

# BECC Challenge Themes

To further develop the organisational structure of BECC and increase the integration of different disciplines, the former Clusters are replaced by *Challenge Themes*.

The vision of BECC is to provide a world-leading research environment, bringing together excellent research and training at Lund University and the University of Gothenburg, with the aim of addressing society's growing need for scientific knowledge to inform the integration of biodiversity and ecosystem services dimensions in policy formulation and decision-making, regionally and globally, in the face of a rapidly changing world. BECC aims to assess global change impacts on biodiversity and ecosystem services, with a particular focus on forest, agricultural and subarctic ecosystems, but also including effects on aquatic systems by runoff from forest and farmland. The main focus is Sweden, but embedded in European and global contexts.

*Grand Challenges* refer to issues where gaps in scientific understanding seriously constrain the ability to make informed decisions on issues of pressing concern for the well-being of people and the environment, today and in a future world affected by continued global change. BECC is organized in *Challenge Themes*, each relating to a Grand Challenge with regard to the impacts of climate and environmental change on biodiversity and ecosystem services, and the ability of society to adapt to the impacts, or mitigate their causes. Each Challenge Theme ("Theme" for short) thus focuses on an overarching issue of scientific importance, in need of scientific coordination, with high relevance to decision making and with potentially high impact on international research, today and in coming years.

Themes function as platforms for intellectual exchange and mutual learning, where researchers meet and develop ideas for new collaborations, research projects, networking, outreach and dissemination activities. To utilize the full potential of the wide range of experience and expertise represented within BECC, Themes cut across disciplines, departments as well as Lund and Gothenburg universities. In this way, the Themes create synergies and added value, bringing together modelling, empirical ecology, economics and social science analysis as well as the practical skills, professional networks and stakeholder contacts of different research teams and individuals.

In addition to acting as a meeting place for BECC researchers, important tasks for the themes are to take initiatives to develop new research projects and synthesis activities that require collaboration between research groups or engagement with stakeholders. To these ends BECC Challenge Themes:

- Synthesize the current state of knowledge and identify major knowledge gaps by creating interactions that bring together research groups and disciplines;
- Concretise specific research needs and opportunities relevant for achieving progress towards meeting the Grand Challenge of the particular Theme, formulating and regularly revising a research agenda for the Theme including specific research aims, and proposed activities to fulfil the aims;
- Advise the BECC board on how BECC as a whole should develop its research agenda, recruitments, funding instruments and support functions, communication and outreach,

organisation and governance to facilitate progress toward meeting the Grand Challenge the Theme addresses;

- Interact with stakeholders on the identification and implementation of sector-relevant applications associated to the Grand Challenge the Theme addresses.

Each Challenge Theme is led by a Theme Coordinator and two Deputy Theme Coordinators, appointed by the board for a mandate period (renewable) of two years. Themes have a budget to cover limited costs for arranging meetings and other activities. Themes are open to all participants in BECC; PIs as well as post-docs and PhD-students supported by BECC in particular are expected to contribute actively to the Challenge Theme which their research is associated to. Participation in multiple themes is permitted and encouraged. Themes organize regular meetings to exchange ideas, define the research agenda of the theme, take initiatives, including organizing internal or external workshops, inviting guest researchers, initiating *action groups*, and applying for external grants. Permitted activities can be covered by the allocated theme budget, while support for others can be sought using existing mechanisms in CEC/BECC. Themes, via their Coordinator, who reports to the Board, will also be crucial for supporting the Board in discussions about the need for future recruitments – performed in close collaboration with the departments associated to BECC – funding instruments and calls, support functions, communication, outreach and potential future adjustments in BECC's organisation and governance.

After discussions at the BECC annual meeting 2015, themes relating to identified societal and scientific Grand Challenges were discussed. The three Challenge Themes outlined below are distilled from this discussion. The scope and potential content of each Theme are intentionally defined only at a general level at present: Themes are tasked with initiating an internal process culminating in a written research agenda encompassing specific research aims and relating to key gaps and opportunities of relevance to meeting the Grand Challenge the Theme relates to. It is expected that the agenda will evolve and be revised as new knowledge is gained, or as new expertise is acquired, for example through recruitments, guest researcher visits, engagement in networks etc. There may also be additional themes proposed in the future. The current Challenge Themes are:

## Constraining the carbon cycle to characterise and mitigate climate change

The carbon cycle dynamically couples the biosphere, oceans and atmosphere, and links societal and biophysical dimensions of the Earth system. A *grand challenge* is to reduce wide uncertainty in the carbon cycle, its responses to anthropogenic and biophysical drivers, and legacy effects of slow-responding processes of vegetation and soils, combining empirical ecology and modelling, informed by studies of the past, and accounting for links across scales from the local to the regional and global. Accurately quantifying and projecting changes in carbon balance, regionally and globally, across compartments and sectors, and accounting for links to other biogeochemical cycles (e.g. N and P), is central to understanding and projecting climate change and its impacts on ecosystems and biodiversity. This in turn provides a necessary basis for the design of mitigation strategies to sequester greenhouse gases from the atmosphere through land use and management interventions.

## Mainstreaming [consideration of] ecosystem services into land use decision-making under global change

Climate, environmental and socio-economic change may negatively impact ecosystems and their services, but may also provide opportunities such as increased agricultural and silvicultural production. A *grand challenge* is to integrate the private and public value of ecosystem services into management and policy while accounting for the projected impacts of climate, land-use and other drivers of change. The design and assessment of adaptation strategies needs to build on future projections and their uncertainties, but also on studies of the motivations, behaviour and interactions of stakeholders and institutions facing different adaptation choices, and having different, sometimes conflicting, goals. Tools are needed that can describe key aspects of change, and consequences of proposed adaptation measures, in terms of metrics of interest to decision-makers ranging from farmers and forest owners to regulators, policy makers, government agencies dependent industries, while accounting for governance factors that may help or hinder the realisation of adaptation goals.

## Effective strategies for biodiversity conservation under the combined pressures from climate change and land use change

Climate change threatens biodiversity directly, but also indirectly through changes in land-use caused by attempts to mitigate or adapt to climate change. The direct and indirect consequences of climate change may have compounding effects, such as habitat loss that constrains species range shifts. A *grand challenge* is to develop a scientific basis for the design of biodiversity conservation strategies under climate change, building on the relative merits of strengthening resilience, using traditional conservation actions such as protected areas, versus enhancing the ability of species to adapt to climate change. This will require improved knowledge of how organisms respond to the combined effects of climate change and habitat deterioration or loss through responses such as range shifts, adapting or going extinct.