



EUROPEAN / Research &
COMMISSION / Innovation



Innovation for Resource Efficiency

A selection of European Research Projects funded by the 6th and 7th Framework Programmes



PROJECT INFORMATION



EUROPEAN COMMISSION

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FOREWORD

We have one major challenge ahead: meeting the needs of a growing population within the ecological limits of our planet.

To tackle this challenge in an increasingly complex and changing world, it is essential to continue supporting research and innovation on technological and non-technological solutions that are environmentally friendly, economically feasible and socially acceptable. A better understanding of interactions between environment, resource availability and growth, as well as breakthrough technologies, approaches and solutions are required.

In this context, the EU has launched the "Resource-efficient Europe" and "Innovation Union" initiatives as two Flagships of the Europe 2020 Strategy to trigger a smart, sustainable and inclusive economy.

While the first flagship initiative supports the shift towards a resource-efficient, low-carbon economy to achieve sustainable growth, the second aims to facilitate access to finance for research and innovation in Europe so as to catalyse innovative ideas into products and services that create growth and jobs.

The "Innovation Union" is the engine for "Resource Efficiency": these initiatives are closely intertwined. Achieving sustainable growth implies a more efficient use of natural and secondary resources such as waste. To improve the way we use these resources, it is crucial to boost innovation in technology and society including changing our consumer's behaviour.

DG Research and Innovation is committed to both initiatives in the context of the 7th Framework Programme for Research and Technological Development. Over past years, specific calls have been launched to ensure that long-term strategies in policy areas such as energy, climate change, industry, transport, agriculture, fisheries and environment as well as capacity building and green skills produce



results on resource efficiency; and thus anticipating on the focus of the policy priorities exposed in the Europe 2020 Strategy.

I am convinced that, by tapping the wide innovation potential of Europe, we can develop together a resource-efficient Europe. This is why I am very pleased to present you this selection of projects already underway. They are prime examples of how EU-funded research is finding concrete solutions to address the intelligent and efficient use of our worldwide limited resources.

Robert-Jan SMITS

Director-General for Research and Innovation



INTRODUCTION

Boosting research and innovation in Europe and moving to a more resource-efficient, greener and competitive economy have been placed at the heart of the European Union's growth strategy (Europe 2020 Strategy) for the coming decade.

In fact, the recently adopted flagship initiative on a "Resource-efficient Europe", which forms part of that strategy, proposes an integrated and coherent framework to help Europe sustain its growth without overexploiting the world's resources. It aims, in particular, to increase the efficiency in the use of all types of resources (from raw materials, such as fuels, minerals and metals, to food, soil, water, air, biomass and ecosystems and waste), and most importantly to help the decoupling of their use from economic growth. The smarter use of scarce resources is not only a strategic necessity, but also an economic opportunity; in this light, resource efficiency has become a common denominator for the development of the EU's sectorial policies, including those on climate change, energy, transport, industry, agriculture, fisheries, biodiversity and regional development.

"Using less, living better". From the perspective of environmental protection, resource efficiency is very important: many raw materials represent large mass flows, which have substantial environmental impacts, whereas our consumption of natural resources is often unsustainable.

On the other hand, resource efficiency is expected to generate positive impulses for economic development: it will bring about major economic opportunities, improving productivity, reducing production costs and boosting competitiveness, thus helping Europe maintain its leadership on existing, well-established markets. In this context, the Innovation Union flagship initiative proposes actions to better exploit and target the very large R&D effort deployed in Europe, in order to



develop key enabling technologies and processes, and means to measure progress towards enhanced resource efficiency throughout the economy.

Enhancing resource efficiency requires investing in eco-innovative solutions, including novel and competitively priced goods, processes, systems, and services. By investing in eco-innovation, Europe can expand its competitive and innovation potential, and thereby maintain its position as leading exporter of goods and services. These should be also designed to satisfy human needs and provide a better quality of life, with a minimal use of natural resources (materials, energy and natural stocks) per lifecycle of unit output, and a minimal release of toxic substances.

Current evidence indicates that the uptake of eco-innovative solutions is progressing: according to a recent Eurobarometer survey, roughly 3 in 10 companies in the EU have introduced eco-innovative production processes or methods, whereas 25% have introduced eco-innovative products or services in the market. The EU core environmental industries have an impressive global market share of almost 40% and continue to grow at rates of more than 8% a year, creating new and skilled green jobs.

Nevertheless, in order to achieve a resource-efficient Europe, there is still a need to deliver more innovative solutions, technologies, processes and strategies. Research in this direction is playing and will play a stronger role. New technologies are needed to create advanced functionalities in existing or new application fields, to substitute existing technologies and to facilitate novel products and processes with higher resource efficiency. Developed innovations also need to be assessed in a holistic way, in terms of their direct effects during production/application, during their usage, and from a long-term perspective, through the change of socio-economic structures and behaviour, including consumption patterns.

EC projects, funded in the context of past and ongoing Framework Programmes for Research and Technological Development, already address a wider range of



resource efficiency issues. The following pages present summaries of ongoing and recently completed research projects on sustainable natural resources management, innovative resource-efficient and energy-saving processes in important industrial sectors, environmentally friendly energy production and storage, and solutions for the sustainable supply and substitution of raw materials.

This selection of projects demonstrate the EU's potential for the delivery of innovative solutions for resource-efficient production, consumption and sustainable resource management, as well as the breadth and variety of solutions proposed. The projects show, for instance, how to reduce resource waste in aircraft manufacturing, how to reduce the dependency of European car manufacturing on rare earth materials, and how to help consumers to make conscious choices regarding energy usage in their home and actively participate in the energy market. The application of cutting-edge technologies in water insulation of vessels can reduce fuel consumption and CO₂ emissions up to 20%; sustainable and cost effective recovered paper can be produced through optimum sorting technologies; a new silvicultural method can be applied to deal with changing climate conditions and its associated risks and uncertainties; an improved approach to the refurbishment of buildings, can help bridge the gap between conservation of historic buildings and climate protection. Effective water treatment technologies, in terms of costs and energy consumption, can be employed in major water consuming industrial sectors (food, textile, chemical and paper), so that water is regarded as a highly valuable asset rather than a production input.

The research presented is not limited to technological development alone but also addresses more holistic assessments for the building of a greener and more sustainable future: our urban systems can be designed in a way which is consistently less damaging to the environment. Sustainable urban water management strategies can help reduce the water and energy footprint of our cities and enhance our quality of life in a cost-effective way. In this effort,



scenario modelling and indicator analysis tools can help decision-makers build an economy that respects environmental limitations and is socially and financially sustainable, enabling both people and nature to thrive. The quantitative economic analysis of the external effects of main economic sectors, the elaboration of new accounting frameworks for sustainability assessment at the micro-, sectorial and macro-levels, and the development of improved and harmonised indicators for measuring and assessing eco-innovation will help build our knowledge base for assessing progress towards a greener economy. In this effort, education for mitigating climate change and increasing resource efficiency is required to make science more engaging and challenging for young people, as future employees, consumers and citizens.

The European Commission recently proposed a Green Paper "Towards a Common Strategic Framework for EU Research and Innovation funding". The Green Paper outlines a new concept for research and innovation, which brings together the current Framework Programme for R&D, the Competitiveness and Innovation Framework Programme and the European Institute of Innovation and Technology. The expectation is to enhance the impact of the next EU research budget, focusing on the EU's strategic objectives, and tackling major challenges, such as resource efficiency, increasing competitiveness, and achieving excellence in the research base.

This framework is expected to provide a new impetus for continuing this effort, and ensure that innovative ideas can be turned into products and services that contribute to building a greener society and to improving our quality of life.



SELECTION OF EU-FUNDED RESEARCH FOR RESOURCE EFFICIENCY





- ADDRESS -

Active Distribution networks with full integration of Demand and distributed energy resources

www.addressfp7.org

Project type: Large-scale integrating project, FP7

Total Project Cost: 16 060 000 €

Maximal EC Contribution: 9 000 000 €

Duration: 48 months

Starting Date: 01/06/2008

Consortium: 24 partners from 11 countries

Project Coordinator: ENEL Distribuzione S.P.A (Italy)



Innovation for resource-efficiency

Intelligent energy supply for European consumers

Summary

The aim of the ADDRESS project is to allow consumers to make conscious choices regarding their energy usage in the home and allow them to actively participate in the energy market. It also seeks to further the use of renewable energy in the electricity supply. As renewable energy often causes an irregular production of energy, ADDRESS will help to ensure a regular and even supply despite any fluctuations.

Main objectives

ADDRESS aims to develop new innovative systems for Active Distribution Networks (AND) which are able to balance in power generation and demand in



real time. This allows network operators, consumers, retailers and stakeholders to benefit from the increased flexibility of the system.

Expected impact/results

By defining their preferences in an intelligent energy management system, the "Energy Management box", consumers can modify their energy consumption so that it corresponds better to the production of renewable energy. Thus the ADDRESS project findings will ensure that more renewable energy can be incorporated into the electricity supply, whilst consumers will become more active in their energy usage, tailoring their choices to their needs.

- AEGOS -
African-European Georesources Observation System
www.aegos-project.org

Project type: Support Action, FP7

Total Project Cost: 2 415 392 €

Maximal EC Contribution: 1 930 996 €

Duration: 30 months

Starting Date: 01/12/2008

Consortium: 23 partners from 20 countries

Project Coordinator: Bureau de recherches géologiques et minières - BRGM
(France)



Innovation for resource-efficiency

Safeguard, share, valorise the knowledge and data archived in African and European geological surveys

Summary

The sustainable use of resources of geological origin such as minerals and non-energy raw materials, groundwater and geothermal energy require knowledge based on data, information and expertise. Collectively, European geological surveys have a unique archive of public Africa-related georesources data that need to be shared with their African partners. Identifying and providing access to this data and information represents a major stake for sustainable policy-making and capacity building in geosciences in Africa.



Main objectives

AEGOS designs a pan-African infrastructure of public, interoperable geological and geology-related data as well as user-oriented services to foster and strengthen the sustainable use of georesources in Africa. The future observation system aims to safeguard, develop, share and add value to the data archived in African and European geological surveys as well as support further knowledge development and capacity building on Africa's geology and georesources. This observation system will provide support to a wide range of end-users: policy-makers at all geographic levels, development agencies, private sector actors, geoscientific communities and civil society.

Expected impact/results

As a preparatory phase for the building of a continental distributed information system on Africa's georesources, the final results of AEGOS will be both technical and organisational terms of references in view to actually implement a permanent infrastructure in a subsequent phase. These will include:

- i) operational procedures for data management (Spatial Data Infrastructure, metadata, data specifications and systems architecture),
- ii) user-oriented products and services including the preparation of innovative spin-off projects,
- iii) the African-European partners network and charter of partnership,
- iv) a geo-science contribution to GEOSS, in the context of the Infrastructure for Spatial Information in Europe (INSPIRE),
- v) a common strategy for capacity building and training programmes.

Thus, AEGOS contributes to the GEO work plan 2009-2011 as a sub-task in the capacity building area. AEGOS contributes also to the development of a Solid Earth Observing System by exploring interoperability and interdisciplinarity scenarios with other data from environment and socio-economic observation systems.

- AFORE -

Added-value from chemicals and polymers by new integrated separation, fractionation and upgrading technologies

www.eu-afore.fi

Project type: Large-scale integrating project, FP7

Total Project Cost: 10 900 000 €

Maximal EC Contribution: 7 600 000 €

Duration: 48 months

Starting Date: 01/09/2009

Consortium: 19 partners from 10 countries

Project Coordinator: VTT, National Technical Research Centre (Finland)



Innovation for resource-efficiency

Expanding the EU forest-based industry with sustainable applications

Summary

The forest-based industry is a significant industrial sector in Europe converting wood to pulp, paper, cardboard, energy, and other wood derived products. To retain and increase its competitiveness in the increasing global competition, the pulp and paper industry needs to maximize the value addition of raw materials in its fibre refining processes and to find new and profitable businesses alongside the traditional product lines.

Main objectives

The main aim of the project is to develop novel and industrially viable solutions for separating valuable chemical components from forest residues, wood chips,



and chemical pulping liquors. These can then be used as starting materials for current and novel value-added applications.

AFORE will focus on two approaches:

- Upgrading the current kraft pulping process into a multi-product biorefinery concept without compromising the process energy balance or the fibre properties, and
- Development of entirely new wood-based biorefinery concepts, in which the wood cellulose is exploited in value-added applications with simultaneous production of a multitude of novel non-cellulosic products.

Expected impact/results

The project should enable the European forest and pulping industry to substantially increase its profitability with a concomitant positive impact on the sustainability of the processes used.



- ALFA-BIRD -

Alternative fuels and biofuels for aircraft development

www.alfa-bird.eu-vri.eu

Project type: Small or medium-scale focused research project, FP7

Total Project Cost: 9 761 379 €

Maximal EC Contribution: 6 822 685 €

Duration: 48 months

Starting Date: 01/07/2008

Consortium: 21 partners from 8 countries

Project Coordinator: European Virtual Institute for Integrated Risk Management
EU-VRi (Germany)



Innovation for resource-efficiency

Taking off on alternative fuels

Summary

According to forecasts, transport will be a major cause of increased energy consumption, particularly of oil. With over three million jobs in the aviation sector, the aim is not to reduce aviation, but to ensure sustainable growth by looking for alternative fuels.

To make the growth of aviation sustainable, using biofuels and alternative fuels in aeronautics is necessary. After all, using oil as a fossil fuel is harmful to the environment and oil reserves are slowly coming to an end. The ALFA-BIRD project seeks to overcome particular difficulties of aviation, like the very cold conditions in which planes are flying, to find alternatives to oil.



Main objectives

The main objective of ALFA-BIRD is to develop the use of alternative fuels in aeronautics with a long-term perspective, to help improve each country's energy interdependence, to help lessening global warming effects, and to soften the economic uncertainty of crude oil peaking. ALFA-BIRD will investigate new approaches and new alternative fuels to power aircraft with the possibility of revisiting the fuel specifications and reconsidering the whole aircraft system.

Expected impact/results

The project has already made an analysis of potential alternative fuels and has selected four alternative fuels for testing their suitability for use in aircraft. This testing will lead to:

- New alternative fuels for aircraft – first blending kerosene and biofuels, later using completely new molecules,
- Redefinition of the requirements of jet fuels,
- Long-term strategy and implementation plan for the use of alternative fuels for aircraft,
- New methodology for assessing the environmental impact of aviation, taking into account the complete lifecycle of aircraft.

- AquaFit4Use -

Water in industry, fit-for-use sustainable water use in chemical, paper, textile and food industry

www.aquafit4use.eu

Project type: Large-scale integrating project, FP7

Total Project Cost: 14 474 200 €

Maximal EC Contribution: 9 650 000 €

Duration: 48 months

Starting Date: 01/06/2008

Consortium: 24 partners from 11 countries

Project Coordinator: Nederlandse Organisatie voor Toegepast

Natuurwetenschappelijk Onderzoek – TNO (The Netherlands)



Innovation for resource-efficiency

New cross-sectorial technologies for sustainable water use in industry

Summary

Sustainable water use in industry is the goal of AquaFit4Use, by a cross-sectorial, integrated approach. The 4 pillars of the project are Industrial Water Fit-for-use, Integrated water resource management, Strong industrial participation and Cross-sectorial technologies and approach. Tools will be developed to define and control water quality. The heart of AquaFit4Use is however the development of new cross-sectorial technologies, with a focus at biofouling and scaling prevention, the treatment of saline streams, disinfection and the removal of specific substances. By intensive co-operation between the industries, the knowledge and the technologies developed in this project will be broadly



transferred and implemented. AquaFit4Use is a flagship project in the area of industrial water technologies and plays a leading role in exploring synergies with ongoing EC funded projects and identifying major gaps of wider EU importance, thus supporting the implementation of Water Supply and Sanitation Technology Platform WssTP.

Main objectives

The aim of AquaFit4use is the development of new reliable cost-effective technologies, tools and methods for sustainable water supply, use and discharge in the main Water consuming industries:

- Reduction of fresh water needs (30 %);
- Less environmental impact (energy, emissions, sludge);
- fit-for-use (increasing productivity, safety, health);
- Closing the water cycle.

Expected impact/results

The expected impacts of AquaFit4Use are: a substantial reduction of fresh water needs (20 to 60%) and effluent discharge of industries; integrating process technologies for further closing the water cycles; improved process stability and product quality in the different sectors and strengthening the competitiveness of the European Water Industry.

- CarboSchools+ -

European network of regional projects for schools partnerships on climate change research

www.carboschools.org

Project type: Coordination Action, FP7

Total Project Cost: 1 430 000 €

Maximal EC Contribution: 981 553 €

Duration: 36 months

Starting Date: 01/01/2008

Consortium: 10 partners from 7 countries

Project Coordinator: Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V. (Germany)



Innovation for resource-efficiency

Green skills: fostering mutual learning on climate change

Summary

CarboSchools+ proposes to link carbon science laboratories with secondary schools to develop partnerships where young Europeans learn and conduct experiments dealing with climate research and reduction of greenhouse gas emissions. In partnership projects, scientists and teachers cooperate over several months to give young people a practical experience of research through real-time experiments, site visits, debates, etc. A final output (article, exhibition) shares the findings with parents, friends, community, etc. A total of 9 research institutes in 7 countries explore how they can best motivate and support such partnerships at regional level in a wide variety of contexts, approaches, topics



and age-groups. CarboSchools+ is proposed by institutes firmly rooted in two FP6 research projects on climate change on the basis of outstanding results from educational projects piloted since 2005.

Main objectives

The initial aim of the project is to propose a European cooperation that allows a comparison of results, the development of replicable good practice, and mutual learning. Pupils gain European experience by doing comparative measurements through a common 'school CO2-web'. An in-depth study of impacts on attitudes, beliefs and skills allows a better understanding of the project's level of effectiveness. Over 2 school years, partnerships have involved about 90 scientists, 140 teachers and more than 3 000 students. Their direct interaction supports teachers in the highly complex, interdisciplinary and socially relevant field of global change, and improve the communication skills of scientists. Methods and materials are being jointly developed and shared with a broad range of players in science education.

Expected impact/results

A field-tested concept, a first set of resources and an enthusiastic human network provides the project participants with confidence and institutional support to make science learning more engaging and challenging for young people as future workers, consumers and citizens.

- CRYSTALCLEAR -

Crystalline Silicon PV: low-cost, highly efficient and reliable modules

www.ipcrystalclear.info

Project type: Integrated Project, FP6

Total Project Cost: 28 140 000 €

Maximal EC Contribution: 16 000 000 €

Duration: 66 months

Starting Date: 01/01/2004

Consortium: 16 partners from 18 countries

Project Coordinator: Energieonderzoek Centrum Nederland – ECN Solar
Energy (The Netherlands)



Innovation for resource-efficiency

Europe takes the world record for converting solar light into electricity

Summary

Researchers of the European funded project CrystalClear have successfully developed innovative technologies for silicon solar modules to be manufactured at € 1 per watt-peak of power. Moreover they have achieved world-record efficiencies for modules with multicrystalline silicon solar cells. Their full-size solar modules have achieved in 2009 a premium aperture area conversion efficiency of 16.0 to 16.4%. The previous world-record was held by Sandia National Laboratory (USA), at 15.5% aperture-area efficiency. Therefore the main project target of reducing the costs of PV modules by more than 50% (if produced in large volumes) has been achieved.



Solar energy and especially photovoltaics are a growing source of electricity in Europe. In 2009 the new capacity constructed for renewable energy sources was about 27.5 GW, photovoltaics accounting for 21% after wind power (37.1%) and before biomass (2.1%). In the same year renewable energy contributed to about 19.9% (608 TWh) of Europe's total electricity consumption (3042 TWh), solar accounting for 0.4%. Business analysts predict the market volume for photovoltaic industry production to reach € 40 billion 2010 worldwide.

Main objectives

CrystalClear intended to develop technologies which allow solar modules to be produced at a cost 1€ /Wp, to improve the environment profile of solar modules and to enhance the applicability of modules and thus raise competitiveness of photovoltaics in the energy mix.

Expected impact/results

Thanks to research the European photovoltaic (PV) sector has developed strongly. One of the main research goals is increasing the conversion efficiency from sunlight to electric energy and reducing the manufacturing costs of solar modules and systems.

Such cost reduction is an important condition to reach grid parity; the point at which the generation cost of electricity produced by PV systems equals the retail price of electricity from the grid. The Commission funded the project CrystalClear with € 16 million (total budget € 28 million).

- DEEPFISHMAN -

Management and monitoring of deep-sea fisheries and stocks

<http://deepfishman.hafro.is/doku.php>

Project type: Collaborative Project, FP7

Total Project Cost: 3 770 000 €

Maximal EC Contribution: 2 924 156 €

Duration: 36 months

Starting Date: 01/04/2009

Consortium: 12 partners from 8 countries

Project Coordinator: Institut français de recherche pour l'exploitation de la mer – IFREMER (France)



Innovation for resource-efficiency

Combining data and knowledge to advance stock and ecosystem assessment for sustainable deep-water fisheries

Summary

Deepwater fisheries pose particular difficulties for management. Target species are difficult to assess and they are generally vulnerable to overfishing. The EU project DEEPFISHMAN will develop a short- and long-term monitoring and management framework for deepwater fisheries in the NE Atlantic that will take account of these factors. Firstly, the aim will be to identify new and more effective assessment methods, reference points, control rules and management strategies to be used in the short term, making better use of available data. Secondly, a reliable long-term framework will be developed for which additional data needs will be specified in order to fill current information gaps to achieve reliable long-



term management requirements. This work will be developed by examining a range of case studies selected to reflect the diverse characteristics of the different types of deepwater fishery. The socioeconomic profile and projected impact of the management strategy options will be examined. The project outputs will aim to provide robust guidelines for deepwater fisheries management suitable for adoption within the Common Fishery policy.

Main objectives

The overarching objective of DEEPFISHMAN is to develop a range of strategic options for the exploitation of deep-water stocks, fisheries and ecosystems in the NE Atlantic with the overall aim of developing a short- and long-term ecosystem based monitoring and management framework. These frameworks will take into account best practice from deep-water fisheries around the world and the latest policy initiatives at the EU and worldwide level, such as to maintain or restore fish stocks to levels that would produce MSY by no later than 2015¹.

Expected impact/results

DEEPFISHMAN will inform deep-water fisheries policy makers, stakeholders and the scientific community.

At the end of the project the management framework developed by DEEPFISHMAN will be delivered to the European Commission. Beyond the policy aspect, the ultimate purpose of the management of fish stocks and the preservation of marine ecosystems is to secure those who derive their livelihoods directly from fisheries. In addition to scientific works, DEEPFISHMAN integrates data and knowledge from stakeholders to both improve the understanding of stocks and ecosystems and contribute to fill the gap between science, policy and stakeholders. Methodologies developed in DEEPFISHMAN are made available to agencies in charge of fisheries resources and ecosystem assessment and management.

¹ World Summit on Sustainable Development, Johannesburg, 2002.

- ECO-INNOVERA -

ERA-net on ECO-INNOVATION – Boosting eco-innovation through joint cooperation in research and dissemination

www.eco-innova.eu

Project type: Coordination and Support Action, FP7

Total Project Cost: 2 359 944 €

Maximal EC Contribution: 1 999 963 €

Duration: 48 months

Starting Date: 01/10/2010

Consortium: 25 partners from 20 countries

Project Coordinator: Forschungszentrum Jülich GmbH (Germany)



Innovation for resource-efficiency

Pooling Europe's most relevant research programmes to boost eco-innovation in industry, policy and society

Summary

The concept of eco-innovation has an increasing impact for the competitiveness of the European industry in global markets. To reach and maintain a worldwide leading position in this knowledge-based sector, Europe needs to boost the application of eco-innovation by industry, especially on the part of SMEs. One supporting pillar to achieve this goal is accelerating the promotion and implementation of eco-innovations, i.e. technologies, processes, products and services with a lower environmental burden. This ERA-NET project is about the coordination and cooperation of national and regional programmes owners and



aims to support research, innovation and environmental policy makers with best practices for funding eco-innovation.

Main objectives

ECO-INNOVERA promotes the development and implementation of eco-innovation in Europe. This will be delivered by:

- Pooling Europe's most relevant research and innovation programmes on eco-innovation to reduce the fragmentation of the European landscape,
- Developing and operating a networking platform for information exchange European eco-innovation research,
- Creating and establishing a common research and funding platform for long-lasting cooperation and joint activities of the national and regional funding organisations to encompass the entire innovation chain.

Expected impact/results

ECO-INNOVERA will have an important impact for research, innovation and environmental policy makers.

Best practices will be defined for funding eco-innovation and researchers will profit from facilitated access to transnational research cooperation and the funding of transnational projects. The visibility of eco-innovation in ERA will be extended by an exchange with other important networks and institutions in the field (like the ETPs).

The development of common metrics for the ex-ante environmental assessment will help to take the whole life cycle of products, projects or programs into account.

Public awareness of the ERA-Net will be promoted via a homepage as well as by printed information flyers, presentation on workshops and meetings and interaction with target groups. Tailor-made information material will be provided to the specific target-groups to anchor the concept of eco-innovation and its impact for a sustainable economy for that stakeholder group.

- EU-FRESHBAKE -

Freshly baked breads with improvement of nutritional quality and low energy demanding for the benefit of the environment

<http://eu-freshbake.eu/eufreshbake>

Project type: Specific Targeted Research Project, FP6

Total Project Cost: 3 399 209 €

Maximal EC Contribution: 2 000 000 €

Duration: 38 months

Starting Date: 01/10/2006

Consortium: 12 partners from 9 countries

Project Coordinator: ONIRIS (France)



EU-FRESHBAKE

Innovation for resource-efficiency

Opening new frontiers in formulation and nutritional properties of bread for "Bake Off Technology" while developing low energy demanding equipments

Summary

EU-FRESHBAKE concerns the bake off technology (BOT) for bread production. BOT breads are prepared at industry level; the bread making process is interrupted by a storage phase of the bread in a semi finished state (frozen dough, part baked bread ...). These products are transformed (final baking) in baking stations (supermarket, gas station, shopping centre...) or at home. The yearly growth rate of BOT is higher than 10%; however, breads produced by BOT demand much more energy and are often "ordinary" breads.



Main objectives

The main questions of EU-FRESHBAKE were:

- i) can we draw benefit of refrigeration to enhance the quality of bread?
- ii) can we draw benefit of refrigeration to improve the nutritional quality of bread?
- iii) can we reduce the energy demand to produce these products?
- iv) can we develop new recipes and processes to make the bread?
- v) can we invent new equipment adapted to the process with lower use of energy?

Expected impact/results

Thanks to the research activities carried out in EU-FRESHBAKE, progresses have been done regarding the partial baking process. In particular its impact on the structure of the product and on the nutritional aspects (glycaemic index) has been evaluated.

Progresses and a better understanding of the technology of frozen dough and of pre-fermented frozen products have been obtained.

More information can be obtained by consulting the scientific articles and the final report of the project (see website).

Equipment and low energy baking oven and freezing equipment have been developed: in particular of low energy oven based on infrared technology has been constructed and is available for tests. It is a deck oven (stone oven) with a 1m² surface.

EU-FRESHBAKE has globally contributed to opening new frontiers in formulation and nutritional properties of bread for Bake Off Technology and has developed low energy demanding equipments, satisfying its main key objectives to accompany the growth of the Bake Off Technology in Europe and all over the world.

- EXIOPOL -

A New Environmental Accounting Framework Using Externality Data and Input-Output Tools for Policy Analysis

<http://www.feem-project.net/exiopool>

Project type: Integrated Project, FP6

Total Project Cost: 6 595 157 €

Maximal EC Contribution: 5 000 000 €

Duration: 56 months

Starting Date: 01/03/2007

Consortium: 38 partners from 15 countries

Project Coordinator: Fondazione Eni Enrico Mattei – FEEM (Italy)



Innovation for resource-efficiency

Supporting cost-effectiveness and cost-benefit analysis of technologies, policies, and standard setting

Summary

EXIOPOL cuts across a number of issues identified as being crucial in the EU Sustainable Development Strategy – including the quantification of external costs of economic sectors to assist in integrated policy analysis – getting prices right to send signals to individuals and businesses and – through communicating the results with the public and industry – developing responsible attitudes.

EXIOPOL will create a novel toolbox supportive of a great variety of EU policy fields, such as Integrated Product Policy, the Strategy on Natural Resources, the Environmental Technologies Action Plan, Sustainable Consumption and



Production, the relation between sustainability and the Lisbon strategy, and impact assessment of related policies in general.

Main objectives

The EXIOPOL project objectives are threefold:

- to synthesise and develop comprehensive estimates of the external costs for Europe of a broad set of economic activities;
- to set up a detailed environmentally extended (EE) Input-Output (I-O) framework allowing for the estimation of environmental impacts and external costs of different economic sector activities, final consumption activities and resource consumption for countries in the EU;
- to apply the results of the external cost estimates and EE I-O analysis for the analysis of policy questions of importance, as well as to evaluate the impact of past research on external costs on policy-making in the EU.

Expected impact/results

EXIOPOL's results will reflect those of the Global Change and Ecosystem Work Programme, which emphasises the importance of a quantitative economic analysis of external effects of the main economic sectors, and the elaboration of new accounting frameworks for sustainability assessment at the micro, sectoral and macro levels.

- FC-DISCTRICT -

New μ -CHP network technologies for energy efficient and sustainable districts

<http://fc-district.eu/project.html>

Project type: Collaborative Project (PPP initiative "Energy-efficient Buildings"), FP7

Total Project Cost: 11 800 000 €

Maximal EC Contribution: 8 000 000 €

Duration: 48 months

Starting Date: 01/09/2010

Consortium: 21 partners from 11 countries

Project Coordinator: Mostostal Warszawa SA (Poland)



Innovation for resource-efficiency

Energy efficient buildings and districts

Summary & main objectives

The project is developing and implementing an innovative energy production and distribution concept exploiting decentralized co-generation coupled with optimized building and district heat storage and distribution network. The concept is based on dynamic heat exchange between buildings fitted with Solid Oxide Fuel Cells (SOFCs) for energy production, in conjunction with improved thermal storage and insulation, the distribution system (optimized piping and district heating with or without a heat buffer) and the consumer (new business and service models).



Expected impact/results

The project will introduce and demonstrate a new paradigm in energy efficiency by developing materials, technologies, methodologies and systems to optimise energy efficiency at the district level.

- Hi-Wi -

Materials and drives for High & Wide efficiency electric powertrains

<http://hiwi-eu.org>

Project type: Collaborative Project, Green Cars Initiative, FP7

Total Project Cost: 3 560 887 €

Maximal EC Contribution: 2 408 672 €

Duration: 36 months

Starting Date: 01/12/2010

Consortium: 7 partners from 4 countries

Project Coordinator: University of Cambridge, Institute for Manufacturing SA
(United Kingdom)



Innovation for resource-efficiency

Reducing dependency on rare earth materials

Summary

The subject of Hi-Wi is the development of advanced electric traction motors for electric vehicles. The Hi-Wi acronym comes in fact from the project target of developing an electric architecture with both a higher efficiency and a wider application range, so that the vehicle can operate efficiently in all operating conditions.

With the anticipated growth of the electric and hybrid vehicle market, the demand for permanent magnets that are central to this technology is certain to grow dramatically. This has already led to a sharp increase in price for rare-earth metals (such as Neodymium (Nd), Dysprosium (Dy) and Terbium (Tb)) because they are essential additives to produce high energy-product magnets.



Considering the resource distribution of rare-earth metals, European car manufactures have to face the problem of restrictive and vulnerable supply chains for rare earth metals, since most reserves are outside Europe and more than 95% of the production is in China or in the hands of Chinese companies.

Main objectives

The use of the Hi-Wi technologies guarantees several important improvements over current motor and vehicle architectures:

- They will be able to deliver higher energy efficiency (i.e. more power with less battery consumption) over a wider spectrum of rotating speeds. Current motors run at high efficiency only in a relatively narrow range, meaning lower efficiency when they operate outside of their optimal speed;
- They will decrease resource dependency, because they use a reduced amount of rare earth materials;
- The new electromotors will eliminate or simplify the mechanical gearbox normally associated with electric motors through so-called magnetic gears, an innovation that might be further developed in the project;
- The resulting magnets will be smaller and lighter, and will need less cooling, leading to cheaper electromotors and therefore cars.

Expected impact/results

The motor architectures and the innovative materials studied in this project have the potential to reach way beyond the electronic vehicle market. Permanent magnet machines have a paramount importance in many other fields. Just to mention one, they are at the core of the electric generators used in all wind generators.

- MOTIVE -

Models for Adaptive Forest Management

www.motive-project.net

Project type: Large-scale integrating project, FP7

Total Project Cost: 9 071 000 €

Maximal EC Contribution: 6 961 000 €

Duration: 48 months

Starting Date: 01/05/2009

Consortium: 20 partners from 14 countries

Project Coordinator: Forest Research Institute of Baden-Württemberg (Germany)



Innovation for resource-efficiency

Tools to support decision-making in forestry in response to climate and land use change

Summary

Forests are a crucial element not only of landscapes but of human living conditions. Climate change will strongly affect forests in the future. The extreme drought of 2003, a series of devastating storms and severe fire seasons across Europe, observed shifts in the altitudinal zones affected by bark beetle damages and latitudinal range shift of biotic disturbance agents are only examples of early warning signals of changes that may be considerably more severe in the future. Thus, the development of adaptive forest management strategies under climate change is a key challenge for sustainable resource management in Europe, and also worldwide.



Main objectives

The ultimate objective is to provide insights, data and tools to improve policymaking and adaptive forest resource management in the face of rapidly changing climatic and land-use conditions. To facilitate this, an integrated assessment of forest management strategies is needed simultaneously considering multiple ecosystem goods and services. By adopting a regional case study approach, the project will consider a wide range of climatic and socio-economic conditions across Europe. In addition, the influence of feedback loops from socio-economy and policy making on resource management will be included in the MOTIVE tools for adaptive resource management. All scientific state of the art knowledge about expected climate change impacts will be translated into decision support tools for policy makers and forest practitioners taking into account uncertainties around exogenous factors, such as climate or markets. These all should improve the robustness of the assessment tools in decision making.

Expected impact/results

Recently observed growth and productivity trends will be documented and synthesised with modelled growth trends in Europe. An overview of projected species shifts as well as a summary of climate change induced risks will be made. New silvicultural methods suitable for dealing with the changing climate and its associated risks and uncertainties will be developed. Scenario calculations will quantify impacts on ecosystem goods and services in case studies across Europe under alternative management strategies. Results of the calculations will show possibilities for advanced methods in adaptive forest management. The individual results and improved methods will be integrated in a decision support tool box for adaptive forest management. Its use will be demonstrated with case study examples.

- OPEN:EU -
One Planet Economy Network EU
www.oneplaneconomynetwork.org

Project type: Research for the benefit of specific groups; Research for Civil Society Organisations, FP7

Total Project Cost: 1 522 742 €

Maximal EC Contribution: 1 300 000 €

Duration: 24 months

Starting Date: 01/09/2009

Consortium: 8 partners from 7 countries

Project Coordinator: WWF UK (United Kingdom)



Innovation for resource-efficiency

Transforming the EU economy in a One Planet economy by 2050:

EU consumption indicators and scenario tools to support policy-making

Summary

The impact of the European economy is nearly three times larger than what is required for a sustainable world. If present patterns of production and consumption continue, the human economy will be double the available bio-capacity by 2050 and we will need the equivalent of two planet Earths to support us. A new future for Europe needs to be achieved by building an economy that respects environmental limits and is socially and financially sustainable, enabling people and nature to thrive. We call this a One Planet Economy. To achieve this will require mobilisation and behavioural change from every aspect of society.



Main objectives

The goal of the project is to develop an academically robust "footprint family" of sustainable development indicators, place these in a scenario modelling tool for evidence-based policy, and create a new forum for the visions, knowledge and interests of different stakeholders to help transform the EU to a One Planet Economy by 2050.

It will address this by:

- **Building the evidence base.** By 2012 the footprint family of indicators (ecological, carbon and water) is used by policy makers in the EU-27 to develop policy towards a One Planet Economy.
- **Building the applications.** By 2012 EU decision-makers are using a scenario modelling and indicator analysis tool to develop evidence-based policy for the transformation to a One Planet Economy.
- **Building the capacity.** By 2012 a network of decision-makers, CSOs and business leaders share and agree on solutions to the challenges of transforming to a One Planet Economy.

Expected impact/results

1. The latest data and definitions of the footprint family of indicators (ecological, carbon and water) for the EU at a country level.
2. A scenario modelling and indicator analysis tool (EUREAPA) for use by EU decision-makers to develop evidence-based policy for the transformation to a One Planet Economy. EUREAPA will enable policy makers to forecast and back-cast, assess policy options and produce scenarios for any EU country or the EU as a whole. The tool will be made freely available across the EU for not-for-profit purposes.
3. A network of decision-makers, civil society organisations and business leaders who share and agree on solutions to the challenges of transforming to a One Planet Economy. The Network will explore "How can we become a One Planet Economy in Europe by 2050?". It is hoped that the outputs lead to the first action plan for a transition to a One Planet Europe.

- PACT -
Pathways for carbon transitions
www.pact-carbon-transition.org

Project type: Small or medium-scale focused research project, FP7

Total Project Cost: 1 790 000 €

Maximal EC Contribution: 1 370 000 €

Duration: 36 months

Starting Date: 01/10/2008

Consortium: 12 partners from 7 countries

Project Coordinator: Enerdata (France)



Innovation for resource-efficiency

PACT considers the very long-term issues (until 2100) related to the nexus between energy-environment-transport and land use with a particular concern on social behaviours

Summary

The PACT project aims at shaping what a sustainable post-carbon society would look like and how we could reach it within the next 50 years.

«Business-as-usual scenarios» built up till now have shown that hydrocarbon resources scarcity and the growing release of greenhouse gases will bring the world far away from sustainability over the next decades. Then, deep changes in behaviours away from «BAU» are unavoidable long before the turn of the century in a move towards a post-carbon society. Urbanisation and mobility are probably the domains where these changes might be the most important and



they will be necessarily driven and limited by socio-economic and cultural forces that will dominate the century.

They will induce further deep changes in behaviours of consumers and producers and are likely to deeply impact the use and production of bulk materials, large energy consumers and GHG emitters. To address these challenges, key milestones were defined by the EU :

- A 20% reduction (minimum) of CO₂ emissions by 2020 (compared to 1990) in Europe
- A reduction of the GHG emissions by 2050 and after, so as to limit the increase of the temperature due to climatic change within 2°C.

Main objectives

In this framework, the PACT project objective is to provide strategic decision-support information to decision makers to achieve these milestones.

It will focus on 3 themes:

- What shape the energy demand, and how this should evolve towards post-carbon concept, from the infrastructures viewpoint, in relation to urbanisation and land-use schemes, and that of the life-styles and behaviours, in relation to the available technologies.
- The question of urbanisation and land-use from the renewable energy perspective, including that of the systems.
- The role of social forces, actors, stakeholders in the transition process.

Expected impact/results

PACT will address these above mentioned issues in two phases: first, by developing the necessary analytical and conceptual framework, second in attempting to quantify scenarios of post-carbon societies at EU and world level by 2050 and beyond, using enhanced versions of the VLEEM and POLES models.

- POLINARES -
Policy for Natural Resources
www.polinares.eu

Project type: Small or medium-scale focused research project, FP7

Total Project Cost: 3 337 000 €

Maximal EC Contribution: 2 680 000 €

Duration: 36 months

Starting Date: 01/01/2010

Consortium: 12 partners from 9 countries

Project Coordinator: University of Dundee (United Kingdom)



Innovation for resource-efficiency

POLINARES tackles not only energy resources constraints but also potential scarcity of other minerals including both technical and geopolitical aspects

Summary

POLINARES concentrates on the global challenges faced with respect to access to oil, gas and mineral resources over the next 20 years and proposes solutions for the various policy actors, including the EU. Combined theoretical and empirical analyses will use expertise from a wide range of disciplines including political science, economics, geology, engineering, technology, law and security studies.

Main objectives

ADDRESS The initial aim will be to understand the causes of past and current conflict and tension relating to access to these resources and identify emergent



sources of future conflict and tension. New frameworks for analysis will be developed using historical experience and political and economic theories. Future availability and demands for energy and other selected minerals will be assessed to provide the basis for evaluation of potential future sources of tension and conflict. Technical and economic data for critical resources will be analysed for key factors determining recent and future supply and demand, and to develop scenarios for the future. Current and recent practices and strategies of key actors will be examined to understand, refine and calibrate theoretical models developed. Building on scenarios developed to identify and assess the major future risks for tension and conflict, POLINARES will integrate assessments of future supply and demand with the understanding of the behaviour of actors and their interactions and interdependencies.

Expected impact/results

POLINARES will establish a new set of criteria for evaluating past, current and future policy approaches, and will develop new understanding from how experience in other natural resource sectors of different approaches have been and can be used. A novel set of policy approaches will be established aimed at mitigating anticipated tensions and conflicts, and will identify clearly the roles which the EU can play in promoting such policy approaches and options.

- RAPOLAC -
Rapid Production of Large Aerospace Components
www.rapolac.eu

Project type: Specific Targeted Research Project, FP6

Total Project Cost: 2 700 000 €

Maximal EC Contribution: 2 100 000 €

Duration: 42 months

Starting Date: 01/02/2007

Consortium: 8 partners from 4 countries

Project Coordinator: University of Sheffield (United Kingdom)



Innovation for resource-efficiency

Building up instead of cutting out: reducing resource waste in aircraft manufacturing

Summary

Materials such as titanium used in aircraft can be very expensive and wasting them when cutting parts in traditional ways is a loss of resources and profit. Thanks to this research, reduction in the cost of manufacturing of final products can be as much as 40%, through the reduction in raw material usage.

Traditional forging or machining subtracts metal from a work piece to get the desired shape. By using the technique of Shaped Metal Deposition (SMD), this destructive, time consuming and costly process is reversed and material is progressively added to create a near-net shaped component, which needs minimal finishing. The technology also enables the production of hollowed



components that couldn't be produced in any other way, allowing lighter aircraft to be built and thus reducing fuel consumption.

The RAPOLAC consortium has developed a method of manufacturing large aerospace parts in which, instead of cutting and wasting metal, liquid is deposited by robots, creating custom shapes.

Main objectives

The goal of RAPOLAC is to develop the process of shaped metal deposition to the point where it can reliably produce parts with repeatable material properties in a range of materials. To achieve these goals, RAPOLAC has three main research strands:

- Investigation of part microstructure and material properties;
- Process modelling at micro- and macro- scales;
- Process control.

Expected impact/results

The RAPOLAC consortium has already produced test parts for six different aerospace companies and is being invited by other sectors, including medical.

Engineers working on RAPOLAC at Sheffield University have been shortlisted for the Times Higher Education awards, as outstanding research team of the year.

- Re-ROAD -
End of life strategies of asphalt pavements
<http://re-road.fehrl.org>

Project type: Small or medium-scale research project, FP7

Total Project Cost: 3 207 409 €

Maximal EC Contribution: 2 415 610 €

Duration: 48 months

Starting Date: 01/01/2009

Consortium: 13 partners from 7 countries

Project Coordinator: Statens Vag- Och Transportforskningsinstitut (Sweden)



Innovation for resource-efficiency

From road to road: recycling of asphalt

Summary

Most European roads (90%) are paved with asphalt material. When they get worn out, the old material is very often removed to make place and a new road is constructed. This has environmental drawbacks in the form of demolition waste and material consumption. Using this type of demolition waste as landfill is proposed to be banned from 2020 and the stone material used in the top surface of roads is becoming more and more scarce.

Another option is rehabilitation and reconstruction of the existing layer, including recycling. This research project is working towards better ways to recycle and renew existing asphalt surfaces by building on knowledge and developing innovative technologies



Main objectives

The objective of Re-ROAD is to develop innovative technologies that can give old asphalt a new life, improving the sustainability of the material used. The project will save natural resources and energy and prevent waste creation.

Expected impact/results

A 99% re-use level for recovered asphalt concrete should be possible. The final project will be an end of life strategy for asphalt pavements that could be used across Europe. The strategy will focus on optimal dismantling procedures, ways to improve the quality classification of the material, handling strategies to optimise recycling at the highest possible level, and criteria concerning the environment and cost effectiveness.

- SELFDOTT -

From capture based to self-sustained aquaculture and domestication of bluefin tuna, *Thunnus thynnus*

www.selfdott.org

Project type: Collaborative Project, FP7

Total Project Cost: 4 410 000 €

Maximal EC Contribution: 2 980 000 €

Duration: 47 months

Starting Date: 01/01/2008

Consortium: 14 partners from 8 countries

Project Coordinator: Instituto Español de Oceanografía (Spain)



Innovation for resource-efficiency

Supporting techniques for the independent production of BFT - without exploiting depleted natural stocks – to supply the market in a sustainable way

Summary

SELFDOTT are implementing knowledge already obtained on the artificial control of reproduction of the Atlantic bluefin tuna (BFT) to get viable eggs, and study embryonic and larval development for the production of fry (juveniles). Wild juvenile and mature bluefin tuna are being reared in floating cages at El Gorguel (Spain) and Marxaslokk Bay (Malta) having been used to study puberty, gametogenesis, and the influence of diet on reproductive maturation and gamete quality. Mature fish were induced to spawn using hormone implants and the eggs were collected using devices designed specifically for cages. To establish the knowledge-base for controlled development of BFT larvae, the mesocosm and



artificial larval rearing methods as clear water and pseudo green water methods have been employed. The ontogenesis of essential biological functions has been studied, including environmental perception, digestion, immunity and behaviour. Besides artificial weaning diets are being developed as well as methods for transporting early stages fingerlings from land based facilities to floating cages. A protocol for the commercial-scale larval rearing of BFT will be recommended at the end of the project. Whole body and stomach composition of wild juvenile fish has been analyzed and served as a guide to formulate nutritionally complete artificial feeds for BFT. Juveniles have been captured from the wild, adapted to captive conditions and used to carry out weaning and feeding experiments, using moist and dry pelleted diets. The environmental impact of the formulated feeds also have been examined and compared to existing raw-fish practices.

Main objectives

Substantiation of the current knowledge on the reproduction of captive BFT, establishment of the knowledge-base for its larval rearing and establishment of the knowledge-base for developing suitable feeds.

Expected impact/results

SELFDOTT is producing the basic knowledge for the development of a self-sustained EU aquaculture industry for the BFT, while at the same time reducing the pressure on the wild BFT stocks and ensuring the conservation and recovery of this species.

- SENSOR -

Sustainability Impact Assessment: Tools for Environmental Social and Economic Effects of Multifunctional Land Use in European Regions

www.sensor-ip.eu

Project type: Integrated Project, FP6

Total Project Cost: 13.633.308 €

Maximal EC Contribution: 10.207.435 €

Duration: 48 + 6 months

Starting Date: 01/12/2004

Consortium: 36 + 6 partners from 15 European countries, China, Brazil, Uruguay and Argentina

Project Coordinator: Leibniz-Centre for Agricultural Landscape Research (ZALF) e.V. (Germany)



Innovation for resource-efficiency

Predicting the policy impact

Summary

When developing a new policy in the European Commission an Impact Assessment is required. Yet, the identification of the likely positive or negative impacts of policies in the future is a methodological challenge for Impact Assessments.

Land use policy making at European level aims at fostering sustainability pathways of natural resource use and rural development, e.g. in the CAP reform or renewable energy policies. Information on the land use changes induced by policies and the resulting impacts on sustainability are of importance to derive



meaningful policy measures. However, transferring multidisciplinary knowledge to support sustainability Impact Assessments at different strategic levels and spatial scales for different sectors is an interdisciplinary, methodologically manifold, but also innovative ambition.

Main objectives

SENSOR supports ex ante Impact Assessment of European level policies on six different land use sectors, namely agriculture, forestry, nature conservation, transport infrastructure, energy and tourism, by developing comprehensive "Sustainability Impact Assessment Tools" ('SIAT'). The tools and methods developed aim to meet the requirements of Impact Assessment procedures at EC level, and they are designed to be transparent, plausible, reproducible, legitimate, easy to use and spatially explicit.

Expected impact/results

The meta-model SIAT is constructed as a quick-scan forecasting tool allowing to analyse possible future policy options as to their potential sustainability impacts. The SIAT tool uses 'response functions' to quantify how the key variables that constitute a given policy option (e.g. direct income support to farmers), and other socio-economic drivers (e.g. oil prices, economic and demographic changes), might impact on land use patterns in European regions in the year 2025, and in turn how these impact on the values of 40 different sustainability indicators (e.g. employment, GDP, nitrogen surplus). Based on qualitative and quantitative indicator analyses, impacts of simulated land use changes on social, environmental and economic sustainability issues are assessed at regional (NUTS2/3) scale. Besides the nucleus tool SIAT, SENSOR provides different results designed to meet the needs of Impact Assessment of land use change: e.g. a data management system, a framework for participatory Impact Assessment, an indicator framework and more.

- SORT-IT -

Recovered Paper SORTing with Innovative Technologies

www.sortit.eu

Project type: Collaborative Project, FP7

Total Project Cost: 4 215 402 €

Maximal EC Contribution: 2 868 966 €

Duration: 36 months

Starting Date: 01/05/2008

Consortium: 14 partners from 8 countries

Project Coordinator: Papiertechnische Stiftung - PTS (Germany)



SORT IT

Recovered Paper SORTing
with Innovative Technologies

Innovation for resource-efficiency

New sorting technologies for paper recycling

Summary

Rising prices for raw materials and energy put pressure on the paper industry. Virgin pulp production is strongly affected by increasing raw material prices as wood demand is subject to competition between several product uses and energy use. At global level, a higher demand for recovered paper as raw material for paper production will increase the competition in recovered paper utilization. Unwanted materials significantly disturb production and final product quality and reject handling is an important environmental and expense factor in papermaking. In the past intense sorting was not economically reasonable due to low raw material prices.



Main objectives

The main objectives are:

- To enable sustainable and cost effective paper recovery from pre-sorted streams with a yield of >95% and a purity of 98% in wanted materials,
- To provide tailor made RP for the best possible re-use in paper & board products.

The improvement of the recovery and increasing the collection rate of used paper products e.g.: analyzing European collection systems in terms of quantitative, qualitative and cost potentials; providing optimized sorting technologies and collection systems with great acceptance and high separation ratio. The exploration of technological processes for optimum recovery of used paper and board, e.g.: optimum sorting technologies for recovered paper. The reduction of specific energy demand for recovered paper processing: evaluating the influence of collection and sorting systems of recovered paper on the specific energy demand/costs of secondary fibre production.

Expected impact/results

Paper recycling is highly beneficial to the economy and the environment. The suitable collection systems must be further developed and recycled paper sorting is a must prior to recycling. There is still a high potential for improvement, in terms of quality and quantity. SORT IT will provide new sorting technologies to support this target. Furthermore extensive life-cycle studies will help quantify the impact at European level.

- SMOOTH -

Sustainable Methods for Optimal design and Operation of ships with air lubricated Hulls

www.smooth-ships.eu

Project type: Specific Targeted Research Project, FP6

Total Project Cost: 2 525 000 €

Maximal EC Contribution: 1 437 750 €

Duration: 36 months

Starting Date: 01/09/2006

Consortium: 11 partners from 6 countries

Project Coordinator: Maritime Research Institute Netherlands (The Netherlands)



Innovation for resource-efficiency

Cleaner ships are coated in air

Summary

The SMOOTH project exploited the fact that the friction of air is much lower than the friction of water. This brought them to the innovative idea of coating ships with a layer of air, hence reducing their fuel consumption

The team tested three different ways of coating a ship's hull in air. One technique involved surrounding the hull in a layer of tiny bubbles, while another involved treating the hull surface with a paint that attracts air, creating an air carpet round the hull. Although these techniques worked well at the model scale, they were less effective at full scale. A third technique, however, which entailed pumping air into cavities in the bottom of the hull, was successfully scaled up to full scale and delivered energy savings of 15%.



Main objectives

Reducing fuel consumption and CO2 discharge by up to 20%.

Expected impact/results

SMOOTH aims at a considerable reduction of fuel consumption, CO2 discharge with at the same time improved safety by applying new, vanguard technologies. The application of this promising technique will strengthen the position of European shipbuilders.

The pumping of air into cavities in the bottom of the hull was already successfully scaled up to full scale use and delivered the expected energy savings of 15%.

- SPREAD -

Platform identifying Research and Policy needs for Sustainable Lifestyles

www.sustainable-lifestyles.eu

Project type: Support Action, FP7

Total Project Cost: 1 587 885 €

Maximal EC Contribution: 1 423 082 €

Duration: 24 months

Starting Date: 01/01/2011

Consortium: 10 partners from 9 countries

Project Coordinator: UNEP/Wuppertal Institute Collaborating Centre on
Sustainable Consumption and Production - CSCP (Germany)



Innovation for resource-efficiency

A European social platform to address the challenge of reducing resource use while improving health quality of life

Summary

SPREAD Sustainable Lifestyles 2050 is a European social platform project where different societal stakeholders – from business, research, policy and civil society – are invited to participate in the development of a vision for sustainable lifestyles in 2050. This process will result in a roadmap for strategic action for policy makers and will deliver innovative ideas for business, research and society, regarding the enabling of sustainable lifestyles in European society.



Main objectives

The project addresses the challenge of maintaining or improving quality of life of an ageing European society while at the same time reducing current levels of energy, transport and resource use.

Societal innovation and significant changes in behaviours and lifestyles are vital to achieve long-term economic prosperity for all within the bio-capacity of our planet. Knowledge on sustainable lifestyles are scattered and so are the sustainable project initiatives. The project aims to bring together current knowledge, experience and relevant stakeholders in a dialogue process, in order to articulate and clarify the main societal challenges that we face in our attempts to reach more sustainable lifestyles.

Expected impact/results

- Bridge-building between citizens, stakeholders, research and political stakeholders.
- Inclusion of real world experiences from citizens in the top 10 research questions.
- Improved and multi-stakeholder-based recommendations on sustainable lifestyles.
- A better understanding of possible future scenarios of sustainable lifestyles.

- SUME -
Sustainable Urban Metabolism for Europe
www.sume.at

Project type: Collaborative Project, FP7

Total Project Cost: 3 629 965 €

Maximal EC Contribution: 2 867 250 €

Duration: 36 months

Starting Date: 01/11/2008

Consortium: 9 partners from 8 countries

Project Coordinator: ÖIR - Austrian Institute for Regional Studies and Spatial Planning, Vienna (Austria)



Innovation for resource-efficiency

Designing future urban systems to reduce resource use

Summary

Societal development is running a high risk, using up resources and unbalancing the environmental system, at least in some regions of the world. The research project SUME (Sustainable Urban Metabolism for Europe) will show how future urban systems can be designed in a way which is consistently less damaging to the environment compared to the current status.

The concept of urban metabolism helps to understand and analyze the way societies – mainly located in urban areas – use resources, energy and land, for maintaining and reproducing themselves. The way cities and urban areas are being built in spatial terms or technological terms is greatly influencing the quantity and quality of resources being used in maintaining urban life. The



extraction of specific energy and material resources as well as the return of waste and exhaust to the environmental system are increasingly damaging and will have to be changed substantially.

Main objectives

The driving forces behind the dynamic processes of urban development are demographic change, the individual performance of urban areas in (global) economic competition, the speed and direction of applying technological innovations under various societal/political conditions. While the dynamics of urban development in these components have been studied and debated for a long time, the interrelation between urban development and urban metabolism in the sense of physical interaction with the environment is far less understood. Specifically, it is the main challenge of this project to find a link between the urban metabolism approaches to urban spatial development concepts in a way to foster a more sustainable development path of urban areas in the future.

Expected impact/results

Urban development includes processes of growth in new areas, decay and abandonment but also restructure and rehabilitation in parallel. The weight and speed of these alternate components of urban development is varying strongly between different cities and countries, leading to different patterns of land use, resource and energy consumption.

SUME will analyse the potential to transform existing urban built environments (buildings and spatial structures) in order to significantly reduce resource/energy consumption, taking these differences into account. From a strategic point of view, it will be necessary to know, if existing rates of transforming urban structures should be increased in order to improve urban forms and to reduce resource use faster. The results will provide an essential input to environmental policy making, to urban development policies and to transportation policies at both, national and local levels.

- SustainComp -
Development of sustainable composite materials
www.sustaincomp.eu

Project type: Large-scale integrating project, FP7

Total Project Cost: 9 400 000 €

Maximal EC Contribution: 6 500 000 €

Duration: 48 months

Starting Date: 01/09/2008

Consortium: 17 partners from 8 countries

Project Coordinator: INNVENTIA AB (Sweden)



Innovation for resource-efficiency

Making traditional materials more sustainable and competitive

Summary

The project aims at developing new types of sustainable composite materials for a wide range of applications and has the ambition to integrate today's large enterprises on the raw material and end-use sides. (e.g. pulp mills and packaging manufacturers) and small and medium sized enterprises on the composite processing side (e.g. compounders and composite manufacturers).

Main objectives

The vision of SustainComp is to introduce several families of new advanced wood-based bio- and nano-composites, into a number of commercial sectors. Such new, high-value, wood-based materials will use resource-efficient, and



therefore sustainable, production methods. A primary goal is to substitute fossil-based materials used in several sectors, ranging from packaging to construction.

Expected impact/results

The project is developing resource-efficient production methods for wood-based materials, which will substitute fossil-based materials in several sectors.

It is also expected to integrate large enterprises on the raw material and end-use sides (e.g. pulp mills and packaging manufacturers), and SMEs on the composite processing side (e.g. compounders and composite manufacturers). The new materials and their manufacturing processes will generate opportunities not only for the existing wood-based industry, but also for the development of new companies, business models and applications.

- SWITCH -

Managing water for the city of the future

<http://switchurbanwater.lboro.ac.uk>

Project type: Integrated Project, FP6

Total Project Cost: 22.933.053 €

Maximal EC Contribution: 14.749.996 €

Duration: 63 months

Starting Date: 01/02/2006

Consortium: 33 partners from 15 countries

Project Coordinator: UNESCO-IHE (The Netherlands)



Innovation for resource-efficiency

Sustainable and integrated approach in urban water management

Summary

Increasing global change pressures, escalating costs and other risks inherent to conventional urban water management are causing cities to face ever increasing difficulties in efficiently managing scarcer and less reliable water resources. As well, satisfying water uses, services and waste water disposal without creating environmental, social or economic damage is an ever more difficult challenge. SWITCH aims to bring about a paradigm shift in urban water management away from existing ad hoc solutions to urban water management, and towards a more coherent and integrated approach. The vision of SWITCH is for sustainable urban water management in the 'City of the Future'.



Main objectives

There are several project objectives designed to achieve this aim and vision. Key to these is to ensure that long term strategies for sustainable urban water management are based on scientific knowledge. This will be achieved through a coordinated approach to research, training and demonstrations involving the SWITCH partners, on a number of specific areas of interest in the project. These activities are further supported by effective dissemination, particularly through the Learning Alliance approach, and central coordination.

Expected impact/results

Results will include:

- 1) an inventory of the major global change pressures affecting urban water systems;
- 2) an overview of the strategic issues that urban water managers face now and in the future;
- 3) a description of the potential of strategic planning for urban water management under changing conditions and uncertainty;
- 4) a strategic planning approach based on a Learning Alliance process and directed at creative visioning, scenario identification and strategy development;
- 5) a method to implement strategic urban water management plans via the government and non-government sectors;
- 6) sustainability indicators to measure the state of the urban water system, the results of which are to be used in strategic planning;
- 7) a decision support tool to evaluate the effect of various options for system sustainability;
- 8) and recommendations on the application of a number of innovative (technological) options in future urban water management schemes.

- TOPCOMBI -

Towards Optimised Chemical Processes and New Materials by Combinatorial Science

www.topcombi.org

Project type: Integrated Project, FP6

Total Project Cost: 22 200 000 €

Maximal EC Contribution: 11 500 000 €

Duration: 60 months

Starting Date: 01/03/2005

Consortium: 22 partners from 11 countries

Project Coordinator: CNRS Institut de Recherches sur la Catalyse - IRC (France)



Innovation for resource-efficiency

Catalysing sustainability

Summary

The integrated project TOPCOMBI aimed at developing alternative catalytic synthesis routes answering demands in chemical production by applying high throughput and miniaturisation methodologies. The IP focussed on topics stemming from European citizens' urging needs for efficient use of sustainable energy and resources, safe chemical products and environmental protection.

Main objectives

The project addressed several key chemical process challenges in catalysis and chemical engineering, such as light alkanes upgrading, N₂O free ammonia oxidation, toxic phosgene replacement in DMC synthesis, green chemistry for



glycerol bio-feedstocks and renewable bleaching agent validation. It developed and implemented high-throughput and miniaturisation methodologies to accelerate the discovery of new catalysts and to propose alternative chemical processes.

Expected impact/results

The project led to the discovery of almost twenty breakthrough catalytic devices and systems, demonstrating greatly reduced lab-to-pilot-to-process cycle times, with higher quality R&D, reduced environmental impact and cost. To support these, a "high-throughput" toolbox was developed, including high-tech micro-engineering, new robotics, appropriate computational tools, databases, optimisation algorithms and e-infrastructure.

- UPWIND -
Integrated Wind Turbine Design
www.upwind.eu

Project type: Integrated Project, FP6

Total Project Cost: 22 600 000 €

Maximal EC Contribution: 14 600 000 Mio €

Duration: 60 months

Starting Date: 01/03/2006

Consortium: 45 partners from 13 countries

Project Coordinator: Danmarks Tekniske Universiteit (Denmark)



Innovation for resource-efficiency

Developing the wind power of tomorrow by designing large onshore and offshore wind turbines consumers

Summary

Wind energy may be able to provide up to 20% of the global electricity supply in the not too distant future. Research into making the turbines more effective and unobtrusive for the population is crucial. Wind turbines of the future will then be able to be grouped in off-shore wind farms and will produce cheap electricity with minimal visual impact. UPWIND is part of this development. It is a project focussing on the development and design of wind turbines, with the aim of maximising efficiency.



Main objectives

In order to ensure that wind energy is able to contribute significantly to the global electricity supply in the future, very large wind turbines operating as wind power plants, are being designed. These machines are not available yet. Their design takes into account efficiency measures and a minimum visual impact.

Expected impact/results

Successful turbine design necessitates an understanding of a number of factors including external design conditions, the availability of appropriate materials, advanced integrated control and measuring systems. All are geared towards achieving the highest degree of reliability. UPWIND has conducted research in a number of areas. It has enabled the development of design for turbine blades twice as long as plane wings, which will be able to convert even more wind energy over the oceans. It has improved the design methods for the gearbox, significantly decreasing gearbox breakdowns. And it has developed the LIDAR system for remote measurements of wind speed characteristics, allowing measurement costs for manufacturers to be decreased. The project results will lead directly to improvements in offshore wind resources in Europe.

- ZEROWIN -
Towards Zero Waste in Industrial Networks
www.zerowin.eu

Project type: Collaborative Project, FP7

Total Project Cost: 8 501 815 €

Maximal EC Contribution: 6 159 927 €

Duration: 60 months

Starting Date: 01/05/2009

Consortium: 31 partners from 11 countries

Project Coordinator: Austrian Society for Systems Engineering and Automation
(Austria)



Innovation for resource-efficiency

Holistic perspective and integrated systems for industrial waste prevention

Summary

Waste prevention has been assigned the highest priority under European waste management law. However, the initiatives which have been taken so far have not reduced the regular annual increase in total waste arising across Europe; we are still far away from achieving a sustainable use of resources. With a rising level of prosperity in industrialized countries, an increasing number of products and services are being produced and consumed. This development is reflected in the amount and toxicity of the waste generated.

In particular, the ZeroWIN project addresses:

- nearly 3 million companies (of which 80% are SMEs);

- 
- with more than 2,8 trillion € turnover and a value creation of more than 800 billion € and with more than 20 million employees;
 - creating about 40% or more than 400 million tons of industrial waste every year;
 - using as much as 50% of all materials extracted from the earth's crust;
 - generating about 40% of all energy use and about 35% of all greenhouse gas emissions.

Main objectives

The main idea of ZeroWIN is that waste prevention has to be seen from a holistic perspective to make it work efficiently and effectively. The plan to move society in the direction of sustainability must be based on an understanding of the constitutional principles of the functioning of the system usually referred to as the eco-sphere. Operational approaches towards dematerializations and substitutions need to comply with the complementary, non-overlapping, conditions for social and ecological sustainability. In order to reach sustainability, actions should be fostered through a set of strategic principles defining a future "landing place".

The Zero Emissions/Waste concept represents a shift from the traditional industrial model in which wastes are considered the norm, to integrated systems in which everything has its use. It advocates an industrial transformation whereby businesses emulate the sustainable cycles found in nature and where society minimizes the load it imposes on the natural resource base and learns to be more efficient with Earth's resources.

Expected impact/results

This project results will enable 9 industrial case studies in the automotive, construction, electronics and photovoltaic industry to prove that the ZeroWIN approach can meet at least 2 of the stringent targets of the call: a decrease of at least 30% of greenhouse gases emissions; at least 70% of overall re-use and recycling of waste; a reduction of at least 75% of fresh water utilisation.

- 3ENCULT -
Efficient ENERGY for EU Cultural Heritage
www.3encult.eu

Project type: Collaborative Project, FP7
Total Project Cost: 6 643 959 €
Maximal EC Contribution: 4 990 475 €
Duration: 42 months
Starting Date: 01/10/2010
Consortium: 22 partners from 10 countries
Project Coordinator: EURAC (Italy)



Innovation for resource-efficiency

Energy efficient retrofit for historical buildings

Summary

Historic buildings are the trademark of numerous European cities, towns and villages: historic quarters give uniqueness to our cities, they are a living symbol of Europe's rich cultural heritage and reflect society's identity.

However, it is clear that these buildings are not energy efficient and are substantial contributors to greenhouse gas (GHG) emissions and rising energy bills. At a time when climate change poses a real and urgent threat to humanity and its infrastructure, it is vital to initiate an improved approach to the refurbishment of historic buildings, which in many cases are in danger themselves.



Main objectives

The project 3ENCULT bridges the gap between conservation of historic buildings and climate protection, which is not an antagonism at all: historic buildings will only survive if maintained as living space. Energy efficient retrofit is useful for structural protection as well as for comfort reasons – comfort for users and “comfort” for heritage collections.

3ENCULT will demonstrate the feasibility of "Factor 4" to "Factor 10" reduction in energy demand, depending on the case and the heritage value.

Expected impact/results

Based on the developed solutions and proposed approach 3ENCULT will provide:

- a **handbook** with design guidelines and a pool of technical solutions for planners
- new or enhanced **products** (interior insulation, windows, lighting, ventilation and solar integration but also wireless monitoring and BMS)
- university & professional **trainings**
- guides for & involvement of **local governments**
- position papers & support for **standards** development (EPBD, CEN TC346)

Channels for dissemination are apart the website (www.3encult.eu with FAQ platform and e-Newsletter), the presentation at conferences & fairs and publications in journals, organisation of workshops and study tours and a video news release.

Factor 4 reduction of energy demand of the 26% of EU building stock dating before 1945 would result in more than 180 Mt CO₂ saved (3.6% of EU-27 emissions in 1990) and improve living conditions and quality management in historic urban areas.

European Commission

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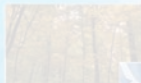
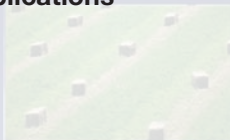
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Meeting the needs of a growing population within the ecological limits of our planet is one of the main challenges of our times. Supporting research and innovation on solutions that are environmentally friendly, economically feasible and socially acceptable is therefore essential. In this context, the EU has launched the “Resource-efficient Europe” and “Innovation Union” initiatives as two flagships of the Europe 2020 Strategy. The Directorate-General for Research and Innovation is committed to both initiatives: the Framework Programme for Research supports projects in a variety of fields such as energy, climate, industrial technologies, transport, agriculture, fisheries and environment as well as capacity building and green skills. This publication showcases EU-funded projects and their concrete solutions for a more efficient use of resources.



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