, digital content, energy efficiency, bioenergy/biotechnology, nano-technology, satellite navigation and earth observation, security, ICT and marine technologies, including mineral resources, intelligent near-zero energy building, well-being and culture, ageing population-related markets, climate change-related markets, new concepts for markets in the automobile sector, textile.

The information collected was discussed by experts throughout the services and whenever needed through further external consultations. The main reasons for not retaining potential areas for a lead market initiative were:

– Absence of clear evidence of the existence of a sufficient potential market;

– That might emerge is a rather short time;

– That were based on clear signals from the market (demand-driven approach);

– The technology was too far from being mature and that the risk of "picking winners" and more precisely to be wrong in making such choices was too high;

– The nature of the problems encountered and respect of the subsidiarity principle.

Priority was also given to markets where the actions were supposed to give the most added-value. Finally six different domains were considered as more suitable candidates, which were retained for a final, more detailed screening.

2 IDENTIFICATION PROCESS ITSELF

Following the pre-identification phase, for each candidate lead market area, the European Commission constituted a task force. Each task force analysed the information collected for

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91 Europe INNOVA: 1st Thematic Workshop: Lead Markets and Innovation, 29 - 30 June 2006, <http://www.europe-innova.org/index.jsp?type=page&cid=6040&lg=en>; and Innovation Panels Report on Lead Markets, 29/11/2006.http://www.europe-innova.org/index.jsp?type=page&cid=7548&lg=en>.

92 European Technology Platforms - Seminar of the Industrial Leaders: Supporting Technology Platforms and the development of Lead Markets, 6 December 2006, <http://cordis.europa.eu/technology-platforms/seminar7_en.html>.

the criteria, elaborated a roadmap for an action plan and conducted the stakeholder consultations in its market area[93].

The outcome of the analysis of the information and the assessment of the actions proposed to implement the lead market approach were extensively discussed with a variety of industry associations. The consultation process involved also stakeholders other than industry representatives: representatives from relevant ministries were consulted as well as user associations. The lead market concept, the analytical information and the policy recommendations were thus scrutinised in a series of meetings arranged in a very short period of time, which in itself is a testimony of the high interest stakeholders have in the initiative.

Stakeholders' appreciation of the proposed market areas and policy measures showed a great satisfaction with the approach proposed. The co-ordination of policy measures from various policy domains in a prospective, coordinated and strategic approach with a synchronised list of actions was considered to provide a very high value-added.

Decisive in the process are the criteria used. They can be grouped into two classes:

(a) the potential or interest of the market area in view of the objectives;

(b) the effectiveness of the policy toolbox to support the market areas to become lead markets.

The criteria are set out in some detail below.

(a) The interest of identified areas for Europe

Public policy in support of emerging innovative markets should be geared towards market areas with high societal and economic interest. The conditions for enterprises located in the Union to respond to the policy initiative effectively need also to be assessed.

Areas could turn around major concerns of citizens: environment, security and health (this is of course not limitative). These are policy domains in which the case for public interest is long recognised. All of them are affected by structural changes due to demography, climate change, new security threats and economic restructuring.

The criteria to assess the interest of the market areas for Europe are:

- Specification of the emerging market and the extent of **customer needs**, both private and public, that would be satisfied, and how this could lead to the development of new products and services with a global perspective.

- The **potential of technologies** under development and of new combinations of existing technologies for the creation of world class markets.

- The basis for the EU to capitalise on investments in such technologies and their applications to develop world class markets, notably in terms of existing or nascent **industrial strengths** in Europe that could develop the new markets.

- Evidence of the **commitment of** industrial and service **sectors** to contribute to the success of the initiative in the proposed domain, following stakeholders' consultations.

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93 The results of this considerable effort are documented in the preparatory reports established by the task forces. These preparatory reports are published separately from the present Communication.

(b) The potential of policies to favour the emergence of lead markets

Market areas in which no decisive obstacles can be observed or where the obstacles can be overcome by the policies already in place are inappropriate lead market areas, because they would not provide any added value in developing a lead market approach. The analysis of the criteria has therefore to establish the presence of obstacles with a considerable delaying effect on the emergence of markets and to show that Community innovation policy instruments can overcome these obstacles.

The second category of criteria related to this assessment comprises:

1. Existence or lack of **regulation of markets of products and services**, which currently, or in the foreseeable future, will impede the development and market take-up in Europe of new products and services in the considered markets.

2. With regard to **product standardisation**, standardisation issues that would need to be addressed in a timely way to foster the development and market take-up in Europe of new products and services.

3. With respect to **intellectual property protection**, the presence of IPR issues specific to the area, which presently, or in the future will impede the faster development of the emerging market.

4. With respect to **public procurement**, the extent to which opportunities for the public sector, acting as a launching customer, to foster the development and market take-up of new products and services through a more proactive and innovation-oriented approach to public procurement.

5. The presence of obstacles to sufficient mobilisation of **finances** (bank, EIB Group, VC) which are specific to support the development of the new world class market to which public measures can contribute to alleviate.

This list of possible policies is not limitative. If the detailed analysis of a case demonstrates the contribution of another policy tool, such an instrument isn't *a priori* excluded.

3 RESULT OF THE IDENTIFICATION PROCESS – DEFINITION AND VALIDATION OF THE PROPOSED LEAD MARKETS

One of the defining results of this preparatory phase was the necessity to retain rather broad definitions of the lead market areas. Systemic interdependencies across technologies used in a broad range of markets for the products and services concerned and interdependencies between policy impacts let expect that the value-added of creating synergies between policies would be the greatest in such broadly defined market areas. This lesson is reflected in the definitions retained for the different markets which are proposed, which were validated by stakeholders.

As regards the screening of criteria, the prevalence of demand-side factors and corresponding innovation policy instruments might in the future be complemented by the more quantitative approach being developed at present in the context of the Internal Market review.

In conclusion, based on an in-depth and objective analysis, by applying the criteria set out above, six candidate lead markets were identified as good illustrative cases for the lead market approach and validated by stakeholders:

- ***eHealth***
- ***Sustainable Construction***
- ***Technical textiles for intelligent personal protective clothing and equipment***
- ***Bio-based products***
- ***Recycling***
- ***Renewable energy***

For each of the initial lead market areas, appendix 3 gives a summary of the definition of the market areas, of the reasons why they meet the two categories of criteria (economic and policy-related) and of the key elements of the action plan needed to support the emergence of such markets.

The areas retained for the approach do not express any political or strategic preference or importance over other market areas or involved industrial sectors. No preferential treatment or fresh money would be allocated to them. The only advantage they enjoy is of operational nature: a tighter policy co-ordination than is available up to now. And even in this respect, they represent a 1st batch of market areas on which to learn lessons for a tighter policy co-ordination ahead of its generalised application. Other areas, for which such a policy approach would be considered useful, could therefore follow.

The identification of such areas in the future could broadly follow the two- stage approach applied in the 1st round of LMI. The analysis complementing the stakeholders' consultations could be further extended to examine in more detail the determinants of innovation take-off and to assess whether the underlying problems are due to market or policy failures. This could be done for example by looking at the market characteristics in terms of structure (number of players, entry/exit conditions, costs structure, characteristics of demand and commercial characteristics), conduct (strategic patenting, use of standards, characteristics of innovation activity, asymmetric information, etc.) and performance (prices, employment, etc.). Afterwards, a more in-depth analysis of the market and policy failures identified in the previous step could follow. As the determinants of innovation take-off are related to the individual decisions of suppliers to disseminate innovation on the one hand, and of the demanders to purchase and adopt new technologies on the other hand, it would be important to have a closer look at (i) the benefits from the innovation; (ii) costs of adoption (acquisition, complementary investments and learning); (iii) market size and its growth potential (e.g. sales forecast), industry environment and market structure; and (iv) network effects.

The absence of specific "exceptional" or "preferential" treatment for the identified lead market areas underlines the full respect of and complementarities to the legislative framework by any action that would be proposed.

APPENDIX 2 - THE POLICY TOOL BOX IN SUPPORT OF LEAD MARKETS

A lead market approach also needs to establish how the policy instruments can be best designed, used and coordinated to favour the emergence of lead markets. The appropriate policy instruments constitute a policy tool box which is proposed for immediate policy action for the lead market areas that have been identified but also a methodology for future lead markets. This tool box comprises six main instruments[94].

1 THE LEAD MARKET INITIATIVE AND REGULATION

Reliable legislative and jurisdictional environments are essential for business to invest in innovation and for consumers to take up new products and services. Legislation needs therefore to be designed also to foster innovation.

Simplifying and improving the EU regulatory environment is one of the European Commission's key instruments under the Lisbon Strategy to restore economic growth and create more jobs in Europe. The 'Action programme for reducing administrative burdens in the EU', outlines how the Commission intends to work with Member States to cut administrative burdens on businesses by a quarter by 2012[95]. A partnership between the EC and regulatory authorities in the Member States is very important, because the actual manner and level of implementation (the responsibility of Member States) is a very significant factor in assessing the impact of legislation on candidate lead markets. The lead markets' approach calls for coherent, comprehensive and coordinated legislative actions in the candidate lead markets.

Within the timeframe of the action plans of the lead markets, certain regulatory aspects will be modified by new or revised legislation and by removing obsolete legislation. The measures proposed in the roadmaps respond to these developments, and some anticipate upcoming legislative activities. For example, the use of bio-based products and the diffusion of new technologies in the production of bio-based products can be supported by streamlining existing legislative actions in Integrated Pollution Prevention Control[96].

In relation to the lead market in recycling, the EU has a range of regulatory measures dealing with waste: a strategic approach to waste and resources; legislation regulating waste treatment; and management of specific waste streams such as end-of-life vehicles, and electrical and electronic equipment. European legislation plays a strong role in driving development and markets – for example, 2015 targets for vehicles will be 85% recycling and 95% recovery.

The measures presented in the lead market should act as a complement and act in synergy with the regulations, both mutually supporting each other. Furthermore, there is an opportunity of including market-based concepts into the future reviews of these Directives and the development on the Sustainable Consumption and Production Plan.

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94 This list is not limitative, but we restricted ourselves to illustrate only the main instruments

95 Communication from the Commission to the Council, the European Parliament, the Economic and Social Committee and the Committee of the Regions "Action programme for reducing administrative burdens in the EU" - COM(2007)23 final.

96 Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control, OJ L 257, 10/10/1996, pp. 26-40. See http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31996L0061:EN:HTML.

The regulatory measures concerning waste, e.g., could be complemented by a range of market-based approaches. The LMI proposes in this domain a *package of polices* (legislation, standards and labelling, public procurement, financing, knowledge sharing, and international action) that acting in synergy can foster recycling markets, increase more and better recycling, yield environmental and economic gains, and in the long run can improve Europe's competitive position.

Besides coordinating development of legislation, operational interfaces (networking) should be developed between ongoing legislative activities that affect a candidate lead market. Examples are; the construction and bio-based products candidate lead markets.

Measures to clarify the judicial situation of the civil liability for defective goods and services have been included in the eHealth action plan, because of the nature of eHealth products and services. There is ambiguity about who is liable for what and how liability is attributed to different service providers in the eHealth supply chain. With the prospective of increasing cross-border healthcare and patient mobility across the EU, this becomes a more pressing issue for innovating businesses.

2 THE LEAD MARKET INITIATIVE AND STANDARDISATION, LABELLING AND CERTIFICATION

Standards are considered to be a facilitator for the creation of new markets, provided they do not exclude competing technologies or unduly limit competition.[97] Each market and business environment will benefit from an optimal use of a consistent set of standards. The future standardisation mandates to European Standardisation Organisations in areas where lead markets shall be facilitated, should accommodate the speeding-up of the development of the necessary standards.

Technicalities, performance and product standards along the whole production chain, from raw materials to intermediate products to end products need to be made consistent and as much as possible harmonized. **Standards should be, as much as possible, performance-based, yet technology-neutral.** As explicitly detailed in the action plans for the protective textiles, bio-based products and recycling candidate lead markets, this equally applies to standards of data collection and data exchange, for example in clinical applications in eHealth. In these areas, the actual standardisation process seems to be too fragmented, resulting in competing standards preventing interoperable solutions. European Standardisation Organisations should be invited to identify, on a case-by-case basis, best available solutions which may result in the withdrawal of outdated standards or a clarification of complementary standards. To a certain extend, the lead market concept can constitute a test-bed for increasing the innovation-friendliness of the standardisation process[98].

Of particular importance for the creation of lead markets is the **interoperability and compatibility of different standards**, allowing for interoperable business solutions. The main added-value of the candidate lead markets that are analysed is located in the ability to incorporate knowledge and various components into complex products and services. Only a clear choice in favour of interoperable solutions can make this possible, not only at the initial phase, but also through a sustainable process of development of innovations.

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97 See economic analysis of the importance for lead markets of this open approach in part 1 of the present report.

98 A specific consultation process on the horizontal issue of innovation and standards is foreseen by the Commission in 2007.

A further lesson to be drawn in this domain is the paramount importance of the actual use of standards, which often requires taking **decisions between competing standards**. In many cases, numerous standards exist for the same problem, thus making it difficult to implement innovative solutions along the value chain. In that situation, it is of paramount interest that the necessary choices will be made in an inclusive manner and preferably at European level. Pan-European standardisation platforms may help identifying the most suitable standards for a given problem, taking into account broad industrial consensus. The Europe INNOVA standardisation networks provide a good example for how to use different standards in support of innovative products, services and business processes that should be further developed.

To improve the commitment to develop and use standards in support of lead markets, it is important **to involve stakeholders from the very beginning into the standardisation process**. Main stakeholders in the standardisation process - industry, standardisation bodies and national authorities, should accelerate the development of new standards and extend the use of **practicable alternative solutions**. In this respect, more detailed requirements should be formulated by standardisation mandates addressed to European Standardisation Organisations, ensuring an appropriate representation of stakeholders in the standardisation process. These requirements may vary from one theme to another, but is important to design the standardisation mandates in a more targeted manner.

To maximise the impact of European standardisation in support of lead markets, it is necessary to improve as much as possible **the access to standardisation activities and deliverables.**[99] In any case, communication about standards should be improved in order to drive the demand of informed buyers and users. The Commission will present concrete proposals on this subject in its forthcoming Communication on standardisation and innovation. New approaches of self-certification by industry may be developed, building on experiences within the industry (eHealth). Labels such as 'remade in Europe' (recycling lead market), 'EU ECO label' and possible a new 'EU-biobased product label' are likely to entice new consumers of these products.

Information on performance beyond minimum legal requirements could drive purchase decisions of potential customers.E.g., the Directive on the Eco-design of Energy-using Products (2005/32/EC) provides the instruments for the development of effective and dynamic market transformation. It can push the market through minimum requirements by banning the worst performing products, while benchmarks – to be identified in the implementing measures of the Directive addressing particular products (Annex I.3.2) - can provide predictability and dynamism for industry. Mandatory performance labels to be displayed at the point of sales is crucial for consumers to make informed choices. Energy star and (Eco-) labels will reward only the best performing products from the environmental perspective.

There is a need to introduce dynamic standards and top-runner schemes[100]. The instruments that are currently being developed under the Directive on the Eco-design of Energy-using Products (2005/32/EC) and the Energy Labelling Directive (92/75/EEC) could be complemented with other measures under the forthcoming Sustainable Industrial Policy and

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99 This could go as far as offering standards in support of lead market areas free of charge under the conditions that are presently used for some standards.

100 The forthcoming Sustainable Consumption and Production Action Plan, the review of the Energy using Products framework in 2010, and eco-label revisions in 2008 will offer a chance to put these dynamic approaches in to practice. Cf. http://ec.europa.eu/enterprise/environment/sip_en.htm.

Sustainable Consumption and Production Action Plan, and the review of the Energy Labelling Directive framework, as well as eco-label revisions in 2008 will all offer opportunities to put these dynamic approaches into practice. The upcoming communication on Standardisation and Innovation pays specific attention to the impact of standardisation on LM, as well as the working plan under the Eco-design Directive.

3 THE LEAD MARKET INITIATIVE AND PUBLIC PROCUREMENT

Public procurement spending is worth about **16% of EU GDP.** Public authorities are very important customers in each lead market. It was estimated that public procurement comprises about 40% of the total production value in construction, while in textile-based protective clothing and equipment, the share of public procurement is close to 100% in defence, civil security or emergency operations.

Directives 2004/17/EC and 2004/18/EC[101] on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts, provides the EU legal framework for public procurement procedures. The work in the various task-forces involved in the initiative made clear that there should be no ambiguity that **the role of these directives in the functioning of the internal market is crucial and that their application should not in any way be limited, restricted or made less efficient**. Since public authorities often procure individually in full compliance of the directives, there is no coherent and unified demand towards suppliers of innovative solutions. The lead markets areas are often characterised by a highly fragmented market. The ways to increase diffusion of information on innovations, and cooperation between public procurers in order to increase their knowledge of the market and of the new services and products that can benefit to the public users, are the main contributors to a better use of public procurement in these areas.

Public organisations face a number of constraints in public procurement. They have to take into account budget limitations and accountability criteria. The procurement of innovative goods and services carries an inherent risk, which public authorities need to manage. Some indications on how to deal with innovative solutions in public procurement are described in a guide recently published by the Commission[102]. Innovative goods and services could transform operations and processes of organisations, and may require changes in human resources and infrastructure. Public authorities may not have the time and additional resources to actively engage in making these changes happen. This applies to the eHealth candidate lead market in particular, where healthcare modernisation requires the commitment of numerous professional stakeholders and public organisations.

A number of proposals of measures to raise awareness of the opportunities that the public procurement framework offers to procure innovative solutions were made in the action plans. **A coherent approach in the initiatives in public procurement across the lead market areas will be highly valuable.** Initiatives for networking, knowledge sharing and exchange of best practices were defined by nearly all the taskforces. Examples are: disseminating a non-Commission guide dealing with public procurement and innovative solutions for the protective textile area, networking hospital procurers in eHealth within Member States and in the EU, and assisting contracting organisations to better understand the "Economically Most

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101 Directive of the European Parliament and the Council on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts, OJ L 134/ of 30/4/2004, p. 114. http://eur-lex.europa.eu/LexUriServ/site/en/oj/2004/l_134/l_13420040430en01140240.pdf

102 http://www.proinno-europe.eu/doc/procurement_manuscript.pdf

Advantageous Tender" (EMAT) award mechanism and how life cycle costs could bring positive changes in the construction supply chain.

Similar initiatives are proposed in the area of **green public procurement**, whereby contracting authorities apply environmental criteria when making choices on whom to buy goods or services from. This is particularly relevant to the lead markets for bio-based products, recycling and sustainable construction. Roadmaps of these markets specify measures in green public procurement, e.g.; developing 'best practices', inclusion of recycled products in procurement and definition of 'priority' product groups in construction materials.

The Review of the EU Sustainable Development Strategy as adopted by European Council in June 2006 sets the objective of aiming to achieve by 2010 an EU average level of Green Public Procurement equal to that currently achieved by the best performing Member States. Member States have or are currently submitting Action Plans on Green Procurement. A Communication on Green Public Procurement is forthcoming. This will specify in more detail the kinds of processes that will be put into place for **voluntary target setting** and exchange of best practice.

4 THE LEAD MARKET INITIATIVE AND INTELLECTUAL PROPERTY PROTECTION

Innovative products and services of candidate lead markets would above all benefit from lower patent costs as well as greater legal certainty by the creation of an integrated EU-wide jurisdictional system for patents and of a single Community patent. Recent studies have also shown that a European patent designating 13 countries is approximately 11 times dearer than a US patent. In the Communication on 'Enhancing the patent system in Europe'[103], the Commission set out the next steps in this policy area. The handicaps for innovative firms in that domain are so great that the enhancement of the patent system in Europe constitutes indeed a prerequisite for any significant progress. In this respect, the Commission Communication on an IPR Strategy for Europe planned for 2008 constitutes a further step. The task-forces couldn't obviously propose that the lead market initiative in itself focus its recommended measures on the issue of patents at this stage. Nevertheless, two elements were emerging of their work as well as from consultations.

The first is that the majority of the lead markets can be best supported through active policies in support of clusters, cooperation of clusters between different European countries and public-funded innovation services in these clusters[104]. In that context support, awareness raising and training activities to SMEs involved in clusters related to the candidate lead markets are of particular importance in the domain of IP management. In particular, alternative options to the use of patents, or the development of patent pools in order to reduce costs might be worth considering.

The second is related to industrial designs and fight against counterfeiting. Industrial designs may be protected under the Regulation 6/2002[105] on Community designs with uniform effect throughout the territory of the whole EU. The entry into force of the Geneva Act of the Hague Agreement concerning the international registration of industrial designs, in respect of the

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103 Communication from the Commission to the European Parliament and the Council, "Enhancing the patent system in Europe" COM (2007) 165 final of 03/04/2007.

104 In conformity with the Community Framework for State aid for Research and Development and Innovation, OJ C 323 of 30.12.2006, p. 1.

105 Council Regulation 1891/2006 amending Regulations (EC) No 6/2002 and (EC) No 40/94 to give effect to the accession of the European Community to the Geneva Act of the Hague Agreement concerning the international registration of industrial designs, L 386, 29/12/2006, p. 14. OJ L3, 5.1.2002, p.1

European Community, on 1 January 2008, will allow companies, with a single application, to obtain protection of a design not only throughout the EU with the Community Design, but also in the countries which are members of the Geneva Act of the Hague Agreement concerning the international registration of industrial designs. Counterfeiting and illegal copying of designs are impacting innovation and technical know-how. This notably applies to the protective textiles lead market and calls for **stricter enforcement** by public authorities.

5 THE LEAD MARKET INITIATIVE AND FINANCE

Most candidate lead markets included measures to improve the access to finance for the development of innovative goods and services. New models of public-private partnerships are proposed, in which investors and other stakeholders (public and private organisations and potential customers) participate, such as in the protective textiles lead market and the bio-based products lead market. Investment funds, with help of the EIB and EIF, could be set up to fund the 'demonstration' and pilot-scale stage of innovative goods and services. European venture capital backed companies attracted over €6.4bn of institutional funding in 2006. It was recognised that the Finnish and Irish public sectors support their young IT companies more than any other European countries and have the largest number of venture backed IT companies per head[106].

In addition, JEREMIE, a joint initiative launched in the context of the 2007-2013 Cohesion Policy programmes by the Commission, the EIF and the EIB, aims to provide improved access to finance for SMEs, such as micro credit, venture capital, loan or guarantees.

A number of measures stress the importance targeted use of the EU Framework Programmes and national research funding to find solutions for bottlenecks getting innovative goods and services to the market, for example in scaling up of production.

6 THE LEAD MARKET INITIATIVE MUST BE BASED ON EFFECTIVE COMMUNICATION AND ON OPEN COMPETITIVE MARKETS

Market fragmentation in Europe leads to higher costs and a lack of economies of scale for companies that offer innovative goods and services. The candidate lead markets of sustainable construction, protective textiles and eHealth stress the importance of integrating innovative products and services right through the supply chain. The supply chain in these candidate lead markets is made up of many actors, including end-users. The supply chain generates knowledge and skills on the application of innovative processes, services and goods. This should be conserved, even after termination of the project. The action plans of the above candidate lead markets address this issue by proposing a number of initiatives to overcome fragmentation and to establish effective communication with consumers and users, for best practices and industry networking, indeed addressing in this way issues related to information asymmetries.

The international dimension of a lead market initiative demands open, competitive markets where European enterprises can become the world standard setter and fully benefit from the potential of economies of scale.[107]

The concrete implementing actions for the candidate lead markets shall fully respect the present framework on competition, State Aid and public procurement. Notably, lead markets

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106 Library House, Report on Venture Capital in Europe, 2007.

107 See in this regard especially OECD Economic Surveys: European Union.Vol. 2007, no. 11.

should in general not be promoted and even less artificially created through State subsidies. In cases where State aid is nevertheless provided, it is important that the aid targets a well-defined market failure, has an incentive effect, is limited to the minimum necessary and does not distort competition. Moreover, such aid is not allowed to cover the costs of meeting Community legislation laying down mandatory requirements.

The facilitation of lead markets should not result either in restricting competition, for example through information exchange systems. The exchange of information can normally only lead to a restriction of competition, if competitors exchange commercially sensitive and company-specific information not in the public domain relating to key parameters of competition (such as information on prices, customers and quantities).

7 IMPLEMENTING THE LEAD MARKET INITIATIVE: ACTION PLANS

The most decisive validation of the proof of concept approach is the testing of the approach in the field. This implies the concrete use in a coordinated and timely manner of the instruments that are described in the specific action plans contained in annex I of the present Communication.

The list of actions contains measures in regulation, standardisation, public procurement policies and complementary policies. Additionally, complementary actions that improve financial incentives on the user-side, IPR, communication and knowledge-sharing have been included among the actions. These were developed by the task forces of the candidate lead markets in close consultation with stakeholders.

Because Europe's lead in candidate markets should be retained, timing is important. Most action plans have a timeline of five years maximum.

These plans are designed in order to reach ambitious objectives. Even so, this will not be a success, unless the Member States, the Commission, the European Parliament and the industrial stakeholders mobilise themselves in the timely implementation of the proposed measures.

The lead market initiative should be accompanied by the development of communication strategies highlighting to stakeholders the overall Community aims and the applied measures. The effects of the measures taken can be considerably enhanced if large groups of stakeholders can be reached and they can make decisions in line with the aims.

Again, the added value of the lead markets' approach is implementing these action plans as a package of measures in a quick and coordinated way.

Action plans are presented as Annex I accompanying the Communication.

APPENDIX 3 - SUMMARY OF MAIN FINDINGS AND RECOMMENDED ACTIONS FOR EACH ILLUSTRATIVE CASE

The 3rd appendix to the present explanatory paper, annex II of the Communication on lead markets for Europe, provides some further information on the scope of the identified lead market areas and the rationale for the action plans in these areas as indicated in annex I of the Communication. The estimates for economic and employment growth in the market areas are based on Commission-internal expert panels using notably the sources and assumptions indicated.

LM 1: eHealth (also referred to as ICT for health)

Definition

This area encompasses all interactions inside and between the three user groups: patients, health-service providers and payment institutions. The proposed lead market area comprises the following four interrelated major categories of applications: [108]:

(1) Clinical information systems

   (a) specialised tools for health professionals within care institutions (e.g., hospitals). Examples are Radiology Information Systems, Nursing Information Systems, Medical Imaging, Computer Assisted Diagnosis, Surgery Training and Planning Systems.

   (b) tools for primary care and/or for outside the care institutions such as general practitioner and pharmacy information systems.

(2) Telemedicine and homecare, personalised health systems and services, such as disease management services, remote patient monitoring (e.g. at home), tele-consultation, tele-care, tele-medicine, and tele-radiology.

(3) Integrated regional/national health information networks and distributed electronic health record systems and associated services such as e-prescriptions or e-referrals.

(4) Secondary usage non-clinical systems

   (a) Systems for health education and health promotion of patients/citizens such as health portals or online health information services.

   (b) Specialised systems for researchers and public health data collection and analysis such as bio-statistical programs for infectious diseases, drug development, and outcomes analysis.

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[108] The market definition was proposed by the eHealth Industry Stakeholders Group, reporting to the i2010 Sub-group on eHealth. The Stakeholders group includes the following representative organisations: COCIR (European Coordination Committee of the Radiological, Electromedical and Healthcare-IT Industry.), IHE (Integrating the Healthcare Enterprise), EHTEL (European Health Telematics Association) and the Continua Health Alliance.

(c) Support systems such as supply chain management, scheduling systems, billing systems administrative and management systems, which support clinical processes but are not used directly by patients or healthcare professionals.

Support systems such as supply chain management, scheduling systems, billing systems administrative and management systems, which support clinical processes but are not used directly by patients or healthcare professionals.

eHealth can thus be said to cover the interaction between patients and health-service providers, institution-to-institution transmission of data, or peer-to-peer communication between patients and/or health professionals; it can also include health information networks, electronic health records, telemedicine services, and personal wearable and portable communicable systems for monitoring and supporting patients.

Interest of eHealth for Europe

The economic weight of the overall health domain is considerable, with 10% of the workforce, and 9% of GDP committed to Health-related services. Within this context, eHealth has an estimated market volume of about 21 Billion Euro. The major source of payments is the social security system, which accounts for the heavy influence of the public hand on the growth of the lead market. This sets the e-health market apart from other potential markets, except the nano-diagnostics area. The estimated increase of health spending to 16% of GDP by 2020 constitutes a grave challenge to the sustainability of the health care systems in the Union. Taking into consideration that, on one hand, over the last 25 years, healthcare has fallen progressively behind other service sectors in terms of relative levels of ICT investment and, on the other, ICT investment has been a main driver of productivity gain in other sectors, the societal interest of this lead market area becomes obvious, all the more so, as the ageing population will increase the strain on the health systems[109]. European investment levels in healthcare ICT is currently at 2% of total revenues, with predicted increase to 5% by 2010, with particularly strong growth forecast in the European Medical Records[110] and remote home health monitoring markets[111].

The technological progress relevant to new solutions puts the Union in a world-wide leader position in certain areas such as the deployment of health information networks, in ICT penetration in primary care and use of health (insurance) cards. The available solutions are expected to have the potential to entail a leadership position also in other segments of the e-health market area. The emerging technological solutions tend however to fragment the market due to incompatibilities between system components, which tend to be exacerbated in the case of cross-border system use, if the interoperability issues are not solved. There is also a lack of legal certainty which hampers business investments and take-up of new products and services by the users.

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109 It is estimated that 70% of care expenditure is dedicated to chronic disease management, with 3 out of 4 elderly experiencing cancer, cardiovascular diseases, mental health problems, diabetes and chronic respiratory disease. By 2030, the World Health Organisation estimates that the incidence of chronic disease in the over 65s will more than double due to the ageing demographic

110 The Frost & Sullivan report, European Electronic Medical Records Markets, values the European EMR market currently to be worth €349.6m and will reach €1.15bn by 2013. http://www.ehealtheurope.net/news/strong_growth_predicted_in_european_emr_market

111 The market for remote home health monitoring in Western Europe and Canada is expected to generate $225 million revenue in 2011, up from less than $70 million in 2006 (Five-Year Annualized Growth Rate over26%), according to Parks Associates' report on 'Digital Health in Western Europe and Canada'. http://www.sys-con.com/read/420161.htm

Those companies which have potential for success in the emerging fields include both large European-based companies of specialised eHealth solutions that are world leaders in their fields as well as the estimated 5,000 European small- and medium-sized enterprises (SMEs) that operate in various sub-sectors of eHealth.

The potential of policies to remove obstacles to eHealth lead market

The primary obstacle which has been identified, is the lack of interoperability between the various system components, which is further exacerbated by cross-border differences, which entail considerable market fragmentation. **Standardisation** e.g. of various information exchange formats, **certifications** of interoperable systems and **large-scale demonstration projects (pilots and/or market replication projects)** are retained to effectively overcome the interoperability barriers.

The task force identified how the **regulatory** environment of the eHealth domain suffers from various legal and factual uncertainties, which affect in particular the cross-border usage of eHealth and hence potential economies of scale. Obstacles concern notably legislation on reimbursement, liability, incorrect or incomplete transposition and lack of awareness on the application of the provision on the protection of personal data[112]. Harmonisation efforts accompanied by implementing guidelines and awareness campaigns are considered appropriate responses.

The fragmented demand leads to an absence of incentives on the side of the public payment system to **finance** the initial investment for a solution that would over its life-cycle cost it less with Union-wide economies of scale being realised. The pilots and market replication projects are expected to contribute to overcoming this barrier by demonstrating the technical, organisational and legal feasibility of eHealth services and evaluate also the financial benefits inherent in eHealth systems. A further important element to develop solutions to fragmentation in demand, often brought about by the differentiated demand of public authorities, is to take into account opportunities in the **public procurement** of eHealth services. The purchase of innovative solutions, including of R&D services, may be facilitated, in which procurers and suppliers should be encouraged, in full respect of the EU public procurement Directives, to co-operate to prevent fragmentation and lack of interoperability.

An Action Plan for a lead market on eHealth

The preparatory report established by the task force details an ambitious roadmap (see table in annex I to the Communication and the detailed explanation in the preparatory report, published separately) with a comprehensive list of measures to take to create a market for innovative eHealth solutions in response to the identified obstacles. Large-scale demonstration projects, standardisation measures, certification guidelines, clarification and guidance for applying the legal framework, networking of public procurers, as well as information of users, doctors, health managers, public authorities' et al. on eHealth benefits would provide the framework conditions. Member States would have to follow up on the initiative to fully benefit, as healthcare is their prime responsibility.

An eHealth scorecard would provide Member States with a tool to learn from well performing solutions and share the information on benefits and lessons learnt.

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[112] COM(2007) 87 final: Communication on the follow-up of the Work programme for a better implementation of the Data Protection Directive (07.03.2007).

eHealth

	2006	**2010**	**2020**	
				Underlying assumption
Volume of the new markets products/services [million Euro]	21000	23300	30000	Health Information Network Europe (HINE) estimates the 2006 eHealth market to be worth 21 billion Euro (HINE report 2006 - European eHealth forecast). Datamonitor's 2007 report on 'Trends to watch: Healthcare Technology' predicts an 11% increase by 2010. If such a rate continued until 2020 the market volume would reach over 30 billion.
Jobs dependent on the new products/services [thousand jobs]	250	275	360	This DG INFSO estimate is based on workers directly involved in the ICT for Health Industry (e.g. Philips Medical etc). There are currently around 20 million Europeans employed in the health sector who could be positively affected by eHealth solutions.

LM 2: Sustainable Construction

Definition

Many elements that are touched upon by environmental concerns, user's convenience and welfare are covered by the very encompassing market area proposed. This is due to the imperativeness of having a coherent approach to system integration so as not to arrive at sub-optimal solutions due to all elements following their growth path irrespectively and becoming incompatible with other system components. Sustainable solutions in residential and non-residential buildings as well as in infrastructure constructions are covered.

- The residential market

– The users' requirements will change more frequently than before. This behaviour should be anticipated in design and construction processes, for instance by separating the technical utilities from the main structure. Renovation will integrate new components and prefabricated products which can be installed and used rapidly.

– Accessibility and flexibility will be significantly improved in dwellings throughout their life cycle for all types of users and ages

– There would be an increased emphasis on energy efficiency, environmental, water, health and safety issues in the selection of materials and structural components.

– The passive house concept will be more and more widespread even in warm climate conditions, as well as the integration of renewable energies.

– Building management systems would enable occupants to control a greater variety of functions for a better comfort (ventilation, air filtration, temperature, lighting, etc.). ICT will facilitate remote supervision and control of appliances, equipment and security systems.

– There would be a growing demand for improving the access to affordable and decent homes and for a more harmonious urban and social mix.

- The non-residential market

– The requirements for improved energy efficiency and the integration of renewable energies would influence both the building structure and its utilities.

– Indoor air quality would be considered as a factor affecting health, comfort and work efficiency. This will require meeting different needs in terms of heating, cooling, ventilation, lighting and acoustic levels.

– Business premises will more often be occupied by fast growing and changing organisations which will require business-related facility services. Requirements for adaptability and divisibility of the premises will stimulate the development of new structural and system technological solutions, which will be facilitated by the expansion of the wireless data transmission.

- The infrastructure market

– Investment will be assessed on a more strategic approach towards the long term functional characteristics of the infrastructure and the associated life-cycle costs.

Interest of Sustainable Construction for Europe

The economic relevance of the market is undeniable with 10% of GDP and 7% of the workforce. The residential sector represents 46% of the total EU production, the non-residential sector 31% and infrastructure 23%. Land use and resources constraints make that the modernisation of existing buildings and infrastructure will gain in importance compared to new construction. 40% of the entire construction sector production has the public hand as a customer, though mostly outside the residential housing segment. Buildings account for the largest share of the total EU final energy consumption (42%) and produces about 35% of all greenhouse emissions. Energy standards for houses and the introduction of more efficient electrical appliances and heating installations have not led to a decrease in total energy and electricity consumption by households. The energy use per household has remained about constant since 1985 and the final energy consumption has risen due to the increase in number of households as well as surface and comfort demand. Also, efforts to improve indoor air quality, and to increase convenience, e.g., in view of the ageing population, still have not exhausted the huge potential for progress.

The technological progress provides the potential for addressing sustainability concerns across the supply chain and for new working methods at the construction site. At this point of the supply chain, innovations can be used in a huge variety of combinations of products which have better performance than established products in terms of sustainability criteria across the various segments of the market area.

Construction is predominantly a local business, i.e., demand is highly fragmented. Its industrial base is moreover dominated by SMEs. Even so, the sector proves its commitment to innovation in sustainable products through its long-standing presence in innovation policy initiatives such as Europe INNOVA and a strong co-operation between the ETPs on construction and sustainable chemistry, which made a substantial contribution to the Lead Market consultation.

The potential of policies to remove obstacles to Sustainable Construction lead market

The market area is highly regulated in Member States, which according to the stakeholders and the task force experts, leads to considerable administrative burden and a high fragmentation of the market area. Besides applying its **better regulation** policy, the Community may further render the **regulatory framework** more efficient by accompanying measures and awareness campaigns, in order to provide a common reference model on sustainability in the market area.

The enormous diversity of regulatory dispositions in Member States contributes to the high market fragmentation. **Standardisation** measures can improve the situation and introduce concepts relevant for sustainability, for instance on indoor air quality and pertaining to improved accessibility, e.g., for older persons in standards. Given the breadth of the effect of standardisation tasks and the focus of Community competence on horizontal measures, standardisation and related **certification** measures are considered to be effective policies to foster the lead market area.

A lack of knowledge on the legal possibilities and practical issues of applying new concepts and innovation-oriented aspects in **public procurement** is a particular concern in

construction, because of its highly fragmented public demand, which however covers overall 40% of the total market volume. This situation could be significantly improved by specific measures to enhance the knowledge by purchasers of the new characteristics of the products, in particular as regards to the explanation of the use and advantages of life-cycle assessment as a criterion.

An Action Plan for a lead market on Sustainable Construction

A different, more goal-oriented approach to construction in the form of a lead market on sustainable construction solutions in residential and non-residential buildings as well as in infrastructure constructions is feasible, if world-leading technological solutions available in the Union are integrated in construction practices all over the Union.

Most of the activities that determine construction practice are in the hands of Member States. The report proposes to the CCCG that Commission support the kick-start of the lead market endeavour and assist by modernising the common reference framework for standards and certification and encourages the development of new, sustainability-oriented practices, e.g., in public works, throughout improved collaborative working in the construction supply chain.

While the full impact can therefore not be realised in the short term, first important results could be expected already in 2009.

Sustainable Construction			
	2006	**2020**	
			Underlying assumption
Volume of the new markets products/services [million Euro]	24000	87000	Actual market estimated at 5% of total construction production - the Lead Market initiative would increase the uptake of new products and services by 5% per year in new construction and by 3% in renovation
Jobs dependent on the new products/services [thousand jobs]	500	870	One employee generates 100000 € per year on average

LM 3: Technical textiles for intelligent personal protective clothing and equipment (PPE[113])

Definition

The market of technical textiles for intelligent personal protective clothing and equipment (PPE[114]) comprises clothing and other often textile-based systems and accessories whose main function is to protect the user. These products are used under very different circumstances:

- Defence personnel and military forces requiring high levels of specific protection (e.g. nuclear, biological, chemical) for intervention in diverse war scenarios or in the event of terrorist attacks.

- Professionals and emergency services in need of protection from health and safety risks arising from activities in hazardous environments or dangerous situations.

- Hospitals or manufacturing environments where insulation from emissions of the human body and of other accessories should provide effective protection from bacterial or viral contamination of patients, health care professionals or the goods manufactured.

In addition to the development and manufacturing of products, a significant part of economic value creation and employment in this market is related to service industry which ensures distribution and correct use as well as professional maintenance and care, critical for preserving protective functionalities and ensuring optimal performance over the whole life-cycle of the products.

Interest of Technical textiles for intelligent personal protective clothing and equipment for Europe

The societal drivers for the market are increasing concerns about security and safety, including regarding the implications of the internationalisation of military and humanitarian interventions of the Member States and those reflected in the new Community strategy for 2007-2012 on health and safety at work to deal with new risks, also related to new materials and production processes.

The technological advances relevant to the new solutions are based on new functional materials, incl. nanotechnologies, and the integration of microelectronics. The field is growing very rapidly in conjunction with the wearable electronics, platforms, networked sensors, et al. The innovations are expected to spill-over into consumer clothing markets, whose growth would also be accelerated, if the PPE market area grows faster.

The Union's technical textile industry holds a world-leading position. A more favourable prospect for innovative products in personal protective clothing and equipment could increase the knowledge base and favour the restructuring of parts of the textile sector that is especially exposed to world-wide competition. Also, the knowledge gained in the area of personal protective clothing and equipment tends to spill over into large consumer markets such as sport wear or fashion, contributing to innovations also in these markets. The existing clusters

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113 All references to PPE are not restricted to the legal definition of Art. 1 of Directive 89/686/EEC but refer to a broader concept

114 All references to PPE in this document are not restricted to the legal definition given in Article 1 of Directive 89/686/EEC but refer to a broader concept, encompassing the above mentioned products and uses.

can play a crucial role in this process. They may also provide an appropriate environment to create a close interaction of product designers, engineers and consumers in view of the innovations in smart clothing.

The lack of official statistics for this market area as well as the dispersed supply chain and multisectoral industrial structure, characteristic of the PPE market, make the volume of this market particularly difficult to assess.. The current size of the manufacturing segment is estimated in 8 billions euros with an additional turnover of 1.5-2 billion euros corresponding to service operations (work wear and healthcare) related to PPE in EU. Around 200,000 jobs are directly or indirectly related to the PPE industry in the EU. Spill-over markets for these innovations include large-scale markets such as interior textiles and consumer products, representing an overall substantially more extensive market Furthermore, the fast growth forecasted in certain parts of the world suggests that EU exports could grow by about 50% over the next years.

Industry shows a very strong commitment to innovation and a high degree of relevant organisation: a high quality of participation of the ETP for the Future of Textile and Clothing in the consultation process as well as its substantial co-operation with other ETPs like the Manufacturing Technologies or Industrial Safety ETPs; its participation in the Europe INNOVA initiative; the maintenance of an internal organisational competence on innovation by its European federation. The commitment of the ETP to the lead market approach was further illustrated by its intervention at the ETP seminar of industrial leaders.

The potential of policies to remove obstacles to Technical textiles for intelligent PPE lead market

Harmonised European standards and related **certification** have an important function in this area. It appeared from the analysis by the task-force that measures to improve the standardisation process should aim at the swift technology-neutral formulation of standards and their early, wide-spread availability in that domain To improve the transparency of the market, it is necessary to establish an **effective communication** among innovation actors both from the supply and from the demand side. In addition, considering the high potential of the market area in a global scale, **external trade** measures to effectively open foreign markets for the use of European standards are considered to be necessary to unlock the potential.

Public purchases have a large role to play, attaining in certain product groups 100%. Gauging this salient role of public procurement to foster demand for innovative products is complicated however by an important fragmentation of demand at the level of local authorities. Given the important role of public procurement in the market area, on one side, and the fragmentation of this demand on the other, the most important field of action is considered to be the dispersion of information on how public authorities can foster innovation through public procurement to the PPE sector.

The prospect of public purchases being more oriented towards innovation may also generate some facilitation as regards access to private **finance** for innovation by the revelation of the potential of demand. This effect together with specific measures to better link innovative enterprises and users with potential investors are deemed to have the potential to alleviate the scarcity of third party financing in this market area.

Developing the knowledge about more adequate handling of **intellectual property** issues in companies is considered by stakeholders and the task-force to have the potential not only to

extend the especially low use of IPR in this market area[115], but also to further improve the external financing possibilities. This should address difficulties of effectively ensuring the respect of property rights in the Internal Market as well as in **external trade**.

An Action Plan for a lead market on technical textiles for intelligent personal protective clothing and equipment

The task force's preparatory report details an ambitious roadmap (see annex I) for the Commission proposing an action plan that integrates all necessary actions in a synchronised way to favour the innovation of the new products and services to accelerate the growth of the technical textiles sector. Significantly, measures to facilitate public procurement of innovative protective textile products are included in the roadmap, since public organisations could be the predominant customers for some textile products, such as for military apparel. Other activities entail facilitation of informed choices by optimising the use of standards, awareness of IPR protection, strengthen SME involvement in the development of standards and initiatives to link investors and PPE stakeholders more effectively.

Protective Textiles				
	2006	**2010**	**2020**	*Underlying assumption*
Volume of the new markets products/services [million Euro]	8800	10325	15200	A yearly increase of almost 4% in value.
Jobs dependent on the new products/services [thousand jobs]	205	210	228	Labour productivity in products will grow by 3% on a yearly basis while the gains in services will stem mostly from higher demand.

[115] EURATEX; Opportunities and Challenges for Financing Innovation in the European Textile and Clothing Industry. Report of the Europe INNOVA project NetFinTex. Brussels; 2007.

LM 4: Bio-based products

Definition

Industrial and consumer products based on renewable, biological raw materials such as plants and trees, are the subject of the candidate lead market on bio-based products. This lead market encompasses non-food new bio-based products and materials such as bio-plastics, bio-lubricants, surfactants, enzymes and pharmaceuticals. It excludes traditional bio-products like paper and wood products but also bio-mass as energy source since other policy initiatives cover the energy aspects. However there are important interlinks between some bio-based products and bio-energy which influence the degree and timing of introduction of bio-products. The large interdependencies and complex value chains across a wide range of products characterises the lead market approach in this domain, which calls for a coherent and coordinated approach in particular across the different policy areas affecting bio-based lead markets (agriculture, enterprise, environment…). A life-cycle perspective of bio-based products is essential in highlighting positive environmental characteristics and having them reflected in efficient market price setting.

There is a wide range of **bio-based products** which could eventually acquire a substantial market acceptance:

- Fibre-based materials (i.e. for construction sector or car industry);
- Bio-plastics and bio-polymers;
- Surfactants;
- Bio-solvents;
- Bio-lubricants;
- Ethanol and other chemicals and chemical building blocks;
- Pharmaceutical products incl. vaccines;
- Enzymes;
- Cosmetics.

Interest of bio-based products for Europe

Bio-based products are of high strategic and societal interest due to the potential impacts on sustainability and the protection of the environment, human health and in supporting rural development and strengthening of industrial competitiveness. The total markets for bio-based products globally and within EU are difficult to estimate. Generally there will probably be a strong tendency to focus on markets where bio-based products can substitute products based on other raw materials and the possibilities to estimate markets for new bio-based products are limited. Examples of estimates are provided in the task force's preparatory report. The main long term growth potentials for bio-based products can be indicated by their capacity to substitute, at lower costs, fossil-based products, to create greenhouse gas (GHG) neutral eco-cycles, thereby contributing to a low carbon economy and to be manufactured with a lower ecological footprint, i.e. lower energy and water use and lower waste generation. The volume of certain consumer product groups that are strongly influenced by health and environmental concerns and are of priority interest to bio-based products amounted in 2005 to roughly € 250 billion euros. The healthcare part of this market segment is expected to grow due to the ageing of the population. In this market segment, the public hand has a role to play as a customer.

Europe is currently well placed to develop lead markets for innovative bio-based products, building on established knowledge and industry strengths:

- it has a leading technological and industrial position in many raw materials and the products derived thereof such as wood;
- it is the world leader in key industrial biotechnologies such as enzyme technologies, which are critical for the production process of the next generation production processes;
- and it is very strong in bio-based speciality products such as fine chemicals.

The competition from other world regions has however increased considerably recently, notably as concerns the emerging next generation production processes, for which the so-called integrated bio-refineries are central. The prospect of a credible commitment towards removing hindrances for the emergence of markets in this huge market area is indicated by some stakeholders as having the potential to tip the balance in favour of the necessary demonstration plants being built in the Union, which would be necessary to maintain the present leading position.

In this emerging market area, the closeness of the pilot plants to the new market is of high importance. The high variety of the products to be developed offers ample opportunities for the manifold of established enterprises and for start-ups, which might find a fertile environment in cluster structures. Relevant industrial sectors are organised in ETPs. Consortia are being developed to invest in the necessary demonstrators as soon as they identify the most promising lead market.

The Common Agricultural Policy (CAP) will impact on industrial non-food production by strengthening the sustainable production of agricultural raw materials and their supply to industry. Similarly, the forest-based industries are important for increasing the use of forest resources. Bio-based products would be produced in an agriculture-forestry-manufacturing industry system. The Rural Development Policy contributes in this industry system through its support for innovative SMEs.

The potential of policies to remove obstacles to bio-based products lead market

Environmental **regulations** have a clear role to play by providing incentives for the bio-based product market area. Scope for a certain improvement of the regulatory framework across various Directives is analysed by the task force with the aim of highlighting possibilities to increase efficiency.

For the prospect of the lead market area to develop its full potential, a large effort must also, according to the task force, be invested in **communication, standardisation, labelling and certification** to overcome perceived uncertainty about product properties and weak market transparency on the whole, diverse, yet interlinked spectrum of bio-based products. Encouraging the Member States and private investors in developing demonstration plants is also considered as an adequate way to assist in the improvement of market knowledge, notably in conjunction with clusters to exploit their possibilities.

Certain measures are considered to alleviate the difficulty for the necessary investments to find private **finance**. Support measures to help **public procurers** to develop the necessary knowledge about bio-based products in a timely manner are considered to alleviate the uncertainty about the prospective market potential at an early stage.

An Action Plan for a lead market on bio-based products

The task force's preparatory report details an ambitious roadmap (see annex I) for the Commission proposing an action plan that integrates all necessary actions in a synchronised way to favour the innovation of the new products and services to accelerate the growth of the bio-based market area. The actions range from standardisation, labelling and certification of bio-based products in order to ensure the quality and consumer information on the new products, over demonstration factories to harnessing the purchases of public authorities to show the way to the future.

Bio-based Products

	2006	**2010**	**2020**	
				Underlying assumption
Volume of the new markets products/services [million Euro]	19000	28000	57000	EU accounting 30% of global volume, being 23 billion $ in 2005. A value of 25 billion $ is estimated for 2006. An exchange rate of 1.3 USD/EUR is applied and values rounded down. The global figures (equivalent to 7, 10 and 20% of sales of global chemical industry) are 77 billion $ in 2005 and McKinsey predicts a global volume of 125 billion $ in 2010 and 250 billion $ in 2020.
Source for volume data	*Data from McKinsey study predicting sales in chemical industries affected by biotechnology (while this does not fully coincide with the bio-based product definition, it is a close indication of market size and development)	** According to McKinsey, this figure could rise to €250b depending on development of feedstock prices, consumer demand, policy framework and investment level	*** Assuming a doubling of market share of bio-based products in major product categories (polymers, etc..)	
Jobs dependent on the new products/services [thousand jobs]	120	190	380	EU figures: equivalent to about 7, 10 and 20% of current EU chemical industry employment; possible additional employment benefits in rural areas not taken into account

Markets and societal interest in bio-based products

1.1 Construction materials; composite materials

Market description	Market analysis	Strategic and societal interest
Products for construction. Products made from natural fibres (flax, hemp, jute, wood) that have found application in production of building materials such as cement-based composites (hemp concretes) that can be used for walls, roofs. Composite materials for the automotive industry. These are made from a mix of natural fibres and polymers (biopolymers or petrochemical) in replacement of fibre glass for the automotive industry. To improve their mechanical properties, fibres of different origins are added to thermoplastic or duroplastic in the production process.	Current: 50,000 t of fibres in the automobile industry and 3,500 t in the construction industry Growth: 100,000 tons in the motor industry (2010); market share of bio-based out of total could be between 5 and 30% maximum (2020) Cost of natural fibres is 3-4 times that of mineral wools but natural fibres have good mechanical properties (impact resistance, acoustic qualities, strongly reduced weight/lightweight concrete.). Benefits in cars are related to lightweight advantageous over conventional glass fibre compounds partly cost advantageous over PUR foam based products. Better waste management: materials containing vegetable fibres are easier to recycle or burn that the materials containing fibreglass fibres.	Sustainability/environmental factors of major interest because of better waste recycling, high environmental quality of products and potential reduction of CO_2 and other emissions in manufacturing (may be of interest to "construction" task force)

1.4 Total biochemical products (bioplastics, polymers, lubricants, surfactants, etc.)

Market description	Market analysis	Strategic and societal interest
All "green" bio-based chemicals that replace fossil-fuel based chemicals, such as bioplastics and -polymers, lubricants, solvents, surfactants. Second generation chemicals applying cellulose-based ethanol-production know-how to produce other chemicals (adipic acid etc.) under R&D development, to enter the market in follow-up of related ethanol production and may replace this due to potentially much higher profits.	Current: 6.4 million tones of renewable raw materials used for EU-25 chemical industry in 2005 (8% of al RRM)	Sustainable chemical production; lower GHG and other emissions in production (in some cases lower resource use in terms of energy, water and less waste compared to fossil-based production); typically better biodegradability; potentially less toxic

Estimated EU potential of major RRM-based products (source: ECCP report[116])

Market Sector	Total Consumption Market (1998) ('000 tonnes)	Renewable Consumption (1998) ('000 tonnes)	Potential in 2010 ('000 tonnes)	Potential Share in 2010 (%)
Polymers	33000	25	500	1.5
Lubricants	4240	100	200	5
Solvents	4000	60	235	12.5
Surfactants	2260	1180	1450	52

The figures on the potential, columns 4 and 5, take into account the future development of the total market without specific additional policies and measures. With such policies and measures, significant increases are possible.

[116] European Climate Change Programme; Long Report. June 2001. Available since 23/07/2007 at: http://ec.europa.eu/environment/climat/pdf/eccp_longreport_0106.pdf

1.4.1 Bioplastics

Market description	Market analysis	Strategic and societal interest
Biopolymers, such as polysaccharides (carbohydrates – starch from maize, wheat, and potatoes). Polylactic Acid (PLA), a plastic material derived by fermentation (producing lactic acid) from starches or glucose. Used for food packaging, bags, hygiene products, packaging for biological waste, plant pots, etc. Also composite materials with new qualities; textiles, etc.	Total EU plastics market about 73 Mtoe, 3-5% growth rates p.a.. Current: 0.1% (50,000 t) of total EU plastic production; but 30% production increase in recent years. World capacity in 2008 is 0.5 MToe. Future: Production: 0.5-1 Mtoe (by 2010) and maximum 3-5 Mtoe (by 2020) - Market share: 1-2% (by 2010) and 1-4% (by 2020) of total plastics (would require an estimated 2.5 million acres of land) 5% market share for packaging plastics by 2010 PLA (produced by Cargill Dow); developed strongly through support from previous FPs. Potential estimated by Cargill Dow to be > 4 Mtoe	Bioplastics usually better biodegradability (starch-based). May provide savings in terms of GHG emission (0.8-3 tons of CO2 less per ton of plastic compared with conventional plastic). Total GHG savings in EU in 2020 would be 9-27 million tons of CO2. Contribute to economic activity and employment opportunities in the agricultural sector and rural areas (also limited: 1-5% of wheat area would deliver all raw materials for bioplastics in 2020). PLA: fully biodegradable

1.4.2 Surfactants

Market description	Market analysis	Strategic and societal interest
Surfactants lower surface tension of liquids and are used in soaps, detergents, pharmaceuticals, food additives, etc. and for the production of emulsions and foams. They are produced largely from oils. Next generation "biosurfactants" can be produced from algae or bacteria.	World market 10 Mtoe in 2002 (EU 2.5Mtoe) of which 30% (700 000 t of vegetable matters, mainly oils) New emerging markets: ▪ plant health products (currently 100.000 tons p.a.) ▪ detergents (60-65% could be of vegetal origin)	Low eco-toxicity, biodegradability and compostability; (enzyme based detergents have hugely reduced energy used by household washing machines and replaced phosphorus)

1.4.3 Biosolvents

Market description	Market analysis	Strategic and societal interest
Solvents mainly part of paintings, inks, varnishes, adhesives etc. Majority of solvents currently petrochemical solvents.	Currently 1.5% of total (60.000 tons out of 4 Mtoe) Could grow to 12%-40% encouraged by environmental regulation.	Bio-based solvents do not emit VOC (volatile organic compounds) which are harmful to human health (and ozone layer). 23% of VOCs emitted into air are from petrochemical solvents.

1.4.4 Biolubricants

Market description	Market analysis	Strategic and societal interest
Biodegradable lubricants made from vegetable oils (and their chemical derivatives) that are non toxic for soil or water. Used as hydraulic oils in areas where high risk of pollution.	Current: 2 % of total (100.000 tons out of 5 Mtoe); mainly in hydraulic sector 50% of total market is automotive, but biolubricant use low. Biolubricants 1.5 to 5 times more expensive (higher development/delivery costs) but prices are decreasing Future: 30% market share by 2010; Total market potential could be up to 90%.	Biodegradability; reduce pollution of petrochemical lubricants in automotive sector.

1.5 Pharmaceutical products, incl. vaccines

Market description	Market analysis	Strategic and societal interest
Biological resources used as feedstock for fermentative production of antibiotics, amino acids, organic acids, vitamins, enzymes, etc.	High value, but low volume niche markets. World market for plant derived pharmaceuticals is €30billion, 10-25% of prescription medicines sales; 60% of anti-cancer drugs and 50% of cardiovascular drugs).	Some new product markets (plant based vaccines) could provide an interesting opportunity for lead markets.

1.6 Enzymes

Market description	Market analysis	Strategic and societal interest
Technical enzymes; food enzymes; animal feed enzymes Only 20% produced on truly industrial scale (75% of production by 4 companies only– DK, NL & DE)	Current: 53Ktoe in 2001 (3/4 in EU); Growth:5% annual growth rate	

LM 5: Recycling

Definition

As world economies continue to expand, natural resources are being increasingly depleted, energy is becoming a key issue, and proper and effective waste management is an increasing challenge. Moving towards sustainable patterns of consumption and production are the cornerstones of development that is sustainable – not only in terms of energy but in terms of *all* resources we produce, consume and dispose. Recycling plays an underpinning role by:

- reducing waste going to disposal
- reducing consumption of natural resources
- improving energy efficiency

There is significant market potential in recycling but barriers to market development need to be to be addressed. There is also potential to significantly improve efficiency and capacity, by encouraging innovation, and introducing more effective processes and improved technologies. This can help save costs, energy, and natural resources – and help Europe be less dependent on rising raw materials prices.

The EU has a range of regulatory measures dealing with waste: a strategic approach to waste and resources; legislation regulating waste treatment; and management of specific waste streams such as end-of-life vehicles, and electrical and electronic equipment. European legislation plays a strong role in driving development and markets – for example, 2015 targets for vehicles will be 85% recycling and 95% recovery.

There is an opportunity to complement these measures with a range of market-based approaches. This Lead Market proposes a *package of polices* (legislation, standards and labelling, public procurement, financing, knowledge sharing, and international action) that acting in synergy can foster recycling markets, increase more and better recycling, yield environmental and economic gains, and in the long run can improve Europe's competitive position.

Interest of recycling for Europe

As world economies continue to expand, natural resources are being increasingly depleted, energy is becoming a key issue, and proper and effective waste management is an increasing challenge. Moving towards sustainable patterns of consumption and production are the cornerstones of development that is sustainable – not only in terms of energy but in terms of *all* resources we produce, consume and dispose. Recycling plays an underpinning role by:

- reducing waste going to disposal
- reducing consumption of natural resources
- improving energy efficiency

Studies indicate that waste is a growing problem for almost all contemporary societies. Waste generation tends to increase with economic growth. On average each person in the EU contributes to over 500kg of municipal waste per year.

At the same time, natural resources are being seriously depleted worldwide. In Asia consumption of metals is growing at a phenomenal rate of over 250% per annum. Our Earth's natural resources cannot withstand such consumption indefinitely.

The Waste Management and recycling sector in the EU has a turnover of over 24 billion Euro, and provides over 500,000 jobs. The Recycling sector is made up of over 60,000 companies in the EU. The profile of these companies tends much more to the small companies: 3% large; 28% medium; 69% small. A lead market in the area requires a strong emphasis on approaches and policy measures that are effective for SMEs.

There is also a large potential for improvement of the mechanical and chemical recycling technologies, in particular for plastics. These technologies exist today but their wide commercialisation is hindered by a number of factors (market failures), e.g. structure of the recycling industry (predominantly SMEs).

By comparison to manufacturing processes and technologies, waste treatment processes are, on the whole, relatively primitive. For instance, in a number of cases sorting is still done by hand. There is significant potential for further developing and advancing both technologies and industrial processes that can be balanced with the fact that the area does provide employment for people, particularly in the lower-skills range. On the whole, creating markets for recyclates and waste treatment technologies would boost their commercialisation and create economies of scale.

Europe holds at present a leading position in processing technology, which is however under threat from manual low-cost processing locations. The industry needs therefore to bring the next generation of processing technologies, known as post-shredder technology, to the stage of pilot plants to keep its technological edge and cost competitiveness and thereby to prevent the processing being delocated.

There is big potential for Europe to develop effective and efficient capability for recycling technologies and processes, as well as coordinated approach to trade in second-hand products and secondary materials. There is an opportunity to reduce costs and foster **competitive** recycling in synergy with EU regulation.

The potential of policies to remove obstacles to Recycling lead market

Considerations regarding the uncertainty on the product properties and weak market transparency in this highly fragmented market are similar to the market area on bio-based products. In particular there are problems with streams and there are indications of market failures, in particular for **plastics.** Also in this area, the establishment of common EU **standards, labels and certificates** constitutes a promising way to reduce the presence of those impediments to market development. Another parallel in this respect is the possible contribution of **pilot plants** to the reduction of these barriers and of the risk involved in upscaling new technologies.

The lead market places a focus on technologies, and processes of waste products related to the directives such as:

– Electrical and Electronic Waste (WEEE)

– End-of-life of vehicles (ELV)

These directives correspond to **significant waste contributions** (for instance over 100,000,000 mobile phones and over 14 million vehicles discarded per annum in the EU).

Plastics correspond to 40 M tonnes per annum in the EU, of which less than 39% is recovered in EU 15 (where recovery means incineration with energy recovery or recycling).

The scope for circumventing the Union's waste management dispositions by exploiting different regulatory frameworks in other regions of the world is considerable and constitutes a risk for the emerging market area. Appropriate **external trade** measures related to the standardisation formulation and enforcement are identified as possible ways to adequately address this risk.

There is also an important international dimension, as a number of countries such as China, Korea, and Australia are adopting regulations very similar to these Directives in their own countries. There is therefore significant potential for export of recycling technologies, industrial processes and European know-how. There is a need to ensure that EU companies can have ***first-mover advantage*** in this regard.

An Action Plan for a lead market on Recycling

Recycling plays an underpinning role in the maintenance of the quality of life of the Union's citizens: by reducing waste, by reducing consumption of natural resources and in contributing to greater energy efficiency. It is therefore key to any sustainable strategy for business and industry.

The European Union is at present world-wide at the forefront of developing the recycling markets with its very ambitious mandatory recycling targets. Meeting quicker the targets in an economical and climate-friendly way requires new determined action.

A strength of this lead market area is that it will work in synergy with EU regulation such as the directives WEEE and ELV. It will focus in particular on areas where there are difficulties with waste streams and there are clear market failures, in particular plastics.

The task force's preparatory report therefore details an ambitious roadmap (see annex I) for Commission proposing an action plan that integrates all necessary actions in a synchronised way to favour the innovation of the new products and services in the recycling market area. The actions range from standardisation, labelling and certification to ensure the quality of and product information on recycling products as well as the environmental friendliness of the recycling process.

Recycling

	2006		**2020**	
				Underlying assumption
Volume of the new markets products/services [million Euro]	24000		36000	The German Federal Ministry for Environment, Nature Conservation and Nuclear Safety expects the waste and recycling industries to grow in turnover at the rate of 3% in the period 2005-2020
Data source	*EU Data from Ernst & Young study on the eco-industry			

Jobs dependent on the new products/services [thousand jobs]	500		535	Recycling is largely automated but still more labour intensive than the virgin material production, thus a growth rate in labour of 0.5% is assumed given the growth notably of the number of electronics goods, goods using recycled materials and relevant services.

LM 6: Renewable energy

Definition

Renewable energy refers to energy that can be derived from regenerative resources like wind, sun, biomass and hydro and is transformed into electricity, heating/cooling or transport fuels (biofuels).

Currently, the European renewable energy sector has an annual € 25 billion turnover and provides jobs to around 300.000 people while meeting approximately 8.5% of Europe's energy needs[117].

Renewable energy

	2006	**2020**	
			Underlying assumption
Volume of the new markets products/services [million Euro]	25000	79000	The European Commission's target of reaching a 20% share of renewable energy sources out of total energy consumption by 2020 is applied under the assumption that the policy scenario is effective. Based upon the approximate 8.5% current share (European Renewable Energy Council), the volume is calculated for 20% while considering a slow growth rate of 0,8% on average per year between 2004 and 2030 as a result of an already well-established electricity market (IEA, International Agency Outlook 2007). The results equal a growth rate of 8,5%
- if policies on renewables fail		41000	Alternative value if no policy impact can be achieved. Current forecast without policy measures is a 10,4 % share (DG TREN - Trends to 2030 - update 2005). Result would equal a 3,7% growth rate.
Jobs dependent on the new products/services [thousand jobs]	300	634	One can expect on average that labour productivity in products will grow by 3% on a yearly basis while the gains in services will be limited, which implies that the volume of employment will not change if physical production grew by at least the same amount. For the higher value a 5,5% growth can be computed.
- if policies on renewables fail		330	Alternative value if no policy impact can be achieved. Result would equal a 0,7% growth.

[117] European Renewable Energy Council

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