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**Roadmap to a Resource Efficient Europe**

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## 1. CHALLENGES AND OPPORTUNITIES FOR EUROPE

Our demand for resources is increasing ever faster, with 200,000 people per day currently joining the global population<sup>1</sup>, and 2 billion middle income earners in 'developing countries' on a trajectory to triple their consumption by 2020<sup>2</sup>.

In the 20th Century, the world increased its fossil fuel use by 12 times, and extraction of material resources grew by a factor of 34.<sup>3</sup> Innovation and use of resources fuelled this growth, but trends show that the era of plentiful and cheap resources is over. Minerals, metals and energy, as well as stocks of fish, timber, water, fertile soils, clean air, biomass, biodiversity are all under pressure. Whilst demand for food, feed and fibre may increase by 70% by 2050<sup>4</sup>, already today 60% of the world's major ecosystems that help produce these resources have been degraded or used unsustainably.<sup>5</sup> Today in the EU, we use 16 tonnes of materials per person each year, of which 6 tonnes are wasted, with half going to landfill. If we carry on using resources at the current rate, by 2050 we will need 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.

Recent food crises, growing impacts from climate change, 'land-grabs', fish stock depletion and water shortages all highlight the fact that we are reaching some of the boundaries of what our planet can sustain. Resources interact with each other in a way that can cause systemic risks - one strategic resource could be depleted so far that it generates a 'tipping point' for other resources beyond which change is irreversible.

While the risks for our economies and wellbeing are clear, and the medium term implications for companies of these constraints are also clear, our economic system still encourages inefficient use of resources by pricing below true costs. Many of the more dynamic businesses have already understood the benefits of more productive use of resources. The World Business Council on Sustainable Development estimates that by 2050 we will need a 4 to 10 fold increase in resource efficiency, with significant changes needed by 2020. But not all businesses or consumers have yet realised the scale and urgency of the transformations they will need to make.

Within a generation our economy will require a fundamental transformation – in energy, industrial, agricultural, fishery and transport systems, in producer and consumer behaviour, and in technological innovation. It is in the interests of all that the transformation should be made in a timely, predictable and controlled manner and not in response to crises. It needs a policy framework that creates a playing field, where innovation and resource efficiency are rewarded, creating economic opportunities from greater recycling, product redesign, sustainable management of environmental resources, substitution of materials and resource savings. Unlocking these new sources of growth needs coherence and integration in the policies that shape our economy and our lifestyles.

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<sup>1</sup> <http://www.grida.no/publications/rr/food-crisis/page/3559.aspx>

<sup>2</sup> To \$20 trillion (a figure twice the size of the current US economy) WBCSD, Vision 2050

<sup>3</sup> Decoupling natural resource impacts from economic growth, International Resource Panel (2011)

<sup>4</sup> EEA, The European Environment – State and Outlook 2010: Synthesis, 2010

<sup>5</sup> Millennium Ecosystem Assessment, Ecosystem and Human Well-being synthesis, 2005

The Europe 2020 Strategy and its flagship initiative on "A Resource Efficient Europe"<sup>6</sup> set the EU on the path to this transformation<sup>7</sup>. The flagship called for a roadmap "to define medium and long term objectives and means needed for achieving them". This Roadmap builds upon and complements the other initiatives under the flagship, and takes into account progress made on the 2005 Thematic Strategy on the Sustainable Use of Natural Resources<sup>8</sup> and the EU's strategy on sustainable development.

This Roadmap, by setting out the EU's policy framework and direction, highlights the urgency and complexity of the challenges we face. It underlines the opportunities making the transformation will offer. To inspire and provide a direction for the necessary changes, it presents a positive vision of the world we and our children would like to live in 2050. The milestones to get closer to this vision in 2020 aim at creating incentives for the economy to work within environmental constraints, rather than having to protect the environment from economic activity. And finally, this Roadmap proposes a set of actions in the short term, which present the necessary first steps to achieve our long-term objectives.

## 2. DELIVERING A RESOURCE EFFICIENT EUROPE

### *Designing the Roadmap*

**The Vision: By 2050 the EU has grown in a way that respects planetary boundaries, thus contributing to global economic transformation. It is competitive 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 targets have been met and biodiversity and the ecosystem services it provides have been protected, valued and substantially restored.**

Resource efficiency 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 objectives on this path, points to actions to be undertaken now, identifies areas where further research should be carried out, and suggests a range of indicators and policy tools which can help guide action in Europe and internationally. It provides a coherent framework in which actors at all levels – private sector and regional, national and European authorities - can act. To ensure coherence the Roadmap considers how policies interrelate and build on each other, rather than looking them in isolation – thus the inter-linkages between key sectors and resources, and their associated EU policy initiatives need been looked at as a whole. (see Annex for an overview of interlinkages). Finally, it identifies where impact assessments will be needed to evaluate the best options to achieve these goals.

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<sup>6</sup> COM(2011)21

<sup>7</sup> See also the OECD's recently adopted Green Growth Strategy and UNEP's Green Economy report

<sup>8</sup> COM(2005)0670

### *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 to align with resource efficiency. 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 technological innovation;
- 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 influence international partners to move in a similar direction.

### *Setting the milestones*

To steer and to assess progress of this Roadmap, and send clear messages to encourage policy makers and businesses to invest in resource efficiency, clear targets underpinned by indicators are required.

This Roadmap proposes a new pathway to action on resource efficiency, including a process to discuss and agree on targets by 2013. This process will involve all key stakeholders, from the business, policy making and academic communities.

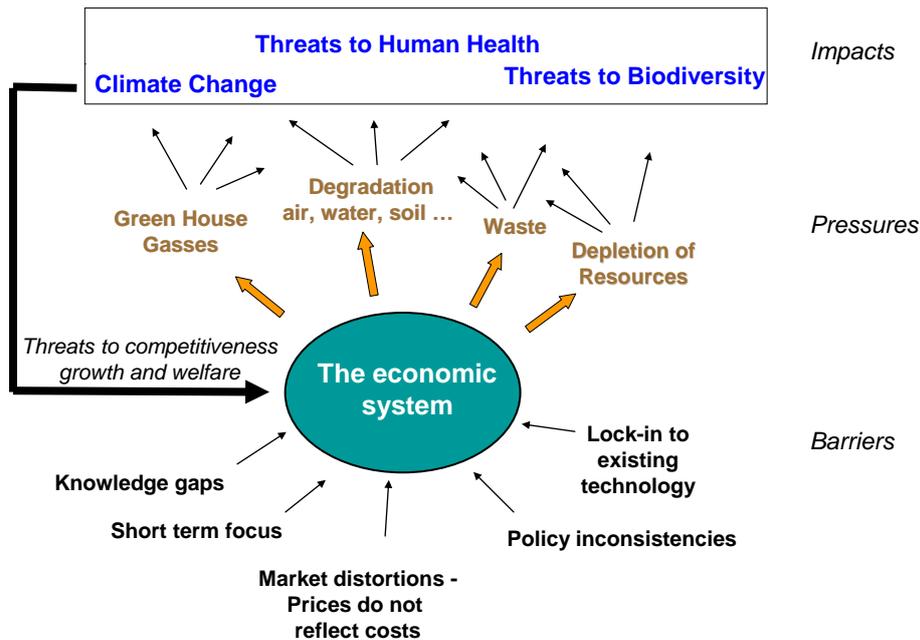
In order to launch this process, two levels of indicators will be tracked:

- (1) A headline indicator - "Resource Productivity" - to measure the main objective of this Roadmap, improving economic performance while easing pressure on natural resources;
- (2) A series of complementary indicators on key natural resources such as water, land and carbon.

The actions and the process needed to take this work forward are set out in a later section.

## **3. TRANSFORMING THE ECONOMY**

Transforming the economy to 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. Policy will have a central role in removing the barriers to resource efficiency including correcting the market signals that prevent change. In doing so, the policy framework should provide a flexible, predictable and coherent basis for business to operate on a level playing field. The diagram below outlines the barriers to resource efficiency, the pressures on the wider resource base and the resulting environmental impacts:



### 3.1. Improving products and changing consumption patterns

Global consumption currently drives resource depletion. Our fishing catches increased by 35, and our water use by 9 in the last century.<sup>9</sup> Global demand for energy and water is on a trajectory to rise by 40 % over the next twenty years, without policy change.<sup>10</sup>

Changed consumption patterns can drive increased resource efficiency. Private and public purchasing can frequently generate direct net savings. This can have an important demonstration effect in getting a critical mass of demand for new services and products. Accurate marketing based on life-cycle impacts and costs of resource use can reshape consumption decisions. Consumers can save costs by avoiding waste themselves, and buying products that last. New entrepreneurial models, where products are leased rather than bought, can deliver consumption needs with less life-cycle resource use.

Internal market and taxation policies have an important role in setting the framework for markets to reward greener products. A coordinated approach using both voluntary and mandatory measures – as in the EU’s Lead Market Initiatives and the Ecodesign Directive – should be rolled-out for a wider range of products and services.

However, improving the efficiency of a technology (and thus lowering its cost) can induce people to consume more<sup>11</sup>. These rebound effects must be anticipated, and accounted for, in developing policy and setting targets. By addressing consumption behaviour using scientific knowledge on the influences on consumption decisions, such ‘rebound effects’ can be mitigated.

<sup>9</sup> Decoupling natural resource impacts from economic growth, International Resource Panel (2011)

<sup>10</sup> EEA, The European Environment – State and Outlook 2010: Synthesis, 2010

<sup>11</sup> A new study on the rebound effect will shortly be published on the DG Environment web pages: [http://ec.europa.eu/environment/eussd/escp\\_en.htm](http://ec.europa.eu/environment/eussd/escp_en.htm)

*By 2020, citizens and public authorities are well informed of the true full life cycle impacts, and costs, of the products and services they buy. Their purchasing choices stimulate companies to innovate and to supply more resource efficient products and services. Minimum performance standards are set to remove the least resource efficient products from the market.*

The Commission will, in 2012, with the objective of promoting a life cycle approach, assess and propose how best to:

- Strengthen the requirements on Green Public Procurement (GPP) criteria for products with significant environmental impacts, and assess where GPP could be linked to Community funded projects;
- promote joint procurement, and networks of public procurement officers in support of GPP;
- Engage with business to enter into voluntary agreements or if necessary propose legislative measures to improve the resource efficiency of certain products over their life cycle;
- Provide methodological guidance to Member States and the private sector on assessing the environmental footprint of products and services;
- Expand the scope of the Ecodesign directive to cover non-energy related products and include material aspects (e.g. recycled content, reusability, recyclability, durability) in Ecodesign implementing measures (depending on the results of the on-going evaluation);
- Inform consumers on environmental performance of products based on the environmental footprint methodology;

And, together with business and Member States, develop in 2012:

- Options to increase market rewards for genuinely green products.<sup>12</sup>
- Measures to ensure producers take responsibility for the full life-cycle of the products they make (for example 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.

### **3.2. 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. Recently secure access to resources has become an increasingly strategic economic concern. In 2007 the total amount of material directly used in the EU economy was more than 8 billion tonnes.<sup>13</sup> We could reduce that amount without disrupting the economy.

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<sup>12</sup> Taking account of the rebound effect, on which a new study will shortly be published at : [http://ec.europa.eu/environment/eussd/escp\\_en.htm](http://ec.europa.eu/environment/eussd/escp_en.htm)

<sup>13</sup> <http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&plugin=1&language=en&pcode=tsdpc230>

In Germany alone a study suggests that resource-efficiency gains in manufacturing could generate annual cost savings between 20% and 30% and up to 1 million jobs for the country.<sup>14</sup> Another recent study estimates at £23 billion the savings from low or no-cost resource efficiency measures businesses could make in the UK<sup>15</sup>. 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 sales<sup>16</sup>.

However some firms are not yet exploiting efficiency gains, especially in non-core business areas (e.g. when energy or water efficiency is not central to the business 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.

Enterprise and innovation policy can help create incentives for greater efficiency. For instance, providing comparable metrics of life-cycle resource use can help identify opportunities for improvement, as can identifying and substituting for harmful chemicals. Exchanging information on routes to resource efficiency between partners in value chains and across sectors, notably SMEs, can prevent waste and create new markets.

***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 come primarily from increases in the value of products and associated services rather than increased resource inputs, which are decreasing. The most harmful chemicals are identified and substituted as one part of innovative chemistry's means to improve efficiency.***

Member States should:

- With EU support as appropriate, ensure that advice<sup>17</sup> and support is available to help SMEs identify and improve their resource efficiency;
- Help companies work together to make the best use of the waste and by-products they produce;
- Put in place incentives that stimulate a large majority of companies to systematically measure, benchmark and improve their resource efficiency;
- Work together with the Commission to ensure that all substances of very high concern are placed on the REACH Candidate List of chemicals needing to be substituted, by 2020.

The Commission will:

- Support the networking and exchange of best practice between agencies running schemes on resource efficiency for SMEs;
- Propose a common methodological approach to enable companies to measure, manage and compare their environmental footprints, based on a life-cycle approach<sup>18</sup>, by 2012.

<sup>14</sup> Distelkamp, M., Meyer, B., Wolter, M.I. (2005) in: Aachener Stiftung Kathy Beys (Hrsg.) Ressourcenproduktivität als Chance.

<sup>15</sup> Oakdene Hollins "Further Benefits of Business Resource Efficiency", 2011

<sup>16</sup> The Economic Benefits of Resource Efficiency Policy, COWI 2011, forthcoming

<sup>17</sup> e.g. Material Effizienz-Agentur, North Rhine Westfalia

- Based on this methodology, also in 2012, develop options for companies to display and benchmark their environmental performance.

### 3.3. Treating waste as a resource

Each year in the European Union we throw away 3 billion tonnes of waste, 90 million tonnes of which is hazardous. Only 40% on average of our solid waste is recycled, the rest going to landfill or incineration. Overall waste generation is still increasing in the EU, from municipal waste, construction and demolition waste to sewage sludge and marine litter.<sup>19</sup> Waste electrical and electronic equipment alone will 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 resources. With improving waste management comes financial savings, new markets and jobs.

If waste is to be treated as a resource to be fed back into the economy as a raw material, then much higher priority needs to be given to prevention, reuse and recycling. A combination of policies would help create a full recycling economy, such as product design integrating a life-cycle approach, market incentives for waste prevention and recycling, as well as public investments in modern facilities for waste treatment and recycling.

***By 2020, waste is seen and used 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 separated collection and the development of functional markets for secondary raw materials. Waste legislation fully implemented. Energy recovery is limited to non recyclable materials and landfilling is virtually eliminated.***

Member States should ensure full implementation of the EU waste *acquis* including minimum targets through their national waste prevention and management strategies.

The Commission will put forward proposals to:

- Reinforce the secondary materials markets and stimulate demand for recycled materials through appropriate economic incentives (2012);
- Include minimum recycled material rates, improving durability and re-usability of key products and reducing the use of hazardous substances (2012);
- Ensure that public funding and particularly EU funding supports the move up the waste hierarchy (e.g. support recycling plants rather than incinerators) (2014);
- Review existing prevention, re-use, recycling and landfill diversion targets to move towards an economy based on recycling, with residual waste close to zero (2014);
- Pursue illegal waste shipments within concerted global action;
- Facilitate the exchange of best practice among Member States.

### 3.4. Supporting research and innovation

The transition to a green economy will require significant innovation, from small incremental changes to technological breakthroughs and new ways of doing things. To trigger this, the right set of incentives needs to be in place so that the private sector invests more in resource

<sup>18</sup> EU Eco-Management and Audit Scheme.

<sup>19</sup> <http://www.eea.europa.eu/soer/synthesis> p.79

efficient research and innovation. This requires clear framework conditions to increase investor certainty and market incentives, encouraging a longer time horizon and better access to finance for companies making green investments that are seen as riskier or that have longer payback times. Demand-side encouragement is needed, for example developing markets for green goods and services by increasing confidence through quality standards, and encouraging demand through technology neutral performance related incentives.

We need a comprehensive and credible knowledge base about how the system Earth functions and reacts to the different pressures we exert on it. Basic and applied research should identify challenges and guide actions, including social sciences research to develop our understanding of behaviour.

More public and private research and innovation would be needed in areas such as: environmentally friendly material extraction, recycling, and re-use potentials; substitution of environmental impacting material; design using less material; green chemistry reducing the use of other resources and improved and biodegradable plastics; as well as water conservation and sustainable agriculture.

The EU Horizon 2020 programme will provide targeted funding for developing our environmental knowledge base and supporting research and innovation on key technologies for dematerialization. But it will also provide coherence and direction to other research programmes, helping to meet the wider resource efficiency societal challenge. It will complement Member States' programmes and encourage smart specialization and increased focus, from exploratory research to demonstration projects, and closer to the market with private actors through private-public partnerships and Innovation Partnerships.

***By 2020, scientific breakthroughs and sustained innovation efforts have brought about dramatic improvements in efforts to reduce, reuse, recycle, safeguard and value the resources. This has been made possible by substantial increases in investment, coherence in addressing the societal challenge of resource use, climate change and resilience, and in gains from smart specialization and cooperation within the European research area.***

The Member States and the Commission will establish an appropriate framework and set of incentives to boost private sector investment into research and innovation for resource efficiency

The Commission will put forward proposals to:

- Use 'Innovation Partnerships' for meeting resource efficiency goals (e.g. on water, raw materials, smart cities and sustainable agriculture), starting from 2011;
- Develop Joint Technology Initiatives or other forms of private-public partnerships;
- Tackle barriers to eco-innovation through an Action Plan, including measures to stimulate private sector uptake of new environmental technologies (2011);
- Focus Community research funding (EU Horizon 2020) on key resource efficiency objectives, supporting, for example innovative solutions for environmentally friendly material extraction, for recycling or re-use, and for substitution of environmental impacting material, on smarter design, green chemistry and lower impact, biodegradable plastics;

- Support Joint Programming Initiatives that pool national research efforts in areas of resource efficiency.

### 3.5. Phasing out inefficient subsidies

Environmentally harmful subsidies (EHS) are a result of a government action that confers an advantage on certain consumers or producers, in order to supplement their income or lower their costs, but in doing so, discriminates against sound environmental practices<sup>20</sup>. EHS lead to higher levels of waste, emissions, resource extraction, or to negative impacts on biodiversity<sup>21</sup>. They can lock in inefficient technologies and hinder businesses from investing in green technologies. 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.<sup>22</sup>

Moving away from such subsidies 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 Survey<sup>23</sup> in order to support budget consolidation. In the European Council Conclusions on the Euro Plus Pact<sup>24</sup> in March and June 2011 the participating Member States committed to engage in pragmatic coordination on the avoidance of harmful practices in their tax policies.

In the process of EHS removal, mitigating arrangements may be necessary for the most affected economic sectors or social groups, and the impact of possible displacement of production to other countries needs to be considered.

***By 2020 EHS will be phased out, with transitional measures for people in need.***

Member States are invited to:

- Prepare plans and timetables to phase EHS out as part of their National Reform Programmes.

The Commission will:

- Monitor and guide the phasing out of EHS in the European Semester as of 2012;
- Organise exchange of best practices on the reform of EHS between the Member States as of 2012;
- Adjust state aid assessments to take resource efficiency objectives into account in the revisions of state aid guidelines by 2013.

### 3.6. Getting the prices right

Market prices are the primary guide for purchasing choices and investment decisions, notably on innovation, but they do not always foster resource efficiency as they do not reflect the true costs of using resources and their environmental impacts.. Taxation policy has a strong role to play in correcting such market failures. For instance, shifting taxation away from labour, as

<sup>20</sup> OECD, Environmentally harmful subsidies: challenges for reform, 2005

<sup>21</sup> OECD, Environmentally harmful subsidies: challenges for reform, 2005

<sup>22</sup> TEEB, chapter 6

<sup>23</sup> COM(2011) 11 final

<sup>24</sup> EUCO 10/1/11 REV1, 20 April 2011; EUCO 24/11, 24 June 2011

proposed in the Annual Growth Survey for 2011<sup>25</sup>, towards resource consumption (including pollution) boosts employment and economic growth. At the same time, it provides the incentives for innovation in efficient resource use. Despite this, the share of environmental taxation in total tax revenues in the EU has been declining since 1999<sup>26</sup>

In the European Council in March 2011 Member States agreed to give particular attention to tax reforms<sup>27</sup> to boost employment. New policy should take the opportunity to align prices of resources which are not appropriately valued in the market, such as water, clean air, ecosystems, biodiversity, and marine resources.

***By 2020 the shift to a share of environmental taxation in public revenues of an EU average of more than 10% (in line with the best performing Member States) will create a level playing field and support the economy to achieve greater resource efficiency. Within fiscal consolidation, this will allow cuts in other taxes, such as on labour.*** Member States are invited to:

- Within fiscal consolidation measures, shift taxation away from labour to environmental impacts;
- Review their fiscal policies and instruments with a view to effectively supporting resource efficiency, and in this context reflect on incentives to support consumer choices and producer action in favour of resource efficiency.

The Commission will:

- Monitor and guide national developments towards environmental fiscal reform through the European Semester from 2012;
- Promote regular exchange of best practices and peer reviews on market based instruments, including on environmental taxation, between Member States, in particular under the recently launched Market Based Instruments Forum.

#### **4. KEY RESOURCES**

We are far away from a genuinely sustainable materials management or a "circular economy", where waste becomes a resource. While material resources, notably minerals, metals and fuels, have received attention in EU policies (such as the Commodities and Raw Materials Initiative<sup>28</sup>) their use is still not sustainable. Climate action and European energy policy are already changing the trends in use of energy, but much remains to be done. Other key resources such as water, air, ecosystems, land and marine resources are often used as if they have no supply constraints, as "free" commodities, leading to unsustainable levels of consumption. These market failures require tailored approaches.

##### **4.1. Saving and protecting water resources**

20% to 40% of Europe's water is wasted and water efficiency could be improved by 40% through technological improvements alone<sup>29</sup>. Changes in land use, in production and water

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<sup>25</sup> COM(2011) 11 final

<sup>26</sup> Environmental statistics and accounts in Europe, Eurostat 2010 edition

<sup>27</sup> EUCO 10/1/11 REV1, 20 April 2011

<sup>28</sup> [http://ec.europa.eu/enterprise/policies/raw-materials/index\\_en.htm](http://ec.europa.eu/enterprise/policies/raw-materials/index_en.htm)

<sup>29</sup> T. Dvorak et al.(Ecologic - Institute for International and European Environmental Policy), EU Water saving potential, Report for DG Environment, 2007

([http://ec.europa.eu/environment/water/quantity/pdf/water\\_saving\\_1.pdf](http://ec.europa.eu/environment/water/quantity/pdf/water_saving_1.pdf))

consumption patterns could increase savings further in a cost-effective way and contribute to ensure both water quality and availability.

The quality and availability of fresh water is decreasing. Many European river basins and waters have been altered by water abstraction, land drainage, and dams, leading often to major adverse ecological effects, poor quality water and limited space for natural habitats<sup>30</sup>. Climate change is projected to increase water shortages as well as the intensity and frequency of floods.

Water is vital for human health and an essential resource for agriculture, tourism, industry, energy and transport. Reduced water availability has a critical impact on energy, not only in hydropower, but also for cooling in nuclear and thermal power stations. The supply of clean water in sufficient quantity and at a reasonable cost remains a challenge EU wide.

Water resource management in Europe has tended to focus on ensuring availability through supply side measures. A better approach for a sustainable management of water resources requires close coordination with agriculture, transport and energy policies as well as effective and fair water pricing as required by the Water Framework Directive. The Commission will put forward new ideas on this in a Blueprint for water policy in 2012.

***By 2020, water is of good quality, efficiently used and is available in sufficient quantity. The impacts of droughts and floods are minimised. Since 2012 all WFD River Basin Management Plans (RBMPs) have been implemented and good status of waters is attained in all EU river basins in 2015. By 2020 water abstraction stays, as a rule, below 20% of available renewable water resources.***<sup>31</sup>

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<sup>30</sup> EEA 2010 State of the Environment Report (SOER), Water, key messages.

<sup>31</sup> Water Exploitation index (WEI): Annual total water abstraction as a percentage of available annual long-term freshwater resources. The warning threshold for the WEI, which distinguishes a non-stressed from a stressed area, is around 20 %. The WEI will be revised as part of the Water Blueprint proposal.

The Commission will further integrate resource-efficiency considerations into water policy, and:

- Assess Member States' RBMPs, with a view to identifying areas where additional action is needed.
- assess and propose in 2012:
  - Indicative water efficiency targets
  - 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;
  - Measures such as green infrastructures to improve natural water retention, flood protection and water purification and availability.
  - an innovation partnership on water

Member States should:

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

## 4.2. Safeguarding clean air

Despite significant efforts to reduce emissions, air pollution continues to cause damage to people's health and the environment. Current concentrations of fine particles cause 500 000 premature deaths in the EU and immediate neighbourhood<sup>32</sup>. In addition, ecosystems and agriculture suffer damage from impacts such as acidification, eutrophication and ozone damage to vegetation. Sulphur in marine fuels remains a major problem for air quality.

Several air quality standards are widely exceeded in the EU's most densely populated areas<sup>33</sup>, especially from the most problematic pollutants such as particulate matter, ground-level ozone, and nitrogen dioxide.

Proper implementation of existing legislation would help address these problems and steer innovation in the right direction. Air quality levels can also be improved by other actions in this Roadmap, for example through reductions in waste and pollutants, through more efficient production methods as well as action in the transport sector.

***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 in view of progressing towards the ultimate goal of achieving levels of air quality that do not cause significant impacts on health and the environment.***

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<sup>32</sup> EEA, SOER 2010

<sup>33</sup> European Environment Agency, SOER 2010.

The Commission will:

- Undertake, by 2013, a comprehensive review of all EU air pollution policies;
- Propose an upgraded strategy looking beyond 2020, assessing the scope for further measures to reduce emissions from key sources (2013);
- Support implementation of existing measures to help resolve persistent air quality problems, such as including the 2008 IMO agreement on the sulphur content of marine fuels in EU legislation (2011);

Member States should step up their implementation of EU air quality legislation.

#### 4.3. Maintaining and enhancing ecosystem services

Biodiversity and ecosystem services provide benefits that support economic prosperity<sup>34</sup> and wellbeing but their value is not properly taken into account in decision making. As a result, our 'natural capital' continues to be depleted, challenging our long-term sustainability.<sup>35</sup> For example, in the EU, 30% of species are threatened by overexploitation and 88% of stocks are fished beyond maximum sustainable yields.

Nature-based solutions can be more cost-effective than technical infrastructures for enhancing resilience, for instance by using forest and wetland ecosystems for flood control and water purification. The magnitude of global business opportunities related to natural resources is estimated to be up to \$2-6 trillion by 2050<sup>36</sup>. Giving those services their appropriate value will induce economic actors to integrate the external impacts of their activities on the ecosystems, thus contributing to their preservation. The new 2020 EU Biodiversity Strategy sets out the main policy tools for achieving the objectives in this field.

***By 2020 the loss of biodiversity and ecosystem services in the EU must be halted and restored as far as feasible***<sup>37</sup>

Member States, with the Commission, will:

- Map the state of ecosystems and their services by 2014, assess their economic value, and promote the use of these values into accounting and reporting systems at EU and national level by 2020.

The Commission will also:

- Strengthen its efforts to integrate biodiversity protection and ecosystem actions in other Community policies, including the greening of 30% of direct Common Agricultural Policy support and providing the right market signals and incentives under the next Multiannual

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<sup>34</sup> www.teebweb.org

<sup>35</sup> Millennium Ecosystem Assessment, 2005; EEA, EU 2010 Biodiversity baseline.

<sup>36</sup> WBCSD (2010) Vision 2050: The New Agenda for Business. World Business Council for Sustainable Development: Geneva

<sup>37</sup> COM(2011)244

Financing Framework to protect and restore agricultural and marine ecosystems and their services;

- Develop, with Member States, policies to reduce the impact of EU production and consumption patterns on biodiversity and ecosystem services within EU and globally;
- Work with Member States and key stakeholders, including the EIB through public private partnerships, to encourage businesses to assess their dependency on ecosystem services;
- Further promote the use of innovative financial instruments including developing payments for ecosystems services and other market based instruments at national, EU and international level;
- Put forward proposals to foster investments in natural capital, (Communication on Green Infrastructure and Restoration in 2012, and a "No Net Loss" initiative in 2015).

#### 4.4. Using land and preserving soils

In the EU, more than 1,000 km<sup>2</sup> are subject to 'land take' every year for housing, industry, roads or recreational purposes. About half of this surface is actually 'sealed'<sup>38</sup>. At this pace, every ten years we pave over a surface area equal 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 800 km<sup>2</sup> by 2020. Situations widely differ from one region to another though, with densely urbanised and coastal areas the most affected.

In many regions soil is irreversibly eroded, or is of poor organic quality.<sup>39</sup> Soil contamination is also a serious problem.

The use of land is nearly always a compromise 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. The EU agricultural, energy, transport and cohesion policy reforms will provide the opportunity to set the framework and the incentives for national and regional/local authorities and land owners to achieve this objective.

***By 2020, EU policies will take into account their direct and indirect impact on land use, and the rate of land take is on track to achieve no net land take by 2050; soil erosion will have been reduced and the organic quality of the soil improved, with remedial work on contaminated sites well underway.***

Member States should:

- Better integrate direct and indirect land-use and its environmental impacts in their decision making, and at an earlier stage and limit land sealing to the extent possible;

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<sup>38</sup> Prokop et al (2011)

<sup>39</sup> Erosion has reached 10 tonnes per hectare per year on more than 100,000 km<sup>2</sup> of the EU (a loss of more than 1-2 tonnes per hectare per year is irreversible for most soils). Scientific evidence points to the need to reduce the area of land that is subject to erosion of more than 10 tonnes per hectare by at least a quarter by 2020. Around 45% of soils in Europe have a low or very low organic matter content, taken to be less than 3.5% organic matter. Evidence suggests that by 2020 soil organic matter levels should not be decreasing overall and should increase for soils with currently less than 3.5% organic matter.

- By 2015, implement the actions needed for the preservation of fertile soils and the identification of contaminated sites, by setting up an inventory of contaminated sites.

The Commission will:

- Assess how to take into account indirect land use change due to EU renewable energy policy and how to account for Land Use, Land Use Change and Forestry in greenhouse gas emissions accounting (proposals in 2011);
- By 2012, publish guidelines on best practice to limit, mitigate or compensate soil sealing;
- Develop the knowledge-base on biotic material, land-use trends and spatial planning and highlight best practices in the Member States (Communication on land use, 2014);
- Include broader resource efficiency considerations in the review of the Environmental Impact Assessment (EIA) Directive (2012).
- Set out the state of play of EU soil policies in a progress report, and propose if appropriate, further to an impact assessment, quantitative targets on erosion;
- Propose a European Innovation Partnership on agricultural productivity and sustainability to address, inter alia, soil fertility.

#### 4.5. Protecting marine resources

As well as fisheries, the marine environment holds economic opportunities in sectors like pharmaceuticals and biotechnology as well as energy. Marine ecosystems also have important natural regulatory functions, helping combat climate change and coastal erosion. However, pressure on these systems are becoming increasingly severe, putting them under threat.

There is sub-optimal management of marine resources. The depletion of fish stocks<sup>40</sup> has severe economic and social consequences for coastal zones and contributes to other biodiversity loss by disrupting systems, while pollution and climate change pose other challenges (e.g. acidification). Fisheries policy is putting sustainability concerns at the heart of its aims, in order to ensure an efficient 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. 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.

***By 2020, good environmental status of all EU marine waters will be achieved, and by 2015 fish and shellfish are fished within maximum sustainable yields***

Member States should implement the Marine Strategy Framework Directive and designate marine protected areas.

The Commission will put forward proposals to:

<sup>40</sup> About 1/3 of the EU assessed stocks being fished are outside their safe biological limits.

- Reform the Common Fisheries Policy in 2011 in a sustainable way, and 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 (2012) as well as continued support for knowledge and demonstration projects;
- Promote eco-system based strategies and integrating 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 new business opportunities in the maritime and coastal economy (Communication on "Blue Growth", 2013);

The Commission will also:

- 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 (2012);
- Support MS by developing measures (2015) to achieve good environmental status in marine waters by 2020 and to establish an extensive network of protected areas (2020).

## 5. KEY SECTORS

In industrialized countries nutrition, housing and mobility are typically responsible for 70-80% of all environmental impacts.<sup>41</sup> The specific energy and climate change impacts in these areas are addressed through complementary long term strategies under the Resource Efficiency Flagship<sup>42</sup>.

### 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<sup>43</sup>. Food and feed are widely traded and our consumption patterns have further impacts globally. Furthermore, in the EU alone, we waste 90 million tonnes of food every year or 180 kg per person<sup>44</sup>. Much of this waste is avoidable (i.e. still edible).

An additional issue for long term global food security is the sustainable 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 and bio-waste systems could reduce our dependence on mined phosphate<sup>45</sup>.

Resource efficiency in this area depends on a combined effort of farmers, the food industry, retailers and consumers. Agriculture, fisheries, consumer and industrial policy can contribute to addressing resource efficiency throughout the food value chain, through resource-efficient

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<sup>41</sup> International Resource Panel (2010) Assessing the Environmental Impacts of Consumption and Production: Priority Products and Materials; and Tukker, A. et al. (2006). Environmental Impact of Products (EIPRO). EC Joint Research Centre - IPTS.

<sup>42</sup> Roadmap for moving to a Competitive Low Carbon Economy in 2050: COM(2011)112, Energy Efficiency Plan: COM(2011)109, Energy 2020 COM(2010)639; Energy Roadmap 2050 (to be adopted); Proposal for a Directive on energy efficiency (to be adopted).

<sup>43</sup> EEA, SOER 2010

<sup>44</sup> EU27 in 2006, excluding agricultural waste, see <http://ec.europa.eu/environment/eussd/reports.htm>

<sup>45</sup> Schroder et al, 2010. Sustainable use of phosphorus

production techniques, sustainable food choices by consumers and reduced food waste, thus contributing to food security and global resource efficiency.

***By 2020, incentives to healthier and more sustainable food production and consumption will be widespread<sup>46</sup> 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<sup>47</sup>.***

Member States are invited to:

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

The Commission will:

- Propose actions on promoting lower impact food choices and limiting food waste throughout the food supply chain, via, for example, the use of green public procurement criteria and improved labelling (Communication on sustainable food, by 2013);
- Take forward the integration of resource efficiency in the reform of Common Agriculture Policy (CAP), as set out in the Communication on the CAP towards 2020 (2011);
- Consider developing a methodology for sustainability criteria for key food commodities by 2014<sup>48</sup>;
- Further assess the security of supply of phosphorus and potential actions towards its sustainable use.

## **5.2. Improving buildings**

By improving construction and use of buildings, the EU can influence 42% of its final energy consumption, about 35% of its greenhouse gas emissions<sup>49</sup> and more than 50% of all extracted materials, and save up to 30% of its water. Existing policies for promoting *energy* efficiency of buildings<sup>50</sup> therefore need to be complemented with policies for *resource* efficiency, which look at a wider range of environmental impacts across the whole life-cycle of buildings and infrastructure. Life-time costs of buildings should increasingly be considered rather than just the initial costs, including construction waste. Better city planning of infrastructure is a prerequisite in achieving resource efficiency in buildings and also mobility.

Specific policies are needed to stimulate SMEs – who make up a vast majority of construction companies<sup>51</sup> – to train and invest in resource efficient building methods and practices.

Significant improvements in resource and energy use and during construction and demolition – with improved materials, higher recycling of construction and demolition waste and improved building design to use fewer materials – will contribute to a competitive construction sector and the development of a resource efficient stock of buildings and

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<sup>46</sup> In line with WHO recommendations

<sup>47</sup> Based on the UN recommendations in "The Environmental Food crises: Environment's role in averting future food crises"

<sup>48</sup> Non-food commodities could be taken up according to their environmental impacts.

<sup>49</sup> As identified in the Lead Market Initiative for Europe on construction, COM(2007) 860 final

<sup>50</sup> Including the Energy Performance of Buildings Directive, measures under the proposed Energy Savings Directive.

<sup>51</sup> Sustainable Competitiveness of the Construction Sector, ECORYS SCS Group, 2011, p. 108

infrastructure in the EU. This requires the active engagement of the whole value chain in the construction sector. Industrial policy can help setting an appropriate regulatory framework, including through norms and public procurement requirements.

***By 2020 the renovation and construction of buildings and infrastructure will be made to high resource efficiency standards. The Life-cycle approach will be widely applied; all new and renovated buildings will be nearly zero-energy<sup>52</sup>, the existing building stock will be refurbished<sup>53</sup> at a rate of 2% per year; 70% of non-hazardous construction and demolition waste will be recycled<sup>54</sup>.***

The Commission, together with Member States, will develop policy to:

- Support greater investment in training and communication on the best resource efficiency practices in the industry;
- Carry out impact assessments for possible measures to : stimulate demand and uptake of resource efficient building practices, through life-cycle costing and suitable financing arrangements; further widen the scope of the Eurocodes to design criteria related to sustainability; develop incentives to reward resource efficient buildings (Communication on sustainable buildings, 2013; and Water Blueprint, 2012)
- Encourage private sector innovation in construction

### **5.3. Ensuring efficient mobility**

A modern, resource efficient mobility system, serving both passengers and freight can contribute to competitiveness and sustainability through reduced resource dependency, and reduced impacts from pollution, land use, and noise on climate change, biodiversity and ecosystems, health and safety. The Transport White Paper<sup>55</sup> promotes a wide range of options for pursuing the required holistic transport policy, including forty initiatives addressing the enhancement of efficient and integrated mobility system; innovation in technology and behaviour; modern infrastructure and smart funding, as well as the international dimension.

***By 2020 overall efficiency in the transport sector will deliver greater value with significantly reduced needs for resources like raw materials, energy, land use, and impacts such as climate change, air pollution, noise, accidents, and ecosystem degradation. Reduction of the materials used in the economy and improved logistics has enabled a reduction of the freight intensity of the economy by 20%. There has been a 1%<sup>56</sup> yearly reduction, beginning in 2012, in transport GHG emissions.***

The Commission will ensure the full integration of the resource efficiency objectives in the implementation of the initiatives under the Transport White Paper, in particular through fuller internalisation of external costs.

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<sup>52</sup> Directive 2010/31/EU

<sup>53</sup> In line with Art. 9 of Directive 2010/31/EU of 19 May 2010 on the energy performance of buildings

<sup>54</sup> In line with Art 11 of Directive 2008/98/EC of 19 November 2010 on waste.

<sup>55</sup> COM(2011)144, White Paper: Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system

<sup>56</sup> ibidem

## 6. GOVERNANCE AND MONITORING

Transforming the EU into a more resource efficient economy is by no means a task for environmental policy alone. It requires, in addition, concerted action across the range of policies set out in this Roadmap – including economic, statistical, fiscal, enterprise, research and innovation, agriculture, fisheries, climate, transport, energy, consumers and health. The Commission will launch a joint effort with stakeholders to work on defining the right targets and indicators for 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.

### 6.1. Steering the transition to a resource efficient economy

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. The substantial gaps in our knowledge about the planet's functioning and carrying capacity call for major research effort, and the increasing body of knowledge on resource efficiency needs to be made accessible, best practices need to be disseminated, and innovation promoted.

***By 2020 resource efficiency considerations will be part of the policy and decision making processes at EU, national and regional and local level. Business and other stakeholders are fully engaged, have worked with policy makers to develop targets and progress is regularly monitored.***

Member States should, by 2013:

- Develop or strengthen existing national resource efficiency strategies;

The Commission will, from 2011, examine the best way to bring together relevant stakeholders, in particular:

- business community, scientists and researchers, consumers, trade unions and NGOs, to discuss their involvement and progress in achieving resource efficiency in an "EU Resource Efficiency Transition Platform"(2012);
- regional and local authorities, for instance, via the extension of the Covenant of Mayors<sup>57</sup> to include the efficient use of resources(2012);
- within key sectors, in order to share knowledge and best practices, e.g. by strengthening existing sectoral platforms<sup>58</sup>, possibly extending them internationally.

The Commission will support - through research funding (EU Horizon 2020) - the building up of knowledge in relation to key resource efficiency objectives, such as on the natural tipping points, ecosystems' resilience thresholds and on changing consumption behaviour.

<sup>57</sup> [http://www.eumayors.eu/home\\_en.htm](http://www.eumayors.eu/home_en.htm)

<sup>58</sup> E.g. the European Retail Forum, the European Food Sustainable Consumption and Production Round Table or the European Re-Building Forum and European Technology Platforms.

## 6.2. Improving implementation of EU legislation

While progress on better implementation of the EU environmental legislation has been made, the performance of Member States remains uneven, especially in nature conservation, waste and water legislation. The costs of not implementing current legislation are estimated around €50 billion per year<sup>59</sup>.

*By 2020 all EU environmental legislation will be fully implemented.*

Member States are invited to:

- Implement fully existing legislation.

The Commission will:

- Propose measures for improved implementation including measures to enhance knowledge, raise awareness and better mobilise key actors (Communication on Implementation of EU Environmental Policy, 2011).

## 6.3. Investing in the transition

Resource efficiency reduces costs, but often requires initial investments. However, these initial investments are often not made because financial markets are geared towards short-term financial performance. Unfamiliarity of financiers with risks and returns on investments in resource efficiency reduces their levels, whilst uncertainty on policy direction and credibility adds financial risk.

UNEP estimate that the annual financing needs for making the world economy more resource efficient are between US\$1.05-2.59 trillion, about 10% of annual global capital investment<sup>60</sup>. In the EU, and elsewhere, this financing will need to come mainly from private sources and will require a combination of well-designed policies creating the right market conditions in order for private investors to perceive profitable opportunities<sup>61</sup>. The rapid growth of global financing for clean energy shows how this shift in mindset is possible.

*By 2020, finance for resource-efficient product innovation and investment in efficiency savings will be available on equal or better terms than comparable investments, with a particular focus on SMEs to finance resource-efficient innovation.*

The Commission will:

- Undertake an impact assessment with a view to possible proposals for the use of innovative financial instruments for investments in resource efficiency (2013)
- 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 for resource-efficiency (2012);
- Promoting investment expertise and take-up of best practices.
- Support investment in necessary skills development through the European Social Fund.

<sup>59</sup> The costs of not implementing the environmental acquis, COWI, June 2011 (to be published)

<sup>60</sup> UNEP Green Economy Synthesis 2010

<sup>61</sup> OECD Green Growth Synthesis 2010

#### **6.4. Supporting resource efficiency internationally**

A number of countries are beginning to think about the gains that can be achieved through greater resource efficiency, not only within the EU but also in Japan, Korea, the United States, China and some developing countries. The EU can learn from this experience and help influence the path that our partner countries take.

This involves a range of actions, including: direct support to and joint initiatives with candidate countries and other neighbours, who share with us many environmental resources; strengthening the implementation of existing agreements; using our own consumer power and trade agreements to influence global consumption and production patterns in line with our norms and standards internationally; using development aid to support resource efficiency in the context of sustainable development in less developed countries; cooperating in research and innovation; and working towards stronger multilateral mechanisms for a global governance of public goods. Progress in resource efficiency in partner countries will not only enable them to develop sustainably, but will also in turn make it easier for the EU to reduce its own global footprint.

In the run-up to the Rio+20 Summit in 2012, the European Commission has proposed a wide range of actions, including new international initiatives on agriculture, land use, forests, chemicals and marine resources, helping mobilise private and public financing and investment, as well as help with progress towards a more effective global, multilateral governance system.<sup>62</sup>

***By 2020 resource efficiency will become a shared objective of the international community.***

At the international level the Commission will:

- Seek to strengthen international agreements such as on marine environments and the oceans, on chemicals and hazardous waste, and international sustainable development governance.
- Support capacity building for sustainable resource management and efficiency in partner countries, in particular to develop know-how and help lift people out of poverty.
- Promote scientific and technological cooperation at the global level and put in motion a mechanism for global science and research cooperation on societal challenges of global importance (e.g. resource constraints, climate change, oceans);
- Include resource efficiency considerations more systematically in our external policies, including trade;
- Explore the scope for further promoting and fostering sustainable production (including sustainable agriculture) and resource standards in producer countries, such as through international partnerships on food commodities;
- Promote delivery on commitments made at the 10th meeting of the Conference of the Parties (COP 10) to the Convention on Biological Diversity (CBD).

#### **6.5. A new pathway to action on resource efficiency**

Setting 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 effectively and the private sector will have a better signal for

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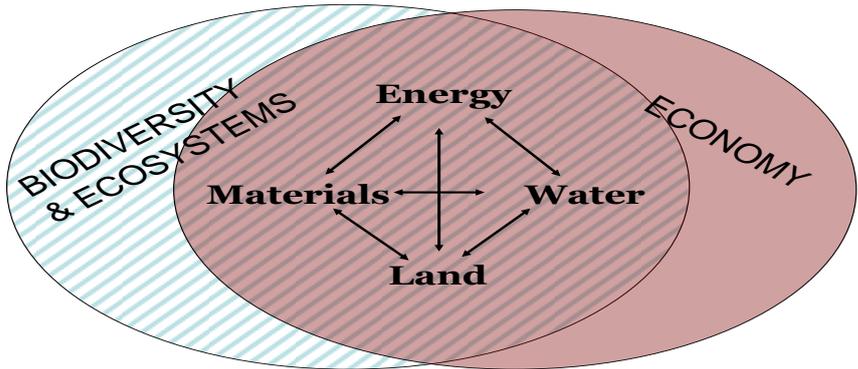
<sup>62</sup> COM (2011) 363

their investment plans, and the necessary predictability and transparency to take long-term decisions.

The sustainable growth objective of the Europe 2020 Strategy already sets specific targets related to green house gas emissions, energy efficiency and renewable energy. Achieving these targets is vital for protecting natural resources.

However, they will not by themselves secure a resource-efficient path for the economy. If we were to achieve the climate and energy targets in full, but not make progress on using resources more efficiently, then our economy would be still dealing with waste, air pollution, the availability of clean water, loss of ecosystem services, with adverse consequences for the efficiency of the economy, the health of people and production of food. Given that other countries are already beginning to act on resource efficiency, the competitiveness of our industry would suffer and we would not exploit new sources of growth.

Setting a target for one resource can have unintended consequences since all resources are interdependent. If one resource reaches a tipping-point beyond which change is irreversible, then this can have consequences for a whole system. Therefore, given the current state of our knowledge, the consumption of materials (abiotic and biotic), energy, water and land use seem to form the best basis for a set of indicators.



**Diagram: Interdependencies of resource use**

To start with, the Commission proposes, as a headline indicator<sup>63</sup>, using resource productivity, measured by the ratio of GDP to Domestic Material Consumption (DMC, expressed in Euro/tonne). This, however, only captures the material resources aspects and does not deal with other resources, or the potential shift of burden across countries.

For these reasons, the headline indicator should be complemented by a 'dashboard' of indicators on water, land and carbon and indicators that measure environmental impacts and our natural ecological capital or ecosystems. Thematic indicators will be used to monitor progress towards existing targets in other sectors, as detailed in the Staff Working Paper accompanying this Roadmap.

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<sup>63</sup> Other indicators as e.g. Carbon Intensity, Ecological Footprint or Environmentally weighted Material Consumption (EMC) have either limited scope, or still need scientific improvements.

These issues are difficult, and there are several competing ideas as to what should be taken as indicators. What is not in dispute is the scale of the challenge, with various proposals going from a 20% reduction in material use<sup>64</sup> to a factor 4 improvement<sup>65</sup>, over 20 years meaning halving the use resources<sup>66</sup> while simultaneously doubling prosperity over the same period. And, in addition to resource use, we need to be able to measure environmental impacts on ecosystems in a better way.

The state of knowledge is not yet sufficient to rely on the indicators that are available as a guide for policy or investment decisions. The Commission will set up a process that should mobilise business, scientists, NGOs, local and national authorities to examine the breadth of the challenge and recommend a set that would show the pathway for short and long term decisions.

The Commission proposes to launch this participative process so that by 2013, we have a broad agreement on how to measure the challenge and to set the targets which are needed to meet that challenge. The objective is to work together to trace out a new pathway to action on resource efficiency and the sustainability of growth, for policy-makers and investors alike.

The Commission will:

- Together with all relevant stakeholders, agree on the scale of the challenge, and define by 2013 appropriate targets on resource efficiency;
- Continue work on indicators with a view to inclusion in the mid-term review of the Europe 2020 strategy;
- Integrate resource efficiency considerations in the European Semester from 2012, focusing initially on prioritising sustainable growth friendly expenditure and savings<sup>67</sup>;
- Propose as soon as possible a headline indicator on natural ecological capital<sup>68</sup> and environmental impacts of resource use<sup>69</sup>;
- Continue its efforts under the "GDP and beyond" road map to measure societal and economic progress more comprehensively, inter alia by further integrating environmental externalities into national accounting and developing a composite index on environmental pressures;
- Include resource efficiency considerations in the impact assessments of future policy proposals, as appropriate.

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<sup>64</sup> See Meyer B. (2009). Macroeconomic Impacts of an Efficient Resource Use. Presentation at the Workshop 'Factor X: Policy, Strategies and Instruments Towards a Sustainable Resources Use', Berlin, June 18th 2009. and Giljum et al. (2008) MOdeling SUStainability in Europe, Giljum et al. (2008)

<sup>65</sup> REPORT on a Thematic Strategy for the Sustainable Use of Natural Resources (2006/2210(INI)), Committee on the Environment, Public Health and Food Safety, Rapporteur: Kartika Tamara Liotard; see also International Resource Panel

<sup>66</sup> I.e., areas such as research and innovation, education and energy; eliminating environmentally harmful subsidies or tax exemptions; "green tax reforms"; exploiting the EU's first mover advantage on competitive environmental goods and services;

<sup>67</sup> In particular Ecosystem Degradation under development by the EEA under their work stream on Ecosystem Accounting

<sup>68</sup> In particular the life cycle based resource-efficiency indicators under development by the JRC

## 7. CONCLUSION

Our growth model has up to now brought great prosperity, but it contains some outdated and perverse incentives which lead to inefficient use of resources. Biodiversity has no market, the costs of waste are 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. In the longer term, if we are to deal with resource constraints in a way which avoids conflict, we will have to create for ourselves and future generations a "safe operating space" within the limits of our planet. This requires a coherent and integrated response over a wide range of policies.

The Commission will prepare policy and legislative proposals to implement this Roadmap preceded, as required, by impact assessments. But without the engagement of other public and private actors along the pathway indicated by this roadmap we will not achieve our resource efficiency objectives and vision.

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.

**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
<b>Circular Economy</b>	Reduce, reuse, recycle, substitute, safeguard, value									Review of SCP (2012)
<b>Energy</b>	Reduce fossil fuels use via: -increased energy efficiency (20% by 2020); -substituting for renewable resources (20% by 2020).	-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	-Reduce land take for biofuels; -Optimise energy infrastructure.	-Prevent soil damage by SO <sub>2</sub> and NO <sub>x</sub> 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	-Ensure energy recovery of non-recyclable waste; -Reduce energy intensity of waste treatment.	-Energy 2020: A strategy for competitive, sustainable and secure energy -Energy infrastructure priorities for 2020 and beyond - A Blueprint for an integrated European energy network -European Energy Efficiency Plan 2020 -Revision of the Energy Taxation Directive. -Energy infrastructure package -Energy Roadmap 2050 -Smart grids -Security of energy supply and international cooperation
<b>Food</b>	-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.	-Reduce GHG emissions; -Reduce SO <sub>2</sub> & NO <sub>x</sub> 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 SO <sub>2</sub> and NO <sub>x</sub> emissions.	-Restore and preserve ecosystems to ensure pollination, water retention, etc.; -Avoid eutrophication from fertilizers.	-Restore fish stocks and eliminate by-catch; -Eliminate destructive fishing techniques; -Develop sustainable aquaculture; -Reduce pollution of coastal areas from fertilizers.	-Reduce food waste, e.g. via better labelling; -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)
<b>Buildings</b>	-Reduce fossil fuels use via better energy efficiency of buildings; -Build zero energy buildings; refurbish the existing stock.	-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.	-Reduce impacts from acidification resulting from GHG emissions.	-Recycle construction and demolition waste (70% till 2020).	-Strategy for the sustainable competitiveness of the EU construction sector -Communication on sustainable buildings (2013) -Initiative on water efficiency in buildings (2012)
<b>Mobility</b>	-Reduce dependency on fossil fuels via electrification (i.a. for all cars in cities by 2050), improved multimodal logistics, better transport networks; more efficient vehicles.	-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, NO <sub>2</sub> ; less sulphur content in marine fuels.	-Avoid land fragmentation from transport infrastructure	-Reduce land sealing from transport infrastructure	-Minimise impacts of land sealing, fragmentation, pollution; -Avoid invasive alien species spread.	-Use the potential of maritime transport to reduce emissions; -Avoid marine litter 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 -Revision of TEN-T -Strategic Transport Technology Plan
<b>EU policy initiatives</b>	State Aid framework; Fuel quality directive; etc.	-Tackling the challenges in commodity markets and on raw materials -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 -Revision of the legislation on monitoring and reporting of GHG -Review. of EU air quality policy (2013)	-Communication on land use (2014)	-Guidelines on best practice to limit, mitigate or compensate soil sealing	-2020 EU biodiversity strategy -Communication on Green Infrastructure and Restoration (2012) -No Net Loss Initiative (2015)	-CFP Reform -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 -Multiannual Financial Framework 2014-2020 -Cohesion Policy Reform -Action Plan towards a sustainable bio-based economy by 2020 -Eco-Innovation Action Plan, 2011 -EU Horizon 2020 -Green Paper on Green Jobs -Review of EIA Directive

