



EUROPEAN COMMISSION

Brussels, 20.9.2011
COM(2011) 571 final

**COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN
PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL
COMMITTEE AND THE COMMITTEE OF THE REGIONS**

Roadmap to a Resource Efficient Europe

{SEC(2011) 1067 final}

{SEC(2011) 1068 final}

TABLE OF CONTENTS

1.	Challenges and opportunities for Europe.....	2
2.	Making Europe resource efficient.....	3
3.	Transforming the Economy.....	4
3.1.	Sustainable consumption and production.....	5
3.2.	Turning waste into a resource	7
3.3.	Supporting research and innovation.....	8
3.4.	Environmentally harmful subsidies and getting the prices right.....	9
4.	Natural Capital and Ecosystem Services.....	11
4.1.	Ecosystem services.....	11
4.2.	Biodiversity	12
4.3.	Minerals and metals	13
4.4.	Water	13
4.5.	Air	14
4.6.	Land and soils	15
4.7.	Marine resources	16
5.	Key sectors.....	17
5.1.	Addressing food	17
5.2.	Improving buildings	18
5.3.	Ensuring efficient mobility	19
6.	Governance and monitoring.....	19
6.1.	New pathways to action on resource efficiency.....	20
6.2.	Supporting resource efficiency internationally	22
6.3.	Improving the delivery of benefits from EU environmental measures.....	22
7.	Conclusion.....	23
	Annex: Resource efficiency – the interlinks between sectors and resources, and EU policy initiatives	24

1. CHALLENGES AND OPPORTUNITIES FOR EUROPE

Europe has enjoyed many decades of growth in wealth and wellbeing, based on intensive use of resources. But today it faces the dual challenge of stimulating the growth needed to provide jobs and well-being to its citizens, and of ensuring that the quality of this growth leads to a sustainable future. To tackle these challenges and turn them into opportunities our economy will require a fundamental transformation within a generation – in energy, industry, agriculture, fisheries and transport systems, and in producer and consumer behaviour. Preparing that transformation in a timely, predictable and controlled manner will allow us to further develop our wealth and wellbeing, whilst reducing the levels and impact of our resource use.

Over the 20th century, the world increased its fossil fuel use by a factor of 12, whilst extracting 34 times more material resources. Today in the EU, each person consumes 16 tonnes of materials annually, of which 6 tonnes are wasted, with half going to landfill. Trends show, however, that the era of plentiful and cheap resources is over. Businesses are facing rising costs for essential raw materials and minerals, their scarcity and price volatility are having a damaging effect on the economy. Sources of minerals, metals and energy, as well as stocks of fish, timber, water, fertile soils, clean air, biomass, biodiversity are all under pressure, as is the stability of the climate system. Whilst demand for food, feed and fibre may increase by 70% by 2050, 60% of the world's major ecosystems that help produce these resources have already been degraded or are used unsustainably. If we carry on using resources at the current rate, by 2050 we will need, on aggregate, the equivalent of more than two planets to sustain us, and the aspirations of many for a better quality of life will not be achieved.

Our economic system still encourages the inefficient use of resources by pricing some below true costs. The World Business Council for Sustainable Development estimates that by 2050 we will need a 4 to 10 fold increase in resource efficiency, with significant improvements needed already by 2020. Some dynamic businesses have recognised the benefits of a more productive use of resources, yet many enterprises and consumers have not yet realised the scale and urgency of the required transformations. Promoting efficient use of resources makes a lot of business sense and should help improve their competitiveness and profitability. It is therefore an integral part of the EU's agenda for global competitiveness. It also helps ensure a sustainable recovery from the economic crisis and it can boost employment.

Transformation will need a policy framework that creates a playing field, where innovation and resource efficiency are rewarded, creating economic opportunities and improved security of supply through product redesign, sustainable management of environmental resources, greater reuse, recycling and substitution of materials and resource savings. Decoupling growth from resource use and unlocking these new sources of growth needs coherence and integration in the policies that shape our economy and our lifestyles. Action on climate change has already led the way in helping to decouple growth from the use of carbon.

The Europe 2020 Strategy and its flagship initiative on "A Resource Efficient Europe"¹ set the EU on the path to this transformation. The flagship called for a roadmap "to define medium and long term objectives and means needed for achieving them". This Roadmap builds upon

¹ COM(2011) 21.

and complements the other initiatives under the flagship, in particular the policy achievements towards a low carbon economy, and takes into account progress made on the 2005 Thematic Strategy on the Sustainable Use of Natural Resources² and the EU's strategy on sustainable development. The Roadmap should also be seen in the context of worldwide efforts to achieve a transition towards a green economy³. It draws extensively on a range of sources which are referenced in the accompanying Staff Working Document, including the European Environment Agency's report on the state and outlook for the European Environment.

2. MAKING EUROPE RESOURCE EFFICIENT

Designing the Roadmap

The Vision: By 2050 the EU's economy has grown in a way that respects resource constraints and planetary boundaries, thus contributing to global economic transformation. Our economy is competitive, inclusive and provides a high standard of living with much lower environmental impacts. All resources are sustainably managed, from raw materials to energy, water, air, land and soil. Climate change milestones have been reached, while biodiversity and the ecosystem services it underpins have been protected, valued and substantially restored.

Resource efficient development is the route to this vision. It allows the economy to create more with less, delivering greater value with less input, using resources in a sustainable way and minimising their impacts on the environment. In practice, this requires that the stocks of all environmental assets from which the EU benefits or sources its global supplies are secure and managed within their maximum sustainable yields. It will also require that residual waste is close to zero and that ecosystems have been restored, and systemic risks to the economy from the environment have been understood and avoided. A new wave of innovation will be required.

This Roadmap sets the milestones, which illustrate what will be needed to put us on a path to resource efficient and sustainable growth. Each section then describes the actions that are needed in the short term to start off this process.

The Roadmap provides a framework explaining how policies interrelate and build on each other in which future actions can be designed and implemented coherently. The inter-linkages between key sectors and resources and their associated EU policy initiatives are outlined in the Annex Table. Impact assessments will be prepared for all significant actions and any potential targets before detailed proposals are presented⁴.

Making and measuring progress

Robust and easily understandable indicators will be necessary to provide signals and measure progress in improving resource efficiency.

² COM(2005) 670.

³ As for instance reflected in the OECD's Green Growth Strategy and UNEP's Green Economy report, as well as work by the European Environment Agency.

⁴ http://ec.europa.eu/governance/impact/index_en.htm

This Roadmap proposes a new pathway to action on resource efficiency, with a process involving all key stakeholders, to discuss and agree on indicators and targets by the end of 2013. This process is described in more detail in chapter 6.

In order to launch this process, two levels of indicators are provisionally formulated⁵:

- (1) A provisional lead indicator - "Resource Productivity" - to measure the principal objective of this Roadmap, of improving economic performance while reducing pressure on natural resources;
- (2) A series of complementary indicators on key natural resources such as water, land, materials and carbon, that will take account of the EU's global consumption of these resources.

Overcoming the barriers

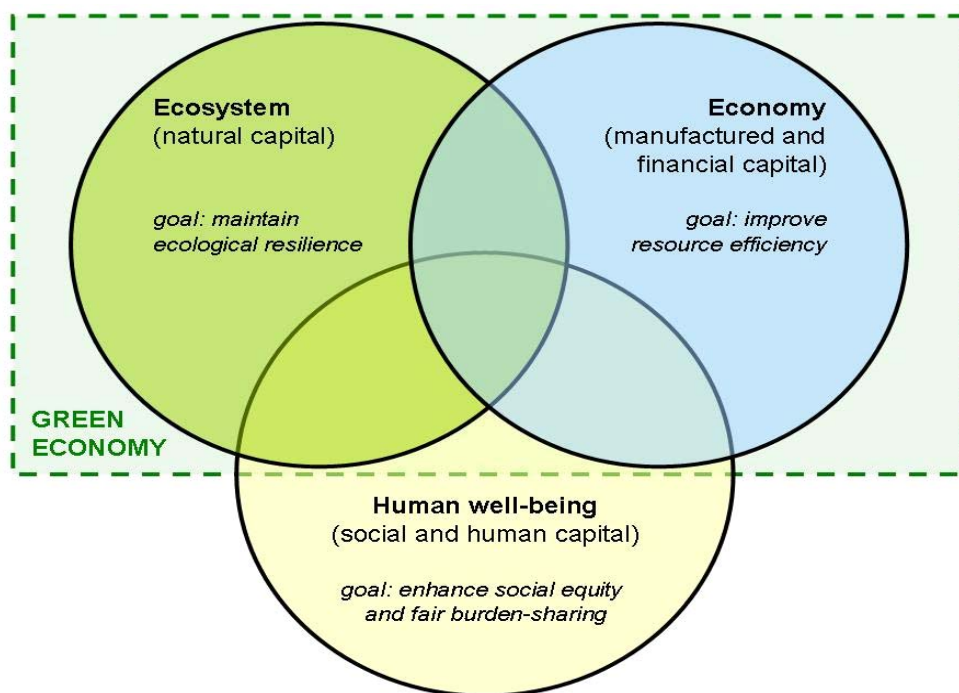
The EU and its Member States should strive to remove barriers that hold back resource efficiency and so create the right set of incentives for production and consumption decisions. This will require:

- Addressing markets and prices, taxes and subsidies that do not reflect the real costs of resource use and lock the economy into an unsustainable path;
- Encouraging more long-term innovative thinking in business, finance and politics that leads to the uptake of new sustainable practices and stimulates breakthroughs in innovation, and develops forward thinking, cost effective regulation;
- Carrying out the research to fill the gaps in our knowledge and skills and provide the right information and training;
- Dealing with international competitiveness concerns, and seeking to get a consensus with international partners to move in a similar direction.

3. TRANSFORMING THE ECONOMY

Transforming the economy onto a resource-efficient path will bring increased competitiveness and new sources of growth and jobs through cost savings from improved efficiency, commercialisation of innovations and better management of resources over their whole life cycle. This requires policies that recognise the interdependencies between the economy, well-being and natural capital and seeks to remove barriers to improved resource efficiency, whilst providing a fair, flexible, predictable and coherent basis for business to operate.

⁵ As set out in the accompanying COM(2011) 571.



Source: European Environment Agency

3.1. Sustainable consumption and production

3.1.1. Improving products and changing consumption patterns

Changing the consumption patterns of private and public purchasers will help drive resource efficiency and can also frequently generate direct net cost savings. In turn it can help increase demand for more resource efficient services and products. Accurate information, based on the life-cycle impacts and costs of resource use, is needed to help guide consumption decisions. Consumers can save costs by avoiding waste themselves, and buying products that last, or that can be easily repaired or recycled. New entrepreneurial models, where products are leased rather than bought, can satisfy consumer needs with less life-cycle resource use.

The internal market and market based instruments have an important role in setting the framework for markets to reward greener products. An approach using both voluntary and mandatory measures – as in the EU’s Lead Market Initiatives and the Ecodesign Directive – should be considered for a wider range of products and services and include more resource relevant criteria.

However, it has been shown that in some cases, cost savings made from improving the efficiency of a technology can actually induce people to consume more. This phenomenon, known as a "rebound effect" must be anticipated, and accounted for, in developing policy and setting targets.

Milestone: By 2020, citizens and public authorities have the right incentives to choose the most resource efficient products and services, through appropriate price signals and clear environmental information. Their purchasing choices will stimulate companies to innovate and to supply more resource efficient goods and services. Minimum environmental performance standards are set to remove the least resource efficient and most polluting products from the market. Consumer demand is high for more sustainable products and services.

3.1.2. Boosting efficient production

Europe has the world's highest net imports of resources per person, and its open economy relies heavily on imported raw materials and energy. Secure access to resources has become an increasingly strategic economic issue, while possible negative social and environmental impacts on third countries constitute an additional concern. In 2007 the total amount of material directly used in the EU economy was more than 8 billion tonnes. We could reduce that amount whilst increasing production and competitiveness⁶. Moreover, Improving the re-use of raw materials through greater 'industrial symbiosis' (where the waste of some firms is used as a resource for others) across the EU could save €1.4bn a year and generate €1.6bn in sales⁷.

Although many firms have already taken action to improve their resource efficiency, much scope for improvement remains. This applies especially to non-core business areas, for example where energy or water efficiency is not central to the firm's activity. Many fail to economise on longer-term resource use because of a short-term horizon encouraged by current corporate reporting practices. Firms which are already beginning to invest in resource efficiency need to benefit from advances in knowledge and innovation.

Exchanging information on routes to resource efficiency between partners in value chains and across sectors, including SMEs, can prevent waste, boost innovation and create new markets.

Avoiding, wherever possible, the use of dangerous chemicals and promoting green chemistry can help protect key resources like soil and water, and make others, like materials, safer, easier and less costly to recycle and reuse. The approach to chemicals management promoted by fully implementing REACH will help identify opportunities for substituting dangerous chemicals with safer and technologically and economically viable alternatives.

Milestone: By 2020, market and policy incentives that reward business investments in efficiency are in place. These incentives have stimulated new innovations in resource efficient production methods that are widely used. All companies, and their investors, can measure and benchmark their lifecycle resource efficiency. Economic growth and wellbeing is decoupled from resource inputs and come primarily from increases in the value of products and associated services.

⁶ In Germany alone a study suggests that resource-efficiency gains in manufacturing could generate cost savings of between 20% and 30% and up to 1 million jobs for the country. Another recent study estimates at £23 billion the savings from low or no-cost resource efficiency measures businesses could make in the UK.

⁷ See the Staff Working Document for details.

In order to promote further sustainable consumption and production, the Commission will:

- Strengthen the requirements on Green Public Procurement (GPP) for products with significant environmental impacts; assess where GPP could be linked to EU funded projects; and promote joint procurement, and networks of public procurement officers in support of GPP (in 2012);
- Establish a common methodological approach to enable Member States and the private sector to assess, display and benchmark the environmental performance of products, services and companies based on a comprehensive assessment of environmental impacts over the life-cycle ('environmental footprint') (in 2012);
- Address the environmental footprint of products, building on an ongoing assessment due in 2012 and following a consultation with stakeholders, including through setting requirements under the Ecodesign directive, to boost the material resource efficiency of products (e.g. reusability/recoverability/recyclability, recycled content, durability), and through expanding the scope of the Ecodesign directive to non-energy related products (in 2012);
- Ensure better understanding of consumer behaviour and provide better information on the environmental footprints of products, including preventing the use of misleading claims, and refining eco-labelling schemes (in 2012);
- Support the networking and exchange of best practice between agencies running schemes on resource efficiency for SMEs (continuous).

Member States, with the Commission should as of 2012, assess:

- Options to increase market rewards for genuinely environmentally friendly products;
- Measures to extend producer responsibility to the full life-cycle of the products they make (including via new business models, through guidance on take-back and recycling schemes and support for repair services);
- Actions to optimise the resource efficiency of packaging.

Member States should:

- Put in place incentives that stimulate a large majority of companies to measure, benchmark and improve their resource efficiency systematically (continuous);
- Help companies work together to make the best use of the waste and by-products they produce (e.g. by exploiting industrial symbiosis) (continuous);
- Ensure that advice and support is available to help SMEs identify and improve their resource efficiency and sustainable use of raw materials (continuous);
- Work together with the Commission to ensure that, by 2020, all relevant Substances of Very High Concern are placed on the REACH Candidate List (continuous).

3.2. Turning waste into a resource

Each year in the European Union we throw away 2.7 billion tonnes of waste, 98 million tonnes of which is hazardous. On average only 40% of our solid waste is re-used or recycled, the rest going to landfill or incineration. Overall waste generation is stable in the EU, however, generation of some waste streams like construction and demolition waste, to sewage sludge and marine litter is still increasing. Waste electrical and electronic equipment alone is expected to increase by roughly 11% between 2008 and 2014.

In some Member States more than 80% of waste is recycled, indicating the possibilities of using waste as one of the EU's key resources. Improving waste management makes better use

of resources and can open up new markets and jobs, as well as encourage less dependence on imports of raw materials and lower impacts on the environment.

If waste is to become a resource to be fed back into the economy as a raw material, then much higher priority needs to be given to re-use and recycling. A combination of policies would help create a full recycling economy, such as product design integrating a life-cycle approach, better cooperation along all market actors along the value chain, better collection processes, appropriate regulatory framework, incentives for waste prevention and recycling, as well as public investments in modern facilities for waste treatment and high quality recycling.

Milestone: By 2020, waste is managed as a resource. Waste generated per capita is in absolute decline. Recycling and re-use of waste are economically attractive options for public and private actors due to widespread separate collection and the development of functional markets for secondary raw materials. More materials, including materials having a significant impact on the environment and critical raw materials, are recycled. Waste legislation is fully implemented. Illegal shipments of waste have been eradicated. Energy recovery is limited to non recyclable materials, landfilling is virtually eliminated and high quality recycling is ensured.

The Commission will:

- Stimulate the secondary materials market and demand for recycled materials through economic incentives and developing end-of-waste criteria (in 2013/2014);
- Review existing prevention, re-use, recycling, recovery and landfill diversion targets to move towards an economy based on re-use and recycling, with residual waste close to zero (in 2014);
- Assess the introduction of minimum recycled material rates, durability and re-usability criteria and extensions of producer responsibility for key products (in 2012);
- Assess areas where legislation on the various waste streams could be aligned to improve coherence (in 2013/2014);
- Continue working within the EU and with international partners to eradicate illegal waste shipments with a special focus on hazardous waste;
- Ensure that public funding from the EU budget gives priority to activities higher up the waste hierarchy as defined in the Waste Framework Directive (e.g. priority to recycling plants over waste disposal) (in 2012/2013);
- Facilitate the exchange of best practice on collection and treatment of waste among Member States and develop measures to combat more effectively breaches of EU waste rules (in 2013/2014).

Member States should:

- ensure full implementation of the EU waste acquis including minimum targets through their national waste prevention and management strategies (continuous).

3.3. Supporting research and innovation

The transition to a green and low-carbon economy will require significant innovation, from small incremental changes to major technological breakthroughs.

At the same time we need a more comprehensive and credible knowledge base about how the natural systems react to the different pressures we exert on them. Basic and applied research

should identify challenges and guide actions, including social sciences research to develop our understanding of behaviour.

To trigger this push in research and innovation, the right set of incentives needs to be in place so that the private sector invests more in resource efficient research and innovation. Demand side measures will help create incentives for green innovation by building markets. Clear framework conditions are needed to increase investor certainty and better access to finance for companies making green investments that are seen as riskier or that have longer payback times.

Milestone: By 2020, scientific breakthroughs and sustained innovation efforts have dramatically improved how we understand, manage, reduce the use, reuse, recycle, substitute and safeguard and value resources. This has been made possible by substantial increases in investment, coherence in addressing the societal challenge of resource efficiency, climate change and resilience, and in gains from smart specialization and cooperation within the European research area.

Member States with the Commission will:

- Establish an appropriate framework and set of incentives to boost private sector investment into research and innovation for resource efficiency (continuous).

The Commission will:

- Develop 'Innovation Partnerships' for meeting resource efficiency goals, e.g. on water, raw materials and productive and sustainable agriculture (from 2011);
- Develop Joint Technology Initiatives or other forms of private-public partnerships, as well as Joint Programming Initiatives that pool national research efforts in areas of resource efficiency (continuous);
- Tackle barriers to eco-innovation (in 2011);
- Focus Union research funding (EU Horizon 2020) on key resource efficiency objectives, supporting innovative solutions for: sustainable energy, transport and construction; management of natural resources; preservation of ecosystem services and biodiversity; resource efficient agriculture and the wider bio-economy; environmentally friendly material extraction; recycling, re-use, substitution of environmental impacting or rare materials, smarter design, green chemistry and lower impact, biodegradable plastics.

Member States should:

- focus public research funding on key resource efficiency objectives (continuous).

3.4. Environmentally harmful subsidies and getting the prices right

Market prices are the primary guide for purchasing choices and investment decisions but they do not necessarily reflect the true costs of using resources and their environmental impacts. In addition, prices may be deliberately distorted by Environmentally Harmful Subsidies (EHS) by governments which confer an advantage on certain consumers, users or producers, in order to supplement their income or lower their costs, but in doing so, discriminate against sound environmental practice⁸.

⁸ OECD, Environmentally harmful subsidies: challenges for reform, 2005

3.4.1. Phasing out inefficient subsidies

The scale of subsidies with potential negative impacts on the environment, notably in the areas of fossil fuels, transport and water, are estimated to be worth a global total of \$1 trillion per year. EHS lead to higher levels of waste, emissions, resource extraction, or to negative impacts on biodiversity. They can lock in inefficient practices and hinder businesses from investing in green technologies. Such subsidies take different forms, with tax reductions or exemptions being one example.

Moving away from EHS can deliver economic, social and environmental benefits, and allow for improved competitiveness. Member States have already been invited to eliminate EHS in the 2011 Annual Growth Survey⁹ in order to support budget consolidation. In the process of EHS removal, alternative mitigating arrangements may be necessary for the most affected economic sectors, regions and workers, or for dealing with energy poverty, and the impact of possible displacement of production to other countries needs to be considered.

Milestone: By 2020 EHS will be phased out, with due regard to the impact on people in need.

3.4.2. Getting the prices right and reorienting the burden of taxation

The market already gives signals for the scarcity of some resources by means of rising commodity prices, and businesses increasingly face an urgent need to adjust in order to preserve their competitiveness, especially in the international context. However, the cost of externalities may still remain unaddressed, and for a number of resources such signals may come too late to prevent their unsustainable exploitation. The overall incidence of taxation often impacts prices in ways that favour resource use rather than increased employment in the economy.

Market based instruments have a strong role to play in correcting market failures – for example by introducing environmental taxes, charges, tradable permit schemes, fiscal incentives for more environmentally-friendly consumption or other instruments. New policies should help to align the prices of resources that are not appropriately valued on the market, such as water, clean air, ecosystems, biodiversity, and marine resources. These may need to be part of a broader approach involving regulation for example where resources are common goods.

Shifting taxation away from labour to boost employment and economic growth is already emphasised in the Annual Growth Survey for 2011¹⁰ and in the European Council Conclusions from March 2011¹¹. "Green tax reforms", which consist of increasing the share of environmental taxes, while reducing others, have a role to play in this context. Environmental taxation can also align the efforts for fiscal consolidation with facilitating the restructuring towards a resource efficient economy. Nonetheless, the average share of environmental taxation in total tax revenues in the EU has generally been declining since 1999, reaching a level of 6.3% in 2009¹².

⁹ COM(2011) 11 final.

¹⁰ COM(2011) 11 final.

¹¹ EUCO 10/1/11 REV1.

¹² Taxation trends in the European Union, European Union 2011.

Some Member States have achieved, through various steps of environmental tax reforms, a share of environmental tax revenues in total taxes of more than 10%, while at the same time preserving fiscal revenues and improving competitiveness and energy efficiency. This demonstrates that it is possible to shift taxation onto environmentally harmful activities within a sound economic framework. However, in order to measure more effectively the shift in the price signals needed to encourage greater investment in more efficient use of resources an additional indicator may be needed, such as the effective tax rate on environmental pollution or resource use.

Milestone: By 2020 a major shift from taxation of labour towards environmental taxation, including through regular adjustments in real rates, will lead to a substantial increase in the share of environmental taxes in public revenues, in line with the best practice of Member States.

In order to address the issues of environmentally harmful subsidies and better price signals, the Commission will:

- Monitor via the European Semester Member States' follow-up to country-specific recommendations on fiscal reform that favours a shift from the taxation of labour to environmental impacts and the phasing out of EHS from 2012;
- Promote regular exchange of best practices and peer reviews on the reform of EHS and on market based instruments between the Member States, in particular under the Market Based Instruments Forum and the Taxation Policy Group (continuous);
- Assess how state aid for measures aiming at increasing resource efficiency has been implemented and to what extent resource efficiency objectives should be strengthened in the revisions of the relevant state aid guidelines as of 2013;
- Continue working on improving indicators on the use of taxes on pollution and resources.

Member States should:

- Identify the most significant EHS pursuant to established methodologies (by 2012);
- Prepare plans and timetables to phase out EHS and report on these as part of their National Reform Programmes (by 2012/2013);
- Shift taxation away from labour to environmental impacts (continuous);
- Review their fiscal policies and instruments with a view to supporting resource efficiency more effectively, and in this context reflect on incentives to support consumer choices and producer action in favour of resource efficiency (by 2013).

4. NATURAL CAPITAL AND ECOSYSTEM SERVICES

4.1. Ecosystem services

Our economic prosperity and wellbeing depend on our natural capital, including ecosystems that provide us with a flow of essential goods and services – from fertile soil to productive land and seas, from fresh water and clean air to pollination, flood control and climate regulation. Many of these ecosystem services are used almost as if their supply is unlimited. They are treated as "free" commodities, their economic value is not properly accounted for on the market, and therefore they continue to be overly depleted or polluted, threatening our long-term sustainability and resilience to environmental shocks.

60% of the Earth's ecosystem services have been degraded in the last 50 years. In the EU, 88% of fish stocks are fished beyond maximum sustainable yields and only 11% of protected ecosystems are in a favourable state.

Ensuring a long-term supply of essential ecosystem goods and services implies we must properly value out natural capital. Investing in natural capital – like green infrastructure – often brings higher returns than constructed or manufactured alternatives, with lower up-front costs.

Milestone: By 2020 natural capital and ecosystem services will be properly valued and accounted for by public authorities and businesses.

The Commission will:

- Promote the use of innovative financial and market-based instruments and explore their wider potential, including a possible establishment of a biodiversity financing facility and payments for ecosystems services, to address challenges to ecosystems and biodiversity at national, EU and international level, in particular in cooperation with the European Investment Bank and through Public Private Partnerships (continuous);
- Put forward proposals to foster investments in natural capital, to seize the full growth and innovation potential of Green Infrastructure and the 'restoration economy', through a Communication on Green Infrastructure (in 2012), and a "No Net Loss" initiative (in 2015).

Member States, with the Commission, should:

- Map the state of ecosystems and their services (by 2014);
- Assess their economic value, and promote the integration of these values into accounting and reporting systems at EU and national level (continuous);
- Work with key stakeholders to encourage businesses to assess their dependency on ecosystem services building upon the EU Business & Biodiversity Platform (continuous).

4.2. Biodiversity

Biodiversity underpins many of our ecosystems and is vital to their resilience. Its loss can weaken an ecosystem, compromising the delivery of ecosystem services and making it more vulnerable to environmental shocks. Restoring degraded ecosystems is costly, and in some cases, change can become irreversible.

It has been estimated that by 2050, the global business opportunities dependent on biodiversity and the ecosystem services it underpins, could have a value of between \$800-2.300 billion per year. In practice however, at the operational level, the value of biodiversity is only starting to be taken into account in decision making. If biodiversity is to be conserved this has to become common practice.

The new 2020 EU Biodiversity Strategy sets out the main policy tools for achieving this objective, and for reversing the trends in loss of biodiversity we have seen in recent generations.

Milestone: By 2020 the loss of biodiversity in the EU and the degradation of ecosystem services will be halted and, as far as feasible, biodiversity will be restored.

The Commission will:

- Significantly strengthen its efforts to integrate biodiversity protection and ecosystem actions in other Community policies with a particular focus on agriculture and fisheries (continuous).

Member States, with the Commission, will:

- Work towards the objectives of the Biodiversity Strategy by integrating the value of ecosystem services into policymaking (continuous).

4.3. Minerals and metals

Improved efficiency of natural resources such as metals and minerals are essential aspects of resource efficiency. Their specific risks, including security of supply, are addressed in the Raw Materials Initiative, as well as the climate and energy policies under the Resource Efficiency Flagship, so they will not be treated extensively in this section, although the interaction between their use and other resources is recognised.

As we move towards a genuinely consumption based, sustainable materials management or a "circular economy", where waste becomes a resource, a more efficient use of minerals and metals will result. The steps outlined in section 3 of this roadmap will have a direct impact on the efficiency of minerals and metal resources, through measures to take life-cycle impacts more into account, to avoid waste, reuse and recycle more, improved research and innovation and other measures to improve market structures.

4.4. Water

Water is a vital resource for human health and an essential input for agriculture, tourism, industry, transport and energy. Reduced water availability has a critical impact on hydropower and cooling of nuclear and thermal power stations.

Good environmental status and citizens' health depend on the quality and availability of fresh water. However, they are decreasing. Climate change is projected to increase water shortages as well as the intensity and frequency of floods. Many European river basins and waters have been altered by water abstraction, land drainage and dams, leading often to poor water quality with major adverse ecological effects, possible health impacts and leaving limited space for natural habitats.

20% to 40% of Europe's water is wasted and water efficiency could be improved by 40% through technological improvements alone¹³. An improved approach for a sustainable management of water resources requires close coordination with agriculture, transport, regional development and energy policies as well as effective and fair water pricing as required by the Water Framework Directive (WFD). Changes in ecosystems, land use, in production and water consumption and re-use patterns could cost-effectively reduce scarcity and ensure water quality.

Milestone: By 2020, all WFD River Basin Management Plans (RBMPs) have long been implemented. Good status – quality, quantity and use - of waters was attained in all EU river basins in 2015. The impacts of droughts and floods are minimised, with adapted crops, increased water retention in soils and efficient irrigation. Alternative water supply

¹³ EU Water saving potential, Ecologic, 2007.

options are only relied upon when all cheaper savings opportunities are taken. Water abstraction should stay below 20% of available renewable water resources.

The Commission will:

- Further integrate resource-efficiency considerations into water policy, with a Blueprint to safeguard Europe's water defining a cost-effective strategy (on-going);
- Assess Member States' RBMPs, with a view to identifying areas where additional action is needed (in 2011);
- Assess and propose (in 2012):
 - Water efficiency targets and improved water efficiency measures (e.g. smart metering, mandatory requirements on water using devices; guidelines for water re-use, reduction of leakage in water infrastructure, water saving in irrigation, etc.);
 - Better demand management through economic instruments (pricing, water allocation) and use of labelling and certification schemes measuring life-cycle impact and virtual water content of products;
 - A candidate European Innovation Partnership on water.

Member States should:

- Set water efficiency targets for 2020 at River Basin level, with appropriate complementary measures, based on a common EU methodology that takes into account the variety of situations across economic sectors and geographic areas

4.5. Air

Clean air is a precious resource. Several air quality standards are widely exceeded in the EU's most densely populated areas, especially from the most problematic pollutants such as particulate matter, ground-level ozone, and nitrogen dioxide. Despite significant efforts to reduce polluting emissions, current concentrations of fine particles cause 500 000 premature deaths each year¹⁴ in the EU and immediate neighbourhood. Other studies have shown that the number of working days lost due to air pollution induced illnesses is higher than the working days required to pay for additional pollutant abatement measures.

Significantly, ecosystems and agriculture also suffer damage from airborne impacts such as acidification, eutrophication and ozone damage to vegetation. The annual economic cost in 2020 has been estimated at €37 bn¹⁵.

Better implementation of existing legislation and new, science-based standards would help address these problems and steer innovation. With appropriate lead-times, these can ensure air quality benefits from transition to a low-carbon economy, and by other actions in this Roadmap, for example through reductions in waste, through more efficient production methods, as well as action in agricultural policy and the transport sector.

Milestone: By 2020, the EU's interim air quality standards will have been met, including in urban hot spots, and those standards will have been updated and additional measures

¹⁴ EEA, SOER 2010

¹⁵ Assessment of Health-Cost Externalities of Air Pollution at the National Level using the EVA Model System, J. Brandt et al., CEEH 2011.

defined to further close the gap to the ultimate goal of achieving levels of air quality that do not cause significant impacts on health and the environment.

The Commission will:

- Undertake a comprehensive review of all EU air pollution policies (by 2013);
- Propose an upgraded strategy looking beyond 2020, assessing the scope for the use of air quality and emission standards and further measures to reduce emissions from key sources (in 2013);
- Support implementation of existing measures to help resolve persistent air quality problems.

Member States should:

- Step up their implementation of EU air quality legislation (continuous).

4.6. Land and soils

In the EU, more than 1,000 km² are subject to 'land take' every year for housing, industry, roads or recreational purposes. About half of this surface is actually 'sealed'¹⁶. The availability of infrastructure varies considerably between regions, but in aggregate, every ten years we pave over a surface area equivalent to Cyprus. If we are to reach the state of no net land take by 2050, following a linear path, we would need to reduce land take to an average of 800 km² per year in the period 2000-2020. In many regions soil is irreversibly eroded, or has a low content of organic matter. Soil contamination is also a serious problem.

The use of land is nearly always a trade-off between various social, economic and environmental needs (e.g. housing, transport infrastructure, energy production, agriculture, nature protection). Decisions on land use are long term commitments which are difficult or costly to reverse. At the moment, these decisions are often taken without proper prior analysis of such impacts, for example through a Strategic Environmental Assessment. The EU agricultural, energy, transport and cohesion policy reforms will provide the opportunity to set the framework and the right incentives for public authorities and land owners to achieve this objective.

Milestone: By 2020, EU policies take into account their direct and indirect impact on land use in the EU and globally, and the rate of land take is on track with an aim to achieve no net land take by 2050; soil erosion is reduced and the soil organic matter increased, with remedial work on contaminated sites well underway.

The Commission will:

- Further develop the scientific knowledge-base on biotic material, land-use effects and trends, and spatial planning, including impacts at global level and effects on trading partners, and highlight best practices in the Member States, leading to a Communication on land use (in 2014);
- Address the indirect land use change resulting notably from the renewable energy policy (continuous);

¹⁶ Report on best practices for limiting soil sealing and mitigating its effects, Prokop et al, European Communities 2011.

- Publish guidelines on best practice to limit, mitigate or compensate soil sealing (in 2012);
- Include broader resource efficiency considerations in the review of the Environmental Impact Assessment (EIA) Directive (in 2012).
- Propose a candidate European Innovation Partnership (in 2011) on agricultural productivity and sustainability aiming, inter alia, at securing soil functionality at a satisfactory level (by 2020).

Member States should:

- Better integrate direct and indirect land-use and its environmental impacts in their decision making and limit land take and soil sealing to the extent possible (continuous);
- Implement the actions needed for reducing erosion and increasing soil organic matter (continuous);
- Set up an inventory of contaminated sites, and a schedule for remedial work (by 2015).

4.7. Marine resources

The marine environment holds economic opportunities in a wide range of sectors such as minerals extraction, pharmaceuticals, biotechnology and energy. The marine environment also provides key ecosystem services like the natural regulatory functions that help combat climate change or slow coastal erosion. Pressures on these systems, including from the discharge into the sea of pollutants in freshwater, are still severe, even if in some cases declining. There is a lack of coherent management of sea space which is already affecting our possibilities to benefit from maritime activities. The use of spatial planning instruments in marine areas would contribute to resource efficiency.

The depletion of fish stocks has severe economic and social consequences for coastal zones and contributes to other biodiversity loss by disrupting systems, while marine pollution and climate change pose other challenges (e.g. acidification). The EU Common Fisheries Policy and the EU Integrated Maritime Policy are putting sustainability at the heart of their aims, in order to ensure an efficient and sustainable use of marine resources by all operators of the value chain.

Over 1 million birds and 100,000 marine mammals and sea turtles die each year as a result of plastic waste and other marine debris. Factors such as marine litter and urban waste water treatment seriously aggravate pollution in some seas around Europe. In order to address such pressures, the Marine Strategy Framework Directive provides for achieving good environmental status in marine waters.

Milestone: By 2020, good environmental status of all EU marine waters is achieved, and by 2015 fishing is within maximum sustainable yields.

The Commission will:

- Within the context of the latest Commission proposals for the reform of the Common Fisheries Policy, aim to ensure sustainable management of fishery resources;
- Make further proposals to phase out all fisheries subsidies that could be environmentally harmful;

- Contribute to safeguarding natural coastal and marine capital by proposing policy measures on management and planning (in 2012) as well as continued support for knowledge and demonstration projects;
- Promote eco-system based strategies and integrate climate risk into maritime activities (Communication "Climate change adaptation in the Coast and the Sea" 2012);
- Support the sustainable use of marine resources, and identify innovative business opportunities in the maritime and coastal economy (Communication on "Blue Growth", 2012).
- Contribute to marine litter strategies in all four EU marine regions in close collaboration with coastal Member States or in the respective Regional Seas Convention (in 2012);
- Support Member States by developing measures to achieve good environmental status in marine waters by 2020 and to establish an extensive network of protected areas (in 2020).

Member States should:

- Implement the Marine Strategy Framework Directive and designate marine protected areas.

5. KEY SECTORS

In industrialized countries nutrition, housing and mobility are typically responsible for 70-80% of all environmental impacts. These sectors are also key to addressing the challenges in energy and climate change dealt with in complementary long term strategies, which combine together with the measures in this paper to maximise synergies under the Resource Efficiency Flagship¹⁷.

5.1. Addressing food

The food and drink value chain in the EU causes 17% of our direct greenhouse gas emissions and 28% of material resource use, with our consumption patterns having global impacts, in particular related to the consumption of animal proteins. It is a major user of high-quality water, which is essential for its success. However, in the EU alone, we waste 90 million tonnes of food every year or 180 kg per person. Much of this is food, which is still suitable for human consumption.

A combined effort by farmers, the food industry, retailers and consumers through resource-efficient production techniques, sustainable food choices (in line with the WHO recommendations on the amount of animal proteins, including meat and dairy products, consumed per person) and reduced food waste can contribute to improving resource efficiency and food security at a global level.

The Commission has proposed in its Budget for Europe 2020 communication the measures that a reformed Common Agricultural Policy will need to undertake to become more resource-efficient¹⁸. An additional issue for long term global food security is the sustainable

¹⁷ COM(2011) 112, COM(2011) 109, COM(2010) 639.

¹⁸ COM(2011) 500.

supply of phosphorus, a key resource for soil fertilisation that cannot be substituted. Further research is needed in order to identify how improvements to the fertiliser, food production and bio-waste issues could reduce our dependence on mined phosphate.

Milestone: By 2020, incentives to healthier and more sustainable food production and consumption will be widespread and will have driven a 20% reduction in the food chain's resource inputs. Disposal of edible food waste should have been halved in the EU.

The Commission will:

- Further assess how best to limit waste throughout the food supply chain, and consider ways to lower the environmental impact of food production and consumption patterns (Communication on sustainable food, by 2013);
- Develop a methodology for sustainability criteria for key food commodities (by 2014);
- Further assess the security of supply of phosphorus and potential actions towards its sustainable use (Green Paper on sustainable use of phosphorus by 2012).

Member States are invited to:

- Address food wastage in their National Waste Prevention Programs (2013).

5.2. Improving buildings

Better construction and use of buildings in the EU would influence 42% of our final energy consumption, about 35% of our greenhouse gas emissions¹⁹ and more than 50% of all extracted materials; it could also help us save up to 30% water²⁰. Existing policies for promoting *energy* efficiency and renewable energy use in buildings therefore need to be further strengthened and complemented with policies for *resource* efficiency, which look at a wider range of environmental impacts across the life-cycle of buildings and infrastructure. Life-time costs of buildings should increasingly be considered rather than just the initial costs, including construction and demolition waste. Better infrastructure planning is a prerequisite in achieving resource efficiency of buildings and also mobility.

Significant improvements in resource and energy use during the life-cycle – with improved sustainable materials, higher waste recycling, and improved design – will contribute to a competitive construction sector and the development of a resource efficient building stock. This requires the active engagement of the whole value chain in the construction sector. Specific policies are needed to stimulate SMEs, which make up the vast majority of construction companies – to train and invest in resource efficient building methods and practices.

Milestone: By 2020 the renovation and construction of buildings and infrastructure will be made to high resource efficiency levels. The Life-cycle approach will be widely applied; all new buildings will be nearly zero-energy²¹ and highly material efficient, and policies for renovating the existing building stock will be in place²² so that it is cost-efficiently

¹⁹ COM(2007) 860 final.

²⁰ COM(2007) 414 final.

²¹ Directive 2010/31/EU.

²² In line with Art. 9 of Directive 2010/31/EU of 19 May 2010.

refurbished at a rate of 2% per year. 70% of non-hazardous construction and demolition waste will be recycled²³.

The Commission, with Member States, will:

- Assess how to support skills investment plans, apprentice schemes and communication on the best resource efficiency practices in the industry (continuous);
- Take measures, using an 'SME test' where appropriate, to stimulate demand and uptake of resource efficient building practices through life-cycle costing and suitable financing arrangements; to further widen the scope of the Eurocodes to design criteria related to sustainability; to develop incentives to reward resource efficient buildings, and to promote the sustainable use of wood in construction, (Communication on the sustainable competitiveness of the construction sector, 2011, Communication on sustainable buildings, 2013);
- Assess how best to encourage private sector innovation in construction (continuous).

5.3. Ensuring efficient mobility

A modern, resource efficient mobility system, serving both passengers and freight can contribute significantly to competitiveness and sustainability. The Transport White Paper²⁴ puts forward a wide range of options for pursuing the required holistic transport policy.

Milestone: By 2020 overall efficiency in the transport sector will deliver greater value with optimal use of resources like raw materials, energy, and land, and reduced impacts on climate change, air pollution, noise, health, accidents, biodiversity and ecosystem degradation. Transport will use less and cleaner energy, better exploit a modern infrastructure and reduce its negative impact on the environment and key natural assets like water, land and ecosystems. There will be on average a 1% yearly reduction, beginning in 2012, in transport GHG emissions.

The Commission will ensure that the initiatives in the Transport White Paper are implemented consistently with resource efficiency objectives, particularly by moving towards internalisation of external costs.

6. GOVERNANCE AND MONITORING

Transforming the EU into a more resource efficient economy will require concerted action across a wide range of policies. The Commission will launch a joint effort with stakeholders to work on defining the right indicators and targets for guiding actions and monitoring progress. These will only have the transformational effect that is required if they play their full part in the Europe 2020 Strategy, with resource efficiency integrated into the European Semester on economic policy coordination.

²³ In line with Art 11 of Directive 2008/98/EC.

²⁴ COM(2011) 144.

6.1. New pathways to action on resource efficiency

Enhancing dialogue: Policy makers, at EU, Member State and regional level, need to engage in active discussion with business and civil society about the policy conditions necessary to overcome the barriers to resource efficiency.

Investing in the transition: Resource efficiency can reduce costs, but often requires initial investments. UNEP estimate that the annual financing needs for making the world economy more resource efficient are between US\$1.05-2.59 trillion²⁵, mainly from private sources. This will require not only spending for green solutions, but greening of all public and private investments. The proposal for a Multiannual Financial Framework 2014-2020 has already made major steps towards integrating resource efficiency in the EU budget. The rapid growth of global financing for clean energy shows how this shift in mindset is possible. However, unfamiliarity of financiers with risks and returns on investments in resource efficiency presents an obstacle to investment, uncertainty on policy direction and credibility adds financial risk, and the longer-term investments are often not favoured by the financial markets geared to short-term performance.

Developing indicators and potential targets: Setting indicators and defining a process for broad resource efficiency targets will help trace the path to the 2050 resource efficiency vision: public policy can be better designed to take into account the costs and benefits of using resources more efficiently and the private sector will benefit from better signals for their investment plans, the necessary predictability and transparency to take long-term decisions.

The sustainable growth objective of the Europe 2020 Strategy sets specific targets related to green house gas emissions, energy efficiency and renewable energy, which are relevant for achieving the resource efficiency objectives. Achieving these targets is vital for protecting natural resources, and action in this Roadmap will also contribute to reaching them. However, they do not capture some important adverse consequences to our economy, health and quality of life, for example factors such as inefficient land use, low water quality and availability, waste, air pollution, and losses of ecosystem services, fish stocks and biodiversity. Taking these into account would reinforce exploiting new sources of sustainable growth and strengthening competitiveness in the longer term.

Important progress is already being made to integrate environmental economic and social accounting systems, but there are several competing ideas on what indicators need to be used, improved or developed to guide better policy or investment decisions. Such indicators will need to be robust, easily understandable and widely accepted in order to continuously measure progress in improving resource efficiency. This is why the Commission proposes to engage with all key stakeholders to develop such indicators and potential targets.

However, recognizing the need to start measuring progress immediately, the Commission proposes using, as a provisional lead indicator, resource productivity, measured by the ratio of GDP to Domestic Material Consumption (expressed in Euro/tonne). A higher ratio would indicate better performance, with growth consuming relatively fewer resources²⁶. This, however, only captures the material resources aspects and does not deal with other resources or the potential shift of burden across countries.

²⁵ UNEP Green Economy Synthesis 2010

²⁶ To illustrate the indicator, the EU average was around 1.30 €/tonne in 2007, ranging from below 0.3 to around 2.5.

Because this provisional lead indicator only gives a partial picture, it should be complemented by a 'dashboard' of indicators on water, land, materials and carbon and indicators that measure environmental impacts and our natural capital or ecosystems as well as seeking to take into account the global aspects of EU consumption. On a third level, thematic indicators will be used to monitor progress towards existing targets in other sectors, as detailed in the Staff Working Paper accompanying this Roadmap.

Milestone: By 2020 stakeholders at all levels will be mobilised to ensure that policy, financing, investment, research and innovation are coherent and mutually reinforcing. Ambitious resource efficiency targets and robust, timely indicators will guide public and private decision-makers in the transformation of the economy towards greater resource efficiency.

The Commission, with Member States, will:

- Integrate resource efficiency considerations in the European Semester from 2012, focusing on prioritising sustainable growth friendly measures;
- Bring together business, scientists, NGOs, local and national authorities to examine the opportunities and the challenges and recommend new pathways to action on sustainable resource-efficient growth (in 2012);
- Reach broad agreement with these stakeholders on how to measure progress and to set the targets needed to meet the challenge (by 2013).

The Commission will:

- Launch an "EU Resource Efficiency Transition Platform"(2012), building upon the work of existing platforms;
- Set up a Resource Efficiency Finance Round Table, including representatives from private and institutional banks (such as the EIB, EBRD), insurance companies and venture capital companies, to identify opportunities to develop adapted finance and use innovative financial instruments for resource-efficiency (2012);
- Develop an EU Skills Panorama and a European Sector Council on skills for green and greener jobs;
- Continue work on indicators, including the quality of the data, taking stock of existing assessment frameworks, such as iGrowGreen, with a view to inclusion in the mid-term review of the Europe 2020 strategy (2013);
- Propose a new lead indicator on natural capital and environmental impacts of resource use (end of 2013);
- Continue its efforts under the "GDP and beyond" road map to measure societal and economic progress more comprehensively, inter alia by continuing the development of the system of environmental accounts, further integrating environmental externalities into national accounting and developing a composite index on environmental pressures;
- Consider how best to include resource efficiency considerations in the impact assessments of future policy proposals.

Member States should:

- Develop or strengthen existing national resource efficiency strategies, and mainstream these into national policies for growth and jobs (by 2013);

- Report their progress on resource efficiency as part of their national reform programmes.

6.2. Supporting resource efficiency internationally

A number of countries are implementing policies to reap the gains of greater resource efficiency, not only within the EU but also Japan, Korea, the United States, China and others. There is also a strong interest in dialogue and cooperation on these issues in EU's neighbouring countries. Such initiatives can be seen in the context of efforts around the globe to promote a transition towards a green economy. The EU can learn from experience of others, and participates actively in helping to influence the path that our partner countries take, specifically the enlargement countries who are invited to start aligning their policies.

As a basis for further discussion at the June 2012 Rio+20 Conference, the European Commission has recently proposed a wide range of possible actions, including new international initiatives on water, energy, agriculture, land use, forests, chemicals and marine resources, skills training programmes, mobilising private and public financing and investment, as well as moving towards a more effective global, multilateral governance system²⁷.

Milestone: By 2020 resource efficiency will be a shared objective of the international community, and progress will have been made towards it based on the approaches agreed in Rio.

The Commission, with Member States will (continuous):

- Promote a successful outcome of the RIO+20 summit in 2012 and concrete progress towards the green economy and a more efficient use of natural resources;
- Improve dialogue with strategic partner countries in order to exchange experience and good practice on resource efficiency;
- Undertake joint initiatives with candidate countries, potential candidates and other neighbours, who share with us many environmental resources;
- Support the conclusion and effective implementation of international agreements to make global consumption and production patterns more sustainable;
- Use development aid to support efforts by less developed countries to improve resource efficiency in the context of sustainable development and poverty eradication;
- Cooperate with international partners on research and innovation on resource efficiency;
- Work towards stronger multilateral mechanisms for a global governance of public goods.

6.3. Improving the delivery of benefits from EU environmental measures

Progress on resource efficiency depends on making improvements in the way our natural resources and ecosystems are managed. There are still important gaps in the performance of Member States in implementing measures, especially in nature conservation, waste and water

²⁷ COM(2011) 363.

management. The costs of not implementing current legislation are estimated around €50 billion per year²⁸.

Milestone: By 2020 the benefits from EU environmental legislation will be fully delivered.

The Commission will:

- Propose measures to enhance knowledge, raise awareness and better mobilise key actors in order to improve delivery of environmental measures throughout the EU.

The Member States should:

- Address gaps in their performance in delivering the benefits from EU legislation.

7. CONCLUSION

Previous patterns of growth have brought increased prosperity, but through intensive and often inefficient use of resources. The role of biodiversity, ecosystems and their services is largely undervalued, the costs of waste are often not reflected in prices, current markets and public policies cannot fully deal with competing demands on strategic resources such as minerals, land, water and biomass. This calls for a coherent and integrated response over a wide range of policies in order to deal with expected resource constraints and to sustain our prosperity in the long run.

The present road map is not the ultimate response to all challenges. It is a first step towards designing a coherent action framework that cuts across different policy areas and sectors. Its objective is to provide a stable perspective for transforming the economy. The Commission will prepare policy and legislative proposals to implement this Roadmap. Without the engagement of other public and private actors we will not achieve our resource efficiency objectives.

The Commission invites the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions to endorse this roadmap and contribute to the further development of the EU's actions to achieve a resource-efficient Europe.

²⁸ The cost of not implementing the environmental acquis, COWI, forthcoming

Annex: Resource efficiency – the interlinks between sectors and resources, and EU policy initiatives

Resource/sector	Fossil fuels	Materials and minerals	Water	Air	Land	Soils	Ecosystems: Biodiversity	Marine resources	Waste	EU Policy Initiatives
Circular Economy	Reduce, reuse, recycle, substitute, safeguard, value									Review of SCP (2012)
Energy	Reduce fossil fuels use via: -increased energy efficiency (20% by 2020); -substituting for renewable resources (20% by 2020, and 10% in transport).	-Ensure security of supply of critical raw materials (for renewables and electrification) -Reduce energy intensity of materials extraction, production & consumption.	-Use efficiently as renewable energy source; -Reduce cooling needs of power plants; -Reduce energy intensity of water treatment; -Reduce use of hot water via better appliances & water infrastructure.	-Reduce pollution with harmful substances, in particular via reduced use of fossil fuels; -20% reduction of GHG emissions by 2020 (30% if the conditions are right); - 80-95% GHG emission reduction by 2050.	-Reduce land take for biofuels; -Optimise energy infrastructure.	-Prevent soil damage by SO2 and NOx emissions; -Mitigate soil impacts of new infrastructure/energy solutions; -Preserve peatlands.	-Reduce acidification via reduced fossil fuels use; -Avoid ecosystem damage from energy carriers extraction/ exploitation.	-Use as a renewable energy source; -Ensure sustainable use of algae for biofuels; -Prevent risks of oil spills & disasters; - Reduce acidification resulting from GHG emissions.	-Ensure energy recovery of non-recyclable waste; -Reduce energy intensity of waste treatment; - Increase use of biodegradable waste for bioenergy and bioproducts.	-Energy 2020: A strategy for competitive, sustainable and secure energy (2011) - Strategic Energy Technology Plan for Europe; -Energy infrastructure priorities for 2020 and beyond - A Blueprint for an integrated European energy network (2011) - European Energy Efficiency Plan 2020 (2011) -Revision of the Energy Taxation Directive (2011) -Energy infrastructure package (2011) -Energy Roadmap 2050 (2011) -Smart grids (2011) -Security of energy supply and international cooperation (2011)
Food	-Reduce fossil fuels use via-improved energy efficiency of food production; -Avoid adverse impacts from the substitution of fossil fuels with biofuels.	-Optimise use of minerals & materials (eg phosphorous); -Improve packaging for better preservation & recyclability.	-Optimize water use in agriculture; -Prevent flooding & droughts, i.e. by fighting climate change; -Ensure clean water availability for quality products; -Avoid pollution from fertilizers and pesticides.	-Reduce GHG emissions; -Reduce SO2 & NOx emissions.	-Optimise land use to reconcile with other uses; -Use taken fertile land for agriculture; -Reduce land take (e.g. via optimal animal protein intake).	- Reverse soil loss; -Restore organic matter content in soils; -Prevent soil damage by SO2 and NOx emissions; -Avoid pollution from fertilizers and pesticides.	-Restore and preserve ecosystems to ensure pollination, water retention, etc.; -Avoid eutrophication from fertilizers and reduce the use of pesticides; - Increase biodiversity through good farming practices..	-Restore fish stocks and eliminate by-catch and discards; -Eliminate destructive fishing techniques; -Develop sustainable aquaculture; -Reduce pollution of coastal areas from fertilizers - Avoid marine litter.	-Reduce food waste; -Use recyclable/biodegradable packaging; -develop composting of biowaste.	-CAP Reform (2011) -Proposal for an Innovation. partnership on agricultural productivity and sustainability (2011) -Green Paper on phosphorous (2012) -Communication on sustainable food (2013)
Buildings	-Reduce fossil fuels use via better energy efficiency and renewable energy use in buildings; -Build zero energy buildings and increase the renovation rate of existing buildings.	-Optimise material use; -Use sustainable materials.	-Improve water efficiency of buildings and appliances	-Reduce GHG emissions from buildings; -Improve indoor air quality;	-Avoid additional land take (e.g. for urban sprawl); -Remediate contaminated sites.	-Avoid urban sprawl on fertile soil; - Minimize soil sealing	-Ensure sufficient and connected green spaces as part of green infrastructures.	-Reduce acidification resulting from GHG emissions.	-Recycle construction and demolition waste (70% till 2020).	-Strategy for the sustainable competitiveness of the EU construction sector (2011) -Communication on sustainable buildings (2013) -Initiative on water efficiency in buildings (2012)
Mobility	-Reduce dependency on fossil fuels by: improved fuel efficiency, renewable energy use, phasing out conventionally-fuelled cars in cities by 2050, improved multimodal logistics, better transport networks; more efficient vehicles.	- Increase resource efficiency of infrastructures; -Optimise logistics of materials transportation; -Ensure security of supply of critical materials (needed for batteries).	-Use the potential of water transport to reduce emissions; -Reduce pollution from water transport.	-Reduce pollution from transport: 60% less GHG by 2050; less ground-level ozone, particulate matter, NO2; less sulphur content in marine fuels.	-Minimise impacts of transport infrastructure on land fragmentation.	- Minimise impacts of transport infrastructure on land sealing.	-Minimise impacts of land sealing, fragmentation, pollution; -Avoid invasive alien species spread.	-Use the potential of maritime transport to reduce emissions; -Avoid marine litter, including from ships	-Ensure efficient reuse and recycling of end-of life vehicles (85-95% by 2015) and ships.	-White Paper on the future of transport (2011) -Revision of TEN-T (2011) -Strategic Transport Technology Plan
EU policy initiatives	State Aid framework (2013); Fuel quality directive; etc.	-Tackling the challenges in commodity markets and on raw materials (2011) -Proposal for an Innovation Partnership on raw materials	-Blueprint on water (2012) -Innovation partnership on water efficiency -Revision of the EQS Directive (priority substances) (2011) -Revision of the Ground Water Directive (2012)	-Low Carbon economy 2050 roadmap (2011) -Revision of the legislation on monitoring and reporting of GHG -Review of EU air quality policy (2013)	-Communication on land use (2014) -Communication on LULUCF in the EU climate change commitments (2011) [-Guidelines on best practice to limit, mitigate or compensate soil sealing	-2020 EU biodiversity strategy (2011) -Communication on Green Infrastructure and Restoration (2012) -No Net Loss Initiative (2015)	- Reform of Common Maritime and fisheries policy (2011)[AGRI] -Climate Change adaptation in the coast and the sea (2012) -Blue Growth (2013) -Integrated Coastal Zone Management (2012) -Maritime Spatial Planning (2012)	-Review of prevention, reuse, recycling and landfill of waste targets (2014)	-Roadmap to a resource efficient Europe (2011) -Multiannual Financial Framework 2014-2020 -Cohesion Policy post 2013 (2011)[REGIO] -Action Plan towards a sustainable bio-based economy by 2020 (2011) -Eco-Innovation Action Plan(2011) -EU Horizon 2020 (2011) -Review of EIA Directive

