



Forest-based Sector input to FP7 2013 Work Programme

Compilation of the topics by the forestry value chain

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1. Understanding water and forest interactions from the leaf to the landscape scale: towards an integrated multi-scale socio-eco-hydrological approach of forest management for optimizing water-related ecosystem services

Justification:

Forest and water related issues are of utmost importance; forests are crucial for the sustainable management of water resources and, at the same time, water is a key factor for the sustainability of forest ecosystems and their potential to provide ecosystem services. Moreover this interrelation will become even more important in a context of global change, with increased temperatures and uncertain future rainfall patterns and important land use changes. Furthermore, the growing population in regions already characterised by water scarcity will further increase demand for water.

Despite this, water and forest management policies, strategies and plans are generally developed and implemented in a sector oriented way, without considering the interrelated implications between the ecosystem and water resources. Because of the sector orientation, the various stakeholders are often in conflict. In addition, notwithstanding a significant advance in scientific understanding of forest and water interactions based on almost a century of research in forest hydrology, uncertainties and conflicts are still present, particularly for the difficulties in translating research findings between different geographic scales and geo-climatic conditions, different forest types, species, and forest management regimes. Time has come to design new management strategies, decision-support tools and policies that effectively integrate knowledge from different scales and disciplines to ensure that forest management and planning takes into account impacts on the water cycle.

Scope:

The project will generate new cross-disciplinary multi-scale research together with stakeholders aiming at developing new integrated knowledge for a better understanding of the impacts of forests and forestry (from the leaf to the landscape-basin scale) on the water cycle and for developing a new effective socio-eco-hydrological approach of forest management that will aim at optimizing water-related services (e.g., water quality and quantity) and minimizing water related risks (droughts, floods).

Specific research areas that need to be developed and linked **in an integrated multi-scale approach** from the stand as smallest meaningful forest management scale level to the hydrological scale of small and mid-sized basins, are:

* improved knowledge on water processes in trees and forests (water productivity, interception losses, root behaviour and water uptake complementarity, use of different water sources, how trees adapt to water stress, etc), and improved knowledge on how forest management can make forests more water-use-efficient, more climate change adapted, and how forests influence atmospheric moisture content;

* improved knowledge on the hydrology of forest ecosystems (at small and mid-sized basins levels) in view of how the composition, density and distribution of the vegetation cover, land-use and management and disturbances affect water resources and related risks (droughts and floods) on different forest ecosystem types;

* improved understanding of the trade-offs between on-site and off-site water-related ecosystem services (green and blue water flows and water quality) and other ecosystem services at different scales (from small to mid-sized basins);

* research into adequate economic instruments involving all stakeholders (water pricing and markets, payments for environmental services, etc) and policy recommendations that look at forests and water in a integrated manner.

* improved understanding of different planning and economic instruments and policies that ensure a socially optimal provision of water and other forest related ecosystem services;

The integration of the previous research topics are the basis for developing a socio-eco-hydrological approach and new decision-support tools and to provide global and regional specific views on the complex interactions of water and forests.

Recommended size (instrument) and duration:

Large scale collaborative project 4 years. International cooperation.

Expected impact:

The research will have an impact in the development of (i) new integrated management strategies and decision-support tools that will link stand (silviculture) to mid-sized basin (land-use planning) level decisions aiming at optimising the impacts of forestry on the water cycle as well as understanding trade-offs with other ecosystem services and (ii) adequate economic instruments (water pricing and markets, payments for environmental services, etc) and policy recommendations that look at forests and water in a integrated manner. Such knowledge and tools will provide more comprehensive knowledge to policy makers on the forest/water interface in the framework of different policy initiatives (e.g. the EU Water Framework Directive and Forest Europe process).

Multiple stakeholders; forest owners, managers, public administrations, water companies, etc will benefit from the project impacts. In addition, enhanced transcontinental (Australia, California, Africa, etc) scientific cooperation in such a globally-relevant-topic will result from the project.

Proposed Programme: Environment

2. Building resilient forests by integrating evolutionary processes into management strategies

Justification:

Due to the rapid pace of current environmental changes (climate, atmospheric N, pests/disease, invasive species) the likelihood that long-lived forest trees can adapt through molecular evolution is very low, therefore tree populations must cope or adapt through phenotypic plasticity, migration or re-assortment of standing genetic variation. In addition, human modification of landscapes and forests has restricted the capacity of populations to change, often limiting regeneration, degrading potential habitat and leaving forest patches fragmented and isolated. Nevertheless, tree populations maintain high levels of genetic variation, have high capabilities for gene flow and show high heritabilities for phenotypic traits indicating a high potential for adaptation if appropriate management strategies can be devised to allow this to happen. Current and future species responses to predicted environmental changes are embedded in demographic and evolutionary processes that occurred in the past. Therefore, understanding range-wide patterns and interactions between environmental change, demography and evolution taking place in the past is essential for developing of management strategies.

Rapid advances in the development of genomic resources for forest trees and in associated fields such as landscape and community genomics mean that the forestry community has never been better placed to develop and test new adaptive strategies, based on the integration of molecular, phenotypic and environmental data to study the basis of adaptation and for selection of genotypes best adapted to given environments. The synthesis of these linked but distinct fields offers the promise of an ecosystem genomic strategy for equipping our forests to cope with environmental change.

Scope:

Research should focus on gathering the necessary empirical data to assess landscape-scale organisation and dynamics of genetic variation in tree populations, particularly for variation in susceptibility, resistance and resilience to pests / diseases and for responses to altered climatic regimes. Research should concentrate to the relation of genomics and resilience to drought and the role of Mycorrhizae. This should include re-evaluation of existing and establishment of new experimental trials to assess variation in phenotypic traits and to form ongoing resources for research into local adaptation, plus combined studies of natural and experimental populations. Options for fast phenotyping of adaptively important traits (cold/drought/pest resistance) should be explored. The project should take advantage of emerging genomic resources for tree species, ensuring integration with ongoing international genome sequencing efforts, and of the current state of the art in plant community genomics. Efforts to synthesise genomic, relation with mycorrhizae and empirical datasets in next-generation models should be undertaken to test strategies in broad consultation, and drawing from existing EU supported research efforts in this field. Finally, the project should be strongly connected with stakeholders at a variety of levels from managers to policy level and in a range of forest contexts to establish practicable strategies for integrating results into management and for motivating the uptake of new ideas.

The combination of population genetics and genomics, biogeography and ecology will provide an integrated view and a powerful approach to uncovering the molecular mechanisms responsible for adaptation, role of mycorrhizae, as well as the drivers of selection (both climatic and ecologic). It will also provide a basis to identify adaptive population differences that might help a species to survive

future environmental changes. Ultimately, the comparison of the results across species will help uncovering the molecular basis of evolution (and its architecture) underlying adaptation in groups of forest trees.

Recommended size (instrument) and duration:

Large scale collaborative project – 3 to 4 years

Expected impact:

Improved international coordination in the development of genomic resources for European trees. Better understanding of mechanisms and patterns of intraspecific local adaptation, role of mycorrhizae, at multiple spatial scales. Improved resolution and better integration of national databases on forest cover, distribution and density of tree species and phenotypic variation. New strategies for management of forests to incorporate the potential of forest ecotems for evolutionary change. Improved capability for responses to environmental changes.

Improve estimates of habitat suitability for each species at different spatial scales. Assess the relationship between demographic processes and the current realized niche of the species. Test whether evolutionary mechanisms, particularly adaptations to regional environmental conditions, translate into ecological niche differentiation within the species concerned.

Proposed Programme: KBBE

3. Quantifying uncertainties and predicting risks to European forest ecosystem functioning from multiple interacting global change drivers

Justification

The last 50 years has seen unprecedented human induced changes to drivers of forest ecosystem functioning. With future pressures predicted to increase still further there is a critical need to assess future risks and critical transitions to European forest ecosystem functioning. Global change drivers (GCDs) include increased atmospheric CO₂ concentrations, climate change, increased frequencies of extreme weather events, increased eutrophying and acidifying atmospheric deposition and land-use and management changes. While the influence of individual drivers on forests has been considered in previous EU projects their interaction has not. The interaction of GCDs has been hypothesised to influence and interact with critical non-linear transitions in ecosystem responses leading to alterations in dominant species, biogeochemical cycling, biodiversity and trophic interactions. Potential risks to forest ecosystem functioning from interacting GCDs and large ecosystem changes include increased fires, forest collapse and desertification of southern regions, prolonged loss in productivity, decreased or reversed carbon sequestration, reduced forest biodiversity and aesthetic value. While possible hypotheses exist there remains considerable uncertainty as to how sensitive forest ecosystems are to these interacting GCDs and what the impacts will be on future forest ecosystem functioning.

Scope

The research should aim to deliver probabilistic predictions of future forest risks with an assessment of uncertainty. This will require:

- Multi-temporal, multi-site observational and experimental research designed explicitly to assess the relative sensitivity of forests to resource alterations and interactions with other GCDs.
- Process-based forest ecosystem modelling coupled with forest population models to provide larger-scale predictions.
- Calculation of probabilistic predictions and uncertainty assessment by fusing together information from observations and forest ecosystem models.

Recommended size (instrument) and duration:

Large scale collaborative project - 3 to 5 years

Expected impact:

This research will quantify and reduce uncertainties of risks and critical transitions to future forest ecosystem functioning. This will aid decision making on future forest management strategies to mitigate future risks.

Proposed Programme: ENVIRONMENT

4. Understanding motivations and decision making among forest owners in Europe as a basis for improved policy approaches

Justification:

Forests in Europe are sources of multiple public and private goods and services, like timber, wood for bio-energy, eco-tourism, biodiversity conservation and forests as carbon sinks. The provision of these goods and services depends crucially on private forest owners: Forests cover around 35 % of the EU territory, 65 % of which is privately owned by approximately 15 million forest owners, a significant part of these owning less than 2 hectares each.

However, European private forest owners form an increasingly heterogeneous group, also due to the documented fragmentation in South-Eastern Europe. In addition, growing numbers of non-agricultural ('urban') owners, owners for whom lack of forest profitability and lack of forest sector knowledge and networks may lead to sub-optimal management. This may lead to a decrease in supply of goods and services and increasing risk of environmental calamities and natural hazards, e.g. fire risk in Mediterranean Europe. This hampers the ability of EU and member states to pursue core policies (e.g. EU's Forest Action Plan; Climate and Energy package; Water Framework Directive, Rural Development policies).

Scope:

This project should explore the diversity of forest owners and forest ownership structures in Europe in order to come up with policy recommendations as well as proposals for organisational designs that may enhance effective provision of public and private forest related goods and services along with adaptation to climate change.

Adopting e.g. a structured case study and quantitative analysis approach, it should address important research questions like: What are the patterns and dynamics of forest ownership throughout Europe? What are the motivations of different types of forest owners to provide goods and services, like biodiversity conservation or wood for bio-energy? What is the organisational and communication structure around different types of forest owners?

The project should elicit the information needed to design evidence based innovative policy approaches and instruments to create the link between individual owners and societal demands for products, goods and services. For effective implementation and transfer of research results, the project should include co-operation between research partners and SMEs from the extension sector enhancing the link between policy and forest owners.

Recommended size (instrument) and duration:

S/M scale collaborative project (3 million € over 4 years)

Expected impact:

The results will greatly improve our insights in the development of European forest ownership structures and the motivations and objectives of forest owners. It will develop guidelines and recommendations about how to best address segments of forest owners, so as to secure a more successful implementation of EU and national policies addressing all aspects from biodiversity conservation, over rural development to resource availability and energy policies. The project will be well-suited to the involvement of SME's in the forestry extension service sector across Europe, and hence foster innovation in this sector.

This proposal is linked to the Strategic Research Agenda of the Forest Based Sector, stressing the need for a better basis for forest policy and governance, and highlighted in the Mediterranean Forest Research Agenda. The project cover important research needs identified in the report to the European Commission "Prospects for the market supply of wood and other forest products from areas with fragmented forest-ownership structures".

Proposed Programme: KBBE Area 2.1.2, Main line: Forestry systems etc

5. The role of urban forests and trees in delivering green infrastructure and regional identity

Justification:

Green infrastructure at different levels, and with forests and trees as major components, can help ensure efficient and sustainable land use by integrating functions or activities on the same piece of land. The spatial character of green infrastructure addresses both the issue of connectivity and the provision of ecosystem services. At the EU-level, green infrastructure has been identified as one of the main contributions to reversing the trend of biodiversity loss and to linking and strengthening diverse ecosystems in urban and rural areas. In urban and peri-urban areas, green infrastructure can help build resilience, for example in terms of adapting to climate change. Moreover, multifunctional urban and peri-urban green infrastructure also makes important socio-cultural and economic contributions. It can provide people with better access to outdoor environments, thus promoting health and wellbeing, while also helping to build regional identity and enhancing bio-cultural diversity. Green infrastructure in urban and peri-urban settings provides more attractive environments for investment and business, thus contributing to the green economy.

Scope:

Although green infrastructure is gaining prominence as a planning approach in urban and peri-urban areas, there is a need to identify state of art and good practices at the European level. Of particular interest in this respect are the study of governance and planning approaches that support the building and maintaining green infrastructure. Research also needs to assess goods and services provided by urban and peri-urban green spaces such as forests and tree plantations, with focus on addressing ways of linking environmental services with socio-cultural and economic services. Delivery mechanisms for multifunctional green infrastructure in urban and peri-urban environments, such as urban forestry and community forestry, need to be identified and studied. Research will require an interdisciplinary approach, including a socio-ecological systems perspective.

Recommended size (instrument) and duration: Large scale collaborative project - 3 to 5 years.

Expected impact:

The project should provide a sound evidence base for the further development of green infrastructure in urban and peri-urban settings, from the local to city region level. It will contribute to enhanced collaboration between disciplines and stakeholders involved with green infrastructure, particularly at the local and regional scale. Moreover, research should enhance the provision of ecosystem services by green infrastructure, and the linking of environmental services with socio-cultural aspects in particular.

Proposed Programme: ENV or KBBE

6. Responsive governance in glocalization of forests

Relation to FTP Strategic Research Agenda: Research area 5.2 Instruments for good forest sector governance

Justification:

Forest policy development is presently caught between two contradictory tendencies. On the one hand forest issues are increasingly becoming globalised with concomitant calls for global governance through international conventions, regulations and programmes. On the other hand much emphasis is put on the need to enhance local participation in the management of forest resources. Emphasis is also on location-specific forest management plans on the basis of negotiated consensus of the various stakeholders concerned. This process of glocalization of forest governance is also evident in Europe. At the international level, European forest governance is shaped by both global policies (e.g. United Nations Forum on Forests, Convention on Biological Diversity..) and specific European policies (e.g. forest-related legislation of the European Union, Forestry Strategy for the European Union, FOREST EUROPE). Some of these policies include legally binding instruments, while others involve non-legally binding instruments. In addition, many efforts at policy decentralization are undertaken in the form of privatization to civil society organisations (e.g. forest certification schemes), administrative deconcentration to lower levels of bureaucracy and devolution to local groups. These contrasting tendencies have resulted in a very diverse arrangements of multi-level and multi-actor forest governance arrangements and a complex array of interfaces between global and local policies. This complexity creates questions on (a) how to manage the interactions of different policy regimes and to create synergy rather than competition at the interfaces between the global and local policy practices, and (b) how to assure that the governance constellation can be responsive to present and newly emerging concerns regarding the productive, regulative and cultural functions of forests.

Scope:

The research should focus on the identification of the interactions between different European forest regimes and localized arrangements for forest governance. It should examine how different European countries deal with multi-level forest governance and the interfaces between global, national and local policy practices, and assess how the related governance activities relate to the concept of responsible governance of multiple forest functions across Europe.

Recommended size (instrument) and duration:

Large scale collaborative project - 3 to 5 years

Expected impact:

The research should result in a series of recommendations how the EU and national governments can stimulate responsible governance of forests through improved interaction management between global and local processes of decision-making and control over forests. The research offers the opportunity to

theorize on the role of the EU in multi-level and multi-actor governance arrangements and to develop innovative communicative instruments for dealing with regime interaction and the principle of subsidiarity.

Proposed programme: SSH (Alternative KBBE, ENVIRONMENT, cooperation project)

7. European wide foresight exercise for the forest-based sector

Justification:

EU is targeting for smart, sustainable and inclusive economy (Europe 2020). The forest-based sector is in a key role – together with other natural resource sectors – for achieving the goals for a more resource efficient, greener and more competitive bioeconomy, as well as the goals for better employment in the rural areas and a variety of social benefits. At the same time there is a growing complexity of issues at stake for forests and the forest-based sector in Europe. The natural resources are under increasing pressure, and the global developments leading to this include foreseeable challenges, but also uncertainties of a new scale due to for example, climate change, social and political developments. More flexibility and anticipation are required from the decision making both in administration, business and in research and development. A European-wide foresight exercise is needed to improve coordination of forest-based sector research in Europe, and to strengthen the forest-based sector response to the grand challenges.

Scope:

The objective is to carry out investigations on the future of forests, changing societal demands on forests goods and services, as well as impacts of policies on goods and service provision. With respect to forests, Europe comprises a variety of landscapes and ecological basis for actions, as well as governance structures and instruments to ensure sustainability of the forest ecosystems in changing conditions and to plan a sustainable provision of forest-based products and services to the evolving needs of the society. Research is needed to focus the European-level efforts to topics where a pan-European added value is achieved across the varying needs and demands in different parts of Europe. A step-wise foresight exercise is needed to combine regional investigations in different parts of Europe – i.e. combining the national requirements and perspectives to region-specific ecological conditions – and convey these investigations to European level goals and measures.

Foresight is a systematic, participatory, future intelligence gathering and medium-to-long-term vision-building process aimed at present day decisions and mobilizing joint actions. Compared with a long tradition in futures orientation in the forest sector – for example in forest growth trends, development projections and trade outlooks – foresight builds capacity to tackle possible futures beyond extrapolation of present and foreseeable trends.

An elementary part of the investigation is methodology development – on one hand, to improve an evidence base from integrated analyses combining quantitative and qualitative investigations and synthesising of the data and results gained in different disciplines, and on the other hand to contribute to the work already carried out in the forest-based sector in scenario modeling, long-term monitoring and impact assessments. Furthermore the method development is needed to ensure a coherent foresight approach and method to the regional exercises, and to fully utilise the work already carried in other sectors e.g. in the SCAR foresight exercise in the agricultural sector.

Recommended size (instrument) and duration:

Large scale collaborative project – 3 to 4 years

Expected impact:

The improved coordination of the forest-based sector pan-European investigations will improve efficiency in using research resources, support the bioeconomy development as well as contribute to vision building process at the European level for forests and the forest-based sector in a long term. Furthermore, foresight improves preparedness to alternative development pathways in the forest-based sector and consequently, improves agility in responding to the global challenges.

Proposed Programme: KKBE

8. Integrated study of biomass energy potentials

Justification:

The forest based sector as well as the agricultural and the waste sector can contribute significantly to the EU aim for a smart, sustainable and inclusive economy (the green economy). Aspects in the forestry sector are the production of sustainable woody biomass, but there are many aspects to this: collection from many forest owners, smart use of the resource, competition with material use of biomass and possible conflicts with other ecosystem services due to nutrient loss, overexploitation and biodiversity decline. In the agricultural sector competition with food and indirect land use change is a mayor issue both considering crops with a potential dual use and specific energy crops. Further research is needed to address economic constraints to the mobilization of biomass potentials and to develop cost-supply curves for all kinds of biomass , for short rotation coppice, other energy crops and from alternative biomass production systems on other land categories. An integrated European study should tackle all these aspects in a coordinated way and shall contribute both for EU-Level and national level assessments that take into account as well global implications and global markets (import/export issues).

Scope:

The research should be of an integrated nature tackling the multiple aspects of biomass from waste , agriculture, woody biomass for bioenergy from European forests and from dedicated energy crops. Realistic implementation potentials should be evaluated that will enable a transition to an energy supply with a significant share from woody biomass from forests, specific plantations, agricultural residues and the biodegradable part of waste The evaluation should include growth and production, harvesting, economics, competition with other utilisations of the biomass, and novel (cascading) ways of using wood (incl. biorefineries etc.).

The study should look into the introduction and transition phase of introducing an increased sustainable use of biomass in the green economy, considering effectiveness of policy instruments. It should provide insights into the resources themselves, and strategic planning of land use and small to large scale biomass utilisation, and evaluate the impact on ecosystem services. Options provided by the current collection systems from the traditional forest based sector should be studied.

The study should be multi-sectoral where it involves competition aspects with other sectors, and with trade from outside Europe. Policy aspects e.g. with regards to the targets set out in the National Renewable Energy Action Plans (NREAP) are to be included.

Recommended size (instrument) and duration:

Large scale collaborative project – 3 to 4 years

Expected impact:

Integrated full chain analyses including costs as affected by alternative policy incentives. Insights in opportunities in an integrated way including competition. Design of transition pathways, and industrial and energy company involvement differentiated for the major European regions

Proposed Programme: KKBE – Theme 5 Energy, 3.7. cross-sectoral

9. Implementing tools for checking sustainability of the production systems of imported timber

Justification:

All (imported) timber and timber products in the EU will need to be proven legal by 2013 onwards, in accordance to the EU Legal Timber Regulation. The responsibility for providing this information is on the one hand with the operators at the first placement on the EU market, on the other hand with the supplier in the country of origin. Products originating from countries which are in a trade agreement with the EU (Voluntary Partnership agreement VPA) will be considered legal in the context of the EU Legal Timber Regulation. Further, the legality definition developed by each country in the context of the VPA includes references to sustainability and governance aspects.

Scope:

The objective is to demonstrate and implement in (with case studies) a consistent system of tools for checking sustainability and legality of imported timber. It should cover and measure multiple aspects of sustainability and legality informing the development of due diligence and timber Chain of Custody systems. Sustainability is understood to include environmental, economic, social, governance and legality aspects. Latest certification standards and certifications under development, particularly in connection to VPAs, shall be taken into consideration. Methods may include different data sources and analysis approaches like e.g. forest inventories, GIS mapping, resource assessment, trade statistics, timber tracking systems.

The project should include the system design, implementation and maintenance plan, documentation of the system and its application in the case studies. Furthermore an assessment of the effect of improved practices (spanning the whole supply chain, at different points in time, including the country level to avoid leakage) shall be provided. The results have to be measurable and documented by a set of indicators for above mentioned aspects of sustainability. The sustainability assessment system should be applicable at field and country level, to be tailored to varying data situations.

Recommended size (instrument) and duration:

Medium scale collaborative project - 3 to 4 years

Expected impact:

The result will address concerns associated with the EU Legal Timber Regulations and develop means to respond to its requirements. It will provide a system of compatible tools to measure, compare and thus check sustainability of imported timber in a consistent and objective manner at different stages in the production and trade process. It should support the Member States in implementing the Timber Regulation.

Proposed Programme: KBBE

10. Long term socio-ecosystem research (LTSER) integrating social and ecological approaches towards adaptive forest systems management

Justification:

The current paradigm in global change and sustainability research frequently is based on deeply accepted assumptions that bio-physical experiments and computational models constitute a core technology to support policy, and that quantitative data are to be prioritised relative to qualitative evidence, information and value-laden judgement. Open knowledge systems, on the other hand, rely on a inter-disciplinary, systemic perspective to embrace complexity and a comprehensive representation of global change and sustainability issues; it includes a combination of participatory experiments and agent-based modelling approaches to examine an increasing wide range of social-environmental problems.

The building of knowledge to govern uncertainty and transition impacting on forest landscape management, under global change, requires an integrated, interdisciplinary approach to provide insights and indicators for sustainable approaches to forest C-management, biodiversity conservation and enhancement, biomass supply and climate change adaptation, in a landscape dimension.

Scope:

To implement a research program that supports a network of rigorously planned, long-term socio-ecosystems case-studies centered on forest environments and landscapes to analyze and, possibly, to simulate the behavior of individuals and groups within different societal structures and environmental contexts, for understanding the drivers and barriers for mitigating global change impacts (i.e. climate change effects, contrasting land-uses in forest landscapes, increasing requirements of biomass for energy vs wood industry, fires, pest outbreaks, windstorms) on forest systems and to increase their adaptive responses. These studies would also demonstrate different mechanisms of engagement and cooperation in knowledge production, learning and evaluation in tackling sustainability concerns in different places.

The research program will supports a series of infrastructures and "laboratories" made of participation-driven field experiments, under contrasting social-environmental set ups, based on different silvicultural systems, for testing integrated methodologies and forest management options to devise robust, sustainable, societal action for global change adaptation.

Through a set of participatory-type experimental research, the program will define sustainable approaches to:

- Favor a transition to a "soft path" and towards more integrated and adaptive regimes in ecosystem management, taking into account uncertainty and complexity.
- Evaluate management effects at forest patch and landscape scales, taking into account ecological connectivity, ecosystem fragmentation and the interactions with the man-made component.

- Establish a network of forest test-sites where it will be possible to follow long-term trends of forest biodiversity and carbon cycling in response to forest management options, defined with a participatory approach.
- Develop and convey to the different groups of stakeholders, a new understanding of what is meant for “managing transitions” and innovative methods for adaptive management options of such processes of change.

Recommended size (instrument) and duration:

Large scale collaborative project - 3 to 5 years

Expected impact:

The project should lead to updated knowledge about the effectiveness of new forest management practices in meeting societal multiple objectives (production, protection, biodiversity, etc) into target European ecosystems/forest types. It will deliver data and policy relevant information about the impact of forest management on carbon cycling and biodiversity. It will lead to evaluation of management effects at forest patch and landscape scales, taking into account ecological connectivity, ecosystem fragmentation and the interactions with the man-made component. Better tools and methods for monitoring global change and for supporting anticipatory, reflexive and adaptive societal responses to global change will be produced as well together with stakeholders and SME's. Improved access to and comparability of large data sets (includes long-term support for maintenance and further development of infrastructure and better meta data).

Proposed Programme: Environment or KBBE

11. Development of 3-D dynamic forest modelling using combined terrestrial and airborne Laser based technologies based on optical and SAR data for spatial forest resource modelling under changing environmental conditions

Justification:

Airborne Laser Scanning (ALS), also known as LiDAR (Light Detection And Ranging) is a highly promising remote sensing technology for qualitative and quantitative description of forest resources at a very high spatial resolution. With respect to other RS techniques (optical and multispectral images from airborne or satellite platforms), Lidar data provide immediate and reliable information about the “3rd dimension” of the forest (tree height and the “thickness” of tree canopy), and on its vertical and horizontal distribution at both single tree and forest stand level. Due to fast development of laser scanning technology the opportunities for dynamic 3-D modelling of forest resources has enormously increased. A dynamic 3-D modelling of forest is of interest for many forest related eco-services, programs and conventions, like CO₂ modelling, biomass modelling, habitat condition, modelling, biodiversity modelling, water resource modelling or wood production modelling. But for innovative LiDAR based modelling in the forest sector the optimization of algorithms and processing procedures, and their implementation into commonly shared software, especially GIS is required. This issue is critical for the advancement of innovation into monitoring of forest ecosystem structure and functioning. Europe has a leading position in the development of laser technology for environmental applications and needs to use this opportunity for more and better focused forest resource and benefit assessment. At the same time optical and SAR based options to determine 3D information evolved in parallel and justify a parallel that analysis of 3D information based solutions for forest information systems from local to national scales.

Scope:

The research should be oriented to study and carry out LiDAR applications for:

1. automatic and semi-automatic discrimination of forest areas from other land uses;
 2. identification of species composition (through integration of Lidar and multispectral data);
 3. description of the vertical and horizontal structure of the forests and automatic extraction of homogenous polygons (stands);
 4. Lidar-based estimation models of timber volume and wood biomass;
- Lidar-based (ground based and/or airborne) derivation of forest condition indicators
5. spatializing data of ground sampling forest inventories;
 6. multitemporal analyses to estimate forest area changes and amount;
 7. forest interventions planning and logistic (forest roads, exploitation lines, ...);

9. identifying hydrogeological sensitive situations;

10. development of ready-to-use GIS procedures to process (ground based and airborne) Lidar data, with a particular sight to mobile-GIS and augmented-reality applications to make Lidar data and analysis available in the field.

In parallel, options arising from optical and SAR technologies shall be examined aiming at applications from local to national level as well as the examination of synergies of the various scales of 3D forest information systems. The study shall include an economic analysis of the efficiency of 3D information based forest information systems (cost efficiency and markets) and shall take into account user requirements at the various scales from operational users to policy and general public.

Recommended size (instrument) and duration:

Large scale collaborative project - 3 to 4 years

Expected impact:

3-D structures of forests and the terrain below can be assessed with an accuracy which is not possible with any other measurement technology today. For the variety of forest information needs from local to national level the integration of the development of solutions both from Lidar, optical and SAR is vital. This will have impact on the utilization, valuation and projection of forest resources in respect to environmental and economical issues, e.g. nature conservation, wood production, climate impact, hazard protection, woody bio-energy volume assessment. It will also provide innovative feed-back to the laser technology industry for adaptive developments. Information system solutions from local to national scale, addressing the need for sustainable use of forests, better information on potentials (material use & energy), Natura 2000 monitoring, REDD and other forest related policies. The project will developed with stakeholders, users, and SME's.

Proposed Programme: Environment / Forestry / Monitoring / Decision support systems (tbc)

12. Cultural Forest and Woodland Landscapes: Past Present and Future

Justification:

Understanding Europe's Cultural Forest and Woodland Landscapes (CFWL), including how they were derived, their current status and their future roles given changing societal priorities has important implications for sustainability. Rural landscapes have been shaped by people's traditional knowledge and institutions, developing their own social, economic and ecological values long before the development of contemporary ideas about sustainable development and adaptive governance. Remaining CFWL provide us with examples of traditional approaches to local place-based governance, whose adoption elsewhere could help us to avoid further loss of social capital in rural areas. Since many CFWL are based on multiple output systems and, in particular, often combine agriculture and forestry, they can also point the way to the development of new, innovative multiple land use systems

Scope:

Understanding the range and diversity of CFWL across Europe, will include refining what 'cultural forest and woodland landscapes' actually means and the ecological and cultural functions they provide. Having defined the range and diversity of CFWL, the next step is to describe the systems of governance and management of remnant CFWL. Lessons learned from existing and historic CFWL will be used to inform approaches to land use in the present and future given different global scenarios and to assess the economic and ecosystem services they can provide to deliver sustainable rural development.

This research project will focus on low productivity land (upland, nutrient poor, arid) in the EU. This is land that often cannot currently produce an economically viable return, regardless of land use. The results will recommend innovative systems of multi purpose land use that will allow both financial and non-financial outputs from low productivity regions of the EU to be optimised in future.

Recommended size (instrument) and duration:

Medium scale collaborative project - 3 to 4 years

Expected impact:

The social, economic and ecological specification of sustainable, multi-output systems for non-productive areas will open up new possibilities for the future use of these areas of Europe. The wider adoption of sustainable CFWL systems in non-productive areas will help to buffer Europe against the ecological, financial and social implications of future environmental change.

Proposed Programme: KBBE

13. Nature & Health

Proposed topic: Quantification of health benefits of nature spaces

Justification: Environment and health is emphasized in many EU policies, e.g. the 6th Environment action programme. The positive contribution of natural environment to health is an integral part of the interplay between environment and human health. However, insufficient attention has been paid in research and in practice to the potential of nature to maintain and improve human health.

Stress and stress-mediated diseases are a growing problem in modern urbanized societies. Health care costs form a major expenditure in public budgets in many countries. New profitable solutions to regulate stress, prevent diseases and reduce costs of health care are called for (E.g. EU Grand Challenges). Existing research already show that visiting or viewing nature can help in promoting human health and preventing illnesses. Nature-based health and well-being services can also bring new income and livelihood especially in rural areas.

Scope: Nature visits or viewing nature can provide many kinds on health benefits, e.g. reduction of stress levels, reduced sympathetic nervous activity, reduction of morbidity, improvement of mood states, vitality, self-regulation and self-esteem, improved concentration and performance, and enhancement of the recovery from stress-mediated diseases. So far, little is known about the needed amounts and types of nature areas that can bring about these benefits. In addition, the health outcomes of nature are underestimated in land use planning, natural resource management and health care. The project will focus on the quantification of different types of health benefits and the potential or various types and sizes of nature areas to produce these benefits. The project will develop models to implement the health benefits into land-use planning and natural resource management as well as in health care and development of health and well-being services. The project will estimate the monetary value of the health outcomes of nature areas and the costs of producing these. The focus on the research is both in urban, peri-urban and rural nature areas nearby development centers that form a continuum of nature areas providing health benefits for urban societies.

Expected impact: The project will provide knowledge on the required amounts and types of nature spaces that can maintain and improve the health of various user and resident groups. The project will develop practical solutions to integrate health values of nature into the practice, e.g. in land-use and urban planning, green space management and health care. One important study area is to develop not only recreation but also nature-based tourism services that enhance health and well-being of various types of clientele. This has an important effect in promoting product development and business opportunities based on amenity benefits of forests also in rural areas. The research knowledge will generate management strategies for health-promoting nature areas and promote the product development of nature-based health and well-being services. It will also produce a cost-benefit analysis of the health outcomes of nature areas and their meaning to societies and public health at large.

Recommended size: collaborative project (large scale integrating project) 6 millions €

Proposed programme: Environment (Challenge 6.2 Sustainable use and management of land and seas. "It will contribute to maintaining and restoring the ecosystem capacity to deliver products and services required by industry and the society. It will also contribute to set-up multi-purpose "green infrastructures" based upon landscape ecology."

14. Incorporating civil society perspectives in forest policy and management by distinguishing social values based on 'citizenship values' or 'consumer choices'

Justification:

Generally civil society is viewed as a conglomeration of individuals and organizations without distinguishing the underlying cultural and social values guiding social action under different circumstances and social roles. Of central importance to forest management and policy is the difference in expression of values and interests when individuals are acting as 'citizens' or 'consumers'. There is a substantial body of scholarly work focused on the importance of this distinction in democratic policy making that draws from society in defining priorities and deciding what kinds of actions are desirable and feasible. However, little of this scholarship or research has focused on natural resource and forest policy and management. Given the critical role of civil society in sustainable forest and natural resources policy and management, it is critical to incorporate this area of research into these fields.

This topic is called for in the Strategic Research Agenda topic 5.3 – Citizens' Perspectives – especially the sub-topics on the role of citizens as political actors and on consumer behaviour and values.

Scope:

When individuals – or organizations – act as 'consumers', they express their 'preferences' in terms of what they would like to be able to 'consume' as economic actors – outdoor recreation, clean water, sustainably harvested wood, for example. However, when individuals and civil society organizations act as 'citizens' they are political actors and they draw upon deeply held common values of what is good for everyone. Indeed, biodiversity, clean air, climate change are all examples of citizen values of what is in the common or public interest; it is not a coincidence that these are also examples of public goods and services. Understanding these differences in the underlying reasons for social values in civil society could improve the ability of policy makers and managers to respond appropriately.

Very often civil society organizations are expressing 'citizen' values of what is in the common and public interest and often the need to provide or protect public goods and services. Understanding this role of civil society organizations is critical for effective policy making and management. All too often in natural resources and forest policy and management, civil society organizations are treated as 'consumers' with 'economic interests' that they want to protect. This is a serious error and has serious implications for policy makers and managers.

The intent of participatory processes in policy and management is to provide fora for the discovery and expression of citizen values of what is important for the common interest. When all participants are reduced to 'stakeholders', they are stripped of this citizen role and reduced to consumers. This means that a successful participatory process is one that *satisfices* the greatest number of 'consumer' desires. One result is that policy makers and managers use the logic and methods of 'tradeoff analysis' that displaces the common interest.

Given the critical problems facing Europe in terms of sustainability of public goods and services like biodiversity, clean water and clean air, sustainable ecosystems and so on, it is a high priority to develop new approaches to policy making and management that are based upon participatory models wherein the actors are considered as 'citizens' and their role is to discover and express 'common interests'. Only with new participatory approaches based upon citizenship can the hope of sustainability be achieved in Europe or anywhere.

Recommended size (instrument) and duration:

Large scale collaborative project - 3 to 4 years

Expected impact:

This research would bring together a broad range of disciplines ranging from moral philosophy to ecology and would demand innovative methodologies in order to not only explore citizen and consumer values, but the process of valuation to natural resources policy and management. This is an opportunity to bridge the gap between the social sciences and the biophysical sciences in which neither considers the ontological importance of society or environment to its theories and methods. Developing new holistic theories of social-ecological systems in which social action occurs within a specific context – historically, culturally, politically, socially – and ecologically would be a major contribution of this research effort.

These new theories and methods have the potential to build upon existing knowledge and practice in participatory processes and create new civic science approaches that are based upon citizenship and processes of discovery (science). These new approaches can be incorporated into a variety of on-going forest policy processes at all levels as well as into sustainable forest management processes in order to further build and elaborate on theory through practice.

Proposed Programme: KBBE, SSH