



Green revolution: making eco-efficiency a driver for growth

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By Annika Ahtonen with Serban Chiorean-Sime

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Taking the steps needed to make the EU a world leader in today's globalised economy, ensure the sustainability of the European economic and social models and maximise citizens' quality of life form the core of this programme's activities.

Europe's ability to create wealth on a sustained and sustainable basis, while at the same time ensuring employment growth, equitable income distribution and the efficient provision of public services, will depend on the necessary reforms being introduced to respond to the challenges of globalisation, the ageing of Europe's population and climate change.

The European Union is well aware of the importance of pooling together the efforts of all Member States and ambitious EU frameworks such as the Europe 2020 strategy. But Europe's commitment will have to be urgently translated into concrete policy actions at all policy levels in a consistent manner.

The EPE programme addresses these issues through a number of fora and task forces. It engages in and stimulates debate on economic, social and environmental policy in general and looks at the extent to which European integration in these fields could bring more added value. It also works with other programmes on cross-cutting issues such as the economic integration of migrants, the EU budget, economic governance and Europe's relations with other parts of the world.

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About the authors

Annika Ahtonen is a Policy Analyst and Serban Chiorean-Sime a Programme Assistant at the European Policy Centre.

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The authors are responsible for the content of this paper.

Foreword

The economic crisis and citizens' disillusionment with the EU are serious challenges for Europe. Europe needs a project that can help to reconnect European policymakers and citizens behind a common goal. A project that can re-stimulate interest in European integration and the internal market. A project that can boost Europeans' welfare and well-being. A project that can provide a much-needed source of new growth and an exit from the economic crisis.

Creating an eco-efficient Europe has the potential to become that project. And if the EU, Member States and the public and private sectors start working together – and involve consumers in the process – then moving towards an eco-efficient Europe will help to deliver the objectives of the 'Europe 2020' strategy, drive smart, green and inclusive growth, and boost Europe's competitiveness.

However, cooperation will be needed in promoting internal and external markets for greener products and services. The EU must create a single market for eco-efficiency, in which barriers to innovation processes and financing are tackled. It must help to enhance expertise and encourage entrepreneurship, train labour forces and involve consumers in action. The EU must ensure that its policies play together with the same aim.

There is a strong rationale for action. The tools exist. And it is time to act. We cannot afford to wait and see how far commodity prices will rise, how volatile they will become, how quickly emerging economies will take over the development of innovative products and services, how far we can go in losing biodiversity in Europe, and how deep into crisis Europe can plunge before realising that eco-efficiency is a fundamental component of green growth and creating a more sustainable economy.

By Hans Martens
Chief Executive
European Policy Centre

Executive summary

Europe is in the midst of a serious crisis. That crisis has two faces, economic and ecological, which are intertwined and reinforce one another. And at the heart of this double challenge is the unsustainable use of our resources.

The consequences of this unsustainable use of our resources, which have already devastated the financial sector, are now becoming more visible in other sectors too. World population growth is putting enormous pressure on global resources like energy sources, water, food and raw materials – and at the same time on the environment. The negative economic and social consequences of increasing competition and prices, such as low growth and energy poverty, are already affecting many parts of the world, including Europe. Waste is mounting, recycling remains minimal and valuable materials are continually being lost. On top of this, the exploitation of the planet has reached such heights that biodiversity losses are threatening our well-being. And despite the horrifying pictures of climate change, efforts to reduce man-made greenhouse gas emissions have remained weak.

Growth which is based on unsustainable use of the planet's resources is no longer sustainable. Recognising this means that resource-dependent Europe must be at the forefront of finding and promoting new sources of growth. As this paper will argue, eco-efficiency is a key component of green growth and creating a more sustainable economy.

Eco-efficiency stands for doing more – or the same – with less. It means resource efficiency: using and reusing resources more efficiently throughout our economy. It is about eco-innovation: developing and using products, processes and other solutions that contribute to environmental protection or efficient use of resources. Eco-efficiency helps to enhance resource productivity and generate more value from the use of resources. It means not wasting valuable materials, but rather recognising the value of resources like energy, water, land and raw materials as the basis of well-being and economic growth in Europe.

Resource efficiency, investment in greener products and services, new business models, more efficient city planning and transportation systems, using new and existing technologies, and developing internal and external markets for eco-efficiency can bring enormous benefits. Eco-efficiency can boost businesses' productivity and competitiveness on the global market. It can help the public sector to improve its finances. It can bring significant gains for European citizens, ranging from jobs to health benefits. It can stimulate interest in the European project. And it can help to deepen the internal market, which is Europe's main driver of competitiveness, security of supply and sustainability. Eco-efficiency has the potential to become the next European success story, helping to deliver the 'Europe 2020' strategy's objectives of driving smart, sustainable and inclusive growth.

This paper studies the challenges and opportunities related to moving towards a more eco-efficient and sustainable European economy. On the basis of these findings, the EPC's Task Force on Eco-efficiency recommends the following five actions:

- 1) The EU must help to build a bigger market for products and services that contribute to a greener economy.
- 2) The price of resources should reflect the true cost of using them.
- 3) Public and private investment for greener products and services must be increased.
- 4) New approaches to meeting the 20/20/20 targets are needed.
- 5) Europe needs to build a knowledge-base, educate stakeholders and empower consumers.

It is time to harness the knowledge economy, generate new ecological know-how and get greener goods and services on the market and in use. Europe cannot afford to wait. The costs of inaction would be devastating for both the economies and societies of Europe.

Abbreviations

CAP	Common Agricultural Policy
CHP	Combined heat and power
CO ₂	Carbon dioxide
C2C	Cradle 2 Cradle Network
ETS	Emissions Trading Scheme
EU	European Union
GDP	Gross Domestic Product
GPP	Green public procurement
ICT	Information and communications technology
OECD	Organisation for Economic Cooperation and Development
PPPs	Public-private partnerships
R&D	Research and development
SMEs	Small and medium-sized enterprises
WTO	World Trade Organisation

INTRODUCTION: RATIONALE FOR ACTION

The economic crisis poses tremendous challenges for Europe. Economic growth has stagnated. Public debt continues to increase. Public finances in many EU Member States are in unsustainable condition. Business and consumer confidence in the economy have been weakened. Unemployment levels continue to rise. It is well-acknowledged that in order to exit the crisis, Europe must find ways to renew itself. At the same time, this is not the only challenge. In fact, Europe is facing an even greater crisis: the economic downturn is accompanied by a worrying ecological decline.

World population growth, and more specifically a growing middle-class population, is putting enormous pressure on global resources such as energy, water, food and raw materials. It is putting the environment under pressure too. The world is losing its biodiversity. Demand for food is growing. Man-made greenhouse gas emissions are increasing at record speed. Waste keeps on accumulating and not enough materials are recycled. As a result, valuable materials are lost, the environment is under enormous stress and health problems are multiplying. As global competition for resources increases, prices rise and resource supplies become less secure. Price volatility fuels more uncertainty. The negative economic and social consequences of this, such as low growth and energy poverty, are already affecting many parts of the world, including Europe. And last but not least, climatic changes and the associated growing number of extreme weather events, coupled with environmental changes like increased soil erosion, deforestation and the extraction of groundwater reserves, represent a further burden on developed and particularly developing countries.

Facts and figures:

The number of middle-class consumers is expected to increase from 1.8 billion today to up to 3.2 billion by 2020 and 4.9 billion by 2030. Most of the new demand for products and services will come from Asia.¹

World commodity prices have increased significantly in the last 10 years. This rise has been most significant with regard to industrial raw materials, partly as a result of increased demand in China.² As China, India and Brazil industrialise and urbanise, competition for raw materials will only intensify, leading to stronger protectionist policies, export quotas and price volatility. This represents a serious challenge for Europe, which as a region outsources the largest share of resource extraction in the world.

¹ Homi Kharas, "The emerging middle class in developing countries, OECD Development Centre Working Paper No. 285", (2010), p.27

² Paavo Suni on behalf of Association d'Instituts Européens de Conjoncture Économique's Working Group on commodity prices: "World commodity prices 2010 to mid-2012" (2010), p.11

Europeans annually create over 500 kg of household waste per person, while the total amount of waste generated in the EU 27 is around three billion tonnes per year. Taking into account that waste is an important source of materials and energy, it is alarming that in a resource-dependent Europe, only 40% of solid waste is recycled.³

Cities produce around 75% of the world's waste and consume a similar proportion of global energy. At the same time they produce over half of the world's greenhouse gas emissions – or as much as 80% if the calculations include emissions caused by urban consumption and production patterns.⁴

Although difficult to verify, the assertion that there is six times more plastic in the ocean than plankton is a worrying reflection of the selfishness and short-sightedness that characterises people's consumption patterns today. Plastic debris in the sea is not only a significant environmental problem, but it also generates enormous economic and social costs in terms of its impacts on health, transportation, tourism and fishing. For example, the Netherlands and Belgium spend around €11 million and the United Kingdom around €19 million every year just on cleaning up their beaches.⁵

Biodiversity loss has become a serious global problem. In Europe, a large number of species and habitats are facing extinction, or their conservation is poor. As a result, many ecosystems have become so vulnerable that their capacity to provide goods and services – the backbone of our well-being and economy – has become limited. We can no longer count on ecosystems to respond to possible shocks, such as the effects of climate change.⁶

It is becoming clear that business as usual is neither sustainable in Europe nor outside the EU. But can these challenges be turned into an opportunity for Europe and a source of sustainable growth, well-being and prosperity?

Other areas of the world are already doing this. Asian powerhouses have demonstrated a strong interest in improving their eco-efficiency and their awareness of their environmental surroundings - while also recognising their economic potential. As people in the developing world start to consume more during the course of their lives, and demand for new products and services in emerging markets grows, we will see greater competition not only for resources but also for champions of sustainability.

Facts and figures:

According to China's 12th five-year plan (2011-2015), the country will invest €368 (\$468) billion in greening key economic sectors.⁷ The main focus will be on waste recycling and reutilisation, clean technologies and renewable energy. For example, China aims to produce 16% of its primary energy from renewable energy sources by 2020. It is illustrative that China has already overtaken the United States as the country with the most installed wind energy capacity in the world. China already produces half of the world's photovoltaic solar cells, and its wind turbine manufacturers are also starting to expand to other markets.

³ Eurostat news release '40% of municipal waste recycled or composted in 2008, Half a tonne of waste generated per person' (19.3.2010)

⁴ UN Habitat: 'Cities and Climate Change Initiative Launch and Conference Report' (2009), p.8

⁵ United Nations Environment Programme (UNEP): 'UNEP Yearbook – emerging issues in our global environment 2011' (2011), p.28

⁶ European Environment Agency: 'EU 2010 Biodiversity baseline' (2010), p. 7-9

⁷ Found on the website: <http://www.unep.org/greenconomy/AdvisoryServices/China/tabid/56270/Default.aspx>

Meanwhile, South Korea is aiming to increase its share of the world's renewable energy market to 18% by 2030, and hoping to create 1.5 million jobs while reducing its reliance on fossil fuels.⁸ Moreover, by harnessing solar energy India could potentially reduce its coal imports by 30% by 2022.⁹

Fortunately, Europe is also starting to rise up to this challenge. The EU's policy framework aims to build the basis for a more sustainable economy. This is reflected in the 'Europe 2020' strategy, which seeks to achieve smart, sustainable and inclusive growth. European industries are continually creating more resource-efficient, low-carbon and environmentally-friendly technologies, products and services, which in this paper will often be referred to as 'green' or 'greener' products and services. European consumers are becoming more aware of their carbon and environmental footprints. People are gradually realising that water, air, land, soil and marine resources, as well as ecosystems, are not free commodities.

However, despite the positive developments seen so far, Europe has still been acting too slowly. Putting forward climate and energy targets and portraying itself as the moral leader in international climate negotiations is not enough. More must be done to develop products that consume fewer resources and pollute less during production and usage - and to ensure that they reach the market. More must be done to use and re-use resources more efficiently. More must be done to value more effectively ecosystem products like raw materials and water, services such as regulation of air and soil quality, and provision of flood and disease control, as well as psychological benefits. Creating genuine momentum for change, making the environmental and economic potential of green solutions a reality and becoming a leader in eco-innovation and resource efficiency requires whole-hearted action and cooperation between producers and consumers, across sectors and across the EU.

It is clear that Europe must act to boost resource efficiency, minimise resource use in production and apply a circular approach to the use and reuse of resources throughout its economy. It must promote eco-innovations: that is, create products, processes or other solutions that can contribute to protecting the environment, softening environmental impacts and/or using resources more efficiently. It must improve resource productivity and thus generate more value from using resources than it has done in the past. This paper uses the wider concept of eco-efficiency to capture the multi-dimensional objective of achieving economic and environmental progress while using resources more efficiently, reducing their consumption, limiting impacts on the environment, and increasing the value of a product or service. This paper argues that eco-efficiency is a key component of green growth and the creation of a greener economy.

Eco-efficiency brings with it the potential to become a true European success story. More efficient city planning and transportation systems, new business models, greener products and services, and more efficient use of resources including energy, raw materials and water could bring enormous benefits for the economy and society as a whole. Investing in greener products and services, and promoting an internal and external market for eco-efficiency, can contribute to delivering the objectives of the 'Europe 2020' strategy: driving smart, sustainable and inclusive growth, and increasing Europe's competitiveness.

⁸ "S. Korea Aims to Create 1.5 Million Jobs in 'Green Energy' (7.6.2011) on the website:

<http://www.bloomberg.com/news/2011-06-07/s-korea-aims-to-create-1-5-million-jobs-in-green-energy-.html>

⁹ KPMG: 'The Rising Sun - A Point of View on the Solar Energy Sector in India' (2011), p. 18

THE POTENTIAL BENEFITS ARE ENORMOUS:

- **Re-stimulating interest in the EU project and deepening Europe’s internal market.**
 - Focusing on an issue that European citizens care about can help to reunite European policymakers and citizens behind a common goal and help to fight growing disillusionment with the EU. Promoting eco-efficiency could be a positive project, which could lead to positive change and benefits for all.
 - The Single Market is Europe’s main driver of competitiveness, security of supply and sustainability. Making eco-efficiency an integral part of the Single Market project would not only benefit consumers and businesses interested in eco-efficiency, but would also be an important opportunity to inspire new interest in European integration.

- **Boosting productivity and saving money.** Using energy, raw materials and water more efficiently, preventing waste and increasing recycling of materials will reduce operating and production costs, and thus costs for manufacturers and consumers alike.
 - It has been calculated that up to **30% of global demand** for energy, water, land and materials in 2030 **could be met by making extraction, conversion and use of resources more efficient.** The total **value of implementing these measures would add up to €2.3 trillion** (\$2.9 trillion) in **2030** and potentially much more if there was a global price for carbon and energy, agriculture and water subsidies were removed.¹⁰
 - More efficient recycling would reduce costs on the economy and the society by lowering the demand for primary raw materials, enhancing reuse of valuable materials, and reducing energy consumption and greenhouse gas emissions from extraction and processing.
 - It has been estimated that **British businesses would gain around €28 (£23) billion annually** by taking no-cost or low-cost measures to improve the way they use energy and water, and by reducing waste. By implementing measures **with a payback period of over a year**, the additional savings opportunities would be worth around €40 (£33) billion, leading to **total annual savings of €66 billion.**¹¹
 - By investing in eco-efficiency, the public sector – as a large consumer of resources like energy and water – can also save money. For example, in the UK, it has been studied that **greatest potential for saving water and money is in the public administration.** The financial annual benefit has been estimated as **€186 (£154) million**, which represents almost **29% of the total water savings opportunity in the UK.**¹²
 - Full implementation of existing and new **energy-efficiency measures can save** European consumers up to **€1,000 per household every year.** In total, this would mean up to **€200 billion of savings by 2020.**¹³
 - According to a study by Copenhagen Economics, **implementing national renewable energy targets together**, so that renewable technologies are placed where they are most efficient, could save EU consumers **€8 to 17 billion annually by 2020.**¹⁴ It has also been estimated that

¹⁰ McKinsey Global Institute and Sustainability & Resource Productivity Practice: ‘Resource Revolution: Meeting the world’s energy, materials, food, and water needs’ (2011), p.2

¹¹ Oakdene Hollins for the UK Department of the Environment, Food and Rural Affairs: ‘Further Benefits of Business Resource Efficiency’ (2011), p.6

¹² Oakdene Hollins for the UK Department of the Environment, Food and Rural Affairs: ‘Further Benefits of Business Resource Efficiency’ (2011), p.8

¹³ European Commission, DG Energy: ‘Saving Energy – time to step up our efforts’ (2011), p.3

¹⁴ Copenhagen Economics: ‘Eco-innovation and resource efficiency: gains from reforms’ (2011), p. 15

by reducing losses from electricity distribution and enabling greater energy efficiency, the **deployment of smart grid** could lead to **savings worth €52 billion a year** in the EU.¹⁵

- As mentioned also in the study by Copenhagen Economics,¹⁶ if the EU were to **cut emissions by 30% by using the Emissions Trading Scheme (ETS)**, it could bring in revenues **worth over 2% of GDP in 2020**.¹⁷ It would also reduce the amount of subsidies required to meet renewable energy targets.
- **More opportunities for innovation.**
 - Deploying existing innovative solutions and developing new goods and services will help to address economic and environmental challenges, meet Europe's 20/20/20 climate and energy goals, and lay the foundations for Europe to become a world leader in eco-efficiency.
 - The fact that **70-85% of opportunities to increase resource productivity** in the energy, land, water and steel sectors **lie in developing countries** is a good reminder of the innovation opportunities that exist outside the EU.¹⁸
- **Significant social and environmental benefits.** Providing sustainable supplies of resources like water and creating a healthier living environment by conserving natural resources and reducing the volume of waste and emissions are the basis of Europeans' well-being.
 - It has been estimated that reducing greenhouse gas emissions by 20% by 2020 could lead to **health savings worth of €52 billion annually**,¹⁹ potentially rising to €60-80 billion if domestic targets of 30% were reached across the EU.²⁰
 - Full implementation of existing and new energy-efficiency measures in the EU could **reduce annual greenhouse gas emissions by 740 million tons**.²¹ At the same time, more efficient waste management in Europe could reduce CO₂ emissions by between **146 and 244 million tonnes** by 2020.²²
 - Better eco-efficiency can help to **combat poverty and create employment possibilities**. Full implementation of existing and new **energy efficiency measures** could create up to **two million jobs**²³ and the **renewable energy sector** up to **three million** more jobs by 2020.²⁴ In addition, it has been estimated that **recycling 70% of key materials** in the EU by 2025 could create over **560,000** new jobs.²⁵

¹⁵ Oracle: 'The Future of Energy – an independent report for Oracle Utilities' (2011), p.5 on the website: <http://www.oracle.com/us/industries/utilities/utilities-future-energy-525446.pdf>

¹⁶ Copenhagen Economics: 'Eco-innovation and resource efficiency: gains from reforms' (2011), p. 15

¹⁷ OECD: 'A framework for assessing green growth policies' (2010), p.60

¹⁸ McKinsey Global Institute and Sustainability & Resource Productivity Practice: 'Resource Revolution: Meeting the world's energy, materials, food, and water needs' (2011), p.80

¹⁹ Health and Environment Alliance, Climate Action Network Europe, World Wildlife Fund: 'The co-benefits to health of a strong EU climate change policy' (2008), p.3

²⁰ Health and Environment Alliance and Health Care Without Harm Europe: 'Acting now for better health – a 30% reduction target for EU climate policy' (2010), p.8

²¹ European Commission Communication: 'Energy Efficiency Plan 2011' (2011), p.3

²² Prognos: 'Resource savings and CO₂ reduction potential in waste management in Europe and the possible contribution to the CO₂ reduction target in 2020 – summary' (2008), p.4

²³ European Commission Communication: 'Energy Efficiency Plan 2011' (2011), p.3

²⁴ European Commission Communication: 'Renewable Energy: Progressing towards the 2020 target' (2011), p.2

²⁵ Friends of the Earth: 'More jobs, less waste – potential for job creation through higher rates of recycling in the UK and EU' (2010), p. 2

- As eco-efficiency creates the basis for economic growth and citizens' welfare, it naturally benefits also the most vulnerable in the society. The concrete benefits would range from more energy-efficient housing to better health.
- **Reduced dependency on external sources of resources and energy.**
 - **Raw materials including energy imports** account for approximately 30% of EU imports, which in 2010 were worth **€528 billion**.²⁶ More efficient use of its own resources, including energy and minerals, and greater emphasis on recycling could help Europe to secure a sustainable supply of energy and other raw materials, and reduce the impact of volatile price movements on its economy.
- **Make EU industries stronger in a highly competitive global market** – potentially even into leaders in providing greener products and services.
 - This makes sense for corporations themselves: it is becoming ever clearer that sustainable corporations outperform others and resource efficiency strengthens economic resilience.
 - Using its dependence on foreign resources as a springboard to improve its own competence in re-using and refining resources could make Europe a global expert and world leader in eco-efficiency. This could have the additional benefit of helping the EU, in close cooperation with its trade partners, to become a standard setter for the global market.
- **Promoting eco-efficiency would help to meet increased global demand for resources, to meet the challenge of rising prices and to alleviate resource poverty not only in Europe, but also outside the continent.**
 - For example, it has been estimated that **removing subsidies** in the world's energy, water, fisheries and agriculture sectors would produce annual savings of between **1-2% of global GDP**.²⁷

The rationale for action exists. It is obvious that the EU's Member States, regions, industry and citizens will squander an enormous opportunity if they fail to take resource efficiency seriously. The cost of inaction would be significant, and thus the transition to a greener economy must start now.

²⁶ European Commission (DG Trade) website: <http://ec.europa.eu/trade/creating-opportunities/trade-topics/raw-materials/>

²⁷ UNEP: 'Towards a green economy – pathways to sustainable development and poverty eradication, a synthesis for policy makers' (2011), p. 36

FRAMEWORK FOR ACTION

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Producing greener products and services as resource-efficiently as possible implies that greenhouse gas emissions and negative impacts on the environment during their life-cycle are kept to a minimum. Many such products and services already exist today, and growing numbers of eco-efficient technologies and solutions are in the process of being developed.

Aeroplanes can fly on recycled cooking oil, and cars can run on solar power and hydrogen. Smarter fridges can reduce food waste. Excess heat from computers in data centres can be channelled into district-heating networks to warm up homes. Waste is used as a source of energy for households or public transport. More energy-efficient and environmentally-friendly motors are available for ships and power plants. Buildings can use daylight for lighting, natural ventilation instead of air conditioning, and geothermal energy for heating. Significant amounts of energy can be saved if structures are insulated and windows upgraded.

But despite the ongoing developments, the uptake of existing solutions has been, and continues to be, slow. It is becoming clear that reducing the negative environmental impact of a critical mass of goods and services throughout their life-cycle and promoting more efficient use of resources throughout the economy will require a comprehensive policy framework, a functioning market and investments. These elements can help to generate demand for greener products and services, encourage their development and promote their uptake.

2.1 EXISTING POLICY FRAMEWORK

Resource efficiency is one of the flagship initiatives under the 'Europe 2020' strategy. This is a sign that the EU acknowledges the importance of creating a long-term framework for success. A European Commission communication, called *Roadmap to a Resource-Efficient Europe*, published in September 2011, creates an initial timeline for needed actions. One of the first tasks will be to define the indicators and targets for resource efficiency, which the Commission suggests should be done by the end of 2013.

In addition to specific work on resource efficiency, the European Commission has published a diverse number of other proposals that can contribute to creating the basis for an eco-efficient Europe. It should be noted these proposals build on and reinforce Member States' existing commitments. Some of the recent proposals that look at necessary developments in the energy sector include *Energy 2020: A strategy for competitive, sustainable and secure energy*, *European Energy Efficiency Plan 2020*, *Energy infrastructure priorities for 2020 and beyond – a Blueprint for an integrated European energy network* and the *Energy Roadmap for 2050*. A strategy for *Tackling the challenges in commodity markets and on raw materials* sets out measures that are needed to secure and improve EU's access to raw materials. In addition, proposals such as the *Low-carbon economy 2050 roadmap*, the *White Paper on the future of transport*, the *2020 EU biodiversity policy and strategy* and proposals on reforming the Common Agricultural Policy and Cohesion Policy demonstrate that there are a vast number of policy areas that can and should take resource efficiency into account. Many of these proposals are currently being discussed in the European Parliament and among Member States, and it is obvious that strengthening the policy framework for resource efficiency will not be easy. However, in order to deliver the objectives of the Europe 2020 strategy, it is vitally important to ensure that the policy framework supports the development of a resource-efficient Europe.

It has been agreed that resource efficiency will be addressed under the European Semester in 2012, during which Member States' budgetary and structural policies will be reviewed and governments will be given policy advice to finalise their budgets for the following year. This is a positive step, which will hopefully lead to real results. As resource efficiency plays an important role in reducing expenditure and increasing revenues, it is in the interest of Member States to take seriously the potential it offers to save money and stimulate the economy. It is in the interest of the whole EU to ensure that country-specific recommendations highlight the urgency of action and pave the way for concrete measures.

As highlighted throughout this paper, all EU policies should support the objectives of the 'Europe 2020' strategy and aim to lay the foundations of smarter, greener and more inclusive growth.

2.2 SETTING TARGETS AND INDICATORS FOR A GREENER ECONOMY

It is clear that Europe needs a long-term target to give policy direction and indicators to describe progress made towards greater resource efficiency. Whether this means establishing ceilings for pollution or the use of natural resources, the targets and indicators should value natural capital and ecosystem services, and help to measure pressures on natural ecosystems and their related impact on the economy. It is important to make sure that they promote smart and efficient use of resources throughout their life-cycle.

Resources must be used in a manner that creates the highest possible value and does not increase exploitation of other scarce resources. The starting point must be using resources in a manner that provides the highest possible value as a food product, as a material for consumer products and as a last level: as a source of energy. Links between resources and trade-offs related to their use must be better understood.

It must also be emphasised that indicators and targets will be most efficient in promoting and achieving a more sustainable economy and greener growth if they take into account links between the environment and the economy, and measure more generally progress towards establishing an

eco-efficient economy. This requires a combination of economic and environmental indicators, together with broader definitions of well-being.

The Organisation for Economic Cooperation and Development (OECD) has suggested four indicators for monitoring progress towards green growth, and these could be used as a basis for further debate. The suggested indicators include describing, tracking and measuring changes in: (i) environmental and natural resource productivity, such as carbon, energy and material productivity; (ii) the natural asset base, including renewable and non-renewable stocks, biodiversity and ecosystems; (iii) quality of life affected by environmental changes, for example in water or air, and; (iv) economic opportunities arising from environmental considerations, including innovation and technological solutions, production of environmental goods and services, and the effectiveness of policy responses, such as taxation and pricing mechanisms for energy and water.²⁸

2.3 PROMOTING LIFE-CYCLE THINKING

The guiding principle of all EU policies and actions should be that resources – energy, other raw materials and water – have a life-cycle. Europe needs to promote a circular economy, in which use of resources is planned from production to disposal and their usage is as efficient and green as possible throughout their life-cycle.

Natural resources provide the energy and raw materials that can be used to make consumer products. Once the product no longer functions or is needed, the product and its component materials should be reused, recycled or as a last resort, thrown away.

Creating a recycling economy that builds on sustainable production and consumption is only possible if producers aim to reduce consumption of primary raw materials and take responsibility for their products from ‘the cradle to the grave’, if consumers buy greener products and dispose of them efficiently, and if policymakers ensure that the framework supports such life-cycle thinking. The ultimate goal should be a ‘cradle-to-cradle’ approach, where the re-use and recycling of all materials allows Europe to become waste-free.

Facts and figures:

Small steps have already been made. For example, SITA France/Suez Environnement and a big car manufacturer have formed a joint venture in France to recycle end-of-life vehicles. They aim to recover 95% of each vehicle by 2015.²⁹

As another example, SITA UK/Suez Environnement is participating in a project in the UK to build plants that convert end-of-life plastic into diesel fuel. The goal is to build 10 plants in the UK that can treat 60,000 tonnes of mixed plastic waste per year. The project aims to address the UK’s shortage of energy production and give plastics a second life through energy recovery.³⁰

If waste is seen and treated as a resource, it can help to reduce Europe’s dependency on imported materials and reduce impacts on the environment. Creating a circular economy comes with significant side-benefits: it saves non-renewable natural resources, contributes to reducing greenhouse-gas emissions and generates employment.

²⁸ Organisation for Economic Cooperation and Development (OECD): ‘Towards green growth: monitoring progress – OECD indicators’ (2011), p.32

²⁹ Example from Suez Environnement

³⁰ Example from Suez Environnement

2.4 INVOLVING ALL

Greening the European economy and its products and services, and more effective use and reuse of resources, calls for a horizontal, integrated approach and more interaction across sectors. At both EU and national levels, this requires involving all relevant policy sectors – including energy, transport, industry, the environment, research, trade and agriculture – in concrete proposals and measures. Developing policies in silos creates fragmentation and insufficient planning, and it makes integrating key objectives across policy fields more difficult. Promoting eco-innovation and resource efficiency as a circular, rather than a sectoral, issue would make implementation easier and bring numerous benefits.

Co-ordination is needed within governments. As different resources are closely linked, and shortages and price fluctuations can easily spread from one resource to another, governments must promote a horizontal, integrated approach to the use of resources. They must understand the impacts of resources on others and possible trade-offs when developing policies and promoting action.

In addition, cooperation is needed – especially between the public and the private sectors – in decision-making and in concrete projects. Both sectors must be involved in policymaking and regulatory processes. At the same time, more interaction is needed in concretising infrastructure projects. Public-private partnerships (PPPs) can provide an important framework for building transport, energy and ICT infrastructure, for example.

Achieving a step change in behaviour and hitting EU's long-term sustainability targets will require an attitude change among policymakers, businesses and consumers alike. Consumption patterns can only be changed if supported with economic, social and environmental incentives, and education.

Policymakers, public and private sector actors and consumers must pursue this aim – together. As this paper demonstrates, this will require tackling a number of obstacles, including barriers to innovation, trade, public procurement and investment.

2.5 SPECIAL ROLE FOR THE PUBLIC SECTOR

The public sector can play an important role in promoting structural changes in society and greening the economy. It can be both a significant producer and consumer of greener products and services.

The public sector has an important role to play in European resource management, given that it owns about 46% of the waste utilities and about 47% of the water management facilities in the EU.³¹ If the prices of resources like water were to reflect the true cost of using them, and if there were a functioning market for recycling and re-using materials, this would lead to direct financial benefits for the public sector.

The public sector is also a large consumer of resources, products and services, and it has key role to play in using public funds more efficiently for the benefit of the whole economy. It should be noted that public procurement, that is, government spending on contracts to buy goods, services and infrastructure, accounts for 17% of the EU's GDP, and thus its actions matter.

³¹ Copenhagen Economics: 'Eco-innovation and resource efficiency: gains from reforms' (2011), p. 10

Facts and figures:

It was estimated already 10 years ago that if the EU Member States would put stronger emphasis on energy efficiency in public procurement and investment practices, and in energy management, the public sector could reduce its use of heating and electricity by 20% by 2020.³²

There are significant opportunities for the public sector to increase efficiency, reap the benefits and contribute to greening the European economy. For example, by greening public infrastructure, including transport and buildings, it also helps to advance eco-efficiency and promote greener products and services.

Facts and figures:

In the UK, studies have shown that the greatest potential to save water and save money lies in the public administration. The financial benefit has been estimated at €186 (£154) million, which represents almost 29% of the total water savings opportunity in the UK.³³

In Malmo, Sweden, 50% of heat is produced from its 550,000 tonnes of annual waste. In Lille, France, on the other hand, household food waste, trimmings from parks and leftovers from school and hospital canteens are turned into methane gas, which is used to power about a third of the city's buses.

Lyonnais des Eaux/Suez Environnement has created a system, which uses a heat exchanger installed in the sewage collection, to recover heat from waste water. This system is used to heat, for example, the water basins of the new Aquatic Center in a medium-sized municipality in France. It has enabled the municipality to reduce the energy consumed to heat the Aquatic Centre by 24% and its greenhouse gas emissions by 66%.³⁴

Individual public institutions can also play a major role. For example, a Finnish hospital wanted to reduce the amount of energy it wastes. By renewing its heating, ventilation and air-conditioning system, its energy savings now amount to about 5 million kWh/year and it has been able to reduce its CO₂ emissions by 2,420 t/year.³⁵

It is important for the public sector to understand that failure to invest in eco-efficiency now means wasting public money in the long term.

2.6 SPECIAL ROLE FOR THE PRIVATE SECTOR

As well as making use of existing solutions, new innovative products and services will be needed to put Europe's economy on a greener path. By greening and decreasing the environmental impacts of their own operations and by bringing greener services and products to market, the private sector contributes to greening the European economy and provides solutions that help to increase global sustainability.

³² PROST Project (EU SAVE Programme): 'Harnessing the power of the public purse: final report from the European PROST study on energy efficiency in the public purse' (2003), p.145 on the website: http://www.eceee.org/EEES/public_sector

³³ Oakdene Hollins for the UK Department of the Environment, Food and Rural Affairs: 'Further Benefits of Business Resource Efficiency' (2011), p.8

³⁴ Example from Suez Environnement

³⁵ Example from ABB

Facts and figures:

Technological developments can play a significant role in promoting eco-efficiency. For example, ABB produces AC drives that optimise the amount of electrical energy needed by changing the motor speed and thus help to reduce energy wastage. Approximately one million energy-efficient AC drives have been taken into use in the last 10 years, and these have generated energy savings of 64 billion kWh each year, reducing annual CO₂ emissions by 32 million tons.³⁶

With regard to products and services, it is good to remember that even small investments can lead to significant savings. For example, basic monitoring tools for measuring resource usage and waste can help to drive behavioural change and enforce resource efficiency. As another example, updating a computer's software can make older models more efficient, reduce power consumption and decrease the need to continually upgrade hardware.

Today's businesses should have and show genuine interest in eco-efficiency. It is obvious that resource efficiency is becoming the basis of competitiveness for European businesses, as it allows them to save money and improve their business models.

Facts and figures:

According to a Eurobarometer survey published in March 2011, 75% of European businesses have experienced an increase in material costs in the last five years, and 90% expect prices to increase in the future.³⁷

Philips has set itself the target of improving the energy efficiency of its entire portfolio by 50% from 2010 to 2015, reducing the CO₂ emissions and energy consumption of its own facilities and logistics operations by 25% by 2012, and increasing the sales of green products by 50% in 2015.³⁸

The gains from making low- or no-cost resource efficiency improvements for UK businesses has been estimated at around €28 (£23) billion annually. The biggest savings opportunities were identified in waste management, recycling (€22/£18 billion), and in the use of energy (€5/£4 billion). For example, making modest changes to transport logistics was shown to increase businesses' energy efficiency tremendously. By implementing measures with a payback period of longer than one year, the additional savings would be €40 (£33) billion. In addition, implementing resource-efficiency measures could reduce the UK's annual greenhouse gas emissions by 13% (i.e. 90 MtCO).³⁹

Businesses that acknowledge the importance of eco-efficiency are eager to participate in building a greener economy, and look up to the EU to provide a clear, long-term commitment and a market for their products and services.

³⁶ ABB: '100 top energy saving ... AC drive tips' (2002), p.6

³⁷ Eurobarometer: 'Attitudes of European entrepreneurs towards eco-innovation' (2011), p.11 on the website: http://ictsd.org/downloads/2010/09/study-patents-and-clean-energy_159101.pdf

³⁸ Example from Philips

³⁹ Oakdene Hollins for the UK Department of the Environment, Food and Rural Affairs: 'Further Benefits of Business Resource Efficiency' (2011), p.6

PRODUCTS AND SERVICES THAT CONTRIBUTE TO A GREENER ECONOMY NEED A MARKET

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Greener growth and the development of a more sustainable economy will only be possible if greener products and services sell. Creating functioning markets and boosting trade in resource-efficient, low-carbon and environmentally-friendly goods and services, not only within the EU but also outside it, would give all companies an incentive to develop and invest much more in greener goods than has been seen so far.

Facts and figures:

The slow development of clean energy technologies is a useful reminder of the lack of demand in world markets: less than 1% of all patents issued worldwide from 1988-2007 were related to clean energy technologies.⁴⁰

More must be done to promote a pull rather than just a push for eco-efficient products and services. This entails creating a functioning internal and external market for eco-innovation and resource efficiency. European policymakers must promote greater price stability and help to lay the foundations for the European private sector to deliver resource-efficient solutions in both domestic and export markets.

⁴⁰ UNEP/EPO/ICTSD: 'Patents and clean energy: bridging the gap between evidence and policy' (2010), p.29

3.1 CREATING A FUNCTIONING INTERNAL MARKET FOR ECO-EFFICIENCY

A larger and more open market means greater incentives for all companies to invest in eco-innovation and resource efficiency, leading to higher growth, better innovation and more jobs. Areas where greater European integration is needed include research and innovation, production and recycling, ensuring that renewable energy is used both smartly and efficiently, and creating best framework conditions for action.

3.1.1 Towards the Innovation Union

Europe's innovation processes are inefficient and the market does not support the deployment of innovative products and services. Cooperation on research and development (R&D), testing and marketing, as well as on getting products and services to market across borders, remains difficult. For example, small and medium-sized enterprises would often need assistance with marketing and commercialising new products and services.

Policy developments

This has been realised at the EU level. The EU aims to stimulate innovation through policies, legislation, financial support and standardisation. The 'Innovation Union' is one of the flagship initiatives under the 'Europe 2020' strategy, placing significant emphasis on knowledge, research and innovation. The Research and Innovation Strategy creates a roadmap for boosting investment in research, and making Europe a more attractive place for investment and more successful at developing new products. However, achieving this will require removing obstacles to cross-border flows of people, ideas and funding.

One of Europe 2020's headline targets is to increase Europe's spending on research and innovation to 3% of gross domestic product by 2020. It is currently 1.9% of gross domestic product (2008) and has not moved significantly for a decade. Although research spending does not always directly lead to innovation, financing remains a bottleneck that must be addressed.

In the Multiannual Financial Framework for 2014-2020, the European Commission proposes a significant 40% increase in research and innovation funding. The main instrument will be the 'Horizon 2020', which will combine all existing funding provided through the Framework Programmes for Research and Technical Development, the innovation-related activities of the Competitiveness and Innovation Framework Programme, and the European Institute of Innovation and Technology. It will have a budget of €80 billion, and thus could play an important role if used to promote resource efficiency.

Increasing cooperation between EU Member States

At the same time, although it is important to promote and invest in new technologies, it should not be forgotten that a number of solutions already exist today that can reduce energy consumption, decrease emissions and increase resource efficiency. The key is to enhance cooperation between EU Member States in getting new and existing solutions adopted on a large scale. Also, it should not be forgotten that often even small changes can lead to significant savings, but the results will only show if supported by a united effort.

For example, new and existing infrastructure, transport, and production and use of energy are areas that create significant amounts of greenhouse gases and could make tremendous improvements with regard to resource efficiency. Numerous solutions already exist today that could help to green

these sectors. However, the results will show only if EU Member States co-operate in carrying out infrastructural changes, using ICT and promoting more efficient logistics.

Facts and figures:

A well-functioning single market for transport would allow logistics operations to be carried out effectively. By reducing the number of empty loads on Europe's highways and railroads, it would help to reduce emissions and pressure on the roads.

At the same time, developing a digital single market and promoting the use of ICT solutions can help to support various greening efforts, drive economy-wide efficiencies and cut down carbon emissions. It has been estimated that ICT could reduce global CO₂ emissions by 15% by 2020.⁴¹ Using ICT helps to dematerialise the economy: for example, by reducing the need to travel and shifting consumption from manufactured goods to electronic services, as exemplified by music and the shift from LPs, cassettes and CDs to electronic tracks. ICT also affects how we generate energy and use resources. Smart electricity grids allow renewable to be used efficiently, while energy meters and new ICT technologies can help to increase energy efficiency and tailored smart water metering services can help individuals, municipalities, businesses and industries to control their water consumption. However, in order to have an effect they must be brought to scale and applied across the EU.

This often easier said than done. For example, companies could significantly reduce the use of servers, save energy and reduce CO₂ emissions by using cloud computing. In fact, annual energy savings linked to cloud computing in the UK are estimated at €1.39 (£1.2) billion, reducing CO₂ emissions by the equivalent annual emissions of over four million passenger vehicles.⁴² However, the advancement of cloud computing is hindered by disagreements at the EU Member State level regarding information sharing, especially with regard to privacy, security and data sovereignty issues.

RECOMMENDATIONS

The EU needs a functioning internal market, where innovation processes are more efficient.

- More cooperation is needed across borders and institutions in research, development, testing, marketing, and getting products and services to market.
- More cooperation is needed to reduce the emissions of buildings, in the production and use of energy, and in transport. ICT systems and more efficient logistics should be used to improve resource efficiency and green the economy.
- Access to finance, such as venture capital, must be improved to provide an impetus to develop new low-carbon technologies and resource-efficient solutions.
- Businesses and especially small and medium-sized enterprises (SMEs) must be given guidance on finding ways to reduce costs and waste, and encouraged to take advantage of being first-movers. The Member States and the EU should help companies to work together on improving the resource efficiency of their operations, products and services. In addition, SMEs need assistance with marketing and commercialising new products and services.

⁴¹ The Climate Group on behalf of the Global eSustainability Initiative (GeSI): 'SMART 2020: Enabling the low-carbon economy in the information age' (2008), p.6

⁴² Verdantix (for Carbon Disclosure Project): 'An addendum for France & the UK to Cloud Computing – The IT Solution for the 21st Century' (2011), p.3

The EU budget and post-2014 research and innovation funding should reflect the political importance afforded to green and smart growth under the Europe 2020 strategy.

- Some of the EU's Structural Funds should be used for procuring innovative technologies and R&D.
- The emphasis on resource efficiency should translate into research and innovation projects that promote solutions from water management to recycling.

3.1.2 *Creating a European life-cycle market*

Facts and figures:

Every year, the EU produces around three billion tonnes of waste. As only 40% of solid waste is recycled, for a resource-dependent Europe, this accounts for a significant loss of resources in the form of materials and energy.⁴³

To illustrate the challenge: certain metals are considered vital for deploying low-carbon technologies and for creating a greener economy, including for producing solar, wind and nuclear technologies, as well as electric vehicles and carbon-capture systems.⁴⁴ However, they suffer from supply bottlenecks due to high demand and concentration of supply in China. To address these upcoming challenges, one important first step would be to enhance waste management and start to re-use existing metals which can already be found on European markets.

Resource efficiency can be applied throughout the value chain, in production, collection and recycling. This requires substituting resources that are scarce or have major environmental impacts, re-using materials, utilizing the potential of valuable primary raw materials by refining them as far as possible, reducing the amount of energy used over the life-cycle and reducing the total amount of materials needed to produce products or services.

Moving towards a circular economy in which resources are recycled and re-used brings many advantages and benefits all stakeholders. It boosts security of supply by helping to save natural resources. It contributes to reducing greenhouse gas emissions and can help to generate employment. It could help the EU to become a global leader in recycling.

Facts and figures:

It has been estimated that a ton of electronic scrap just from personal computers contains more gold than what can be recovered from 17 tons of gold ore.⁴⁵

Recovering 10 kilograms of aluminum via recycling, for example, uses less than 10% of the energy and saves 20 kilograms of CO₂ compared to primary production.⁴⁶

⁴³ Eurostat news release '40% of municipal waste recycled or composted in 2008, Half a tonne of waste generated per person' (19.3.2010)

⁴⁴ R.L.Moss, E.Tzimas, H.Kara, P.Willis and J.Kooroshy, Joint Research Centre Scientific and Technical Reports: '*Critical Metals in Strategic Energy Technologies - Assessing Rare Metals as Supply-Chain Bottlenecks in Low-Carbon Energy Technologies*' (2011)

⁴⁵ USGS Fact Sheet: 'Obsolete Computers, "Gold Mine," or High-Tech Trash? Resource Recovery from Recycling' (2001) on the website: <http://pubs.usgs.gov/fs/fs060-01/fs060-01.pdf>

⁴⁶ Science Daily: 'Set World Standards For Electronics Recycling, Reuse To Curb E-waste Exports To Developing Countries, Experts Urge.' (17.9.2009), on the website: <http://www.sciencedaily.com/releases/2009/09/090915140919.htm>

In the last years, employment has continually grown in the recycling sector,⁴⁷ and it has been estimated that recycling 70% of key materials in the EU by 2025 could create over 560,000 new jobs.⁴⁸

Tackling the barriers

However, many barriers must still be tackled. For example, in Eastern Europe, poor waste collection contaminates significant amounts of potentially recyclable materials. This low use of waste management solutions can be explained by inadequate infrastructure, lack of environmental awareness, and weak political will to tackle the issue.

There are no strong incentives for producers to develop products from recycled materials or to re-use them. For example, users of recycled materials are not rewarded for substituting raw materials, and green public procurement does not encourage such practices.

It should also be noted that in most cases the user or consumer decides what happens to a product at the end of its life-cycle and they are not legally required to recycle products. This creates a mismatch between the responsibility of producers and their inability to control a product's destiny at the end of its life-cycle.

In addition, as will be described in Section 3.2.3 'Becoming a leader in eco-efficiency', significant amounts of waste and therefore valuable materials are continually exported illegally outside the EU. One of the main challenges in bringing about a change is confusion over who is and should be responsible for recycling.

Under the Waste Framework Directive, the European Commission is developing end-of-waste criteria for specific waste streams, and working on rules for ferrous metals, aluminium, copper, recovered paper and glass. However, as long as Europe does not have functioning markets for recycling or using secondary raw materials, valuable materials within Europe will be wasted and demand for natural resources from outside Europe will only continue to increase.

Facts and figures:

Cradle 2 Cradle Network (C2C) between some European regions calls for fundamental redesigning of material flows. For example, the majority of known recyclable materials are reused in lower applications (down-cycling) because it is not possible to separate valuable materials at the end of their useful life span. Gradually these materials are dumped or they are incinerated with or without energy recovery. In order to reuse products in the manufacturing chain, a completely new kind of cooperation is needed between suppliers, producers, product designers, customers, consumers and material managers. C2C calls this eco-effectiveness.⁴⁹

RECOMMENDATIONS

The EU must promote a system – a functioning internal market – in which a life-cycle approach to the use of all key resources is supported. Resources must be used in a manner that provides the highest possible value as a food product, as a material for consumer products and finally: as an energy source.

⁴⁷ European Environmental Agency: 'Earnings, jobs and innovation: the role of recycling in a green economy' (2011), p.16

⁴⁸ Friends of the Earth: 'More jobs, less waste – potential for job creation through higher rates of recycling in the UK and EU' (2010), p. 2

⁴⁹ Example from Province of Limburg

Europe needs a comprehensive policy framework for secondary raw materials.

- The EU should consider developing reward mechanisms for substituting virgin materials with secondary raw materials.
- As the design of products influences their recyclability, the Eco-design Directive should be extended to all products, products should be subject to standard recyclability requirements and producer responsibility schemes should be improved.
- Waste must be seen and treated as a resource, which includes treating it as a good and granting producers more control over products at the end of their life-cycle. This also requires consumers and product owners to take more responsibility for products at the end of their life-cycle.
- Europe needs a market for secondary materials and recycling schemes for goods like bottles, mobile phones or light bulbs.

3.1.3 *Creating a market for renewables*

Each EU Member State has been given a national target for a minimum share of renewable energy in its total production of energy. That means there are 27 different national support schemes instead of a single framework, and as a result, technologies lack the chance to develop and mature properly, and end up being used in less than optimal locations.

Facts and figures:

According to the Copenhagen Economics study, implementing national renewable energy targets together, so that renewable technologies are placed where they are most efficient, could save EU consumers €8 to 17 billion annually by 2020.⁵⁰

Smart electricity grids are an essential element in creating an internal energy market. They would allow large amounts of different renewable energy sources, including new offshore wind capacities, to be connected to the grid. Their deployment would bring enormous benefits: increase network security and reliability, reduce CO₂ emissions, and enable consumers to control their use of energy and thus encourage energy savings.

The European Commission's recent Communication 'Smart Grids: from innovation to deployment' is an important step in encouraging the deployment of smart electricity networks and smart meters. However, technological uncertainties and lack of public acceptance, common standards and regulation offering incentives to develop smart grids are hindering investment in electricity networks.

Facts and figures:

These challenges need to be tackled if the EU is to meet the investment need for digitised electricity grids, which is estimated to be €142 billion by 2020.⁵¹

It has been estimated that while reducing losses from electricity distribution and enabling greater energy efficiency, the deployment of the smart grid could lead to savings worth €52 billion a year in the EU.⁵²

⁵⁰ Copenhagen Economics: 'Eco-innovation and resource efficiency: gains from reforms' (2011), p. 15

⁵¹ European Commission Staff Working Document: 'Impact assessment, accompanying document to the Energy infrastructure priorities for 2020 and beyond – A Blueprint for an integrated European energy network' (2010), p.19

⁵² Oracle: 'The Future of Energy – an independent report for Oracle Utilities' (2011), p.5 on the website: <http://www.oracle.com/us/industries/utilities/utilities-future-energy-525446.pdf>

RECOMMENDATIONS

The EU needs a functioning internal market, in which a common framework for meeting the renewables target ensures that renewables are located where they are most efficient.

- This includes the creation of a smart pan-European grid.
- Joint implementation mechanisms for national targets should be considered.

3.1.4 Ensuring that policies set the right framework conditions

Investments in eco-efficiency require policies that set the right framework conditions. They must create incentives for eco-efficient solutions, while reducing incentives to produce energy, products and services with high CO₂ emissions. They must be created with a long time horizon, thus promoting predictability and stability on the market, and reducing resource price volatility. They must provide investors with confidence that they will get a return on their investment. If implemented well, this framework can create a springboard for European companies to enter first European and then global markets, and consequently help to promote better resource efficiency around the world.

The EU already has a basic framework that supports resource efficiency both directly and indirectly. The Landfill Directive, revised Waste Framework Directive, fiscal incentives such as VAT reduction on recycled products and goods or landfill taxes, Producer Responsibility Schemes that are used to enhance recycling performance, Green Public Procurement, expansion of the Eco-design Directive and the Water Framework Directive are just some examples at Member State and EU level. Energy efficiency has been on the political agenda for years, and latest addition to policies in this area was the Commission's proposal for increased energy efficiency, put forward in June 2011.

The adoption of new legislative instruments is unlikely to be the solution, as the greatest challenge is in fact the implementation of existing legislation. Many EU Member States have not developed their infrastructure or regulatory and enforcement systems to the level required by European regulations. Many Directives are not implemented fully and the European Commission is not using the powers given to it to start infringement procedures against violators.

However, the existing framework could be developed further. For example, the Eco-design Directive could be used not only for efficient products but for services too. In addition, the energy efficiency requirements could address not only new buildings but also existing buildings.

In addition, the EU should continue to encourage Member States to shift taxation from labour to pollution. This would boost employment and push for greener production, making polluters pay. The basis already exists: the European Commission's proposal for a revised Energy Taxation Directive suggests that tax should take into account both CO₂ and the energy content of a product, and thus reflect the environmental impact of energy products.⁵³ It proposes that a minimum rate for CO₂ emissions (20 €/tonne of CO₂) should be introduced for all sectors of the economy, including households, transport, smaller businesses and agriculture, which are outside the EU ETS. Also, it proposes that fuel used for transport or heating should be taxed on the basis of the amount of energy that it generates, and thus reward greater energy efficiency.

⁵³ European Commission Communication: 'Smarter energy taxation for the EU: proposal for a revision of the Energy Taxation Directive' (2011), p.7

Facts and figures:

It is estimated that implementing the revised Energy Taxation Directive could lead to additional economic growth of 0.27% of GDP annually and create one million jobs by 2030.⁵⁴ It is positive that many countries in Europe are already introducing some form of energy tax to encourage more efficient use of energy.

In the UK, the government estimates that its Climate Change Levy will cut CO₂ emissions annually by 2.5 million tonnes. UK also uses a tax incentive, Enhanced Capital Allowances, to allow companies to write off 100% of the cost of certain types of equipment, like AC drives, thus encouraging the adoption of energy-saving equipment.⁵⁵

Environmentally-related taxation can also provide incentives to take up technologies that promote eco-efficiency. For example, after Sweden introduced a tax on NO_x emissions, the adoption of supporting technology in the private sector increased from 7% to 62% within a year.⁵⁶

RECOMMENDATIONS

More must be done to promote a pull rather than just a push for eco-efficient products and services across the EU.

- Value of nature and biodiversity must be taken into account in impact assessments, legislation, and review and reform of existing policies.
- The framework conditions such as tax, competition and intellectual property policies but also R&D financing should aim to reinforce both economic growth and sustainable development, and when possible, reward industries that promote resource efficiency. On taxation, for example, the EU should push Member States to understand the benefits of shifting from taxing 'goods' such as work to taxing 'bad' factors, such as pollution.
- The EU must adopt minimum performance standards, which will raise the bar as technologies and solutions progress, helping to remove the least resource-efficient products from the market.

Pan-European regulation together with clear and achievable policy objectives can create a market and provide greater certainty for investment.

- The potential of existing policy instruments and legislation such as the Waste Framework Directive, Eco-design Directive and Water Framework Directive should be fully exploited: harmonised implementation and better enforcement are needed.
- Voluntary agreements and self-regulation can drive change without imposing additional administrative burdens – and should be considered.
- New legislative instruments should only be adopted if necessary.

⁵⁴ European Commission Communication: 'Smarter energy taxation for the EU: proposal for a revision of the Energy Taxation Directive' (2011), p.11

⁵⁵ ABB: "100 top energy saving ... AC drive tips" (2002), p.10

⁵⁶ OECD: 'Taxation, Innovation and the Environment' (2010), p.13

3.2 CREATING A FUNCTIONING EXTERNAL MARKET FOR ECO-EFFICIENCY

Developing a more sustainable economy requires resource-efficient products and services that can cut the use of fossil fuels and reduce pollution in society. The speed of the development will depend to a great extent on boosting trade in such products and bringing the best solutions to scale.

International corporations, including many European businesses, operate on global markets. However, to get the best products to scale, they need a global level playing field and equal incentives for their operations and investments. International agreements can help to create more equal conditions for competition and to create international markets for green technologies, products and knowledge.

Having a global market for green products and services is the basis for economic growth. It can also help to develop the EU's innovation capacity, as the research and development costs can be spread over a larger volume of sales.

Facts and figures:

It has been estimated that trade liberalisation and the elimination of tariffs and non-trade barriers could increase trade volumes of clean energy technologies, including clean coal, wind, solar, and fluorescent lighting, by 7-13%.⁵⁷

3.2.1 Improving access to global markets

However, the reality is that European businesses and their greener products and services have difficulties entering the global market. This access is currently prevented by local purchasing provisions, technical barriers to international trade, and particularly high tariff barriers for environmental goods.

Facts and figures:

For example, of the 153 WTO member nations, nearly 60% impose a tariff of 7.4% on wind turbines and nearly 43% impose a tariff of 8.8% on solar panels.⁵⁸

RECOMMENDATIONS

The EU needs a functioning external market, where greener goods and services can get free access to global markets on fair terms. Global and WTO rules should help combat green protectionism and provide a positive framework for external trade in products and services that support eco-innovation and resource efficiency.

3.2.2 Tackling green protectionism

Fostering trade in low-carbon and energy-efficient technology holds the key both to combating climate change across the globe and to creating international markets for green technologies. Unfortunately, however, green protectionism is becoming an increasing problem on the global market. While often used to support domestic industries, the benefits are seldom long-lasting. In

⁵⁷ World Bank: 'Warming Up to Trade: Harnessing International Trade to Support Climate Change Objectives' (2007), p.69

⁵⁸ Example from General Electric (GE)

fact, such protectionist measures keep prices high for consumers, weaken the development and deployment of new solutions, and slow down the transition to a low-carbon economy.

Facts and figures:

For example, with the EU-India Foreign Trade Agreement, Europe has a unique opportunity to improve market access for its green energy service suppliers. At the moment it takes six weeks for engineers to obtain the necessary visa to work in India. In emergency situations, where European engineers need to urgently repair wind turbines, gas turbines or solar panels, this delay in visa proceedings is a significant problem for the industry.

RECOMMENDATIONS

In the absence of progress in the Doha WTO round, the EU must take the lead in liberalising clean technologies and within its multilateral and bilateral trade agreements negotiate additional trade liberalisation commitments in favour of green technologies. The EU must promote an ambitious and coherent green agenda in all present and future trade negotiations, which aims to fight green protectionism and liberalise trade in clean technologies.

Trade negotiations should seek to bring down barriers to trade in energy services and secure free cross-border movement of highly qualified personnel.

- They should aim for full transparency, national treatment in government procurement and customs procedures, and elimination of local content, sourcing, and ownership requirements, as well as other discriminatory practices that may impair EU investment.

- An agreement on intellectual property rights should also be sought.

3.2.3 *Becoming a leader in eco-efficiency*

As global interest in resource efficiency and new solutions increases and the market grows, the drive for leadership will intensify. Historically, the European Union has been a leader in producing and exporting environmentally friendly technologies, and many European companies are still leaders in emerging green technologies. For example, Europe produces around 27% of the world's bio-plastics and continues to lead the world market in offshore wind installations.

However, in recent times this position is increasingly threatened by both developed countries like Japan or the United States, and by emerging powerful economies in Asia. Competition over who will get to set global standards for new products is ongoing.

Facts and figures:

In the US, new financial investment in renewable energies has increased from just under €12 (\$16) billion to over €19 (\$25) billion.⁵⁹

China already produces half of the world's photovoltaic solar cells, and its wind turbine business is also booming.

⁵⁹ Commissioned by UNEP's Division of Technology, Industry and Economic (DTIE) in cooperation with Frankfurt School-UNEP Collaborating Centre for Climate & Sustainable Energy Finance and produced in collaboration with Bloomberg New Energy Finance: 'Global trends in renewable energy investment 2011 – Analysis of trends and issues in the financing of renewable energy' (2011), p.21

South Korea wants to be a leader in creating a green economy and it aims to invest €355 million (540 billion KrW) in the next five years in promoting eco-friendly sectors. For example, in order to lead the demand market, the South Korean government will push for the use of LED lighting in public institutions, and South Korea is expected to change 30% of its lighting to LED by 2012.⁶⁰

It is in the interest of the EU and European actors to take part in this race. Europe should view this global challenge as a business opportunity. Building on pre-existing expertise on electrical devices, transportation, customised solutions, waste management, energy services, efficient use and re-use of resources, and financing investment could help European companies to become global experts and leaders in developing eco-efficient solutions. It is in the interest of resource-dependent Europe that it will strive to become a world leader in refining and recycling resources.

Facts and figures:

The potential is significant: 70-85% of the opportunities to increase resource productivity in energy, land, water and steel sectors lie in developing countries.⁶¹ Feeding nine billion people by 2050, providing access to clean water for the 800 million people who currently lack it and improving sanitation for 2.6 billion people are just a few examples of the major challenges that could be turned into innovation opportunities.⁶²

An additional benefit of acting first is the possibility that it could allow Europe to become the standard setter for eco-efficiency. This would provide a model which other manufacturers could follow. It happened with telecommunications in the 1990s. As European mobile phone companies started to dominate international markets, as a consequence the European standard for cellular networks, called 'GSM', became the global standard. If Europe were able to set the standards for resource efficiency in the global market, it would bring enormous benefits for European companies. It would promote interoperability and at the same time allow European companies to trade their products and services effectively across the world.

Leading by example

At the same time, it should not be forgotten that becoming a leader in eco-efficiency requires leading by example. Unfortunately this is still not the case. Even now, both legal and illegal waste from EU Member States is transported to developing countries. Some products, like old cars or electronics, may be re-used for a while, while some untreated waste is simply dumped. The European Commission has worked to support Member States in implementing the Waste Shipment Regulation, and members of the European Parliament have called for a collection target of 85% for electrical and electronic equipment from 2016 onwards, in a bid to increase the recovery of valuable raw materials. However, opposition in Member States unfortunately remains strong.

Facts and figures:

For example, 6,000 used mobile phones contain about 3.5 kilograms of silver, 340 grams of gold and 130 kilograms of copper.⁶³

⁶⁰ Example from Philips

⁶¹ McKinsey Global Institute and Sustainability & Resource Productivity Practice: 'Resource Revolution: Meeting the world's energy, materials, food, and water needs' (2011), p.80

⁶² UNEP: 'Towards a green economy – pathways to sustainable development and poverty eradication, a synthesis for policy makers' (2011), p.1

⁶³ Science Daily: 'Set World Standards For Electronics Recycling, Reuse To Curb E- waste Exports To Developing Countries, Experts Urge.' (17.9.2009), on the website: <http://www.sciencedaily.com/releases/2009/09/090915140919.htm>

It is time to recognise waste as a valuable commodity and understand that this kind of material leakage is detrimental to the European economy. As mobile phones are a gold mine of resources, would it be time to start recycling them, at least?

It should also be noted that as long as developing countries do not have the skills, knowledge or technologies in place to turn waste into energy or to recycle the materials efficiently and safely, illegal European exports and dumping waste will continue to contribute to increasing global emissions and worsening the environmental and health impacts of their waste. Moving the problem outside the continent is not the same as solving it.

Leading by example could also provide a model for others. The EU can only convince others to join, if it demonstrates that sustainability and growth can go hand-in-hand. This could also help to create an international market and legal infrastructure, which are needed for promoting eco-efficiency across the world.

The time is ripe for action. World leaders are meeting at the UN Conference on Sustainable Development (Rio+20) in June 2012 to discuss measures to conserve natural resources, to invest in green technologies and human capital, and to improve global environmental governance. The EU can and should play a central role in making the summit a success.

RECOMMENDATIONS

EU industry and the EU economy as a whole should strive to be leaders in developing greener products and services. This could help the EU, in close cooperation with its trade partners, to become a standard setter for the global market.

Although change must start at home, the EU must promote policies and solutions that contribute to solving energy and climate challenges across the world. The aim must be to promote solutions that reduce carbon leakage and increase resource efficiency, also outside the EU.

- For example, rather than reviewing the Waste Shipment Regulation, which is widely recognised as satisfactory, it should be better enforced. Awareness raising, training and strengthening of Member States' enforcement authorities is crucial. Establishing a European Waste Implementation Agency would be an option worth exploring.
- In order to avoid leakage of valuable resources in waste, it is also important to work upstream and to implement more effectively Extended Producer Responsibility.
- When European waste is transported to developing countries, waste producers should contribute to developing safe and efficient waste management in the receiver country.
- The EU should promote its model as an example for others: by demonstrating that sustainability and growth can go hand-in-hand, we will also be able to convince others to take action.

SENDING THE RIGHT PRICE SIGNALS

4.1	Prices of resources should reflect the true cost of using them	25
4.2	The ETS must be improved	27

Much of the public and private sectors is locked in traditional behaviour and attitudes with regard to eco-efficiency. Thus, changes and investments in greener products and services will be possible only if there are strong incentives to do so. The fiscal framework can play an important role in achieving Europe's societal and environmental objectives if it helps to send the right price and investment signals to producers and consumers. At the same time, that would help to settle the economic and ecological bill now – not in the future.

4.1 PRICES OF RESOURCES SHOULD REFLECT THE TRUE COST OF USING THEM

The prices of resources such as water and energy would be very different today if they were to incorporate the full economic, environmental and social costs of using these resources, if scarcity of natural resources were reflected in their price or if products purchased were also to incorporate the cost of recycling. As price would be an important driver of eco-efficiency, much more emphasis must be given to creating and sending the right price signals.

So far, most of our decision-making processes - as reflected in public tendering, for example, as well as the way consumers, media, politicians and businesses make judgements or evaluations - is primarily based primarily on lowest initial cost. Thus there is a tendency to disregard future costs and benefits related to using the given goods and services.

For example, both water and waste are often underpriced. In many countries, the end-of-use price of water does not reflect the full cost of running the service or its scarcity. At the same time, as long as the extraction costs for raw materials are not fully reflected in the sales prices, secondary raw materials retrieved from recycling will not be competitive against virgin raw materials. This also makes it difficult to develop a market for them.

The price of energy, whether from renewable sources, nuclear energy or high CO₂ energy sources such as coal, would change significantly depending on the value given to ongoing or potential damage costs. Be it carbon dioxide emissions from coal or sulphur oxide emissions from geothermal power plants, it is clear that energy prices should better reflect all costs related to using them. So far, some

progress has been made with pricing carbon emissions: the European Emissions Trading Scheme (ETS)⁶⁴ puts a price on CO₂ emissions from European power stations and large industrial facilities. However, work has only just begun.

Challenges on the way

Full incorporation of external costs is difficult. For example, incorporating damage costs related to greenhouse gas emissions (CO₂, NO_x, SO₂, NMVOCs, PM10, NH₃) into the price of resources like energy will be a long process, mainly because calculating impacts often requires long-term analyses. This naturally gives rise to different views on the damages. For example, none of the existing estimates include or arguably can measure every external cost arising from man-made climate change, including health and environmental damages.

Counter-productive and environmentally-harmful subsidies pose further challenges. They reflect an ongoing lack of policy coherence. Subsidies distort the price of resources, and they become counter-productive if they reduce the price of water or energy below their extraction cost or increase their unsustainable use. Irrigation subsidies in agriculture are a perfect example. Environmentally-harmful subsidies are used in the fields of fossil fuels, fisheries, transport and water. For example, when energy subsidies are used to support fossil fuel production, they hinder the development of greener energy solutions and in fact increase CO₂ emissions.

Facts and figures:

Harmful energy subsidies used in only emerging and developing countries are responsible for 10% of global greenhouse gas emissions.⁶⁵

Progress in incorporating recycling costs into the prices of products has also been slow. Doing so could provide an attractive incentive for consumers to recycle their old products, but it would require more efficient networks for recycling across the EU.

Facts and figures:

In many EU Member States, incorporating recycling costs into the prices of products, which are paid back to the customer once they have returned the product to a store, has proven an efficient instrument for changing recycling habits. It has given consumers an attractive incentive to recycle plastic and glass bottles, for example.

The way forward

It is obvious that more effort needs to be devoted to creating and sending the right price signals to consumers. For example, providing consumers with financial incentives and information about the environmental costs of using a given product will create awareness of the importance of eco-efficiency and can help to change consumption patterns.

Taxation is often mentioned as a tool to internalise the external costs of using resources. It should be noted that while the European Commission itself is pushing forward the idea of shifting taxation from labour to environmentally-harmful products and practices, the EU competences here are limited and in the end, success will depend on political and market pressures.

⁶⁴ Directive 2003/87/EC of the European Parliament and of the Council: Establishing a scheme for greenhouse gas emission allowance trading within the Community

⁶⁵ OECD: 'Green growth strategy interim report: implementing our commitment for a sustainable future' (2010), p.10

RECOMMENDATIONS

It is necessary to recognise and calculate the true cost of using energy and resources throughout their life-cycle. There must be a price for pollution and exploitation of resources. The focus must be on realistic pricing.

- This requires internalising external costs such as process costs and ecological, health and safety costs related to using specific resources.
- Recycling costs should be incorporated into the prices of products, and if possible used as an incentive to promote recycling.
- Economic instruments, regulation, price signals and incentives such as tax breaks and creating new markets for ecosystem and sustainably-produced products and services must be used to capture the true value.
- The estimates will always feature a degree of uncertainty. However, a good starting point would be to identify and evaluate who is affected, what the consequences of the change would be, and when possible give the change an economic value. For example, in the case of carbon emissions, more assessment is needed of how high CO₂ energy sources such as coal affect the population and what proportion of a population is affected by having this energy source in national and the EU's energy mixes.
- New pricing should be complemented by labelling and information to consumers about the real costs of goods and services.

Subsidies and support mechanisms must be smart and cost-effective:

- Counter-productive and environmentally-harmful subsidies must be removed. Counter-productive support mechanisms and government subsidies must be stopped.
- Temporary 'green' subsidies must be targeted and cost-effective.
- State aid must be compatible with resource-efficiency objectives.

4.2 THE ETS MUST BE IMPROVED

The European Emissions Trading Scheme (ETS) is the biggest cap-and-trade scheme in the world. Around 11,000 industrial enterprises and energy companies are currently involved in the scheme in Europe. Together, these companies are responsible for around 50% of the EU's CO₂ emissions. The latest newcomer, airline industry, was brought into the ETS at the beginning of 2012.

However, the ETS has faced a lot of criticism. Some argue that current carbon prices are too low and are not triggering the expected investment in low-carbon technologies, while others fear that increasing carbon prices in the EU alone will lead to carbon leakage.

It should be noted that during the first phase of the EU ETS (2005-2007), the total emissions of the participating sectors increased by about 2%. As more allowances than needed were available, prices crashed. However, the second phase (2008-2012) has been slightly better. The amount of distributed allowances was reduced by 11% between 2007 and 2008, and there was a 2% emission reduction in

the participating sectors. Although the decline in emissions can partly be explained by the economic crisis, there is also proof that the ETS could have contributed to the reduction.⁶⁶

However, challenges remain. It is believed that the ETS in its current form can neither drive an energy transition, nor change the fuel mix in Europe. Carbon pricing is not consistent: prices vary widely between EU Member States and sectors. For example, tax rates for fossil fuels for transportation and heating are different. There is so far no evidence that the ETS would have increased companies' profits or employment and thus brought added value. And as long as there is no global cap-and-trade scheme, carbon leakage from Europe will remain a serious challenge. Ensuring that Europe and its industries contribute to reducing worldwide emissions rather than increasing them requires a careful balancing act.

Facts and figures:

However, the potential with the ETS should not be totally ignored. According to the OECD, a 30% reduction target for the ETS sector could bring in revenues worth 2% of GDP. It would also reduce the amount of subsidies required to achieve renewable energy targets.⁶⁷

RECOMMENDATIONS

The European Emissions Trading Scheme (ETS) must be improved with the aim of creating a realistic, long-term predictable price for carbon. The system would ideally be extended into a worldwide emissions trading scheme, which includes most polluting economic sectors.

⁶⁶ Georg Zachmann, Anta Ndoye, Jan Abrell, Bruegel working paper: 'Assessing the impact of the EU ETS using firm level data' (2011), p.9

⁶⁷ OECD: 'A framework for assessing green growth policies' (2010), p.60

INCREASING PUBLIC AND PRIVATE INVESTMENT

5.1	The role of the public sector and public procurement	30
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5.3	The role of innovative funding mechanisms	33

Developing a greener economy requires reallocation of public and private capital. Investments will be needed in research and development; to support natural resources such as water and soil; to promote the development and deployment of new eco-efficient solutions, such as resource and energy-efficient infrastructure, low-carbon transport systems, renewable energies, and waste management and recycling facilities; and to educate and provide people with relevant knowledge and skills. It is also important to ensure that poorer and more vulnerable people can deal and benefit from these investments too.

For example, Europe's current energy infrastructure is built to support fossil energy production rather than renewable energies, and substantial investments would be needed to adapt it to a greener economy. This would also provide the necessary push for investment in alternative sources of energy and technologies such as combined heat and power (CHP).

Facts and figures:

At the moment, all signs suggest that Europe is falling behind in the green investment race. For example, the financial sector's investment in green technologies dropped by 22% in a year, to €28 (\$35) billion in 2010. And for the first time, developing countries were making more new investments in renewable energy projects and providing more equity capital for renewable energy companies than developed countries.⁶⁸ While investment in the renewable energy sector increased globally by 30% to €166 (\$211) billion in 2010, China became the single largest investor (with €39/\$49 billion), while the Middle East and Africa increased investment most significantly (up 104% in 2010).⁶⁹

If Europe wants to take this game seriously, it cannot wait. Both the public and private sectors together with consumers must be given financial, social and/or environmental incentives to start investing in a greener economy. For example, better access to venture capital would act as an incentive for early-stage start-up companies to invest in greener products and services.

⁶⁸ Commissioned by UNEP's Division of Technology, Industry and Economic (DTIE) in cooperation with Frankfurt School-UNEP Collaborating Centre for Climate & Sustainable Energy Finance and produced in collaboration with Bloomberg New Energy Finance: 'Global Trends in Renewable Energy Investment 2011' (2011), p.11, 18

⁶⁹ Oracle: 'The Future of Energy – an independent report for Oracle Utilities' (2011), p.5 on the website: <http://www.oracle.com/us/industries/utilities/utilities-future-energy-525446.pdf>

It should be noted that long-term institutional investors such as pension funds and insurance companies, who control a significant share of world's investment capital, are becoming increasingly interested in this market. However, much more should and could be done to attract these investments in Europe.⁷⁰ The starting point would be for the EU and Member State governments to provide a stable policy framework for investment and innovative funding mechanisms, which bring together public and private funding.

In addition, as a significant source of funding, the EU should itself start to transfer money from slow-growth sectors such as agriculture to areas with potential for growth. It should provide the direction and framework for change.

5.1 ROLE OF THE PUBLIC SECTOR AND PUBLIC PROCUREMENT

Although the vast majority of investment comes and should come from private sources, including long-term institutional investors, public funding is also needed to fill the gaps and address market failures. Currently, at the Member-State level, the strongest hindrance to new thinking and eco-efficient investment in the public sector is lack of initial capital. At a time of economic crisis when austerity measures are needed, it is difficult to convince policymakers to make the initial investment required. This, coupled with the public sector's call for short pay-back periods, explains the slow move towards eco-efficiency projects.

Facts and figures:

European public authorities are important consumers. They spend approximately €2 trillion annually on different products and services.⁷¹ At the same time, they can have a significant impact on saving energy, natural resources and water, reducing waste and emissions, and influencing people's behaviour. Public authorities can build sustainable buildings, buy energy-efficient computers and cars, use environmentally-friendly public transport, and reduce and recover their own waste. By using green public procurement (GPP), public purchasers can also provide industry with incentives to develop greener products and services, and thus influence the market.

It should also be noted that governments have played an important role in providing targeted support and subsidies for greener products. But although this is often required at the start in order to make greener products, such as renewables, commercially viable, it is not a long-term solution. In the long term, subsidies distort the market.

However, green public procurement could be a significant driver for creating a more sustainable European economy. At EU level, the European Commission adopted in 2008 a Communication on 'Public procurement for a better environment', which was meant to offer "guidance on how to reduce the environmental impact caused by public sector consumption and to use GPP to stimulate innovation in environmental technologies, products and services".⁷² So far, most EU Member States have adopted National Action Plans for green public procurement, which include targets and needed measures.

⁷⁰ See e.g. European Climate Foundation: 'Roadmap 2050: financing for a zero-carbon power sector in Europe – a financial sector's view on the decarbonisation of the European power sector' (2011)

⁷¹ European Commission (DG Environment) website: http://ec.europa.eu/environment/gpp/what_en.htm

⁷² European Commission Communication: 'Public procurement for a better environment' (2008), p.4.

But much more must be done to remove the barriers. As public sector institutions are looking to get a return on their investment in a short timeframe of 3-4 years, public procurement often favours the lowest possible purchase price. This undervalues energy efficiency, and undersells the beneficial long-term impacts on society and lower user costs over the product's or infrastructure's lifetime. Challenges also exist in the process. Procurement processes are often lengthy. Small, local and regional governments and small to medium-sized businesses suffer from complicated procurement processes, and bidding for public contracts across borders in the EU or outside the continent is often difficult, as tenders are only published in the local language.

RECOMMENDATIONS

Although subsidies for greener products and services are often needed at the start, more must be done to create positive incentives for investment, for example through green public procurement.

- Governments should become front runners in buying greener products and services. They should create demand for products rather than support manufacturers directly. Public sectors should buy products rather than provide subsidies.
- In the long term, more market-driven mechanisms and incentives for investment are needed. The regulatory framework should encourage long-term investment.

The EU needs a functioning internal market, where sustainable procurement is encouraged.

- Sustainable procurement must take into account not only the initial costs, but also maintenance costs, energy savings, CO₂ emission costs/benefits of emission reduction and recycling costs, thus supporting a life-cycle approach to the use of resources.
- Procurement processes must be simplified so that also small, local and regional governments and small to medium-sized businesses can use them. Relevant training and skills must be available for green procurement.

5.2 ROLE OF EU FUNDING

The EU can provide some financial assistance, and help to provide a push for a greener and more competitive economy. Its research funding and funding schemes such as the European structural funds and cohesion fund can be used to promote innovative, resource-efficient technologies and infrastructure in the EU Member States.

Facts and figures:

For the period 2007-2013, €308 billion has been reserved for regions and structural funds have been used partly to co-finance national, regional and local projects to, for example, insulate walls, roofs and windows, install solar panels, and to replace old boilers.

The EU has also targeted financial mechanisms, for example, to promote energy efficiency. Examples include the Intelligent Energy Europe Programme (2007-2013), which provides €730 million to support projects to overcome market failures; the European Economic Recovery Programme funds, which provide €1 billion to research methods and technologies to reduce the energy consumption of new and renovated buildings, and the Framework Programme for research, technological

development and demonstration (2007-2013), which has financed more than 200 projects to the tune of €1 billion.

The new Multiannual Financial Framework for 2013-2020 is currently being negotiated. The proposal refers to a 'Connecting Europe Facility', which can be used to finance infrastructure projects with high EU added value, such as cross-border interconnections or the deployment of EU-wide systems – and thus could be important in supporting eco-efficiency.

Simultaneously, the discussion about the post-2013 cohesion policy has also taken off. The general hope is that it could become one of the EU's main tools for delivering smart, sustainable and inclusive growth across Europe's regions. It could and should help to connect researchers, and public and private actors, in promoting and taking up eco-efficient solutions in regions.

As noted throughout this paper, the agricultural sector holds enormous potential for improvement. As a contributor to soil degradation, water pollution and biodiversity loss, it is obvious that reform of the Common Agricultural Policy (CAP) must create the framework and incentives for the sector to become a driver for sustainable consumption and production. This should include allocating more money to rural development schemes that promote eco-efficiency. Ideally, the CAP's budget of around 40% of the EU's total annual spending would be cut, and this money would be reallocated to sectors that promote eco-efficiency and hold serious growth potential.

However, although the European Commission's proposal suggests some greening of the budget, the Member States unfortunately continue to oppose linking structural funds or support for European farmers to 'resource efficiency' criteria. Without buy-in from Member States and regions, the potential of EU funding to support eco-efficiency cannot be realised.

At the same time, it should be noted that the absorption of structural funds has so far been low. This can be explained at least partly by lack of knowledge and resources in the Member States to prepare and apply for projects. They often do not have the staff resources and administrative support to apply for and implement projects.

RECOMMENDATIONS

The EU's new Multiannual Financial Framework (2013-2020) must support long-term investment in 'greener' infrastructure and solutions, reflecting the political objectives of the 'Europe 2020' Strategy. European funding mechanisms such as the structural and cohesion funds, the Common Agricultural Policy, the 'Connecting Europe' facility and EU project bonds must promote and aim to reward eco-efficiency, and promote good examples and best practices.

The public sector needs to have the capacity to utilise existing funding for greener solutions.

- This requires awareness raising and improving organisations' capacities to access funds. One concrete step would be to increase the EU budget for technical assistance.
- Also the possibility to simplify the application process at local level should be explored.

5.3 ROLE OF INNOVATIVE FUNDING MECHANISMS

Bringing together public and private funding, for example, either in the form of public-private partnerships (PPPs) or public-private cooperation, could help to fill some of the market gaps. For example, energy performance contracting is a market-oriented mechanism that can be used to make energy efficiency improvements in the building sector. In this, the energy service company agrees to improve the energy efficiency of a facility, and the energy savings are used to pay for the investment.

Recent EU policy frameworks, whether the 'Europe 2020' strategy or the proposal for the Multiannual Financial Framework, have highlighted the need to mobilise private finance and develop new financial instruments to respond to the huge investment needs Europe is currently facing. In the current economic context, PPPs appear to be an interesting instrument to overcome public budget constraints and finance Europe's investment needs. PPPs also provide excellent means for private operators to bring expertise and efficiency to public spending. Cooperation between the private and public sectors can also generate more research and innovative solutions and deliver solutions to public policy problems, including environmental and resource-related issues.

The European Commission introduced in its 7th Framework Programme the concept of Joint Technology Platforms as a new way of realising public-private partnerships at European level. The platforms were created to find synergies between the private and public sectors and address technological challenges deemed to contribute to a number of key policy objectives, which are essential for Europe's future competitiveness. The European Commission has reiterated its intention to 'improve the framework for PPPs'⁷³ and has proposed different financing tools, such as EU project bonds, to facilitate the use of PPPs. However, having recourse to PPPs will clearly not be enough to bridge Europe's investment gap and achieve all the policy objectives of Europe 2020.

RECOMMENDATIONS

New innovative funding mechanisms (including PPPs and private investment are needed to make Europe more sustainable by 2020 and to generate the investment required to deliver the EU's green growth objectives, including smart grids, smart transport and next-generation broadband. The proposed EU project bonds and the Connecting Europe Facility will help and should be implemented, but they are not enough: new ways of creating genuine partnerships between public, private and other stakeholders are needed.

Although PPPs are not a silver bullet to every investment need, they promote knowledge and can leverage private capital in certain circumstances. To make a full use of private investment and achieve the Europe 2020 policy objectives, the EU needs to assess under which circumstances a PPP is suitable, develop other forms of public-private cooperation going beyond traditional models of PPPs and create an appropriate policy framework, which can provide private companies with a long term investment stability.

⁷³ European Commission Communication: EUROPE 2020, A strategy for smart, sustainable and inclusive growth (2010), p.10.

NEW APPROACHES NEEDED TO MEET THE 20/20/20 CLIMATE AND ENERGY TARGETS

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Europe has set itself ambitious energy and climate change objectives for 2020: to make a 20% improvement in energy efficiency, to increase the share of renewable energy in the EU's energy mix to 20%, and to reduce greenhouse gas emissions by 20%, rising to 30% if the international conditions are right. These goals have also been incorporated into the Europe 2020 Strategy for smart, sustainable and inclusive growth and into its flagship initiative 'Resource-efficient Europe'.⁷⁴ Meeting the climate and energy targets is an integral part of creating an eco-efficient economy and society. At the same time, it is worth remembering that greater emphasis on resource efficiency will help to achieve the climate and energy targets. For example, recycling and using secondary materials is much more energy-efficient than producing products from primary materials. It is time to see and treat the climate and energy crisis as a part of a greater ongoing challenge, that is, the economic and ecological crisis.

6.1 TOWARDS GREATER ENERGY EFFICIENCY

Facts and figures:

The European Commission already noted five years ago that Europe's inability to use energy efficiently will result in €100 billion wasted annually by 2020.⁷⁵

Improving energy efficiency can boost competitiveness, improve security of supply and help to reduce the greenhouse gas emissions responsible for climate change. It is a key component of the successful transition to a low-carbon and resource-efficient economy.

Businesses, national governments, regions, provinces, municipalities and cities all have a role to play in increasing energy efficiency. However, urban hubs can be particularly important players in enhancing resource efficiency. For example on a global scale, cities are responsible for 75% of total

⁷⁴ European Commission Communication: 'EUROPE 2020, A strategy for smart, sustainable and inclusive growth' (2010)

⁷⁵ European Commission Communication: 'Action Plan for Energy Efficiency: Realising the Potential' (2006), p.3

energy consumption.⁷⁶ The potential to reduce consumption, especially in energy-intensive sectors such as construction, manufacturing and transport, is enormous.

Facts and figures:

Take buildings, for example. They account for 40% of energy consumption and 36% of carbon emissions in the EU. Existing buildings are a particularly significant untapped source of energy savings. As 90% of these buildings will still exist in 2050, renovating and upgrading this building stock will be of key importance. In fact, if existing technologies and solutions were deployed by 2020, residential energy demand would decrease by 35-40% for existing homes and by 90% for new homes.⁷⁷ This would require, for example, changing systems for heating, ventilation and air-conditioning, paying more attention to building fabrics and insulation, and upgrading appliances and electronics.

At the same time it is worth remembering that with electric cars and other goods and services that are powered by electricity, the assumption is that electricity demand in the EU will only continue to increase in the future. Thus it is important to pay attention to both electricity production and electric goods and services. When carrying out reforms, it is time to extend the focus from energy to greater resource efficiency.

Facts and figures:

For electric power generation, boosting resource efficiency would mean, for example, generating the same amount of electricity from less fuel, water and land, or generating more electricity from the same input of fuel, water and land. Upgrading turbines and switching fuel from coal to gas are examples of the ways in which electricity production can be made more eco-efficient. One under-exploited opportunity lies in using combined heat and power. It can be used to recycle waste heat, for example, from industrial processes to electric power generation.

Electric motors and the systems they drive are the world's single biggest consumers of electricity, accounting for between 43% and 46% of all global electricity consumption.⁷⁸ Thus using more efficient motors would enable users to save both energy and money. In fact, optimising motor-drive systems worldwide could save power equivalent to the annual output of 250 nuclear reactors. Improving the energy efficiency of motor systems by 20-30% would help to reduce global electricity demand by around 10%.⁷⁹ The potential is enormous: for example, the low-voltage drives that ABB installed in 2010 saved an equivalent of 1.3 times the energy consumption of all Indian households in that year (260,000 GWh).⁸⁰

Lighting, on the other hand, represents 14% of Europe's electricity consumption, with 25% being used for residential lighting and as much as 75% used for non-residential buildings and street lighting alone. By switching to energy-efficient lighting, savings in Europe could amount to €28 billion in reduced electricity costs and 98 million tonnes of CO₂, which is the equivalent of taking 38 million cars off the road.⁸¹

The EU recognises the potential of energy efficiency. Achieving primary energy savings of 20% by 2020 was even put forward as one of the five headline targets of the Europe 2020 Strategy for smart,

⁷⁶ UN Habitat: 'Cities and Climate Change Initiative Launch and Conference Report' (2009), p.8

⁷⁷ McKinsey Quarterly 'Winning the battle for the home of the future' on the website: https://www.mckinseyquarterly.com/Energy_Resources_Materials/Electric_Power/Winning_the_battle_for_the_home_of_the_future_2874

⁷⁸ International Energy Agency: 'Energy-Efficiency Policy Opportunities for Electric Motor-Driven Systems' (2011), p.11

⁷⁹ International Energy Agency: 'Energy-Efficiency Policy Opportunities for Electric Motor-Driven Systems' (2011), p.13

⁸⁰ Example from ABB

⁸¹ Example from Philips

sustainable and inclusive growth – although due to internal disagreements, the target was not made binding.

Taking into account the national energy efficiency targets for 2020 that Member States have set themselves, it currently seems that the EU will achieve only half of the 20% target by 2020. Thus, to create a sense of urgency, the European Commission presented a Directive for increased energy efficiency in June 2011. However, it should be noted that it faces strong internal opposition and continues to trigger discussion about the related costs, especially in the Member States and small and medium-sized companies.

RECOMMENDATIONS

To ensure its delivery, the framework for achieving energy efficiency target must be strengthened.

- This includes agreeing on the framework: who is responsible for the required actions and how achieving the energy efficiency target will be measured.
- More attention is needed on financing solutions. For example, the Structural Funds can play a significant role in supporting the uptake of energy efficient solutions in regions.
- Greater cooperation is needed across sectors and between different levels of society in order to ensure a coherent approach to energy efficiency.
- If progress towards improving energy efficiency by 20% is insufficient, then the current College of Commissions should consider making the target legally binding.
- The aim must be to reduce the amount of energy used over a product's life cycle. Motor systems, buildings and transportation are key areas for action. More emphasis must be placed on renovating existing buildings.
- The public must be educated about the benefits of energy efficiency, including cost savings. They must be provided with incentives and tools to reduce their energy consumption.
- More emphasis must be placed on the supply side, for example the resource efficiency of transport or electric power generation. Renewing and expanding electricity generation capacities must include promoting eco-efficiency and reducing CO₂ emissions.
- Horizontal criteria for energy efficiency should be identified and applied across all future European policies and programmes (e.g. cohesion policy, energy infrastructure priorities) to assess improvements in the Member States. For example, the EU's cohesion policy should help cities to replicate effective solutions by giving them incentives to procure solutions together.

6.2 REALISING THE FULL POTENTIAL OF RENEWABLES

Renewable energy is considered central to achieving a greener European economy. Wind power, solar power, geothermal energy, hydro-electric power, tidal power, biofuels and biomass all offer great potential. They can help to reduce global emissions and enhance Europe's energy security by helping to diversify its energy supply and reducing its dependence on volatile oil and gas markets. In addition, developing these new technologies could provide a source of growth for Europe.

Facts and figures:

According to the European Commission, if Europe is able to lead in this development, the EU could employ up to three million additional employees to work in this sector by 2020.⁸²

A key challenge in developing renewables is financing. So far, a number of EU Member States have provided significant subsidies for the installation of, for example, solar and wind power. This has helped to sustain high prices and supported renewable technologies in places which are not always the sunniest or the windiest. Subsidies distort the market and keep investments away from the often less-developed countries that would be better suited to the use of renewables such as solar power. Having 27 different support schemes for renewable energy is extremely inefficient.

Facts and figures:

For example, Germany has invested over €50 billion in solar photovoltaic installations in the last 10 years, but the share of electricity produced by them was only 0.6% in 2008.⁸³

It should also be noted that in order to increase the share of renewables in the EU's energy mix, they need to be interconnected via a pan-European electricity grid. This infrastructure will, however, require significant investments in interconnections and upgrading grids with information and communications technologies. As mentioned earlier, the European Commission has estimated that this will require €142 billion by the end of 2020. As the investments of today will determine the energy mix of Europe in 2030, 2040 and 2050, it is clear that a pan-European electricity grid that allows the incorporation and storage of different sources of energy should be high on the priority list for investment.

Another serious challenge is the potential for clashes with other economic, social and environmental goals. For example, a scarcity of good land for wind power sites is already an issue in Europe. When renewables are used, they must be smart, efficient and take into consideration other policies too.

A well-known note of caution relates to the objective of increasing the share of renewables in transport fuel by 10% by 2020. Although it has been agreed that 40% of the 2020 goal must be met with non-food and feed-competing second-generation biofuels, or from cars running on green electricity and hydrogen, there are widespread fears that the biofuel objective will lead to over-use of valuable materials.

Facts and figures:

Crude tall oil is produced from pulp mass by the pulp and paper industry because it is a valuable resource. Once it has been refined, it can be used to produce paints, paper and pharmaceuticals, for example. The leftover product can be re-used to produce biodiesel. However, the EU's commitment to meeting its renewables target is already threatening a true life-cycle approach to using this resource, as there is an increasing interest in using crude tall oil directly as an energy source. Unless the full potential of these valuable resources is not harnessed as much as possible by refining them, European eco-efficiency will be undermined.

⁸² European Commission Communication: 'Renewable Energy: Progressing towards the 2020 target' (2011), p.2

⁸³ Christoph M. Schmidt, Resp. Editor, Ruhr Economic Papers: 'Economic Impacts from the Promotion of Renewable Energy Technologies, The German Experience.' (2009), p. 5, 10

RECOMMENDATIONS

Increasing the share of renewable energy to 20% should be smart, efficient and forward looking.

- Valuable resources should become waste and be used as a source of energy only at the end of their life cycle.
- Support mechanisms need to be cost-effective and these technologies need to be used only where they are most efficient.
- Achieving a higher share of renewables in the EU's energy mix will require investment in a European smart grid that includes a solution for energy storage.

6.3 PRIORITISING EMISSIONS REDUCTION - GLOBALLY

Energy is the single biggest source of greenhouse gas emissions in the EU. It accounts for 60% of total emissions, and is followed by transport (19%), industry (9%), agriculture (9%) and waste (3%). There is enormous potential for action, and solutions exist already.

Facts and figures:

While full implementation of existing and new energy-efficiency measures in the EU could reduce annual greenhouse gas emissions by 740 million tons,⁸⁴ more efficient waste management could reduce emissions by between 146 and 244 million tonnes by 2020.⁸⁵

Combined heat and power is an excellent example of a technology that can help to reduce carbon emissions caused by heating. By capturing excess heat from power plants or even from people in crowded places, CHP helps to redirect heat, for example, into district heating systems.

The European Union is committed to reducing its greenhouse gas emissions by 20% by 2020. It has also opened up a debate on increasing the target to either 25% or to 30%. Although the economic crisis has led to a reduction in emissions, at the moment, it seems that more ambitious targets will not win the necessary support from Member States and industry.

In addition, the European Commission adopted in March 2011 a "Roadmap for moving to a low-carbon economy in 2050," in which it proposed an 80% to 95% reduction of greenhouse gas emissions by 2050 from a 1990 baseline.⁸⁶ The Energy Roadmap 2050 could play an important role in promoting a new policy framework for achieving this.

It is naturally important for the EU to have a long-term target and to create a roadmap for it. However, it should be noted that this will not stop climate change. If the United States, China and India – the big polluters – are not on board in reducing their global emissions, the EU's efforts will go to waste.

Although there is still no reason to celebrate, some progress was made in the United Nations Climate Change Conference in Durban in 2011, at which the international community agreed to adopt a

⁸⁴ European Commission Communication: 'Energy Efficiency Plan 2011' (2011), p.3

⁸⁵ Prognos: 'Resource savings and CO₂ reduction potential in waste management in Europe and the possible contribution to the CO₂ reduction target in 2020 – summary' (2008), p.4

⁸⁶ European Commission Communication: 'A Roadmap for moving to a competitive low carbon economy in 2050' (2011), p.3

universal legal agreement on climate change as soon as possible, and no later than 2015. Developments such as the commitment of the G20 leaders to rationalise and phase out inefficient and costly fossil fuel subsidies are the basis for concrete action on a global level and it is essential that these commitments will be realised.

Facts and figures:

The biggest fossil fuel subsidisers in the world paid €315 (\$409 billion) in 2010, in order to reduce the prices of especially oil, natural gas and electricity for consumers.⁸⁷ The amount was €85 (\$110) billion higher than in 2009, which can be explained by increase in international energy prices. As energy prices continue to increase, subsidising fossil fuels will not be sustainable economically, socially nor environmentally.

RECOMMENDATIONS

Innovative approaches are needed to reduce greenhouse gas emissions by 20% by 2020.

- Europe needs to focus more on outcomes rather than inputs. As one solution will not suit all, EU policies should ensure that rather than defining the right solutions, they help to develop and promote innovation platforms for creating new solutions.
- A long-term perspective is needed. Europe must already focus on the 2050 goals to reduce greenhouse gas emissions by 80-95% and create a roadmap for achieving this target - while pushing for global action on emission reduction. Action will be needed across the world.

⁸⁷ International Energy Agency, Organization of the Petroleum Exporting Countries, Organisation for Economic Cooperation and Development and World Bank: 'Joint report by IEA, OPEC, OECD and World Bank on fossil-fuel and other energy subsidies: An update of the G20 Pittsburgh and Toronto Commitments' (2011), p.5

BUILDING THE KNOWLEDGE BASE, EDUCATING STAKEHOLDERS AND EMPOWERING CONSUMERS

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Creating a greener economy requires all the stakeholders involved to understand what it means for them. They need to understand what the objectives are, and how it would benefit them. Whether the public or private sector, Member States or consumers, in order to take eco-efficiency seriously, they must be educated, and provided with the knowledge and tools to act.

For example, lack of knowledge and analysis of the costs and benefits of investment are serious barriers to spending on eco-efficiency in both the private and public sectors. The payback period and return on investment – as well as external costs and benefits, such as impacts on health, the environment and agriculture – can vary greatly depending on the investment. This lack of knowledge affects investment decisions and explains, for example, why it can often be very time-consuming to win governmental approval for new, greener products and services. At the same time, without public acceptance it will be impossible to create a greener society with greener solutions and services.

7.1 ACKNOWLEDGING THE DIRECT BENEFITS

The campaign has worked, and although weak on implementation, European citizens are in general aware of the risks related to climate change and the need to reduce their carbon footprints. They see the benefits of saving energy in their purses. However, what is lacking is a wider understanding of the importance and benefits of resource efficiency and creating a greener economy.

As investments in eco-efficiency can save money and increase productivity in both the private and public sectors, the whole story must be communicated to relevant stakeholders. Many examples already exist, but many more will be needed to highlight the benefits and make the case for eco-efficiency in Europe.

Facts and figures:

For example, by greening data centres, Microsoft has been able to reduce water consumption by millions of gallons and the use of concrete by thousands of tons. At the same time, capacity and efficiency have improved.

The city of Tilburg in the Netherlands has switched to energy-efficient LED street lighting, which automatically burns more brightly when someone cycles or walks past, and dims when nobody is around. This has given rise to energy savings of up to 80% and reduced emissions, while creating a greater feeling of safety for people on the street.⁸⁸

General Electric's (GE) 'ecomagination' strategy has allowed the company to save over 73 million euros in the past five years. GE reduced its energy intensity by 33% between 2004 and 2010, thus surpassing its goal of 30% by 2012. It also reduced greenhouse gas emissions by 24%. By 2015, GE aims to improve the energy intensity of its operations by 50%, and reduce its absolute greenhouse gas emissions by 25%. GE has also been able to reduce its water consumption by 22% from a 2006 baseline.⁸⁹

In a similar manner, after ABB helped to refurbish a boiler at a power plant based at Grosskraftwerke Mannheim in 2006, the plant was able to reduce its CO₂ emissions by 10,000 t/year and reduce its annual energy consumption by 20-25%. By upgrading the pump motors at China Steel in Taiwan, meanwhile, the metal industry has been able to save energy (three million kWh/year), reduce its CO₂ emissions (1,465 t/year), reduce water costs (resulting from 65,000 tons of water saved/year), reduce maintenance costs and improve product quality. Finally, by upgrading the fan at Cruz Azul cement plant in Mexico, the industry saved energy (5.5 million kWh/year), reduced CO₂ emissions (2,750 t/year), increased productivity (amounting to a revenue increase of €700,000) and reduced maintenance costs by 97%.⁹⁰

7.2 ACKNOWLEDGING THE INDIRECT BENEFITS

The indirect benefits of eco-efficiency for society and the economy must not go unnoticed. Promoting eco-efficiency across sectors has multi-dimensional advantages.

Facts and figures:

For example, cleaner transport and cleaner sources of energy can reduce levels of air pollutants and thus benefit everyone's health. New attitudes to transport and getting people to walk and cycle more often would promote healthier lifestyles and lead to reductions in cardiovascular and other chronic diseases. The result would be enormous savings in public health expenditure resulting from improvements such as increases in the expected number of healthy life years, falling use of medication and fewer hospital admissions. Meeting the 20% emissions reduction target by 2020 could lead to annual health savings worth €52 billion, and if the EU's domestic target were to be increased to 30%, it could lead to additional savings of €10-30 billion per year.⁹¹

⁸⁸ Example from Philips

⁸⁹ Example from General Electric (GE)

⁹⁰ Examples from ABB

⁹¹ HEAL and Health Care Without Harm Europe: 'Acting now for better health – a 30% reduction target for EU climate policy' (2010), p.8

As another example, more energy-efficient lighting solutions at European schools have had interesting side effects. They have helped to increase reading speed by 35%, decrease errors by almost 45% and improve pupils' attention spans and behaviour.⁹²

The music industry serves as a useful reminder of how the side effects of new developments often only become apparent later. As music delivery turns digital, it has been noted that buying music online reduces carbon emissions by at least 40% compared to buying a CD. If the downloaded music is not burned onto a CD, the saving rises to 80%.⁹³

RECOMMENDATIONS

Investments are always characterised by some level of uncertainty – and this must be accepted when dealing with complex investment decisions and assessing possible costs and benefits. However, to move forward Europe needs to build up a knowledge base on resource efficiency.

- More research, information, examples, communication and knowledge-sharing between and within the public and private sectors is needed, particularly about the economic, social and environmental costs and gains in both the short- and long-term.
- More must be done to demonstrate what efficient use of resources by individuals and by the public and private sectors actually consists of, what the benefits of 'invest-to-save' are and how these measures can be introduced on a day-to-day basis.
- The EU must also show better understanding of the trade-offs or synergies between policies and sectors in order to promote the right balance between actions.
- Knowledge must be communicated to the public and to businesses, and used for the benefit of society as a whole.

7.3 MORE STUDIES ARE NEEDED

Research funding for technologies and solutions that help to green our economy are hugely important and more work is needed to increase collaboration between businesses, innovators, the public sector and consumers in the innovation process – across borders. It is time to put the knowledge economy into use and generate new ecological know-how.

A much more comprehensive picture is needed about what makes a greener economy. A clearer understanding is needed of areas of action and what the most cost-efficient measures would be in the short-, medium- and long-term.

Facts and figures:

Media attention does not always focus on where the greatest potential lies. It is illustrative that while electric and hybrid vehicles have received the most public attention in recent years, their contribution to a resource-efficient economy falls far short of the opportunities related to, for example, improving the energy efficiency of buildings and reducing food waste and water leakages.⁹⁴

⁹² Philips: 'Brighter schools – lighting a sustainable future for education' (2010), p.7

⁹³ Stanford and Carnegie Mellon University: 'The energy and climate change impacts of different music delivery methods' (2009), p.i

⁹⁴ McKinsey Global Institute and Sustainability & Resource Productivity Practice: 'Resource Revolution: Meeting the world's energy, materials, food, and water needs' (2011), p.121

Better understanding of the links and trade-offs between sectors and resources is needed. This will help to avoid and prepare for unwanted consequences, and to reap the benefits that emerge from action.

Facts and figures:

For example, electricity generation requires fuel, water and land, and rising demand can put these resources under significant pressure. Electricity production is already the largest single consumer of water, accounting for 44% of EU's water withdrawals.

In addition, better understanding of consumption patterns and how to influence human behaviour is needed. European consumers are key players in promoting a more sustainable economy and more knowledge is needed on how to enhance this role.

RECOMMENDATIONS

The EU budget and post-2014 research and innovation funding should reflect the political priority given to smart and sustainable growth under the Europe 2020 Strategy. The emphasis given to resource efficiency should translate into research and innovation projects that promote solutions from water management to recycling.

7.4 BUILDING A COMPREHENSIVE STATISTICAL FRAMEWORK

Currently, Member States use different definitions of what constitutes municipal waste, recycling and recovery. There is no common understanding of how primary resources and products flow between Member States and outside the EU, and how resources can be preserved and waste reduced. They use different methodologies, measurement systems and indicators for water scarcity, recycling, use of renewable energy and material-specific recovery. They have different methods of calculating national targets. This makes it difficult to compare waste statistics and performance on recycling and recovery.

RECOMMENDATIONS

The EU needs a comprehensive statistical framework on resource efficiency that it can use for strategic planning. This requires Member States to apply comparable methodologies, measurement systems and indicators for resource efficiency. It could also help companies to compare their environmental footprints.

7.5 MAKING INFORMATION MORE TRANSPARENT

It should be noted that individuals and organisations seldom have an idea of the greenness of products on sale or how much they consume resources. As long as information on products and services is not informative and transparent, it is difficult to change consumer behaviour.

Labelling systems can be used to provide information, for example, about the efficiency of products. As energy prices continue to increase, consumers are increasingly likely to look at the energy efficiency of products when deciding whether to buy. At the same time, solutions such as smart metering for electricity and water can help consumers to measure and manage their use of resources.

Facts and figures:

It is in consumers' own interest to control their water bills and limit exposure to water leakages. Smart water metering services can help individuals, municipalities, businesses and industries to control and manage their water consumption. Households can manage their budgets more precisely thanks to daily consumption monitoring and the introduction of threshold settings that warn of overconsumption or leakages. Meanwhile, municipalities benefit from full optimisation of the local water system through more precise management of the network.

It has been estimated that in the UK alone, rolling out smart meters from 2014 onwards could lead to savings of €8.8 (£7.3) billion in fuel bills over 20 years.⁹⁵

New efficiency labelling is coming into force in Europe for electric motors, ranging from 1.1 to 90 kW. This makes it easier for anyone buying a motor to make a choice for energy efficiency. Using a more efficient motor in an application that runs 8,000 h/year can significantly reduce both energy use (2,288 kWh/year) and CO₂ emissions (1 t/year).⁹⁶

RECOMMENDATIONS

Information must become more transparent and both smart metering and product labelling can play an important role here. In addition, the role of web applications and social media in making consumption of resources more visible and transparent for consumers should be explored.

7.6 EMPOWERING CONSUMERS

Empowering consumers, be they businesses, public sector actors or individuals, means providing them with access to information and giving them the opportunity to act on it. Whether this requires skills, capital, financial instruments, social media, or a supporting policy and market framework – it is clear that empowering citizens will be crucial to achieving a more sustainable economy.

⁹⁵ Oracle: 'The Future of Energy – an independent report for Oracle Utilities' (2011), p.11 on the website: <http://www.oracle.com/us/industries/utilities/utilities-future-energy-525446.pdf>

⁹⁶ ABB: "100 top energy saving ... AC drive tips" (2002), p.13

Facts and figures:

Examples such as Eye On Earth, a joint collaboration between Microsoft and the European Environment Agency, allows European citizens to monitor and comment on air and water quality online in real time.⁹⁷

A team of researchers at Imperial College London is creating a platform called PoliWiki, which will allow members of government and businesses to examine, update and suggest changes to local environmental legislation across Europe, and swap best practices.⁹⁸

RECOMMENDATIONS

Businesses and the public sector need to have the capacity to assess and adapt greener products and services. They need to be able to assess the functionality of new products and services for their purposes, train people to use them, secure their acceptance, find innovative ways of integrating these products and services into everyday use, and develop other practices and infrastructures to support them. While product standardisation is important, different forms of public-private partnerships will also be useful tools to support this aim.

Empowering consumers entails giving them not only access to information but also opportunities to act on that knowledge.

- When this necessitates using new technologies such as smart metering, this may require not just capital but also the skills to harness these new solutions.
- Special loans or bonus schemes can help to encourage sustainable consumer and public sector behaviour and are necessary to overcome initial barriers to investment.

⁹⁷ Example from Microsoft

⁹⁸ Example from Microsoft

CONCLUSIONS

Eco-efficiency stands for doing more – or the same – with less. It means resource efficiency: using and reusing resources more efficiently throughout our economy. It comprises of eco-innovation: developing and using products, processes and other solutions that contribute to environmental protection or more efficient use of resources. It is about enhancing resource productivity and generating more value from the use of resources. It means not wasting valuable materials.

The EU has rightly started to shift its focus from the energy and carbon agenda to a more inclusive vision of resource efficiency. It is becoming clear that meeting the 20/20/20 energy and climate objectives must be aligned with a greater target: eco-efficiency and achieving a circular approach to the use and reuse of resources. Eco-efficiency deserves much more attention and detailed analysis than has been devoted to it so far.

Eco-efficiency is a key component of green growth and the creation of a more sustainable economy. It could provide significant economic, social and environmental benefits for Europe. It can help to deliver the objectives of the Europe 2020 Strategy, drive smart, sustainable and inclusive growth, and boost Europe's competitiveness. It can help businesses to boost their productivity and thus become more competitive on the global market. It can help public sectors to improve their finances. It can bring significant gains for European citizens, from jobs to health benefits. It can help to re-stimulate interest in European integration and in the Single Market project. It could become a positive project for Europe and for Europeans.

The EU cannot afford to wait. Europe needs an exit from the economic crisis. It must find ways to boost its economy, increase its competitiveness and create more growth. Resources including energy, water, land and raw materials are the basis of well-being and economic growth in Europe, and if their value is not recognised now, European citizens will become net payers for this short-sightedness. The EU has put a lot of emphasis on creating a knowledge economy and an innovation union. It is time to make that into a reality, to generate new ecological know-how and to get greener goods and services onto the market and into use – and reap the benefits of being a first mover. It is in the interests of the EU, its Member States and regions, the public and private sectors, and EU citizens for the bloc to unite behind a common goal: becoming a champion of sustainability.

Resource efficiency and eco-innovation = eco-efficiency

Eco-efficiency is the basis for creating a greener economy

The benefits for Europe would be significant

Action is needed – now...

Solutions for efficient management of resources are needed at home, at work, in the public and private sectors, in cities and in regions. And the most efficient and cost-effective way to achieve this is to promote a life-cycle approach to the use of resources. Producers must take responsibility for their products from production to disposal, consumers must be given incentives to buy greener products and learn to dispose of them efficiently, and policymakers must ensure that the policy and market framework supports such life-cycle thinking.

It is clear that Europe needs a single market for eco-efficiency, where EU Member States cooperate on research and innovation, producing and recycling materials, ensuring that the use of renewables is both smart and efficient, and creating the best framework conditions for action. The bottlenecks identified – in innovation processes, in creating expertise and encouraging entrepreneurship, in financing, in educating labour forces and consumers, and in ensuring that policy frameworks, markets and infrastructures support this aim – should be unlocked. This requires horizontal actions across sectors, across the EU – and ultimately across the world.

It should not be forgotten that although change starts at home and action is urgently needed within the EU, in the end, boosting resource sustainability, halting biodiversity loss, tackling climate change and water scarcity, and improving waste management are global challenges.

The responsibility of European policymakers and industries does not end at the EU's borders. Measures to reduce emissions and increase resource efficiency within the EU will be in vain if at the same time the situation deteriorates outside its borders. Thus both carbon and material leakage must be taken seriously. The ultimate aim for policymakers in the EU must be the creation of a global policy framework and a global market for eco-efficiency.

*... and must start
with creating a
single market for
eco-efficiency*

*Global challenges
require global
solutions*

SUMMARY OF RECOMMENDATIONS

I BUILDING A BIGGER MARKET FOR PRODUCTS AND SERVICES THAT CONTRIBUTE TO A GREENER ECONOMY

A) The EU needs a functioning internal market, in which:

- Innovation processes are more efficient. More cooperation is needed across borders and between institutions on research, development, and getting products and services to market.
- A life-cycle approach and effective use and reuse of resources are supported. This requires creating a market for secondary materials.
- A common framework for meeting the renewables target ensures that technologies are located where they are most efficient.
- A pull rather than just a push for eco-efficient products and services is promoted across the EU. Framework conditions such as taxation and competition policies should aim to provide a favourable environment for green growth, e.g. through taxation of environmentally-harmful activities. Minimum performance standards are also needed to help remove the least resource-efficient products from the market.
- Harmonised implementation and better enforcement of pan-European legislation such as the Waste Framework Directive, the Eco-design Directive or the Water Framework Directive are needed to create a level playing field.

B) The EU needs a functioning external market, in which:

- Green goods and services get free access to global markets. Trade rules should help combat green protectionism and provide a positive framework for external trade in products and services that support eco-innovation and resource efficiency.
- The EU takes the lead on liberalisation of clean technologies and systematically negotiates additional trade liberalisation commitments in favour of green technologies in all its multi-lateral and bilateral trade agreements.
- The EU strives to be a leader in greener products and services, and to become a standard setter. The EU's aim must be to promote solutions that reduce carbon leakage and increase resource efficiency, both within and outside the EU. It must lead by example.

II SENDING THE RIGHT PRICE SIGNALS

A) Resource prices should reflect the true cost of using them:

- It is essential to calculate the true cost of using energy and resources throughout their life cycle. There must be a price for pollution and exploitation of resources. Counter-productive support mechanisms and subsidies must be removed.

B) The ETS must be improved:

- The European Emissions Trading Scheme (ETS) must become a system that can be trusted, which aims to give a realistic price for carbon and will ideally be linked to a global emissions trading scheme.

III INCREASING PUBLIC AND PRIVATE INVESTMENT

- More must be done to create positive incentives for investment, for example, through green public procurement and better access to venture capital.
- The post-2014 EU budget, including research and innovation, transport, energy and regional funding, should reflect the political priority given to green and smart growth under the Europe 2020 Strategy. It must support long-term investment in 'green' infrastructure and aim to reward eco-efficiency, as well as promoting good examples and best practices.
- Public-sector and SME capacity to access and utilise existing funding for greener solutions must be improved.
- Innovative funding mechanisms (including public-private partnerships) that promote knowledge and leverage private capital must be harnessed to generate the investment required to deliver green growth objectives, including smart grids, smart transport and next-generation broadband. The proposed EU project bonds and the Connecting Europe Facility will help and should be implemented, but they are not enough: new ways of creating genuine partnerships between public, private and other stakeholders are needed.

IV FINDING NEW APPROACHES TO MEETING THE 20/20/20 CLIMATE AND ENERGY TARGETS

A) Towards greater energy efficiency

- To ensure its delivery, the framework and drivers for achieving the energy-efficiency target must be strengthened. More effective implementation of measures is needed. If progress towards improving energy efficiency by 20% is insufficient, then making the target legally binding should be considered.

B) Realising the full potential of renewables

- Increasing the share of renewable energy in the EU's energy mix to 20% should be smart, efficient and forward-looking. Valuable resources should only become waste and be used as an energy source at the end of their life cycle. Support mechanisms for renewables need to be cost-effective, and the technologies should only be used where they are most efficient. Investment in a European smart grid is required.

C) Prioritising emissions reduction – globally

- Europe's priority must be to reduce greenhouse gas emissions by 20% by encouraging innovative approaches to reducing emissions, which is not limited to renewables. The EU must also already focus on its 2050 goal of reducing greenhouse gases by 80-95% from 1990 levels, and create a roadmap for achieving this target – while pushing for global action to reduce emissions.

V BUILDING THE KNOWLEDGE BASE, EDUCATING STAKEHOLDERS AND EMPOWERING CONSUMERS

- Europe needs to build a knowledge base on resource efficiency. Possible actions and the benefits of 'invest-to-save' must be communicated among the public and private sectors, and used for the benefit of society as a whole.
- The EU needs a comprehensive statistical framework on resource efficiency, which it can use for strategic planning. Member States must apply comparable methodologies, measurement systems and indicators for resource efficiency.
- Information for consumers must become more transparent. Smart metering or product labelling can play a particularly important role here.
- Empowering consumers requires not only giving them better access to information but also providing them with opportunities and the ability to act on that knowledge. For example, special loans or bonus schemes can help to support sustainable consumer and public sector behaviour.

Appendix

Sector-specific recommendations

Looking specifically at key sectors, action will be needed in the following policy areas:

AGRICULTURE

Agricultural use of land has serious impacts on biodiversity, and if ecosystems are not valued, the current decline is only expected to increase. It is estimated that 11% of natural areas will be lost by 2050, mainly to agriculture, and further pressures on biodiversity will emerge as intensive agricultural use of land increases.⁹⁹

Agriculture and land use are also a significant source of emissions: methane and nitrogen oxide emissions from agriculture account for 9.2% of Europe's total greenhouse gas emissions.¹⁰⁰ At the same time, the agricultural sector uses over 40% of water resources in the EU.¹⁰¹ While the EU's agricultural sector has continued to reduce its greenhouse gas emissions, due to factors such as implementation of agricultural and environmental policies and declining numbers of cattle, global farming emissions have notably continued to increase. Policymakers and the private sector have now started to recognise this challenge. At EU level, discussions about a greener EU budget and the associated reform of the Common Agricultural Policy reflect this realisation.

At the same time, businesses are putting forward innovations that can contribute to tackling the challenge. One example is an already-existing agricultural monitoring system that helps to control water distribution on a farm on the basis of seed type, amount of moisture, soil requirements and weather patterns. Results show that the monitoring system can reduce water use by as much as 50% whilst doubling yields.

Action will be needed in the following areas:

- 1) Policy and regulatory framework:
 - Reform of the CAP represents an enormous opportunity to promote eco-efficiency in the agricultural sector.
 - Stronger incentives should be developed for soil protection and management measures, particularly to protect carbon-rich soils.
 - Further research is needed on innovative, sustainable solutions for agricultural production, which will help to lower the sector's greenhouse gas emissions.
 - Sharing best practices among Member States can help the agricultural sector to both mitigate and adapt to climate change.

⁹⁹ The economics of ecosystems and biodiversity (TEEB): 'An interim report' (2008), p.9

¹⁰⁰ European Commission Staff Working Document: 'The role of European agriculture in climate change mitigation' (2009), p.7

¹⁰¹ European Environment Agency: 'Water use by sectors' on the website:

<http://www.eea.europa.eu/themes/water/water-resources/water-use-by-sectors>

- Providing consumers with information e.g. via labeling systems can help to orientate food consumption trends towards more climate-friendly alternatives.
- 2) Investments:
- Climate-friendly farming practices need to be encouraged and adopted on a wider basis. Investment is needed in new technologies and solutions that can promote more sustainable agriculture. More emphasis must also be placed on creating the skills and technical knowledge required to support this shift.

CLIMATE ACTION

Keeping the global average temperature increase below two degrees Celsius compared to pre-industrial levels requires sustained efforts and innovative solutions across the world. The EU must do its part to reduce global greenhouse gas emissions, protect the ozone layer, and reduce its own vulnerability to climate change by promoting adaptation.

Action will be needed in the following areas:

- 1) Policy and regulatory framework:
- The European Emissions Trading Scheme (ETS) must be improved (the aim: a realistic price for carbon) and ideally extended into a global emissions trading scheme, which includes most polluting economic sectors.
 - The EU must already focus on its climate policy post-2020. Many investment projects in the area of energy have lifetimes that run into decades. Hence, the EU should introduce a rolling commitment programme for greenhouse gas emission reductions that always runs more than a decade into the future: this should already start in 2012, setting a target for 2022 or, even better, 2025.
 - Climate and energy policy must be promoted in the wider context of eco-efficiency. The aim must be to create a low-carbon, resource-efficient and more sustainable European economy.
- 2) Investments:
- There is a stringent need to invest in solutions that contribute to building a greener economy. Investments decisions today will determine, for example, the energy mix in 2020, 2030 and 2040.
 - As the impacts of extreme weather events and natural catastrophes are increasingly felt in Europe too, it is clear that mitigation must be coupled with adaptation measures. Investments in infrastructure and the agricultural sector must aim to reduce emissions but also to prepare for changing circumstances.

ENERGY

Europe's energy policy is influenced by its dependency on energy from outside the EU and its desire to move towards low-carbon energy. It is clear that maintaining energy security and competitiveness will require changes to the energy architecture. As a result, emphasis has been placed on diversifying the EU's energy sources and increasing energy efficiency.

Action will be needed in the following areas:

- 1) Policy and regulatory framework:
 - National energy plans must support common goals set at EU level (energy and climate goals, the creation of a functioning energy market).
 - The EU must promote implementation of existing energy policy (binding energy-efficiency targets needed if voluntary measures lead to no improvement).
 - National and EU policies must help to create demand for greener, more energy-efficient products and services.
 - Harmful energy subsidies must be removed, as they are costly for taxpayers and the environment.

- 2) Investments (in the grid and other new technologies, including storage systems, smart meters and renewable technologies):
 - The private sector and the market must deliver some of the required infrastructure investment. It is estimated that €1 trillion will be needed by 2020 for investment in energy technology in the EU's power sector alone. This amounts to €60-80 billion per year from now until 2020.¹⁰²
 - New innovative funding mechanisms must also incorporate the public sector – ensuring efficient implementation of projects requires cooperation between the public and private sectors. Public-private partnerships could lead to significant energy and cost savings. However, it should be noted that in many countries such partnerships would require reform of government financial control systems.

ENVIRONMENT

A healthy living environment and biodiversity are essential for European citizens' well-being. There is an ever-greater acknowledgement that more must be done to reduce the negative environmental impact of our economies, raise awareness about environmental sustainability, enhance resource efficiency and limit pollution.

¹⁰² Proposal for a Regulation of the European Parliament and of the Council 'Establishing the Connecting Europe Facility' (2011), p.2

Action will be needed in the following areas:

1) Policy and regulatory framework:

- A life-cycle approach to the use and reuse of resources, calculating the true cost of using energy and resources, and putting a price on pollution and exploitation of resources is needed. This requires internalising external costs such as process costs and ecological, health and safety costs. By letting the polluter pay, the real cost becomes visible to the polluter, thereby making it easier to address the negative externalities of economic activity.
- Stronger incentives and signals are needed to encourage substituting resources that are scarce or have major environmental impacts, re-using materials, harnessing the potential of valuable primary raw materials by refining them as far as possible, reducing the amount of energy used over the life-cycle and reducing the total amount of materials needed to produce products or services.

2) Investments:

- Investments will be needed in research and development, and in both the public and private sectors, to support greater resource efficiency.

INDUSTRIAL POLICY

Strengthening European industry and supporting the transition towards a low-carbon economy is crucial if the EU is to maintain its competitiveness on the global scene, and to create a thriving business environment, particularly for SMEs. The industry is currently facing strong competition from both developed and emerging economies.

Action will be needed in the following areas:

1) Policy and regulatory framework:

- There is a need to develop a sustainable industrial base, and steps should be taken to ensure that the objectives of the Europe 2020 flagship 'An industrial policy for the globalisation era' are met.
- EU industry and the economy as a whole should strive to become a leader in greener products and services. This could help the EU, in close cooperation with its trade partners, to become a standard setter for the global market (as was the case with the GSM). The EU can play a significant role in promoting both internal and external markets for greener products and services.

2) Investments:

- The provision of loans and venture capital for SMEs needs to be facilitated, to ensure growth and innovation for small businesses across Europe. An integrated European venture capital market is needed.
- Public-private partnerships (PPPs) can be an important instrument in leveraging private capital.

INTERNAL MARKET

The European Single Market is Europe's main driver of competitiveness, security of supply and sustainability. Making eco-efficiency an integral part of the Single Market project would benefit both consumers and businesses. Creating a functioning internal market for eco-efficiency would create a pull for eco-efficient products and services across the EU.

Action will be needed in the following areas:

- 1) Policy and regulatory framework:
 - More cooperation in innovation processes is needed across borders and institutions on research, development, testing, marketing and getting products and services to market.
 - A life-cycle approach should be supported. For example, to ensure a life-cycle approach to recycling, Europe needs a market for secondary materials and recycling schemes for bottles, mobile phones, light bulbs, etc.
 - A common framework for meeting the renewables target would ensure that renewable supplies are located where they are most efficient. This includes the creation of a smart pan-European grid. Joint implementation of national targets should be considered.
 - Sustainable public procurement should be encouraged.
- 2) Investments:
 - Entrepreneurship must be encouraged. Small and medium-sized enterprises need assistance with marketing and commercialising new products and services.
 - There is a need to invest in ICT-systems and logistics so that they support resource efficiency and greening the economy, and help to reduce emissions in buildings, in transport and in the production and use of energy.
 - More emphasis must be placed on developing efficient recycling schemes across borders.

REGIONAL POLICY

Achieving Europe 2020 targets, in particular those pertaining to the flagship initiative 'Resource Efficient Europe', will depend greatly on decisions taken at local and regional level. The EU's Regional Policy can play a crucial role in stimulating investment in smart and sustainable growth. The geographical concentration of interlinked businesses, research centres and other innovation stakeholders, known as 'clusters', is an important regional instrument. Local authorities can interact with environmental and energy clusters based on a public-private partnership model, and thus stimulate investment in eco-efficiency.

Action will be needed in the following areas:

- 1) Policy and regulatory framework:
 - The EU must support closer collaboration between Member States, regions and cities. The EU projects must be used as a tool to share best practices, models and solutions.

2) Investments:

- A substantial portion of the Structural Funds for less-affluent regions should be earmarked to help these regions to speed up compliance with EU standards in the area of water and waste management.

RESEARCH AND INNOVATION

In its proposals for the new Multiannual Financial Framework post-2013, the Commission has already proposed a significant increase of research and innovation funding (+40%). Recognising the importance of boosting innovation, the new Common Strategic Framework for Research and Innovation, which will be called 'Horizon 2020', will be allocated €80 billion. Needless to say, green products and services are among the top sectors that should benefit from this, with new, improved technologies constantly being developed.

Action will be needed in the following areas:

1) Policy and regulatory framework:

- The EU needs to build a knowledge base, and the Member States must collect and share data on resource efficiency. This should include analysis of the costs and benefits of investment in resource efficiency.
- The EU needs a comprehensive statistical framework on resource efficiency that it can use for strategic planning.

2) Investments:

- EU funding for basic research and innovation should support the political priority given to resource efficiency under the Europe 2020 Strategy.

TRADE

European trade policy aims to reduce barriers to EU exports and EU investment through negotiations, and to facilitate better conditions for third-country operators that import into the Union. In a globalised world and with the emergence of new economic blocs, the EU needs to ensure that it remains a trading power, particularly when it comes to new, green technologies.

Action will be needed in the following areas:

1) Policy and regulatory framework:

- Green goods and services need access to global markets on fair terms. Global and WTO rules should provide a positive framework for external trade in products and services that support eco-innovation and resource efficiency.
- The EU should systematically aim to negotiate trade liberalisation of green technologies in all its multilateral and bilateral trade agreements.

TRANSPORT

The Europe 2020 targets regarding energy efficiency, greenhouse gas emissions and renewable energy sources cannot be achieved without a considerable contribution from the transport sector. Furthermore, this sector is particularly vulnerable to oil supply disruption and price volatility. Although there has been a significant reduction in emissions of harmful pollutants, air quality and noise are still causing concern. The Directive on the Promotion of Clean and Energy Efficient Road Transport Vehicles seeks to encourage widespread purchasing and use of environmentally-friendly vehicles, which are one part of the solution. The Commission also supports the development of alternative types of fuels, like biofuels, hydrogen and fuel cells, and batteries for electric vehicles. Additionally, the Clean Transport Systems (CTS) initiative seeks to establish a viable long-term alternative fuel strategy, in a context of declining oil supplies.

Action will be needed in the following areas:

- 1) Policy and regulatory framework:
 - More efficient logistics across the EU must be encouraged. This would help to reduce loads, traffic and emissions.
 - More emphasis must be placed on the supply side. For example, car manufacturers have a key role to play in creating more resource-efficient and environmentally-friendly vehicles.
 - Recycling and disposal of cars must be improved. Car manufacturing and disposal are good examples of how difficult it can be to create a life-cycle approach to a consumer good. While a significant amount of materials from old cars could be recycled and re-used today, there is no functioning market for these materials.

- 2) Investments:
 - European funding mechanisms such as the Connecting Europe Facility can play an important role in facilitating investment. The new instrument will fund infrastructure projects with high EU added value, with the transport sector being one of the three targeted areas (along with energy and ICT). The development of the 'core transport network' is to be given full support and priority.
 - There is significant scope to utilise public-private partnerships to achieve the Europe 2020 objectives, especially in sectors where they have been tried and tested, such as transport.

WASTE

Every year, the EU produces around three billion tonnes of waste. Moreover, the trend is increasing, suggesting that we could be producing 45% more waste in 2020 compared to 1995 levels. Disposing of it is therefore by no means an easy task. The EU's Sixth Environment Action Programme made waste prevention and management one of the Union's top priorities. But much more still needs to be done.

Action will be needed in the following areas:

1) Policy and regulatory framework:

- Harmonised implementation and better enforcement of pan-European legislation such as the Waste Framework Directive.
- Sectoral resource and process efficiency benchmarks must be set to reduce waste generation and maximise the return of unavoidable waste back into the economy. Not everything is waste. The cycle must start with the re-use and refining of valuable materials: they become waste only at the end of their life cycle.
- Market-based mechanisms should be considered to stimulate demand for secondary raw materials.
- Products must be designed to ease the dismantling and recovery of critical and essential raw materials.
- Industrial partnerships between producers and the waste management industry must be encouraged and supported.

2) Investments, pricing:

- The cost of handling waste should be incorporated into the sales price of products.

WATER

Water is essential for agriculture, industry, energy production – and people’s well-being. In Europe over 40% of total water abstraction is used for agriculture (mainly irrigation), 40% for industry and energy production (cooling in power plants), and 15% for public water supplies.¹⁰³ In water-stressed regions, water has turned into a rare and precious resource that should not be wasted. In addition, certain fossil groundwater reserves are not renewable. Thus sound management of water consumption is essential. It is clear that Europe needs a better water management chain in which production and consumption chains are interlinked.

Action will be needed in the following areas:

1) Policy and regulatory framework:

- The EU should put greater emphasis on water, and call for local and regional authorities to be directly involved in redefining, coordinating and harmonising existing directives and strategies (Water Framework Directive (WFD), Groundwater Directive, Floods Directive (FD), Water Scarcity and Droughts Strategy) and new proposals (EU climate change adaptation proposals and goals, Blueprint to Safeguard European Waters).
- EU policies must maximise the use of water before returning it to the water cycle (e.g. reusing water for agriculture and industry, recovering heat from wastewater networks or sludge).

¹⁰³ European Environment Agency: ‘Water use by sectors’ on the website:
<http://www.eea.europa.eu/themes/water/water-resources/water-use-by-sectors>

- The objective of water efficiency must be streamlined across key areas (agriculture, industry, buildings).
- Harmonised implementation and better enforcement of pan-European legislation such as the Water Framework Directive.
- The price of water should not only reflect the price of infrastructure, but also the price of water as a scarce resource.
- The EU should set precise targets for water efficiency at river-basin level for every water-dependent sector. A multi-level governance approach is needed, involving European, national and particularly regional and local authorities in the management of each water basin.

2) Investments:

- More innovative solutions are needed that help to maximise the use of water before returning it to the water cycle.
- Investment in smart water metering is crucial for households, and the public and private sectors.