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The network promoting European research on biodiversity, ecosystem services and nature-based solutions

BiodivERsA 2019-2020 Call for proposals

Biodiversity and climate change

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The network promoting European Research on biodiversity, ecosystem services and nature-based solutions

BiodivERsA

BiodivERsA is the European network of programmers and funders of research on biodiversity, ecosystem services and nature-based solutions. Created in 2005, and transformed into a long-term partnership in June 2018, BiodivERsA is a network of 39 agencies and ministries from 25 countries.

Since 2008, BiodivERsA has launched 10 calls and has funded 125 transnational research projects selected both for their scientific excellence and societal, policy relevance, quality of stakeholder engagement for a total amount of over 237.3 million euro (including ca. 149.8 million euro of money directly raised by the BiodivERsA partners and the European Commission).

To further strengthen the European Research Area on biodiversity, BiodivERsA has developed a great diversity of activities ranging from research mapping, programming and funding, to stakeholder engagement, capacity building, dissemination of projects' outputs and knowledge brokerage.

For more information: www.biodiversa.org

BiodivClim

In September 2019, BiodivERsA launched a programme named BiodivClim for supporting research on biodiversity and climate change. This programme will run until August 2024.

BiodivClim consists of a joint call for international research projects, co-funded by the European Commission and a set of other activities addressed to researchers, non-academic stakeholders and research programmers of this domain. These activities include networking and capacity building events for researchers, as well as dedicated support and events for the engagement of stakeholders and for the uptake of research results in non-academic realms. Building on the contributions from the BiodivClim and previous BiodivERsA funded projects, scientific foresight work will also be performed, aiming to identify new research frontiers, gaps and priorities related to biodiversity and climate change.

BiodivClim has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 869237

The BiodivClim partners

1. Belgian Science Policy Office, BELGIUM - Coordinator
2. Austrian Science Fund, AUSTRIA
3. The Fund for Scientific Research - Wallonia, BELGIUM
4. The Research Foundation - Flanders, BELGIUM
5. National Science Fund Bulgaria , BULGARIA
6. Technology Agency of the Czech Republic, CZECH REPUBLIC
7. Innovation Fund, DENMARK
8. Estonian Research Council, ESTONIA
9. The Academy of Finland, FINLAND
10. French National Research Agency, FRANCE
11. French Foundation for Research on Biodiversity, FRANCE
12. Guadeloupe Region, FRANCE
13. Reunion Region, FRANCE
14. Federal Office for Agriculture and Food, GERMANY
15. Federal Ministry of Food and Agriculture, GERMANY
16. German Research Foundation, GERMANY
17. German Aerospace Centre, on behalf the German Federal Ministry of Education and Research, GERMANY
18. General Secretariat for Research and Innovation, GREECE
19. Environmental Protection Agency of Ireland, IRELAND
20. Ministry of Environmental Protection, ISRAEL
21. State Education Development Agency, LATVIA
22. Research Council of Lithuania, LITHUANIA
23. Research Council of Norway, NORWAY
24. National Science Centre, POLAND
25. Portuguese National Funding Agency for Science, Research and Technology, PORTUGAL
26. Regional Fund for Science and Technology, Azores, PORTUGAL
27. The Executive Agency for Higher Education, Research, Development and Innovation Funding, ROMANIA
28. The Slovak Academy of Sciences, SLOVAKIA
29. Department of Science and Technology, SOUTH AFRICA
30. The Spanish State Research Agency, SPAIN
31. Regional Government of the Canary Islands, SPAIN
32. Swedish Research Council for Environment, Agricultural Sciences and Spatial Planning, SWEDEN
33. Swiss National Science Foundation, SWITZERLAND
34. Ministry of Higher Education and Scientific Research, TUNISIA
35. Ministry of Agriculture and Forestry, TURKEY

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From the BiodivClim Coordinator and European Commission

The World Economic Forum's latest Global Risks report (2021), looking back at a year ravaged by a global pandemic, still ranked climate action failure and biodiversity loss within the top five global risks both in terms of likelihood and impact. Also, as highlighted during the recent One Planet Summit for biodiversity organized in Paris, it is now also widely recognised that climate change and biodiversity loss are twin crises that should be tackled together. In addition to the direct impacts on the economy, societies and people's health, rapidly advancing climate change negatively impacts many of the world's species and ecosystems, driving biodiversity loss. At the same time, protecting and restoring biodiversity is crucial to addressing climate change. Both the Convention on Biological Diversity (CBD) and the United Nations Framework Convention on Climate Change (UNFCCC) indeed recognize that working with nature to conserve, manage and restore ecosystems – known as nature-based solutions – is one of the most cost-effective approaches to both mitigating and adapting to climate change, and therefore to reach the targets.

It is now also widely recognised that climate change and biodiversity loss are twin crises that should be tackled together.

Interlinkages between climate change and biodiversity loss thus need to be further understood and addressed. BiodivERsA therefore decided to address these needs by launching a Joint Call for research projects on "biodiversity and climate change", which was co-funded by the European Commission under the leadership of Ursula von der Leyen through the BiodivClim programme. The relevance of such research topic was highlighted by the number of eligible pre-proposals received: 231. This is the highest number of pre-proposals ever received for a BiodivERsA Call!

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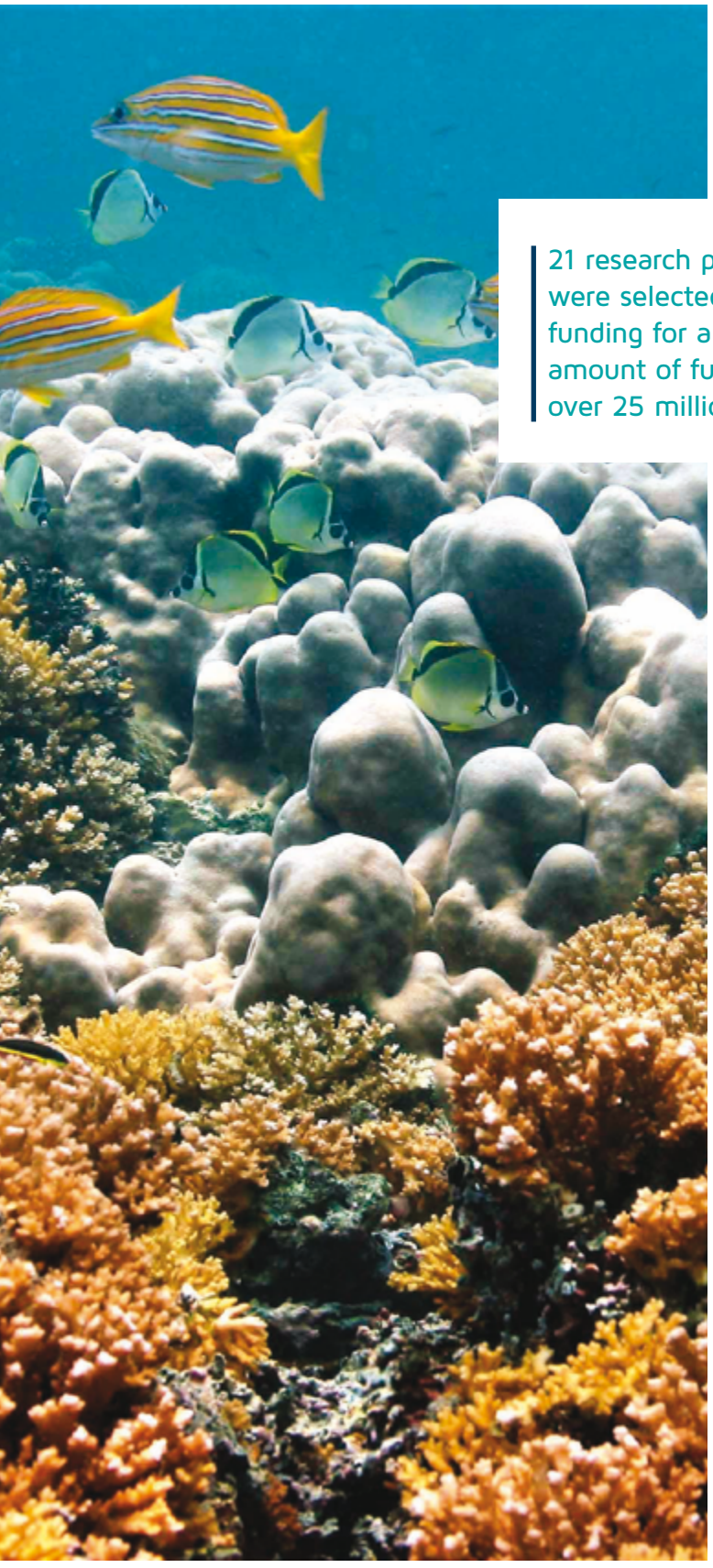


> 21 research projects were selected for funding for a total amount of funding of over 25 million euros.

The call clearly aimed at funding proposals addressing both biodiversity and climate change issues: research questions, expected impacts and composition of consortia should reflect this. In the end, 21 research projects were selected for funding for a total amount of funding of over 25 million euros; they will hopefully help to advance the research field while providing stakeholders and policy makers with new evidences and concrete knowledge for better informed actions and decision-making. Congratulations to the winning consortia for the excellent quality of their proposals and for their commitment in bringing science forward to combat this double crisis.

We would like to warmly thank the evaluation panel members as well as the external reviewers who ensured a high-quality evaluation process and a fair ranking of the pre- and full proposals. We would also like to express our gratitude to the different ministries and funding agencies that participated in the call. Their efforts allowed a smooth call implementation and funding of the highest possible number of top-ranked proposals.

This brochure gives insight on the call process, from the call development to the selection of proposals and their follow-up. It gives an overview of the profile of the submitted proposals and a short description of each of the 21 projects selected for funding.

We wish you a pleasant reading!

Hilde Eggermont
BiodivClim Coordinator (BelSPO)

Josefina Enfedaque
Senior Expert for Biodiversity Research
DG Research and Innovation, European Commission

Overview of the BiodivClim Call

Summary of the 2019-2020 BiodivERsA Call

The aim of this call was to support transnational research projects jointly addressing issues at the nexus between biodiversity and climate change, properly taking into account socio-ecological contexts, and promoting innovative research for more informed decision-making.

Four major (non-exclusive) themes were addressed by the call.

Projects could address one or several themes. Projects combining aspects from two or more themes were encouraged.

Theme 1: Consequences of climate change on biodiversity and nature's contributions to people.

Evaluating the effects of climate change on biodiversity, with a focus on genetic, species, structural, functional or ecosystem diversities was at the core of this theme. Research on the cascading effects of climate change on biodiversity, ecosystem functioning and services was highly welcomed.

Theme 2: Climate-biodiversity feedback processes.

This research theme focussed on the feedbacks of biodiversity change to climate. The research project had to aim at quantifying the consequences of major modifications or loss of biodiversity on climate change. This theme also encompassed research seeking to understand how societal responses to biodiversity change may have consequences for both the climate system and for the ways in which societal actors are (and are not) able to undertake effective mitigation of and adaptation to climate change.

Type of research funded

This call targeted transdisciplinary projects of 3 years, involving partners from at least three different countries participating in the call.

Given the nature of the research supported through this call, proposals had to engage different disciplines including biological, natural, social, economic, political sciences and/or humanities.

The added value of international collaboration and the level of collaboration between teams from different countries had to be clearly demonstrated to allow for upscaling of knowledge beyond the national level, or for comparative approaches of different local contexts. Contributions to global research programs, assessment bodies, and multi-lateral environmental agreements, were encouraged.

Theme 3: Potential of nature-based solutions for mitigating and adapting to climate change.

The objective of this theme was to evaluate the effectiveness of nature-based solutions for climate change mitigation and adaptation along with other environmental, economic and social benefits, while preserving or strengthening biodiversity. Studying interactions between different kinds of nature-based solutions was also welcomed.

Theme 4: Synergies and trade-offs between policies on biodiversity, climate and other relevant sectors, and the role of agents of change.

This theme's objective was to assess the synergies and trade-offs between policies and strategies developed for the preservation and restoration of biodiversity and related ecosystem services, climate change mitigation or to address other key societal challenges.

Call process

The topic of this call for research proposals was a priority for the BiodivERsA network and its members, as defined in the BiodivERsA Strategic and Research Innovation Agenda (2017-2020) and Implementation plan (2017-2019). Up to now, connections between biodiversity and climate change had not been the specific focus of a call launched by BiodivERsA, yet this topic was recognised as being of vital importance. That is why BiodivERsA, together with the European Commission decided to launch an ambitious joint co-funded call in 2019-2020 addressing this issue.

The content and procedures for this joint co-funded call were defined by the 34 national and regional funding organisations from 26 countries participating in the call. ANR, the French National Research Agency, hosted the Call Secretariat and thus played a key role in the implementation and success of the call.

The call was launched on the 2nd of September 2019 with a deadline to submit pre-proposals on the 5th of November 2019. Eligible pre-proposals were evaluated by an independent Evaluation Committee and the shortlisted pre-proposals were invited to submit full proposals by the 21st of April 2020. The full proposals were evaluated by the independent Evaluation Committee as well and by external reviewers between April and early July 2020. Based on the results of the evaluation process and without modifying the ranking of the projects established by the independent Evaluation Committee, the funding organisations agreed on the number of projects to be recommended for funding in September 2020, allowing for a start of the funded projects between December 2020 and April 2021.

All the projects have a 3-years duration. During their lifetime, they will be requested to submit a mid-term and a final report.

Agencies and organisations participating to the call

FWF – AUSTRIA
BELSPO – BELGIUM
F.R.S.-FNRS – BELGIUM
FWO – BELGIUM
CONFAP – BRAZIL
FAPESP – BRAZIL
BNSF – BULGARIA
TACR – CZECH REPUBLIC
IFD – DENMARK
ETAG – ESTONIA
AKA – FINLAND
ANR – FRANCE
GUA-REG – FRANCE, GUADELOUPE REGION
REU-REG – FRANCE, REUNION REGION
DFG – GERMANY
DLR-PT – GERMANY
GSRT – GREECE
EPA – IRELAND
MOEP – ISRAEL
VIAA – LATVIA
RCL – LITHUANIA
RCN – NORWAY
NCN – POLAND
FCT – PORTUGAL
FRCT – PORTUGAL, AZORES
UEFISCDI – ROMANIA
SAS – SLOVAKIA
DST – SOUTH AFRICA
AEI – SPAIN
GOBCAN – SPAIN
FORMAS – SWEDEN
SNSF – SWITZERLAND
MHESR – TUNISIA
TAGEM – TURKEY

Composition of the Evaluation Committee

The composition of the Evaluation Committee slightly differed between step 1 and step 2. All EvC members that participated either to only step 1 or step 2 or to both steps are mentioned below.

Scientific experts

Sir Robert Watson (Chair of the Evaluation Committee) - Former IPBES Chair, UNITED STATES

Christian Ammer – University of Göttingen, GERMANY

Kate Brauman – University of Minnesota Institute on the Environment, UNITED STATES

Iain Brown – University of Dundee, UNITED-KINGDOM

Lijbert Brussaard (first step only) – Wageningen University, THE NETHERLANDS

Harriet Bulkeley (first step only) – Durham University & Utrecht University, UNITED KINGDOM & THE NETHERLANDS

Alex Bush (first step only) – Lancaster University, UNITED KINGDOM

Scott Collins – University of New Mexico, UNITED STATES

Simon Ferrier – CSIRO Land and Water, AUSTRALIA

Niki Frantzeskaki (second step only) – Swinburne University of Technology, AUSTRALIA

Lauchlan Fraser – Thompson Rivers University, CANADA

Jasmin Godbold – University of Southampton, UNITED KINGDOM

Hefin Jones – Cardiff University, UNITED KINGDOM

Rik Leemans – Wageningen University, THE NETHERLANDS

Carolyn Lundquist – NIWA and the University of Auckland, NEW ZEALAND

Frits Mohren (second step only) – Wageningen University, THE NETHERLANDS

Nathalie Pettorelli – Zoological Society of London, UNITED KINGDOM

Jake Rice – Ministry of Fisheries and Oceans, CANADA

Carlo Rondinini – Sapienza University of Rome, ITALY

Melinda Smith (first step only) – Colorado State University, UNITED STATES

Esther Turnhout (first step only) – Wageningen University, THE NETHERLANDS

Peter Verburg – Vrije Universiteit Amsterdam, THE NETHERLANDS

Jan D van Elsas – University of Groningen, THE NETHERLANDS

Stephen Williams (first step only) – James Cook University, AUSTRALIA

Policy/management experts

Simon Gardner (Vice Chair of the Evaluation Committee) – Natural Environment Research Council, UNITED KINGDOM

Jos Brils – Deltares Institute, THE NETHERLANDS

Peter Cochrane – IUCN, AUSTRALIA

Simon Duffield – Natural England, UNITED KINGDOM

Bernal Herrera-Fernández (first step only) – Fundecor, COSTA RICA

Colin Hindmarch – Independent Consultant, UNITED KINGDOM

Katia Hueso Kortekaas – Universidad Pontificia de Comillas, SPAIN

Marcel Kok (first step only) – PBL Netherlands Environmental Assessment Agency, THE NETHERLANDS

James Lloyd – Nature4Climate, UNITED KINGDOM

Vinod Mathur – National Biodiversity Authority, INDIA

Eugenie Regan (first step only) – UNEP-WCMC, IRELAND

Cristina Romanelli (first step only) – World Health, CANADA

Yulia Stange – ClientEarth, UNITED KINGDOM

Sunandan Tiwari – ICLEI local, GERMANY

Wouter Vanneuville – European Environment Agency, DENMARK

Esther Wolfs – Wolfs Company, THE NETHERLANDS

Evaluation process

The submitted proposals were evaluated by an independent Evaluation Committee at step 1 and by an independent Evaluation Committee and external reviewers at step 2. Both the Evaluation Committee and the external reviewers consisted of scientific experts, as well as policy/management experts and practitioners.

The proposals were evaluated following specific guidelines and according to specific criteria that were pre-defined and communicated in advance to the applicants.

Evaluation criteria at the first step of the evaluation process were: (1) fit to the scope of the call; (2) novelty of the research; and (3) transnational added value.

Evaluation criteria at the second step of the evaluation process were: (1) scientific excellence; (2) quality and efficiency of the implementation; (3) impact.

At each step, three scores corresponding to the above-mentioned criteria were given to each proposal. While the three criteria had the same weight at step 1, they had a different weight at step 2, with a slightly higher weight on scientific excellence over impact and a higher weight on impact over implementation. Proposals with scores below the pre-defined threshold values were not ranked nor considered for funding.

The first Evaluation Committee meeting was organised in Brussels from the 27th to the 30th of January 2020 and the second step of the Evaluation Committee meeting was held virtually from the 30th of June to the 2nd of July 2020 due to the sanitary situation. During these meetings, the Evaluation Committee members had the opportunity to discuss about the pre- and full proposals and to agree on the final scores to be attributed to the pre- and full proposals.

This evaluation process led to the establishment of a final ranking list of the best proposals, which was sent to the Call Steering Committee composed of the national and regional funding organisations participating to the call. The funders then decided on the maximum number of top-ranked projects that would be funded, strictly following the ranking list.

From the Evaluation Committee Chairs

It was a pleasure to be invited to act as Chair and Vice-Chair of the Evaluation Committee of the 2019-2020 “Biodiversity and Climate Change” call for proposals, given the outstanding quality of the scientific and policy evaluation committee members and the quality of the pre-proposals and full proposals. The composition of the evaluation committee members was international and gender diverse, with complementary scientific and policy skills.

The topic chosen was of immense importance, i.e., the interactions between climate change and biodiversity. Indeed, BiodivERsA should be congratulated on choosing this topic at a most opportune time.

Climate change and loss of biodiversity threaten the well-being of current and future generations. Unfortunately, there is no doubt that we are not on track to meet the Paris Climate goal of limiting climate change to less than 2°C compared to pre-industrial levels, let alone the aspirational goal of 1.5°C, and none of the 2020 Aichi targets were met. Projected changes in climate and the continued loss of biodiversity will undermine achieving the UN Sustainable Development Goals, especially food and water security, human health, and poverty alleviation. The current Paris climate pledges place us on a pathway to a warming of 3-4°C, and the continued degradation of nature places one million species at risk of extinction. The scope of the call for proposals recognizes that climate change is becoming an increasingly important driver of biodiversity loss, and that losses of biodiversity in turn affect climate, and that we need an improved knowledge of the interactions between them.

The call covered four critical issues: consequences of climate change on biodiversity and natures contributions to people; climate-biodiversity feedback processes; potential of nature-based solutions for mitigating and adapting to climate change; and synergies and trade-offs between policies on biodiversity, climate and other relevant sectors, and the role of agents of change.

The 21 research projects funded for over 25Mio€ address each of these four areas, with some proposals focusing on one area, whereas others address several areas. Climate change mitigation and adaptation are covered, as are all areas of biodiversity, i.e., terrestrial, freshwater and marine ecosystems.

The selected proposals are both trans-disciplinary and innovative, and will require close working between scientists and stakeholder communities. They will apply research excellence to the needs of decision-makers, within an international context. As a result, they promise to be highly relevant in both policy and societal terms. The research findings will provide knowledge for future international assessments such as the Intergovernmental Science-Policy Platform for Biodiversity and ecosystem Services (IPBES) and the Intergovernmental Panel on Climate Change (IPCC), which feed into the negotiations and work programs of the UN Convention on Biodiversity and the UN Convention on Climate Change.

The committee members were incredibly constructive in their assessment of the quality of the pre-proposals and full proposals, aided significantly by the external reviews. When differences of opinion arose, they were quickly resolved by consensus. This made chairing the scientific and policy sub-committees extremely easy and enjoyable. However, none of this would have been possible without the incredibly efficient secretariat. They made the whole process run smoothly, which was no small task given the final meeting to select the top proposals to be funded had to be done virtually due to the impacts of the Covid-19 pandemic. The committee members spanned 17 different time zones, yet with careful planning by the secretariat, we completed our work on schedule.

Professor Sir Bob Watson
Chair of the Evaluation Committee

Dr Simon Gardner
Vice-Chair of the Evaluation Committee

Analysis of the call results

Analysis of the call results

Overall figures of the call

	No. of proposals	No. of teams	Budget
Submitted pre-proposals	231	1,516	241.8 M€
Submitted proposals	82	553	98.9 M€
Selected proposals	21	162	25.07 M€

With a total of 231 eligible pre-proposals submitted and 1,516 participating teams, this 2019-2020 call is the BiodivERsA call, which attracted the highest number of proposals. The interest from the scientific community regarding the different topics and themes proposed within the call was strongly identified.

Out of the 231 pre-proposals received, the Call Steering Committee decided to fund the 21 highest ranked proposals for a total amount of over 25 million euros, which represents a success rate of ca. 9%. Given the very high competitiveness of the call, the success rate was lower than the average success rate in BiodivERsA calls (which is of 18%). Yet, thanks to the high flexibility of several funding organisations who agreed to increase their budget, it was possible to fund the maximum number of top-ranked proposals.

Geographical origin of the applicants

The large majority (93.6%) of the teams who submitted a pre-proposal were from the 34 funding organisations' countries participating in the funding of the call, i.e. Austria, Belgium, Brazil, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France (including the Guadeloupe and Reunion Region), Germany, Greece, Ireland, Israel, Latvia, Lithuania, Norway, Poland, Portugal (including the Azores), Romania, Slovakia, South Africa, Spain (including the Canary Islands), Sweden, Switzerland, Tunisia and Turkey.

The remaining 6.4% came mostly from European countries not participating in the call (3.3%), including the United Kingdom (1.2%), Italy (0.9%), the Netherlands (0.6%) and to a lesser extent from Cyprus, North Macedonia, Serbia and Slovenia. The other 3.1% of the applicants came from non-European countries not participating in the Call, i.e. United States of America (0.7%), Canada (0.3%), Kenya (0.3%), Australia (0.3%) or Algeria, Bolivia, China, Chile, Indonesia, Iran, Japan, New Zealand, Senegal.

Teams from countries not participating in the Call were sub-contracted or self-funded Partners.

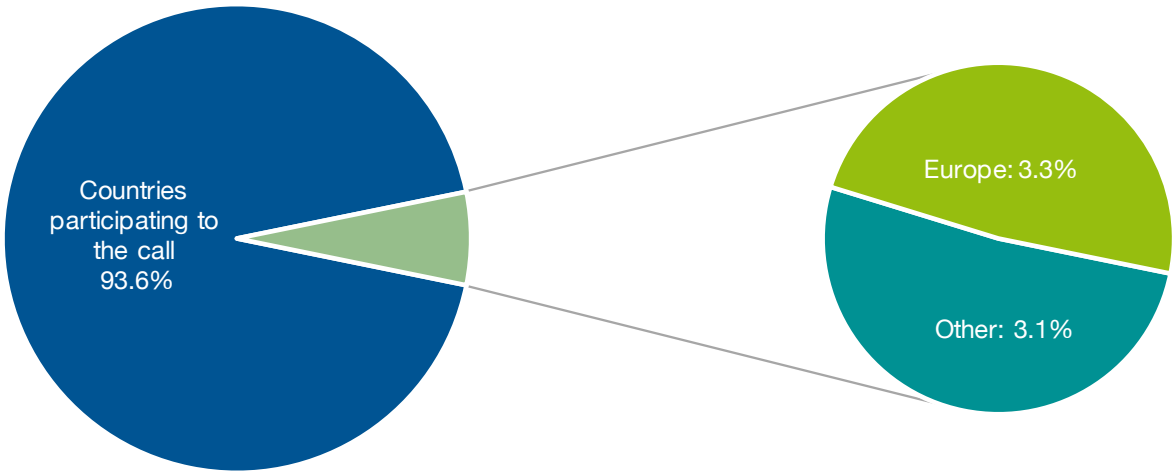


Fig. 1: Geographical origin of the applicants participating in the 2019-2020 call

Reserved and requested budgets

The reserved budgets for the participating countries were published during the announcement of the call which might have influenced the budget requests made by applicants. The highest values of both reserved and requested budgets were observed for France, Germany, Sweden and Switzerland which were indeed the countries with the highest reserved budgets.

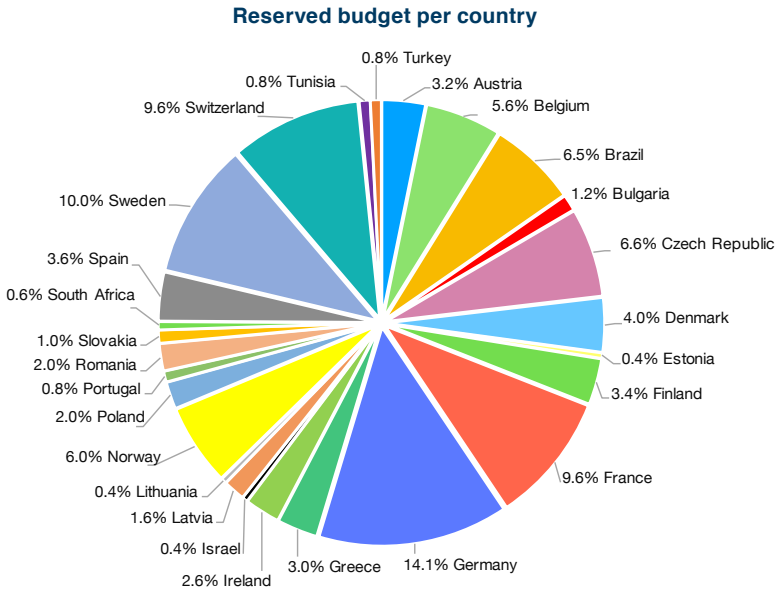


Fig. 2: Distribution of the reserved budget among participating countries

In some cases, such as for Austria, Belgium (Flanders), Denmark, Norway and Sweden, the reserved budget proved to be insufficient compared to the financial demand from the successful applicants. Yet, thanks to the flexibility of these funding organisations, this did not jeopardise the call outcome. On the other hand, some funding organisation did not use their reserved budget, due to a lower success of their research community.

Ultimately, the 21 top ranked projects could be funded, strictly following the ranking list established by the Evaluation Committee.

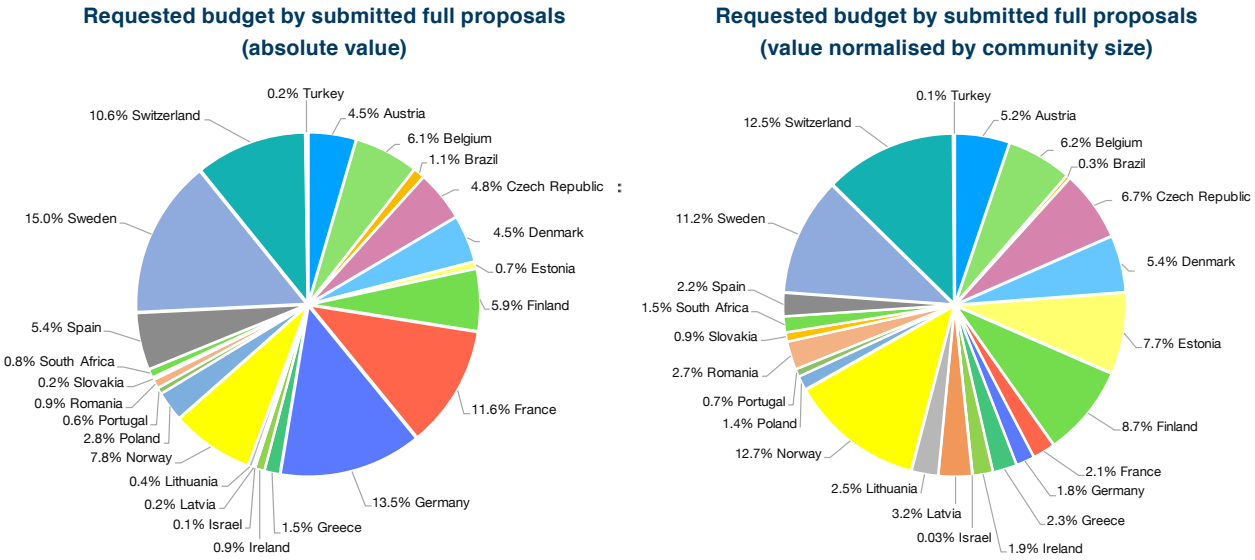


Fig. 3: Budget requested to participating countries by the applicants in the submitted full-proposals, in absolute values (left) and values normalised according to the size of the national scientific community (right) [source Eurostat 2017, UNESCO 2017, all sectors, Full Time Equivalent unit]. Note that depending on the countries, requested budget may, or may not, include salaries for permanent positions.

Despite a relatively low participation in terms of requested budget (Fig. 3), the scientific communities from Estonia, Norway and to a lesser extent Latvia and Lithuania seem to have responded well to this call once the budget requests are normalised according to the estimated number of researchers from all scientific areas in each country. Unfortunately, we do not have numbers of the size of the biodiversity research communities per se, which would have improved the normalisation.

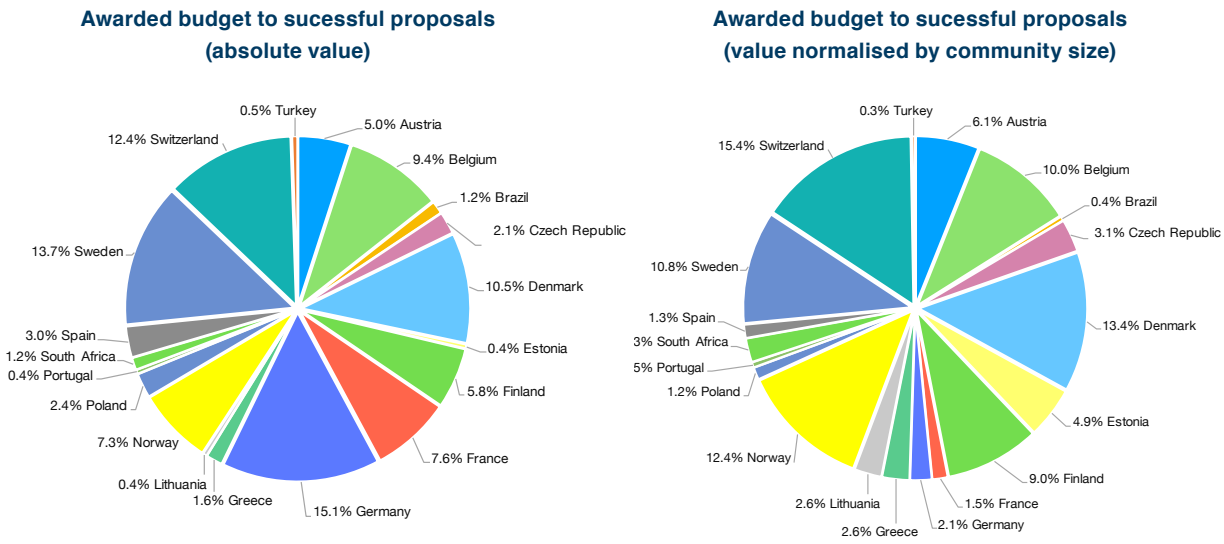


Fig. 4: Distribution of awarded budget to the successful applicants among participating countries in absolute value (left) and in values normalised according to the size of the national research community (right) [source: Eurostat 2017, UNESCO, all sectors, Full Time Equivalent unit]

The teams funded through the 2019-2020 call came from 19 different countries (Fig. 4). The largest number of funded teams mostly came from the countries with the highest amount of reserved funding, namely Germany, Sweden and Switzerland.

Again, it is worth comparing the funding amounts between countries both in terms of absolute values and in terms of amounts normalised according to the estimated number of researchers from all scientific disciplines in each country (Fig. 4). These normalised numbers are more representative in highlighting the high success rate observed for countries such as Denmark, Estonia, Finland, Norway and Switzerland.

Success rate per country

The Belgium, Danish, South African and Turkish research teams applying to this call had a particularly good success rate at the second step of the evaluation process (ratio of granted to requested funded amounts), i.e. above 30% (Fig. 5). These figures should however be viewed with caution for some countries, given their low number of submitted proposals.

Despite the participation of Bulgaria, Ireland, Israel, Latvia, Romania, Slovakia and Tunisia to the call, none of the 21 funded projects involved a research team from these countries, likely due to the low number of submitted proposals including teams from these countries. The research teams from Bulgaria and Tunisia were no longer involved at the second step of the evaluation process.

The same situation occurs for the overseas, as none of the 21 funded projects included teams from their territories (particularly for Réunion, the Canaries Islands, Guadeloupe and Azores who participated in this call). Again, this is largely due to the low number of proposals submitted by their teams. Only 1.4% of the teams in submitted pre-proposals and 0.7% in submitted full-proposals were from these Outermost Regions (ORs) or Overseas Countries and Territories (OCTs).

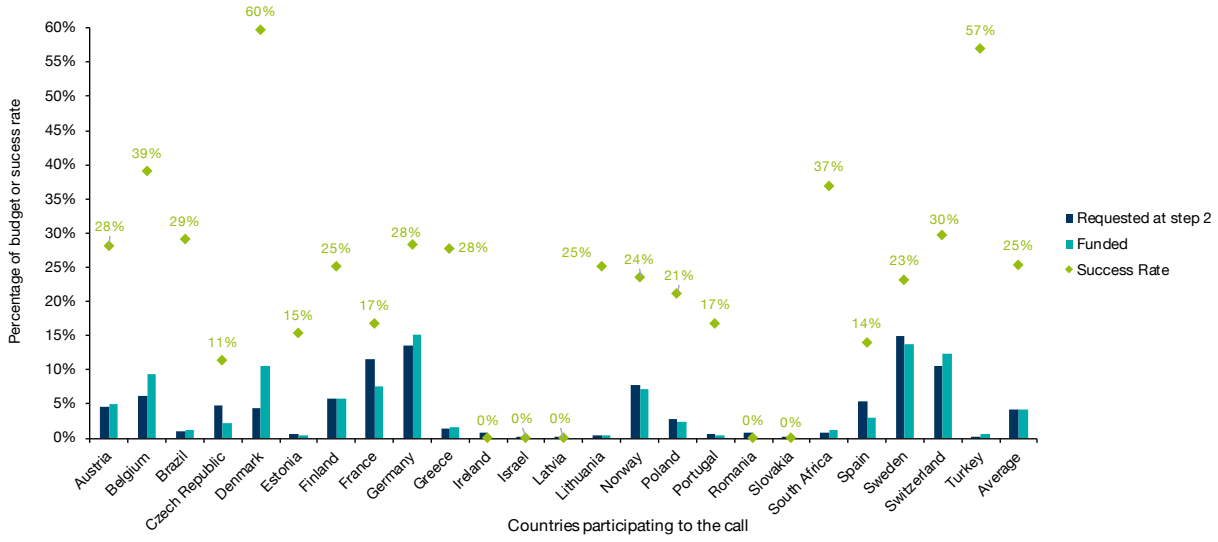


Fig. 5: Comparison of the percentage of budgets in the proposals between countries at the submission phase (requested at step 2 – blue bars) and after selection (funded – turquoise bars), along with the financial success rate (green diamonds)

Project coordinators

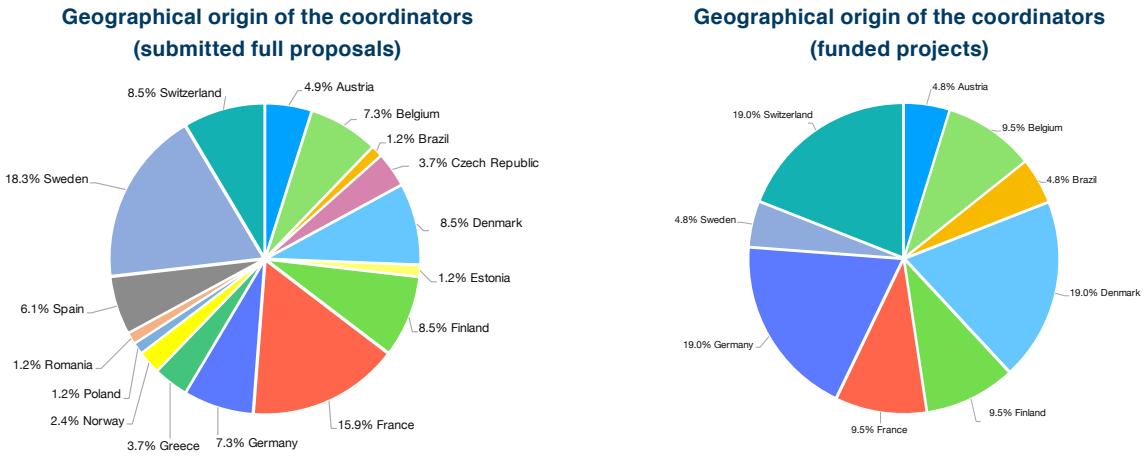


Fig. 6: Geographical origin of the coordinators in the submitted full-proposals (left) and funded projects (right)

At the full proposal submission stage, the project coordinators represented 16 countries participating in the call (Fig. 6), whereas the coordinators of the pre-proposals represented 24 countries participating in the call (out of 26).

In the end of the process, the coordinators of the funded projects only come from 9 countries. Again, these figures should be viewed with caution since they represent the geographical spread of coordinators only. Still, it can be noted that the Danish, German and Swiss coordinators were very successful.

Call themes and sub-themes addressed by the proposals

This 2019-2020 call was composed of four main themes: "Consequences of climate change on biodiversity and nature's contributions to people" (theme 1), "Climate-biodiversity feedback processes" (theme 2), "Potential of nature-based solutions for mitigating and adapting to climate change." (theme 3) and "Synergies and trade-offs between policies on biodiversity, climate and other relevant sectors, and the role of agents of change" (theme 4). One project could address several themes.

During the submission phase, the project's coordinator had to indicate to which theme(s) they applied.

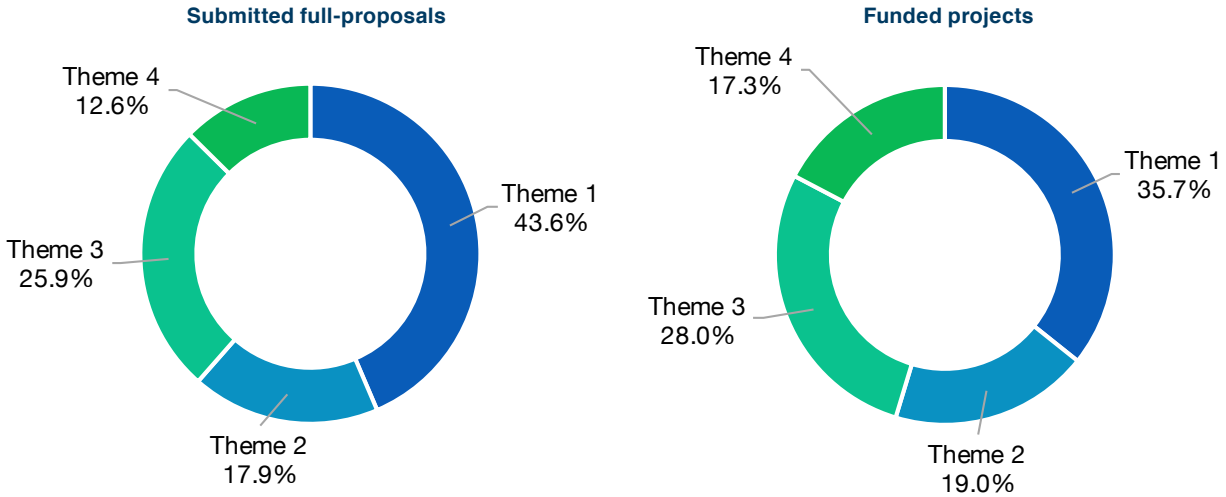


Fig. 7: Percentage of total requested budget for themes 1, 2, 3 and 4 in the submitted full-proposals (left) and funded projects (right).

Overall, there was a fairly good balance in the way the full-proposals and funded projects addressed the four themes of the call (Fig 7), with a slightly higher interest for theme 1 on the consequences of climate change on biodiversity and nature's contributions to people, and somewhat lower interest for Theme 4 on synergies and trade-offs between policies.

Studied environments

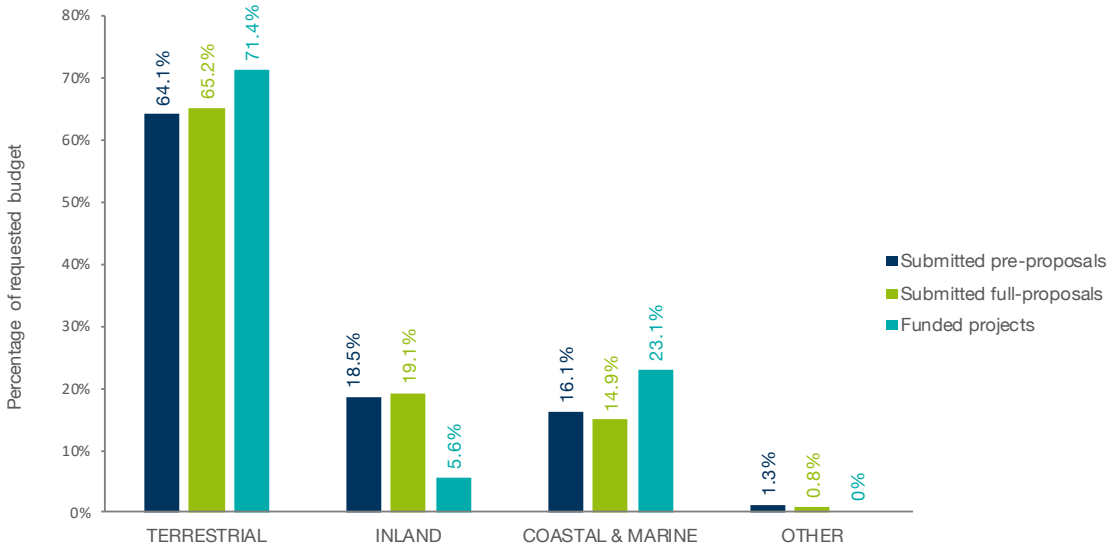


Fig. 8: Distribution of budgets of submitted pre-proposals, full-proposals and funded projects according to the studied environments. One proposal can address several environments

The majority of submitted and funded proposals focused on terrestrial ecosystems (Fig. 9), whereas those focusing on inland water and marine/coastal environments were fewer. This is a general tendency in BiodivERsA calls and this may be due to the fact that there are other well-known funding resources available for marine biodiversity research at the European level.

The proposals addressing other environments were planning studies on solar salterns or brackish/transitional waters.

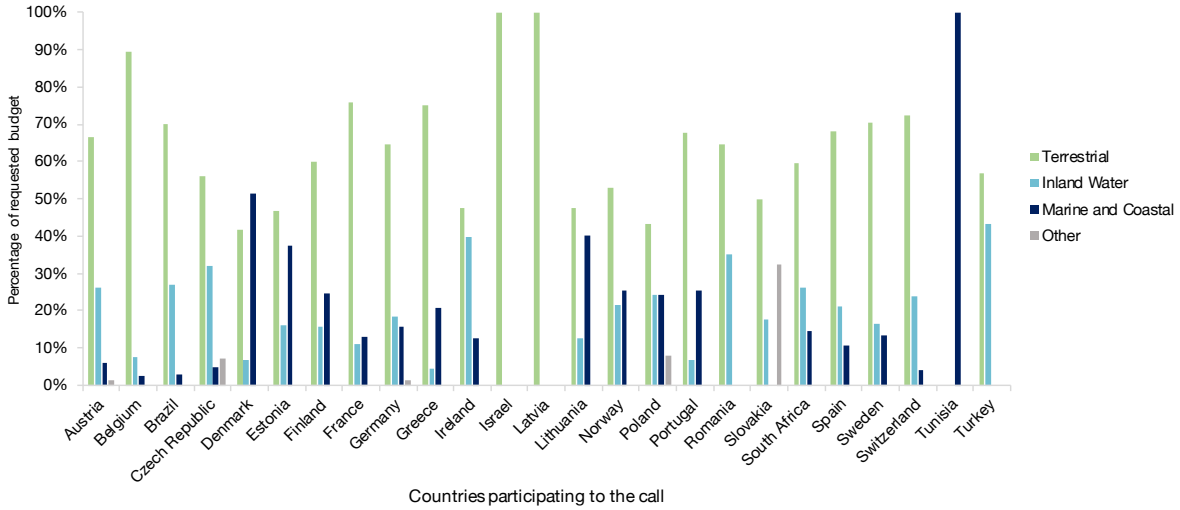


Fig. 9: Percentage of the requested budget in the submitted full-proposals by country according to the studied environment

Ireland and Turkey had the highest portion of inland water-focused submitted full-proposals. Denmark, Estonia, Lithuania and Tunisia were also among the countries with the highest proportion of full-proposals focusing on marine and coastal environments (Fig 10).

Given the small number of teams originating from some countries (including Bulgaria, Estonia, Latvia, Lithuania, Ireland, Israel, Slovakia, South Africa, Tunisia and Turkey), these figures should be taken with caution.

Conclusion

The analysis presented above provides a good insight into the implementation and results of the 2019-2020 COFUND Call. The following aspects were found useful for future calls:

- Overall, the extremely high number of pre-proposals received shows the relevance of the topics of this call for the research communities.

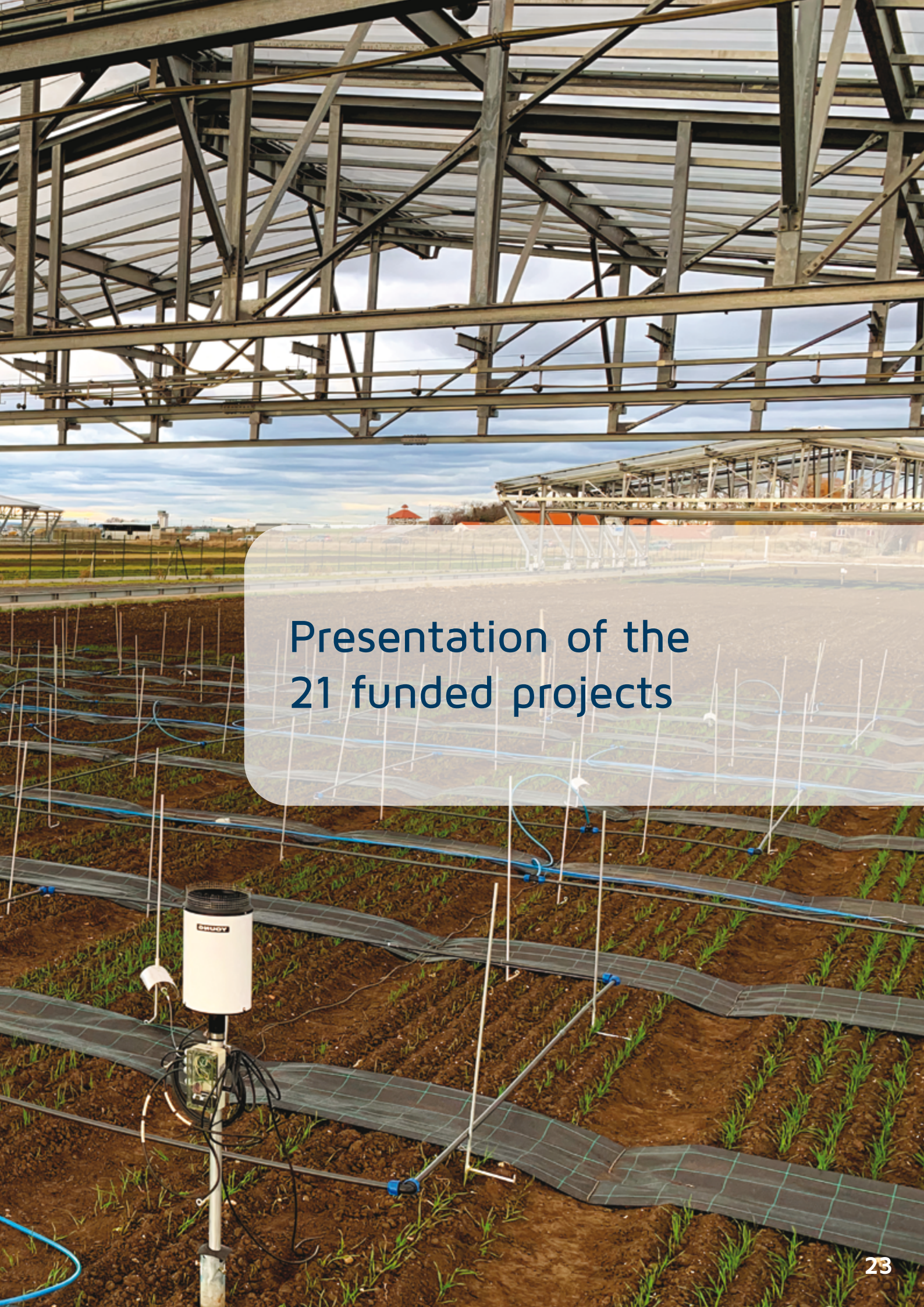
- Unfortunately, some countries and regions participating to the call did not have any teams in the 21 proposals selected for funding. This was the case of Bulgaria, Ireland, Israel, Latvia, Slovakia, Tunisia, Outermost Regions (ORs) and Overseas Countries and Territories (OCTs). This situation can be largely explained by the fact that these teams were not well represented in the submitted pre-proposals, and subsequently full proposals.

- Thanks to the initial balance in the amounts of funding reserved by countries and to the flexibility of funding organisations to increase their budget when needed, BiodivClim partners were able to fund the highest number of top ranked projects, strictly following the outputs of the selection procedure. Yet, the success rate is lower than the average BiodivERsA success rate (18%), due to the very high competitiveness of this call (231 eligible pre-proposals received!).

- BiodivERsA and BiodivClim will now implement a range of activities and a continuous dialogue with the funded projects to increase the outcomes of the individual projects and the program as a whole.

Photo from the SUSTAIN COCOA project: cocoa pod in Ghana

Photo from the BIOFAIR project: free-Air Carbon dioxide Enrichment set-up in the Pheno3C platform



Presentation of the 21 funded projects

Acorn harvesting in a forest stand of pedunculate oak (Quercus robur) growing at a very dry site on a steep slope in Austria

Partners of the project:

Coordinator: Silviculture – University of Natural Resources and Life Sciences – Vienna - Austria

Health and Bioresources – Austrian Institute of Technology – Tulln – Austria

Forest Conservation – Forest Research Institute of Baden-Württemberg – Freiburg - Germany

Forest Genetics and Plant Breeding – Aristotle University of Thessaloniki – Thessaloniki - Greece

Biodiversity and Conservation Biology – Swiss Federal Institute WSL – Birmensdorf – Switzerland

Plant Genetics – Middle East Technical University – Çankaya, Ankara – Turkey

National Botanical Garden of Turkey / TAGEM – Çankaya, Ankara - Turkey

Duration:

01/04/2021 – 31/03/2024

Total grant:

€ 1,256,710

Further information:

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ACORN – Identifying seed sources for highly adaptable oak forests in a changing climate

Context

Given the pace of climate change, the question is raised whether local gene pools of forest trees will be able to adapt to the changing environmental conditions. Transfer of forest reproductive material (FRM) from arid sites (assisted gene flow; AGF) might improve tree fitness under increasing drought and heat. Source populations for such plantations may originate from lower latitudes or from arid sites within a larger region. However, current guidelines for FRM are strongly focused on local seed sources.

Main objectives

ACORN aims to identify oak populations capable to cope with future drought-stress due to climate change. The main objectives of the project are:

- To detect signatures of adaptation to drought at the regional and continent-wide scale in the genome of oaks.
- To investigate physiological and morphological traits involved in drought tolerance and address their genetic background.
- To address whether FRM transfer at the regional/continental scale will significantly increase the adaptive capacity of future forests.
- To assess which strategy of FRM transfer is optimal to increase benefits and decrease risks of such transfers.

Main activities

ACORN will investigate forest stands of pedunculate, sessile and downy oak (Quercus robur, petraea and pubescens, respectively) from Central Europe and the Eastern Mediterranean. To address adaptation at the regional level, 10 pairs of closely situated populations of each species will be selected within each region. At the continent-wide scale, ACORN will compare the two study areas which display contrasting climates in terms of aridity. It assumes that past selection for drought tolerant phenotypes has resulted in genetic differences between different environments. To address this, an environmental association analysis will be performed to test whether there is a significant association between environmental conditions and tree genotypes. In addition, a common garden trial with progenies from the study stands will be set up to investigate physiological and morphological differentiation based on traits related to drought tolerance. A genome-wide association analysis between the phenotype and the genotype will provide clues about the genes underlying the assessed traits. Based on these results, an innovative AGF concept will be developed, in order to inform FRM guidelines and adjust them to the needs resulting from climate change.

The participation of applied research institutes, which are also responsible for formulation of FRM guidelines, will ensure that all practical and policy-related aspects will be considered from the beginning of the project. Moreover, a wider network of stakeholders will be engaged from the beginning of the project. These include policy makers like authorities in charge of issuing seed transfer guidelines, private businesses like nurseries and non-governmental organisations like nature conservation associations. ACORN attaches particular importance to an early exchange on the project aims and approaches, as well as stakeholders' perceptions and expectations from the planned research. Thus, bilateral meetings will be organised at the national and international level throughout the project. A workshop at the end of the project will be held to inform stakeholders from all participating countries about the project results and the developed AGF concept.

ASICS – ASsessing and mitigating the effects of climate change and biological Invasions on the spatial distribution of biodiversity in Cold environmentS

Context

In these times of rapidly accelerating global changes, our planet's biodiversity is being challenged to adapt. For many species, this means adjusting their life cycle, interactions and distributions as a reaction to the changes occurring in their habitats. These rapid changes, such as changes in habitat characteristics, pollution, biological invasions and climate change are together creating extra pressures on native communities. Polar and alpine regions host most of the world's last remaining wilderness ecosystems, yet are also particularly vulnerable to these dynamic changes. These ecosystems are disproportionately affected by climate change, and are suffering from a rapidly increasing influx of new species originating from warmer regions of the planet. A growing number of non-indigenous invertebrates, plants and vertebrate species have now colonized these environments, profiting from increased human-related disturbances. They are increasingly outcompeting indigenous species thanks to their life-history strategies adapted to opportunistic change, disturbance and warmer and more variable climates.

Main objectives

ASICS aims to significantly improve understanding of the effects of climate change on the distributions of both non-indigenous and native species in cold environments. To achieve this, a broad array of experimental approaches, notably on species reactions to climate change, cutting-edge modelling techniques, and decade-long time series of species occurrence and climatic data will be used. Ultimately, ASICS aims to achieve accurate and reliable forecasting of future species redistributions that will allow us to anticipate their impact and cost in cold regions. In a world where environmental changes have become virtually unstoppable, being able to anticipate responses and consequences gives valuable knowledge to pre-emptively prevent, mitigate and/or be prepared for the negative effects of biological invasion processes.

Main activities

Species physiology & adaptation to climate change - ASICS will improve mechanistic understanding of species thermal physiology, thereby providing the key to better predict biodiversity loss and redistribution under different scenarios of future climate change. This will help in the development of future management strategies, policies and budgets, and will thus better equip humanity to tackle emerging threats for biodiversity in polar regions.

Species redistribution - ASICS aims to evaluate the extent and impacts of both climate-related range shifts and biological invasions in polar and alpine regions to improve our understanding of the factors controlling the current distribution of species. This will allow us to inform biodiversity managers of the local and regional habitats primarily at risk from biodiversity changes.

Species interaction & ecosystem functioning - Species interactions – and their dynamics due to climate change – to arrive at generalisable findings of environmental change effects on species redistributions will be taken into account. As such, we can pinpoint the winners and losers of accelerating changes in cold-climate regions. This research will be the ultimate test to assess the stability and/or vulnerability of cold-region ecosystems towards species redistributions.

Providing tools for management & policy makers - With unprecedented levels of global connectivity through human activities, the movement of species around the world has never been greater. Combined with a warming climate, invasive species are set to threaten biodiversity in even the coldest regions. Environmental risk assessments for key areas will be developed. In order to ensure that our findings are able to inform change or offer advice that will protect and conserve the world's fragile polar and alpine environments, ASICS will liaise with appropriate committees, managers and policy makers in relevant study regions.

The ASICS project: a global network of ecologists passionate about biodiversity in the earth's most remote areas: the cold north and south, and high-elevation areas

Partners of the project:

Coordinator: Ecosystems, Biodiversity, Evolution (EcoBio) - University of Rennes 1 – Rennes - France

Botany and Biodiversity Research - University of Vienna – Vienna - Austria

Biology - University of Antwerp – Antwerp – Belgium

Invasion Ecology - Academy of Sciences of the Czech Republic – Pruhonice - Czech Republic

Bioscience - Aarhus University – Aarhus – Denmark

Chemistry and Bioscience - Aalborg University – Aalborg – Denmark

National Nature Reserve - Terres Australes Françaises - La Réunion, France

Lille Infection and Immunity Center (CIIL) – University of Lille - Lille – France

Ecology of natural and anthropized hydrosystems (LEHNA) - University Claude Bernard Lyon 1 – Villeurbanne – France

Arctic and Marine Biology - The Arctic University of Norway – Tromso – Norway

Terrestrial Biodiversity - The Norwegian Institute for Nature Research – Trondheim - Norway

Plant and Soil Sciences - University of Pretoria – Pretoria - South Africa

Biology and Geology, Physics and Inorganic Chemistry - University Rey Juan Carlos – Madrid – Spain

University of Birmingham – School of BioSciences College of Life and Environmental Sciences - Birmingham - United Kingdom

British Antarctic Survey – Cambridge – United Kingdom

Duration:

01/04/2021 – 31/03/2024

Total grant:

€2,108,217

Further information:

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Seagrass meadows form a characteristic biotope type of shallow coastal waters of the Baltic Sea and have great ecological importance as potent biofilters

Partners of the project:

Coordinator: Biological Oceanography - Leibniz Institute for Baltic Sea Research Warnemünde (IOW) - Rostock-Warnemuende – Germany

Hydrobiology, Estonian Centre for Limnology - Estonian University of Life Sciences – Estonia

Environmental and Marine Biology - Abo Akademi University – Abo/Turku - Finland

Biology - University of Copenhagen – Helsingor – Denmark

Marine Evolutionary Ecology - GEOMAR Helmholtz-Zentrum für Ozeanforschung Kiel – Kiel - Germany

Marine Research Institute - Klaipeda University - Klaipeda – Lithuania

Fisheries Economics - National Marine Fisheries Research Institute – Gdynia – Poland

Gene Technology - KTH Royal Institute of Technology – Stockholm - Sweden

Duration:

01/04/2021 – 01/04/2024

Total grant:

€ 1,441,685

Further information:

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BaltVib - Pathogenic Vibrio bacteria in the current and future Baltic Sea waters: mitigating the problem

Context

Vibrio – microbes that are part of the natural bacterioplankton in temperate marine waters – have in recent years flourished in the Baltic Sea, probably stimulated by elevated surface water temperatures. Several *Vibrio* species are human pathogens. It is hence of great concern that *Vibrio*-related wound infections and fatalities have increased dramatically along the Baltic coasts. Future climate change is predicted to escalate this problem, posing a significant threat to human health and the Baltic tourism industry. However, the projections do not yet take into account the influence of 'ecosystem engineers' such as mussels and macrophytes on *Vibrio* diversity and abundance. Recent data indicate that in some of the 'ecosystem engineers' habitats the abundance of pathogenic *Vibrio* spp. is reduced. However, climate change will also affect the structure and functioning of the ecosystem engineers, with as yet unknown consequences for the Vibrio populations in the Baltic Sea.

Main objectives

BaltVib aims to delineate the current and future *Vibrio* status, determine biotic and abiotic key factors regulating *Vibrio* prevalence, and identify nature-based solutions (NbS) to mitigate the problem. This opens up the option for NbS strategies to control pathogenic vibrios in the nearshore habitat where humans interact with the sea.

Main activities

The main activities will be understanding *Vibrio* – ecosystem engineer relations in the past, indexing the current distribution, regulation and pathogenicity of *Vibrio*, making a projection of *Vibrio* - ecosystem engineer relations in the future. Further we will test the potential of underwater islands as an NbS to reduce pathogenic *Vibrio* spp.

National authorities of the partner countries with responsibility for public health, bathing water quality, Marine Strategy Framework Directive and Water Framework Directive will be actively included in the decision-making process during the project through means of an advisory board. Additionally, politicians, stakeholders and the general public will be actively engaged to foster understanding of the need to protect and restore the biodiversity of seagrass meadow habitats as potential biofilters to conserve or reach a good ecological status and protect human health. This will be achieved through a number of workshops, trainings, the provision of data and open web-GIS "BALTIC SEA ATLAS" maps and a website.

BaltVib's goals will be achieved through interdisciplinary integration of marine, microbiological, molecular and socio-ecological expertise carried by partners from seven Baltic nations.

BIOFAIR - BIOdiversity of soils and FArming Innovations for improved Resilience in European wheat agrosystems

Context

In the face of climate change, crop species and agricultural practices will require adaptation to produce high quality food while reducing the impact of agriculture on the environment. The study of mechanisms underlying the anticipated negative impact of climate change on food production thus needs all the attention in order to design cropping systems resilient to climate change. To date, most of the climate change studies have been focused on the plant physiology without addressing key questions linked to root and soil diversity and functioning under fully realistic anticipated climatic scenarios.

Main objectives

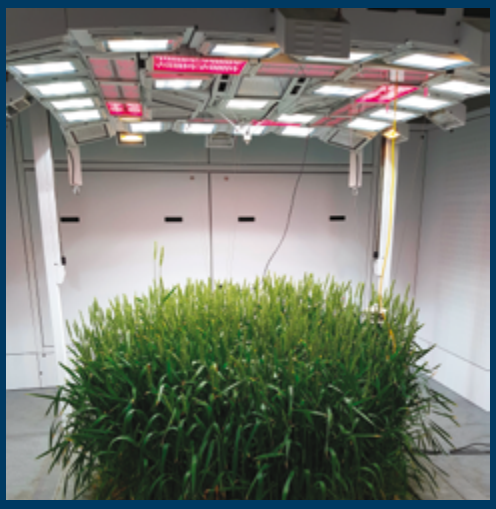
BIOFAIR's main goal is to assess the impacts of climate change and innovative farming practices on plant productivity, nutritional quality and fitness. A strong focus will be given on the study of soil functioning and the related soil microbiome as well as micro- and meso-fauna biodiversity. This will allow a better understanding of the reported changes in productivity, quality value of the cereal grains and the suppressiveness capacity of such soils against (a)biotic stresses.

Main activities

BIOFAIR is based on a co-creation process of the experiments with a relevant EU stakeholder board to be consulted before, during and after the development of the experiments. Practically, experiments in cutting-edge Ecotrons as well as long-term field trials in which abiotic stress and innovative farming practices are tested will be performed with wheat to:

- Measure the impact of climate change on crop growth kinetics, yield and quality traits with a focus on grain nutritional and technological quality.
- Identify soil taxa clearly impacted by climate change and whose functions are directly or indirectly linked to nutrient use efficiency, disease resistance and crop quality traits.
- Assess and characterise farming innovations that enhance the prevalence of beneficial taxa vs pathogenic ones and the production of healthy and nutritious wheat grains.
- Provide recommendations that target farming practices enabling quality wheat production together with soil biodiversity and ecosystem services conservation under predicted climate change.

The project outcomes will provide the basis for the development of future ecologically intensive crop management strategies maximising resource use efficiency and production of quality traits linked to human health and nutrition, in the context of climate change. The BIOFAIR project will therefore directly contribute to policies related to key areas for European citizens: food security and industry, human health, sustainable consumption and production patterns, mitigation of climate change impacts and protection of terrestrial ecosystems. It will aim at actively feeding the political processes at EU and national level by effectively disseminating the project results to the most relevant public and private stakeholders with interest in the field. These include policy makers (e.g. DG AGRI, DG SANTE, DG ENV, EIP-AGRI), private and industrial stakeholders (e.g. COPA-COGECA, EBIC, European Flour Millers, etc) as well as EU administrators in charge of developing the Soil Health and Food Missions of the "Horizon Europe" program.



Winter wheat plants growing under a projected 2094 climate in a Controlled Environment Room of Gembloux Agro-Bio Tech's Ecotron facility

Partners of the project:

Coordinator: Plant Sciences – Liège University Gembloux Agro-Bio Tech – Gembloux – Belgium

FiBL Europe – Brussels – Belgium

Functional Plant Biology – Ghent University – Ghent – Belgium

Genetic, Diversity and Ecophysiology of Cereals (GDEC) – INRAE/ University of Clermont Auvergne – Clermont-Ferrand - France

Nutritional Crop Physiology - Hohenheim University, Institut für Kulturpflanzenwissenschaften – Stuttgart – Germany

Functional and Evolutionary Ecology - Estación Experimental de Zonas Áridas – CSIC – Almería – Spain

Soil Sciences – FiBL Switzerland – Frick – Switzerland

Duration:

01/04/2021 – 30/03/2024

Total grant:

€1,469,380

Further information:

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During dry years, anthropogenic forest fires can become so common in some parts of Amazonia that the air turns hazy from smoke. Climate change is predicted to make the situation worse, which would have adverse effects on rainforest species

Partners of the project:

Coordinator: Biology - University of Turku – Turku - Finland

Wetland Ecology - Karlsruhe Institute of Technology – Rastatt - Germany

Biodiversity - National Institute of Amazonian Research, Amazonas - Brazil

Arts, Sciences and Humanities - University of São Paulo - São Paulo - Brazil

Environmental Sciences - University of East Anglia – Norwich - United-Kingdom

Duration:

01/04/2021 – 31/03/2024

Total grant:

€561,000

Further information:

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CLAMBIO - Assessing the effects of past and future climate change on Amazonian biodiversity

Context

Climate change affects life at all levels, from genetic structure of animal and plant populations to socio-economic organisation of human communities. For Amazonia, current models project warmer and drier climates, which could make large areas unsuitable for species adapted to moist rainforest conditions and increase the susceptibility of vegetation to wildfires, thereby promoting savannisation. This, in turn, would reduce biodiversity, biomass, carbon storage and productivity of the forests, as well as further reduce local rainfall and affect river water levels through impacts on water circulation.

Main objectives

CLAMBIO aims to clarify:

- Climate–biodiversity feedback processes in Amazonia, such as the consequences of past climate changes on the evolution and distribution of Amazonian plants and animals.
- How the ongoing climate change may affect the viability of Amazonian plant and animal species, and which Amazonian regions and habitat types are most vulnerable to the combined effects of climate change, deforestation and fire.
- How the sources of indigenous livelihoods in major river basins have already been impacted by changes in their environment, which aspects are most vulnerable to climate change in the future, and how the communities could mitigate the adverse effects.

Main activities

The project will integrate data from geological sediment cores and existing models of past climate with data on species distributions, genomics and community phylogenetics to reconstruct past climatic changes in Amazonia and to infer how past climate changes have impacted habitat stability, species dispersal and local extinctions. Present-day environmental data will be used to identify the most important constraints on species distributions, and to model how the distributions of suitable habitats may change in the future, given current climate scenarios and the likely increasing risk of forest fires. Long-term monitoring of annual cycles by indigenous communities will be analysed to characterise natural resource use.

These results will be integrated to estimate the degree of both uniqueness and vulnerability of biological communities across Amazonia, and to unravel specific threats to human populations within two indigenous lands located in distinct ecological and socio-economic scenarios within Amazonia. The studies will be made in close collaboration with indigenous peoples who depend on the forests for their livelihoods. The results will be available for the local communities to use in defending their rights and exposing the impacts of anthropogenic development to their modes of life, as perceived by themselves.

EASMO – Eastern Tropical Pacific reef fish on the move: biodiversity reorganisation and societal consequences

Context

Species are "*on the move*" throughout the planet escaping hostile climatic conditions. These movements have advanced four times faster in the ocean than on land, causing dramatic ecosystem changes and redistributing resources across borders. The ecological, food security, and governance implications are obvious. Yet, two persistent gaps hinder our capacity to effectively manage coastal social-ecological systems to safeguard both fisheries and human wellbeing in the face of such challenges: i) regional studies documenting recent species redistributions have not quantified the societal repercussions, and ii) future projections have mapped expected catches and metrics of socio-economic impact (e.g. fisheries revenue) globally and at coarse resolutions, unfitting to support local or regional decision-making. Fish redistributions are particularly concerning, as three billion people depend on them for 15% of their animal protein intake and essential nutrients to tackle malnutrition. Although fish range shifts should be urgently investigated in the Global South, studies have focused disproportionately on wealthy parts of the world.

Main objectives

EASMO will investigate for the first time the impact of climate change on the distribution of reef fish throughout the Eastern Tropical Pacific Ocean (ETP) considering cascading effects on biodiversity, ecosystem function, reefs' contributions to people, climate feedbacks, and socio-economic wellbeing. Ultimately, it will deliver several layers of new scientific knowledge that can be directly integrated into decision-making tools, support adaptive transboundary governance approaches, and propel actions for meeting the UN Sustainable Development Goals 2 Zero hunger, 13 Climate action, and 14 Life below water.

Main activities

EASMO will undertake four overarching activities:

- First, EASMO quantifies climate and ocean changes in the ETP for the past 20 years, and forecast changes expected by the mid-21st century under two greenhouse emissions scenarios, revealing the driving mechanisms. We use the Coupled Ocean-Atmosphere-Wave-Sediment Transport modelling system to model contemporary and future atmospheric, oceanographic, and biogeochemical characteristics at high spatio-temporal scales, relevant for management of local impacts and ecosystem services.
- Second, the project uncovers whether reef fish will adapt to shifting climatic conditions in the ETP, or shift their distribution range to escape them, and investigate how range shifts i) cascade onto the benthos, and ii) redistribute fish biodiversity, ecosystem function, and potential catch characteristics among Exclusive Economic Zones.
- Third, EASMO reveals how societies react to emerging climate and reef fish catches. Solidly engaged with stakeholders and policy-makers, we examine collaboratively whether and how existing governance arrangements that support fisheries management should be reformed to safeguard food security in the face of emerging catch structures and societal behaviours.
- Fourth, the project translates our scientific outcomes into policy and public awareness integrating local stakeholder representatives, resource users (e.g. fishers), and conservation organisations at the national, regional, and global scales (e.g. Conservation International, World Wide Fund for Nature, Wildlife Conservation Society). To this aim, we will not only publish and disseminate scientific papers and policy briefs (in Spanish and English), but also lead regular stakeholder engagement and advisory workshops, co-produce audio-visual material, and remain active in the web and social media.

Moorish idols (Zanclus cornutus) in Gorgona Island, Eastern Tropical Pacific (Colombia)

Partners of the project:

Coordinator: Reef Systems - Leibniz Centre for Tropical Marine Research – Bremen - Germany

Arts, Law and Education & Centre for Marine Socio-ecology - University of Tasmania - Hobart – Australia

Biological, Earth & Environmental Sciences - University of New South Wales Sydney – Sydney - Australia

ECOMARES Foundation, Universidad del Valle - Cali – Colombia

Climate - Norwegian Research Centre – Bergen – Norway

MarViva Foundation – San José – Costa Rica

Applied Molecular Biosciences (UCIBIO) - Universidade Nova de Lisboa – Almada – Portugal

Stockholm Resilience Centre – Stockholm University - Stockholm – Sweden

Lancaster Environment Centre - Lancaster University – Lancaster – United Kingdom

Geography - University of Hawai'i at Mānoa – Honolulu - United-States of America

Duration:

01/04/2021 – 31/03/2024

Total grant:

€ 903,297

Further information:

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Cattle grazing on land recently deforested - Vaupés department, Colombia

Partners of the project:

Coordinator: Law and Development - University of Antwerp – Antwerp - Belgium

Rural development – Federal University of Santa Catarina - Florianópolis - Brazil

Economics - Federal Fluminense University - Niteroi - Brazil

Governance of Ecosystem Services - Leibniz Centre for Agricultural Landscape Research – Muncheber – Germany

Politics and Government - Universitas Gadjah Mada -Yogyakarta - Indonesia

Geography - Norwegian University of Science and Technology – Trondheim – Norway

Sustainability Studies - Lund University - Lund - Sweden

Duration:

01/04/2021 – 31/03/2024

Total grant:

€ 1,263,862

Further information:

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EPICC - Environmental Policy Instruments across Commodity Chains Multilevel governance for Biodiversity-Climate in Brazil, Colombia, Indonesia

Context

The conversion of natural ecosystems for agricultural land use and minerals' extraction is one of the main drivers of global biodiversity loss. At the same time, deforestation and forest degradation in the tropics is the second largest source of global greenhouse-gas (GHG) emissions. Despite the scientific evidence about agriculture and mining as major threats to biodiversity and the global climate, the frontiers of global value chains continue to be expanded into tropical forests, causing deforestation, forest degradation and biodiversity loss.

The planetary organisation of value chains is part of the problem: it intensifies the need for meat and minerals, increases the distance between the locations of extraction and production, and places of processing and final consumption. This telecoupling disconnects spaces of consumption with the local socio-ecological impacts of production. In the last years, consumers, governments and companies based in the EU are increasingly looking for solutions to address environmental and social externalities of imported commodities such as meat and minerals. This renewed sensitivity has led to new regulations (e.g., the EU FLEGT), but also transnational corporations to adopt best practices guidelines and certification schemes (e.g., Fairmined).

Main objectives

EPICC applies a polycentric governance and environmental justice approach to investigate four selected commodity chains (cattle, palm oil, gold and tin) that 'feed' the European market. EPICC seeks to map the governance and power links that connect the multiple territories of production and transformation and their plural legal systems with the European regulatory, political and socio-economic space. By doing so, EPICC identifies and analyses leverage points (chokeholds) and blind spots, and sheds light on the micro and macro conditions that may facilitate the mitigation of environmental and social impacts that occur at the selected locations of production (in Brazil, Colombia and Indonesia).

Main activities

EPICC pursues a multi-actor and transdisciplinary approach. Stakeholder involvement is thus one key aspect in each phase of the planned research project: this happens via the organisation of a series of local workshops in Europe and the three countries of origin of the goods, along with the realisation of several rounds of semi-structured interviews with actors directly involved in climate change mitigation and biodiversity project. Commodity chain actors are one of the main target groups and include all actors that shape, implement and are bound by governance structures along the selected commodity chains - from individual workers and owners to consumers, passing through traders, retailers, contractors, national and local governments, and inter-governmental organisations such as the EU.

Project results will be prepared for dissemination in the following formats: i) EPICC project website, including data storage and exchange structure, ii) target group tailored materials in writing (e.g. policy briefs, newspaper articles, short videos), iii) academic publications; iv) policy briefs aimed at relevant stakeholders in the three countries of origin and translated; v) symposia, conference participation and stakeholder workshops in the respective countries.

FeedBaCks - Feedbacks between Biodiversity and Climate

Context

Terrestrial ecosystems cycle energy, water, chemical elements, and trace gases, and through this influence the climate. To mitigate the effects of global climate and biodiversity change, an improved understanding of the links between these two aspects is essential. Many research projects have studied the effects of climate variation and climate change on biodiversity and related Nature's contributions to people. However, little is known about the effects of biodiversity on climate and to what degree this feedback can be used to mitigate climate change. For example, a recent study has quantified that the projected warming will likely add an additional 0.1 - 0.25 °C due to increased methane emissions from natural wetlands by the end of the 21st century. But biodiversity change can also mitigate climate change effects through carbon sequestration. More species-rich forests accumulate more biomass, which could result in a 2.7% decrease in carbon storage per year if tree richness in forests decreased by 10%. In summary, biodiversity effects on climate are manifold, but are still widely understudied. This is partly due to the fact that climate or Earth System Models (ESM) only use a very simple parametrisation scheme of biodiversity due to computational limitations. ESMs only differentiate between very broad vegetation classes, such as broadleaved and needle leaved forest or simplified plant functional types. Such simple classifications of the functional diversity do not well represent the processes relevant for addressing biodiversity feedbacks to the atmosphere.

Main objectives

The overall objective of this research is to investigate biodiversity-climate feedbacks by creating an integrated biodiversity-climate model interface. Within this system, various biodiversity components will be randomized or excluded to investigate their effects on climate, and vice-versa. Since biodiversity patterns and changes also affect nature's contributions to people, we will additionally focus on these contributions, and how nature's contributions will change in response to changing climates and to changing feedback components.

Main activities

To fully assess climate-biodiversity feedbacks, FeedBaCks will specifically focus on both, the effects of biodiversity on climate and on nature's contributions to people. Combining climate models with biodiversity models is however challenging, as i) the combined expertise from a wide variety of fields is required, ii) different model structures and formats need to be combined, and iii) many of the processes linking biodiversity to climate are still unknown. To study feedbacks of biodiversity on the climate system FeedBaCks will use downscaled ESM output and link it to dynamic vegetation and biodiversity models, disentangle the effects of biodiversity, and subsequently feed them back into the ESM to quantify their effect on the climate system. Biodiversity will be quantified by building and benchmarking an effective vegetation classification that is linked to specific plant functional traits, and combined with a set of harmonised plant diversity data across Europe. Based on the quantified effects of biodiversity on the climate system, we will be able to quantify ecosystem functioning and nature's contributions to people, and provide quantitative predictions of their influence in the biodiversity-climate system.

FeedBaCks integrate a range of stakeholders such as national nature protection agencies or, national parks that have stewardship over biodiversity and are commissioned with its protection. In an initial stakeholder integration workshop, the project will set priorities in the model experimental design relevant to climate change mitigation efforts of these agencies and will choose relevant ecosystem services which are of interest for stakeholders. Over the course of the project we will have a series of workshops, discussing the outcomes of these analysis to foster their implementation in the respective domain of the stakeholders.

Vegetation climate interactions via evapotranspiration over sparse vegetation in the high Alps of Switzerland

Partners of the project:

Coordinator: Land Change Science - Swiss Federal Research Institute WSL - Birmensdorf - Switzerland

Botany and Zoology - Masaryk University – Brno - Czech Republic

Alpine Ecology (LECA) – University of Grenoble Alpes/ University of Savoie Chambéry/ CNRS – Saint-Martin-d'Hères – France

Biodiversity and Climate - Senckenberg Society for Natural Research -Frankfurt - Germany

Biology / Geobotany and Botanical Garden – Martin Luther University Halle-Wittenberg - Halle – Germany

Stockholm Resilience Center - Stockholm – Sweden

Atmospheric and Climate Science - Swiss Federal Institute of Technology -Zurich – Switzerland

Duration:

01/03/2021 – 28/02/2024

Total grant:

€ 1,480,116

Further information:

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Mixed species forest with heterogeneous structure in Southern Finland

Partners of the project:

Coordinator: Forest Ecology- Natural Resources Institute Finland (LUKE) – Helsinki – Finland

Mountain ecosystems and societies (LESSEM) – INRAE – Saint-Martin-d'Hères – France

Forest Economics and Sustainable Land-use Plannin - University of Goettingen - Göttingen - Germany

Duration:

01/04/2021 – 31/03/2024

Total grant:

€1,182,860

Further information:

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FUNPOTENTIAL - Potential of functional diversity for increasing the disturbance resiliency of forests and forest-based socio-ecological systems

Context

Climate change is expected to intensify natural disturbances in forests. The ecological and economic implications of the new disturbance regimes, and the best ways to limit their adverse impacts, need to be better understood. A growing consensus of scientific opinion suggests that increasing the species diversity of ecosystems improves their resilience to disturbance. Making wider use of diversity concepts in forest management could therefore help improve livelihoods, mitigate climate change, and adapt to its consequences. Forest characteristics and management goals vary throughout Europe. Local disturbance regimes are dissimilarly affected by climate change. Hence, the best ways to adapt to the changing disturbances may vary across Europe.

Main objectives

The aim of FUNPOTENTIAL is to develop disturbance-resilient forest management concepts and policies that balance the provision of timber and climate services, and sustain biodiversity in a changing climate.

Main activities

FUNPOTENTIAL will:

- Quantify the present disturbance regimes for the study regions by analysing the damage risk probabilities and losses due to damage, and factors that improve the forests' resilience. Future scenarios of potential disturbance pathways will be charted to support resilience and economic analyses.
- Evaluate how functional diversity promotes the forest resilience in boreal, temperate and Mediterranean parts of Europe (Finland, Germany, France), focusing on recovery after disturbances. More risk-resilient management principles, which draw from functional and structural diversity of forests will be developed.
- Study how the tree species and structural diversity influence the profitability of forestry and climate services provided by forests, and how it may promote the resilience of incomes and climate change mitigation under increasing disturbances.
- Examine optimal policies to reduce disturbance risk in forests by promoting species diversity. Examine how the outcomes of policies to promote carbon storage in forests are affected by the changing disturbance regimes.

The results of the project will be disseminated in scientific journals and policy briefs, and presentations in various fora. Bidirectional communication with the forest sector stakeholders in the advisory board and in the organised modelling workshops will provide feedback for the project on relevant and topical policy issues and questions. The results of the project on disturbance vulnerability, resilient management practices and optimal policies will benefit the development of forestry best practice guidelines in three countries, and the development of national and EU level strategies and policies promoting sustainable use of forests.

FutureArcticLives - Future Arctic livelihoods and biodiversity in a changing climate

Context

Climate change occurs faster in the Arctic than in any other region, with tremendous consequences for Arctic biodiversity and people, undermining established production patterns of hunting, fishing, gathering and herding. These changes furthermore occur in a context of far-ranging economic, cultural and political change and commercial interests. Information about the welfare and wellbeing consequences for local communities is scarce, and particularly the subsistence component of natural resource dependency is often not visible in national income assessments. Policies favouring large-scale commercial operations in other sectors may furthermore inhibit historically used adaptation strategies. FutureArcticLives is, therefore, guided by the overall question - what are the likely future impacts and adaptation possibilities for small-scale primary resource users in Greenland and Northern Sweden and Norway in the face of climate and biodiversity change? Focus is on traditional Inuit hunters and small-scale fishermen in Greenland, Saami reindeer herders in northern Sweden and Norway and the sea Saami in the Porsanger Fjord in Norway, in the context of broader interests and commercial operations.

Main objectives

FutureArcticLives will explore and compare management options and draw synthesis across the three cases.

In Greenland, specific objectives include quantifying reliance on wildlife and fish at the household economic level and assessing welfare implications in future scenario simulations on biodiversity change and development in other sectors. Literature review and user-generated data will be applied to evaluate species-specific vulnerability and predict population trends for developing future scenarios in a context of limited scientific data.

For reindeer herding, objectives include determining the extent to which cultural and intrinsic values and income from reindeer husbandry are crucial to modern Swedish and Norwegian reindeer herders and their coping strategies. Forecasts will assess Saami herder livelihood strategies' viability and be used as input to a bio-economic model evaluating the costs and benefits of climate scenarios.

For the sea Saami, objectives include an ecosystem service assessment of nature's contribution, identifying local conceptions of ecosystem health and community wellbeing indicators. Ecosystem restoration goals will be co-developed with local communities and authorities as part of an adaptive management plan for the Porsanger Fjord.

Cross-cutting objectives include analysing the synergies and trade-offs between policies and laws applicable to hunting, fishing and reindeer husbandry and their relation to those on biodiversity, climate and other relevant sectors and contexts at different levels. Experience with nature-based solutions will be compared, identifying barriers to adaptation.

Main activities

FutureArcticLives will conduct household questionnaire surveys and choice experiments and use detailed register data combined in new ways to produce datasets used for econometric regression analysis, space-time models, bio-economic models and simulations. Stakeholder interviews will support policy and legal analysis and narratives about local wellbeing will be recorded using audio-visual approaches. National scientific advisory groups, including local stakeholders, will guide scientific work and help to identify policy interphase pathways to impact. A data management plan and dissemination strategy will be developed to enhance the transfer of co-created knowledge. An exploitation plan will highlight how results can be further developed and used after finalizing the project. Exploitable results will be presented to policy-makers on national and regional levels, through individual meetings and at strategic events.

Flensing minkewhale in Nuuk, Greenland

Partners of the project:

Coordinator: Food and Resource Economics - University of Copenhagen Frederiksberg C - Denmark

Institute of Learning – Ilisimatusarfik, University of Greenland – Nuuk – Denmark

Sustainable Design and Transition – University of Ålborg – Copenhagen – Denmark

Social sciences - Arctic University of Norway - Tromsø - Norway

Economics - Norwegian University of Science and Technology – Trondheim - Norway

Lillehammer - Norwegian Institute for Nature Research – Trondheim - Norway

Business Administration, Technology and Social Sciences - Luleå University of Technology – Luleå - Sweden

Geography - Umeå University - Umeå - Sweden

Duration:

01/01/2021 – 01/01/2024

Total grant:

€1,053,446

Further information:

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GenClim Logo

Partners of the project:

Coordinator: Marine Living Resources – Technical University of Denmark - National Institute of Aquatic Resources – Silkeborg – Denmark

Agricultural Economics - University of Kiel – Kiel – Germany

Centre for Marine Sciences (CCMAR) – Faro – Portugal

Biosciences - University Institute of Psychological, Social and Life Sciences – Lisbon – Portugal

Botany and Zoology - Stellenbosch University – Stellenbosch – South Africa

Duration:

31/03/2021 – 01/04/2024

Total grant:

€ 669,128

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GenClim – Biodiversity on the run: evolutionary and socio-economic consequences of shifting distribution ranges in commercially exploited marine fishes

Context

Ongoing climate change is rapidly transforming marine ecosystems and communities throughout the world's oceans. Increases in temperature are considered one of the main drivers of latitudinal distribution shifts in marine fishes, which are predicted to migrate towards cooler areas. These range shifts mean that commercially important species are likely to cross geo-political boundaries, increasing the likelihood of mismatches between current fishing practices (and policies) and future distributions. Forecasting models that predict range shifts are thus essential to anticipate and mitigate potential fisheries conflicts and the subsequent socio-economic impacts of a moving resource. Genomic data has the potential to increase the accuracy of forecasting models, by identifying locally adapted populations that might perform better/worse under certain climate scenarios.

Main objectives

GenClim brings together state-of-the-art genomics, forecasting modelling and socio-economic modelling to disentangle the multiple consequences of range shifts of commercially exploited marine fishes.

- Identify and assess the main genomic changes and the drivers of differentiation between core, leading and trailing edges of populations of range shifting species Merluccius merluccius, M. paradoxus and Engraulis encrasicolus.
- Improve the ability to foresee future range shifts by including genomic information, as well as the likelihood of populations persisting, expanding or collapsing under a changing and variable climate.
- Evaluate if the reliability of ecological forecasts depends on life-history features and evolutionary histories of species, or if they are primarily driven by region-specific climatic variability.
- Assess if the combination of genomic data and forecasting models can be used to anticipate socio-economic consequences of status-quo policies as well as of different management options, and thereby inform advice for relevant stakeholders, such as the International Council for Exploration of the Sea, the European Union, the Benguela Current Commission and national governments, to mitigate future conflicts arising from shifting resources.

Main activities

GenClim conducts five major activities: sampling, acquiring and analysing genomic data, forecasting modelling, socio-economic modelling and disseminating activities. Sampling will be conducted between Portugal and Denmark in the north-eastern Atlantic, and Namibia and South Africa in the south-eastern Atlantic, targeting over 750 samples per species in each region. These samples will then be used to generate genomic datasets where GenClim will investigate population structure patterns and the presence of adaptive loci that might improve forecasting predictions regarding which populations are more likely to persist or collapse under different scenarios of climatic change. Finally, these forecasts will be used to run socio-economic modelling scenarios to understand which fisheries are more likely to thrive or disappear under different management regimes and climate scenarios.

Apart from academic dissemination activities, such as publishing papers and attending conferences, the outputs of GenClim will be of great importance for the development of future policies on fisheries under climate change. As such, engagement with stakeholders (Scientific Technical and Economic Committee for Fisheries (STECF) experts, Benguela Current Commission (BCC), national governments, fishery industry representatives and NGOs) will be conducted via yearly regional workshops and advisory reports. For example, GenClim will provide genomic metrics for International Council for the Exploration of the Sea (ICES) Benchmarks, as well as for National Stock Assessments; while forecasting outputs target the ecosystem overview approach of ICES. A final synthesis report will seek to integrate advice from STEFC Experts and the Coordinating institution to be published, as well as presented at the Annual Science Forum of the BCC.

GRADCATCH - Using natural environmental GRADients to decipher the adaptation of soil microbial Communities to climATe Change

Context

Climate change has large effects on most biomes on Earth. This includes effects on soil microorganisms and their activity, which in turn may affect the release of greenhouse gases and the turnover of nutrients important to plants. Despite their importance, these effects are poorly understood by the scientific community. The overall aim of GRADCATCH is to unravel the effects of climate change at regional and global scales on soil microorganisms and their feedbacks on climate. To accomplish this, GRADCATCH will study trans-continental natural gradients in aridity, latitude and altitude.

Main objectives

GRADCATCH aims to:

- Understand short- and long-term adaptation and susceptibility of soil microbial diversity and functions to climate change, such as variations in soil water availability and temperature.
- Identify phylogenetic and functional soil microbial indicators of climate change.
- Generate robust data for modelling of climate-soil biodiversity feedback processes, mainly production and consumption of the greenhouse gases CO_2, CH_4 and N_2O.

Main activities

GRADCATCH will assess how soil microbial abundance, diversity, activity and functions change along four natural gradients, i) a trans-continental latitudinal gradient from the extreme high Arctic in North Greenland through low Arctic to boreal and temperate Europe, ii) an altitudinal gradient in the Swiss Alps, and iii) two aridity gradients, one from the humid NW to the arid SE Spain and one from humid to arid biomes in South Africa. This encompasses sampling 70 field sites. In addition, we will perform in situ soil transplantation experiments along the four gradients and in silico laboratory experiments on soil microcosms to investigate the short-term (one year) effects of predicted climate change.

In the field, we will measure the fluxes of CO_2, CH_4 and N_2O. In the laboratory, we will employ DNA- and RNA-based methods as well as assays of enzyme activity to investigate how soil microbial diversity and activity link to predicted climate change scenarios. In addition, we will use our data to parameterise computer models of microbial functioning and response to climate change.

It is expected that the data generated by GRADCATCH will have an impact beyond the scientific community. Thus, stakeholders from local communities, NGOs, government departments and policy makers will be engaged in the planning of our experiments and in the interpretation of the data generated. Their involvement will enhance knowledge transfer as stakeholders can offer more efficient routes of communication of main GRADCATCH data and findings to local and national governments. It is expected that stakeholders will help the project bringing data to the attention of key government institutions, which ultimately may improve regulations in order to mitigate the effects of climate change.

GRADCATCH will study the effects of climate change on soil microorganisms along altitudinal, latitudinal and aridity gradients

Partners of the project:

Coordinator: Biology – University of Copenhagen - Copenhagen -Denmark

Biochemistry, Genetics and Microbiology - University of Pretoria - Hatfield, Pretoria – South Africa

Aquatic Ecology - University of Girona – Girona - Spain

Forest soils and biogeochemistry - Swiss Federal Institute for Forest, Snow and Landscape Research (WSL) – Birmensdorf – Switzerland

Ecology and Evolutionary Biology - University of California - Irvine – United states of America

Duration:

01/04/2021 – 29/02/2024

Total grant:

€ 932,089

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MICROSERVICES will focus on microbial diversity in wheat cropping

Partners of the project:

Coordinator: Institute of Agricultural Sciences – ETH Zürich – Zürich – Switzerland

EU Projects and Research – European Landowners' Organization – Brussels – Belgium

Agroecology – INRAE/ University Bourgogne Dijon/AgroSup Dijon/ UBFC – Dijon – France

Soil Biology and Plant Nutrition – University of Kassel – Witzenhausen – Germany

Institute for Astronomy, Astrophysics, Space Applications and Remote Sensing – National Observatory of Athens – Penteli – Greece

Applied Microbiology & Biotechnology – Leitat Technological Center – Terrassa – Spain

Duration:

01/04/2021 – 31/03/2024

Total grant:

€ 944,880

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MICROSERVICES - Predicting climate change impacts on the crop microbiome and cascading effects on ecosystem services delivery in agroecosystems

Context

Climate change is affecting Earth's biodiversity and the multitude of ecosystems services it provides. This is particularly problematic for agroecosystems, where climate change combined with unsustainable management threatens global food production. However, political actions that aim at quantifying and mitigating the impact of climate change and unsustainable management on biodiversity are not on track to be achieved in the near future. Soil microbial diversity is central to agricultural systems. Soil microorganisms interact with crops and carry out processes that promote plant growth, improve nutrient utilization, reduce greenhouse gas production, and increase resistance to diseases and abiotic stressors. There is great potential to harness these microbial functions while progressively decreasing the amount of chemical inputs in order to develop a sustainable and climate-resilient agriculture. However, the extent to which climate change affects microbial diversity is unclear and remains underrepresented in ongoing debates about climate change, global biodiversity loss and conservation policy.

Main objectives

MICROSERVICES will use a multi-domain approach to assess the impact of climate change on the crop-soil-microbiome nexus under various agricultural management regimes, with the aim to increase our capacity to predict and mitigate future climate change impacts on soil biodiversity and its cascading effects on agroecosystem functioning.

Main activities

Shifts in soil microbial diversity, crop-microbiome interactions, and ecosystem multifunctionality across different agricultural management regimes will be assessed along natural European climate gradients with forecasted climate progressions into the future as well as using an in-situ field-scale drought simulation experiment. In the first part, regional climate models informed by Earth Observation data will identify specific ecoregions within the Atlantic, Continental, and Mediterranean biogeographic zones to create gradients of forecasted climate progressions. Wheat cropping sites along these climate gradients and across different conventional and conservational management regimes will be identified and sampled in collaboration with stakeholders from the EU agricultural value chain. In the second part, effects of drought will be simulated using rain-out shelters installed in one of the world's longest running agricultural field experiment comparing different conventional and organic farming systems since 1978, the DOK trial in Switzerland. The multi-level responses of the crop-soil-microbiome nexus will be assessed by harnessing ground-breaking methods from different scientific disciplines that range from metagenomic assessments and isotope labelling techniques to the implementation of Earth Observation tools and machine learning algorithms.

Results will be made operative and accessible for stakeholders and policymakers through a communication and dissemination plan operating at the national (seminars, press releases, outreach activities) and European level (policy paper, communications to policymakers). MICROSERVICES will i) provide scientific insights into future impacts of climate change on soil biodiversity and associated ecosystem services, ii) promote political and public awareness of the importance of microbial diversity for sustainable agriculture, and iii) establish interactions between research institutions and agricultural stakeholders (farmers) for the field work, and between research institutions and policymakers to discuss the relevance of the results for policy agendas at the national and European level.

MixForChange - Mixed Forest plantations for climate Change mitigation and adaptation

Context

Forest landscape restoration and afforestation have recently received much international attention as a crucial opportunity for mitigating climate change through carbon sequestration. Yet, forests should also be adapted to the ongoing increase in biotic and abiotic stress driven by climate change. A growing body of evidence suggests that mixed forest plantations, i.e., plantations where several tree species (or varieties) are mixed, are more efficient in sequestrating carbon, while better coping with climate change-related stress. However, monocultures still dominate the world's forest plantations. Promoting the large-scale expansion of climate change-resilient mixed forest plantations will require 1) to foster the scientific base for mixed forest management and 2) to identify and address in future forest policies the reasons for the apparent reluctance to adopt mixed plantations among landowners and stakeholders.

Main objectives

The overall objective of the MixForChange project is to promote mixed-species forest plantations as nature-based solutions to fight the causes and consequences of climate change, by providing science-based recommendations and guidelines endorsed by forest owners, managers and policy-makers.

MixForChange will:

- Provide a mechanistic understanding of why and how tree diversity, species identities and forest management (thinning and fertilisation) influence the potential of forest mixed plantations to mitigate (carbon sequestration) and adapt to (stress resilience) climate change, in a win-win approach.
- Characterise stakeholders' awareness of mixed plantations benefits and identify barriers to implementation under contrasting management objectives, biomes and cultural contexts.

Main activities

Empirical research in existing tree diversity research sites will be conducted in contrasting climatic regions (Austria, Belgium, Brazil, Canada, France, Germany, Italy and Sweden). Specifically, the following topics will be quantified across tree diversity gradients: above-ground and soil carbon sequestration, drought-induced growth responses and mortality, water use and water use efficiency, leaf herbivory, mycorrhizal fungi. A socio-economic assessment of mixed plantations will be carried out in four countries (Brazil, France, Sweden, Canada).

MixForChange will engage and involve forest landowners and stakeholders interested in mixed plantations using direct consultation, encounters in the field, and exchange visits. This engagement to stakeholders will be key to characterise stakeholders' representations toward mixed plantation and build management recommendations that can be adopted in the field, and to broadly communicate and discuss the implications of the results of the project. In addition to organising at least two workshop in Europe and in Brazil, the project will take advantage of standing meetings and FAO projects to introduce these questions and dialogues. MixForChange will bring together key decision makers, landowners, academia, and international organisations in at least one meeting convened with FAO to discuss the results and agree on key guidance for policy makers. A policy brief in several languages based on the project results will be published. Associated media will include infographics and social media cards; short films; and press releases.

Planting of a tree diversity experiment in southern Brazil

Partners of the project:

Coordinator: Functional Ecology and Biogeochemistry of Soils & Agroecosystems (Eco&Sols) - INRAE/ IRD/ Montpellier SupAgro/ CIRAD/ MUSE - Montpellier – France

Forest and Soils Sciences - University of Natural Resources and Life Sciences - Austria

Forest & Nature - Ghent University – Gontrode – Belgium

Earth and Life Institute – Mycology and Forest Sciences units – Catholic University of Louvain – Louvain-la-Neuve – Belgium

Floragro Support Production Ltd. - Itatinga – Brazil

Forest Research and Studies Institute - Piracicaba – Brazil

Agro Ambiência Serviços Agrícolas Ltd. - Piracicaba – Brazil

Forest sciences - University of São Paulo - Piracicaba – Brazil

Forest Study Centre (CEF) - Université de Québec à Montréal – Montréal – Canada

Ontario Forest Research Institute - Ontario Ministry of natural Resources and Forestry - Sault Ste. Marie - Canada

Geobotany – University of Freiburg - Freiburg – Germany

Mass Spectrometry - STZ Soil Biotechnology – Huckstorf - Germany

Agricultural and Environmental Sciences, University of Rostock - Rostock - Germany

Ecology of Mediterranean Forests - INRAE Avignon - Avignon - France

Soil Interactions Plants Atmosphere (ISPA) - INRAE/ Bordeaux Science Agro - Villenave-d'Ornon – France

Biodiversity, Genes and Communities (BIOGECO) - INRAE/ University of Bordeaux – Cestas – France

Silva – INRAE/ AgroParisTech/ University of Lorraine - Champenoux - France

Alliance Forêt Bois – France

Forestry Policies, Resources and Management – FAO – Rome - Italy

Italian National Research Council – Sassari - Italy

Crop Production Ecology - Swedish University of Agricultural Sciences - Uppsala - Sweden

Duration:

01/02/2021 – 31/01/2024

Total grant:

€1,373,800

Further information:

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Intermediate wheatgrass (Thinopyrum intermedium L.)

Partners of the project:

Coordinator: Institute of Agricultural Sciences in the Tropics (Hans-Ruthenber-Institute) - University of Hohenheim - Stuttgart - Germany

Environmental Biotechnology - Graz University of Technology - Graz - Austria

Plant Sciences - Liège University, Gembloux Agro-Bio Tech - Gembloux - Belgium

Agroecology and Environment - ISARA Lyon - Lyon – France

Soil Sciences - University of Trier – Trier - Germany

Microbiology - Nicolaus Copernicus University -Torun - Poland

Horticulture - Sapientia Hungarian University of Transylvania - Cluj-Napoca - Romania

Ecology, Environment and Plant Sciences - Swedish University of Agricultural Sciences - Alnarp - Sweden

Duration:

01/02/2021 – 31/01/2024

Total grant:

€1,740,000

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NAPERDIV - Nature-based perennial grain cropping as a model to safeguard functional biodiversity towards future-proof agriculture

Context

The impact of intense annual crop production on natural resources under the threat of climate change has resulted in a global magnification of environmental degradation and biodiversity loss. A concept for mitigating such consequences is the development of perennial grain cropping systems. Intermediate wheatgrass (*Thinopyrum intermedium* L.) is among the most advanced examples of recently developed perennial grain crops for food or forage production with established experimental sites across Europe. Informed by natural ecosystems, especially grasslands, such systems provide an excellent and innovative design to promote nature-based solutions (NBS) to mitigate agricultural disservices and provide ecological, social and economic benefits. With a permanent soil cover, high total biomass production and deeper root systems, perennial grain crops provide fundamental advantages for climate change mitigation and adaptation. Perennial grain crops support highly structured and complex food webs, improving the functional diversity and the conditions for its conservation. However, there is only limited understanding of biodiversity effects, crop performance and ecosystem services resulting from these systems. The vision of NAPERDIV is thus to investigate and introduce perennial grain crops as an NBS for innovative and future-proof agricultural systems in Europe to move from current crop production towards sustainable alternatives acknowledged by the EU's agricultural and environmental legislation.

Main objectives

NAPERDIV is founded on comparative analyses between established perennial versus annual grain cropping systems along a Pan-European gradient with different agro-ecological and climatic conditions. With an inter-disciplinary and multi-sectoral network of researchers and stakeholders across Europe, NAPERDIV pursues the following objectives:

- Analyse the agronomic performance of intermediate wheatgrass to assess and simulate its resilience against climate hazards.
- Characterise the crop-associated microbiome and its functional benefits for the system, and the resilience of the soil microbiome against expected climate variability.
- Assess the biodiversity of soil and soil-dwelling invertebrates, its benefits and indicator values for crop performance, system diversity and processes.
- Improve the understanding of ecological and economic benefits of perennial grain cropping systems among stakeholders (farmers, politicians, general public) to realize perennial grain crops adoption and legitimization, and the creation of value chains.

Main activities

The multiple impacts of NAPERDIV on environment, policy, society and economy will support the EU to strengthen its role as world leader both in research and innovation by:

- Contributing to a sustainable, nature-based agriculture with benefits for biodiversity and climate change adaptation and mitigation as a solid scientific baseline for legislative frameworks of the EU for future-proof solutions in agricultural production.
- Contributing to nutrition security and generate novel bio-economic opportunities with investment potentials by increasing the awareness of farmers, EC policy, industry, and the general public about the manifold benefits of perennial grain cropping.
- Identifying requirements, limitations, expectations and perspectives for perennial cropping through interaction with diverse stakeholders and following the interactive innovation model promoted by the EC; and regularly informing stakeholders about project progress to improve engagement and sensitization.

NordSalt: Climate Change Impacts & Biodiversity Interactions in Nordic Salt Marshes

Context

Globally salt marshes store over 50% of coastal "blue" carbon, (BC) and are responsible for 25-40% of global oceanic carbon storage. Coastal marshes in the Nordic region are largely understudied and differ substantially from "classic" macrotidal salt marshes. The Baltic Sea's microtidal nature and strong salinity gradient means marsh vegetation changes from classic grass dominated marshes to salt meadows to brackish reed lagoons and coastal meadows. Very little is known about BC storage, greenhouse gas (GHG) emissions, habitat and biodiversity loss and ecosystem services in Nordic salt marshes under a changing climate. We also lack information about the extent and temporal dynamics of Nordic marshes, especially the vulnerability and adaptability of these ecosystems to climate change, local stressors, and management practices (e.g., livestock grazing). The strong regional salinity gradient is expected to have important effects on BC sequestration and GHG emissions due to shifts in plant communities and the expected increase methane release with lower salinities. Improving the understanding of biodiversity relationships, ecological functioning and ecosystem services provided by coastal Nordic habitats is essential for assessing their role in climate change mitigation and adaptation.

Main objectives

NordSalt will:

- Assess relationships between Nordic salt marsh plant community structure, biodiversity and carbon cycling, with focus on BC sequestration and GHG emissions.
- Explore historical changes in Nordic coastal marsh distribution and community biodiversity changes related to climatic and local pressures and management practices.
- Evaluate the potential of management of Nordic coastal marshes as Nature-based Solutions (NbS) in a local, regional, and global contexts.

Main activities

NordSalt will fuse data from multiple sources, establishing a comprehensive inventory of Nordic salt marsh habitats. This will provide an assessment base of habitat classification types (EU, Nordic, national), spatial status, dominant plant communities, and present/future management options, including maps of the status of current salt marshes. We will assess environmental and anthropogenic pressures impacting marsh habitats in the Nordic region.

We further measure BC stocks and sequestration rates in salt marshes with grazed and ungrazed marsh plant communities. Methane emissions and net CO_2 fluxes will be measured along coastal gradients. We will quantitively link plant biodiversity and community composition to C stocks, BC sequestration and GHG emissions along the Baltic Sea gradient, and experimentally test how plant functional diversity, fundamentally altered by grazing management practices, changes climate-related C cycling in a climate warming experiment.

NordSalt is centred around increasing public awareness of the ecological role and importance of these habitats for climate mitigation, biodiversity maintenance and coastal protection. Multiactor labs (MAL) will engage local and national policy makers, NGOs, landowners, scientific experts, administrators in policy management and other relevant actors to co-produce knowledge and understanding of Nordic ecosystem services and advise the project team in implementation strategies. Results will be synthesised and assessed as ecosystem services related to climate mitigation, biodiversity, and coastal protection provided by these habitats. NordSalt will advise end-users on actions to synergistically manage Nordic salt marshes as NbS to enhance climate protection, increase biodiversity and improve ecosystem services.

Gazed (near) versus Ungrazed (far) coastal marshes near Turku, Finland

Partners of the project:

Coordinator: Biology – University of Southern Denmark - Odense - Denmark

Bioscience - Aarhus University - Silkeborg and Aarhus – Denmark

Environmental and Marine Biology – Åbo Academy University – Åbo – Finland

Bioeconomy and Environment - Natural Resources Institute Finland (LUKE) – Joensuu – Finland

Plant Science and Microbiology - University of Hamburg – Hamburg - Germany

Circular Bioeconomy - SINTEF Ocean – Trondheim – Norway

Ecology, Environment and Plant Sciences - Stockholm University – Stockholm – Sweden

Duration:

01/03/2021 – 28/02/2024

Total grant:

€ 1,549,087

Further information:

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Wild strawberry (Fragaria vesca) at sunset.

Partners of the project:

Coordinator: Plant Protection Biology– Swedish University of Agricultural Sciences – Alnarp – Sweden

Biology - Ghent University – Ghent – Belgium

Agricultural Sciences - University of Helsinki – Helsinki – Finland

Molecular Biology and Biochemistry - University of Malaga – Malaga – Spain

Duration:

01/03/2021 – 28/02/2024

Total grant:

€ 1,211,250

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PlantCline - Adapting Plant genetic diversity to Climate change along a continental latitudinal gradient

Context

Climate factors such as temperature and precipitation vary tremendously over continental scales, strongly structuring biomes along latitudinal gradients. Many species, however, have continental distributions and are assumed to be adapted to cope with their local climate, either genetically or plastically. While such adaptive capacities are central to their resilience to climatic changes, few studies have explored the underlying mechanisms in terms of genetics and ecological traits.

Main objectives

PlantCline aims to generate and share knowledge on how climate change affects the evolution of plant traits and trait diversity, as well as interactions between the plant and pest organisms, via changes in abiotic as well as biotic conditions such as novel insect communities due to climate-induced range shifts. Overall, the project aims to obtain a mechanistic understanding of the interrelationships among selection of genes, expression of phenotypic traits, and real-life fitness. Woodland strawberry (Fragaria vesca) will be used as model species as it has a cross-continental distribution, is fully genome sequenced, and is an important wild genetic resource for garden strawberry breeding.

Main activities

- A large collection of European woodland strawberry genotypes will be screened for phenotypic variation in functional traits, such as phenology, and phytochemical traits mediating resistance to abiotic and biotic stressors.
- Genetic determinants of the focal plant traits will be identified.
- Effects of climate change on local natural selection on the focal traits will be studied at several latitudes along the distributional range of wild strawberry in Europe.
- Advanced data synthesis and predictive modelling will be used to obtain a mechanistic understanding of the interrelationships among selection of genes, expression of phenotypic traits, and real-life fitness under climate change.
- Workshops with specific groups of stakeholders (agencies for pest risk analysis; crop breeding and production; agencies of environmental protection; higher education) will be organised to determine how the obtained knowledge can improve pest risk assessments, plant breeding, and in situ protection of genetic resources under climate change. Representatives from these stakeholder groups are also engaged in an advisory panel, giving feedback to the researchers throughout the project.
- Two summer schools in Málaga (focusing on evolutionary applications - molecular techniques for breeding resilient plants) and Ghent (focusing on ecological applications - optimising plant translocations for both yield and robust multifunctional species communities) will be organised to train students, young scientists and professionals (e.g. plant breeders).

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PRINCESS - Peatland Rewetting In Nitrogen-Contaminated Environments: Synergies and trade-offs between biodiversity, climate, water quality and Society

Context

Europe faces three major environmental challenges: greenhouse gas emissions, nitrogen pollution, and biodiversity loss. Peatlands play a vital role in addressing these challenges. Drained peatlands in the EU emit ~5% of total EU greenhouse gas emissions, mainly from conventional agriculture on drained peat soils. Drained peatlands in the EU are also an annual source of 1-5 Mt of nitrate, with substantial impact on water quality, drinking water provision, and biodiversity. Typical peatland biodiversity has been devastated by drainage. Consequently, all relevant EU policy objectives include rewetting of drained peatlands as a nature-based solution to avoid peatland GHG emissions, reinstall carbon sequestration, reduce nitrogen mineralization, enhance nitrogen removal, and/or restore peatland-specific biodiversity. A wide range of alternative, wet land use options is needed, which must include options that allow for a fair income to farmers.

Main objectives

The objective of PRINCESS is to evaluate the synergies and trade-offs between key EU policy objectives such as (1) restoring biodiversity and healthy ecosystems, (2) keeping global warming below 2°C, (3) clean water, and (4) guaranteeing a fair income to farmers at rewetted peatlands under alternative land use options. PRINCESS will explore to what extent nitrogen loads can guide decision-making with respect to land use that optimally contributes to these policy objectives. PRINCESS tests basic research hypotheses and delivers tools and guidelines for sustainable use of rewetted peatlands in Europe.

Main activities

To achieve these objectives, PRINCESS:

- Focuses on the peatlands which are the largest sources of GHG and affected most by nitrogen loads, i.e. temperate fens.
- Compares wet wilderness, low-intensity paludiculture and high-intensity paludiculture.
- Brings together complementary skills from six peatland-rich countries, including those with little (FI, NO, PL) and strong peatland degradation and N loading (AT, BE, DE), the latter being also front-running in rewetting and paludicultures.
- Analyses crucial processes under highly controlled conditions in the laboratory and in mesocosms, tests them under more realistic conditions in the field, and models and upscales them to catchment and EU scale.
- Uses these different scales of study to maximise internal (sound interpretation of causal effects) and external (their relevance) validity.
- Applies the most advanced techniques and methods from biogeochemistry, microbial ecology, plant ecology, socioeconomic modeling on and across scales, using measurable and quantifiable indicators.

Dialogue with stakeholders (e.g. farmers and neighbours of peatland sites, fen peatland scientists, regional/national governments and advisory bodies, EU Commission and NGOs at European and international level) and capacity building will take place e.g. during meetings along with field campaigns, scientific events and a policy event. PRINCESS will advance the knowledge base of various stakeholder groups on fen restoration and will directly impact the application of policy in this field by providing vital scientific information for agricultural land use policies for peatlands in the EU (e.g. via publications and a webinar) and by targeted policy outreach (e.g. a policy brief on opportunities and co-benefits of rewetting at EU level and a policy event).

Formerly drained fen peatland in NW-Germany after rewetting and planting of cattail (Typha) for paludiculture

Partners of the project:

Coordinator: Experimental Plant Ecology– Greifswald University– Greifswald – Germany

Geography and Regional Research - University of Vienna – Vienna - Austria

Plants and Ecosystems (PLECO) - University of Antwerp – Wilrijk – Belgium

Bioeconomy and environment - Natural Resources Institute Finland (LUKE) – Helsinki - Finland

Ecologic Institute – Berlin – Germany

Biogeochemistry and Soil Quality - Norwegian Institute of Bioeconomy Research – Ås - Norway

Biological and Chemical Sciences - University of Warsaw – Warszawa – Poland

Duration:

01/02/2021 – 31/03/2024

Total grant:

€ 1,479,096

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Researchers in the Swiss Alps studying potential impacts in alpine ecosystems of range expanding plants under warming climate

Partners of the project:

Coordinator: Environmental Systems Science – ETH Zurich – Zürich – Switzerland

Forestry Sciences – University of Concepción – Concepción – Chile

Bioscience – Aarhus University – Rønde – Denmark

Ecology and Dynamics of Anthropised Systems (EDYSAN) – CNRS/Université de Picardie Jules Verne – Amiens – France

Institute of Biology – Martin Luther University Halle-Wittenberg – Halle – Germany

Biological Sciences – University of Bergen – Bergen – Norway

Norwegian Biodiversity Information Centre – Trondheim – Norway

Afromontane – University of the Free State – Phuthaditjhaba – South Africa

Biological and Environmental Sciences – University of Gothenburg – Gothenburg – Sweden

Forest Ecology and Management – Swedish University of Agricultural Sciences – Umeå – Sweden

Duration:

01/04/2021 – 31/03/2024

Total grant:

€1,731,214

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Website

https://www.mountaininvasions.org/rangex

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RangeX - Mechanisms underlying the success and impacts on biodiversity and ecosystem functioning of range-expanding species under climate change

Context

Plants are on the move due to climate change and through biological invasions, many expanding their ranges across elevation gradients. This is resulting in novel biological communities of resident and range-expanding species. But which species will be the winners and losers of climate change, and what their impacts will be on biodiversity and key ecosystem services like carbon storage or pollination, remain poorly understood. There is therefore a need to achieve both a process-based understanding of range expansions, and a shared understanding of this issue between researchers, natural resource managers and policymakers.

Main objectives

The main aim of RangeX is to better understand the processes and impacts of plants that are expanding their ranges following climate warming, and to inform policy regarding range-expanding plant species. Focusing on elevation gradients in mountains, the specific project objectives are to:

- Develop an explanatory framework for the processes driving variation in species' range expansion with climate warming.
- Quantify the contribution of range-expanding plants to change in biodiversity, ecosystem processes (e.g. carbon cycling and pollination services), and possible climate feedbacks, in mountain ecosystems globally.
- Develop trait-based predictors of range expansion (identifying potential "winners") and range-expander impact on native biodiversity (potential "losers") and ecosystem processes.
- Co-develop policy recommendations related to range-expanding species under climate change, with a focus on mountain ecosystems.

Main activities

RangeX adopts a hierarchical approach, nesting detailed experimental and comparative studies within a global network of researchers and managers studying range expansions of mountain plants. Field experiments will be used to identify mechanisms underlying plant range expansions, including biotic interactions with resident communities above and below ground, and the impacts of range expanding species on carbon cycling and pollination.

RangeX will integrate our experimental results (sites in South Africa, Switzerland and Norway) with detailed vegetation survey data from up to 22 mountain regions around the world (https://www.mountaininvasions.org). This project will involve national and international stakeholders, including natural resource managers as well as national and regional policy makers and government agencies, to synthesise knowledge and co-develop a joint understanding of the challenges and opportunities caused by range-expanding species. Building on participatory workshops and questionnaires, we will co-produce outputs and targeted dissemination strategies to improve awareness and integration of range-expanding species in regional and global policy.

RESTORE - (natuRe-basEd SoluTions for imprOving REforestation) - Innovative biotechnological strategies to improve tree drought tolerance and microbial diversity for forest restoration purposes: the application of plant associative microorganisms and nature-based materials

Context

Climate projections indicate higher precipitation variability along this century with more frequent drought extremes, which would have a strong influence on forest biodiversity due to impacts on ecosystem functioning, tree ecophysiology, and microbial communities. Reforestation with native trees has been considered a useful strategy to mitigate climate change. Still, its success is hindered by the high mortality of tree seedlings in the field and the difficulty in restoring native soil microbiota, which are amplified by drought events. Thus, it is of great interest to improve seedling production practices in nurseries, with the induction of mechanisms that increase drought tolerance.

Main objectives

RESTORE's main objective is to explore plant-microbiota interactions in forest ecosystems facing increased drought stress due to climate change, allowing the development of nature-based solutions to improve forest restoration initiatives.

Main activities

In this study, the responses of trees and associated soil microbiota to drought stress in three different forest types (Brazilian Seasonal Semideciduous Atlantic Forest, French Deciduous Mediterranean Oak Forest, and German Mesic Temperate Forest) will be evaluated, allowing to search for unifying patterns among geographically distant sites, across gradients, and by the use of experimental treatments.

Further, the application of different nature-based solutions as innovative strategies for improving tree seedling production and soil microbiome functioning/structuring will be tested. Associative microorganisms from tree species of the three ecosystems will be isolated and characterised to obtain beneficial microbial strains that can be used as bio inputs for seedling production. Moreover, biodegradable and biocompatible nano/microparticles and composite materials produced from natural sources will be used as carrier systems for plant growth regulators, microbial living cells, or chemical elicitors to improve their delivery to the plants.

The efficiency of these nature-based solutions in inducing tree seedlings' tolerance to drought stress and the corresponding effects on soil microbiota diversity and functioning will be evaluated using different approaches, including greenhouse cultivation, nursery seedling production, and field trials.

The economical balance of the proposed solutions will be evaluated through cost-effectiveness and cost-benefit analyses, and the evaluation of their social acceptance will take advantage of the engagement of stakeholders in the project. Restoration practitioners who plan, execute, and manage restoration projects will be first assessed by means of phone calls, e-mails, and in-person meetings to rise their potential contributions to and gain from their involvement in the project. The stakeholders who feel motivated to join the project will be invited to discuss firstly research questions and experimental designs, then project development and results, and later project evaluation and conclusions, by means of surveys, formal workshops, meetings, and joint experiments. Thus, in addition to contributing to the basic knowledge of the mechanisms of drought response of trees and soil microbiota, work undertaken in RESTORE will seek to improve reforestation programs' success, with important environmental, economic, and social impacts. The success of the project is based on an international multidisciplinary consortium (plant ecophysiologists, soil and rhizosphere microbiologists, microbial ecologists, chemists, engineers, economists) that will collaborate on a range of nature-based solutions.

Tree seedlings in the nursery of the Laboratory of Biodiversity and Ecosystem Restoration (State University of Londrina – Brazil) in front of a small forest restoration site

Partners of the project:

Coordinator: Animal and Plant Biology - State University of Londrina - Londrina - Brazil

Biochemistry and Biotechnology, General Biology, Agronomy – State University of Londrina – Londrina – Brazil

Socioeconomics – Institute of Rural Development of Paraná-IAPAR-EMATER – Londrina – Brazil

Environmental Engineering - São Paulo State University – Sorocaba – Brazil

Bioactivity Assessment and Toxicology of Nanomaterials - University of Sorocaba – Sorocaba – BrazilNatural and Human Sciences - Federal University of ABC – Santo André - Brazil

Continental Ecosystems and Environmental Risks (ECCOREV) – CNRS/Aix-Marseille University – Aix-en-Provence - France

Microbial Ecology of the Rhizosphere and Extreme Environments (LEMIRE) – BIAM/CEA/CNRS/Aix-Marseille University – Saint-Paul-lez-Durance – France

Fungal Biotechnology in Wood Science - Technical University of Munich - Munich - Germany

Network Biology and Biochemical Plant Pathology – Helmholtz Zentrum München (HZM), Neuherberg, Germany

Duration:

01/04/2021 – 31/03/2024

Total grant:

€ 579,963

Further information:

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Cocoa monoculture in Ghana

Partners of the project:

Coordinator: Institute for Environmental Decisions – ETH Zurich - Zürich - Switzerland

Biological Sciences – University of Queensland – Brisbane - Australia

Data and Policy Analysis - Alliance of Bioversity and CIAT – Cali– Colombia

Earth and Life Institute – Catholic University of Louvain – Louvain-la-Neuve – Belgium

Resources and Development – Stockholm Environment Institute – Stockholm – Sweden

Institute for Agricultural Science – ETH Zurich - Zürich – Switzerland

EcoVision Lab – University of Zurich - Zürich – Switzerland

Duration:

01/04/2021 – 31/03/2024

Total grant:

€ 1,050,904

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SUSTAIN-COCOA: Sustainable sourcing policies for biodiversity protection, climate mitigation, and improved livelihoods in the cocoa sector

Context

The conversion and degradation of tropical forests have multiple negative socio-environmental impacts. Conversely, their restoration, including enhancing tree cover on already cleared farmland, is a powerful nature-based solution to climate mitigation and adaptation, with potentially large biodiversity and rural livelihood co-benefits. A major driver of forest loss and degradation in the tropics is the production and trade of food commodities and associated land management practices, with cocoa being the leading forest-risk commodity in West Africa. Yet, cocoa production in agroforestry systems harbours the potential to partially restore biodiversity in key hotspots. Acknowledging these challenges and opportunities, ending deforestation and encouraging agroforestry has become a high priority in cocoa supply chains as part of interventions such as the Cocoa and Forests Initiative.

Main objectives

In the proposed research SUSTAIN-COCOA aims to investigate the conditions under which supply chain sustainability initiatives (SSIs) can lead to reduced deforestation and increased shade-tree cover in cocoa production systems and, in turn, a triple-win of increased biodiversity, climate change mitigation, and livelihood resilience. To meet this aim, six sub-objectives are integrated:

1. Developpe and synthesise datasets of cocoa supply chains, SSI attributes and coverage, and current extent of cocoa agroforestry;
2. Quantify the impacts of shade-tree cover on farm-level biodiversity, carbon storage, food production, farm and household income, and climate resilience;
3. Identify the drivers and impacts of SSIs on shade-tree cover, deforestation, and biodiversity in cocoa producing landscapes;
4. Estimate the potential carbon and biodiversity benefits of shade-tree adoption at regional scales;
5. Assess the overlap between SSI benefits and company motivations for adoption;
6. Deliver recommendations for how to improve the design, uptake, and implementation of SSIs in cocoa producing landscapes to promote biodiversity, climate, and livelihood synergies.

Main activities

To achieve these objectives, SUSTAIN-COCOA integrates (agro)-ecological fieldwork in cocoa agroecosystems, household and supply chain interviews, supply chain and land cover mapping, regional modeling, and stakeholder workshops. The cross-scale, interdisciplinary, and transnational approach will provide insights into the on-the-ground impacts of existing SSIs in the cocoa sector and the potential impacts of scaling up SSIs to reduce deforestation and enhance shade-tree cover. Furthermore, the role that agroforestry can play in helping deliver multiple sustainability objectives will be clarified: protecting biodiversity, climate mitigation, and improved farmer livelihoods. The project thus aligns well with the EU's efforts to step up action to protect and restore the world's forests. The engagement strategy enables stakeholders (including chocolate companies, federal ministries, farmers groups, and environmental and social NGOs) to inform the project from design to implementation. In the first year of the study SUSTAIN-COCA will hold a virtual workshop or meetings to gather more feedback on the research design and solidify fieldwork locations. Virtual meetings in year two and an in-person workshop to share and discuss results in year 3 will also be held.

NOTES

NOTES

Contributors

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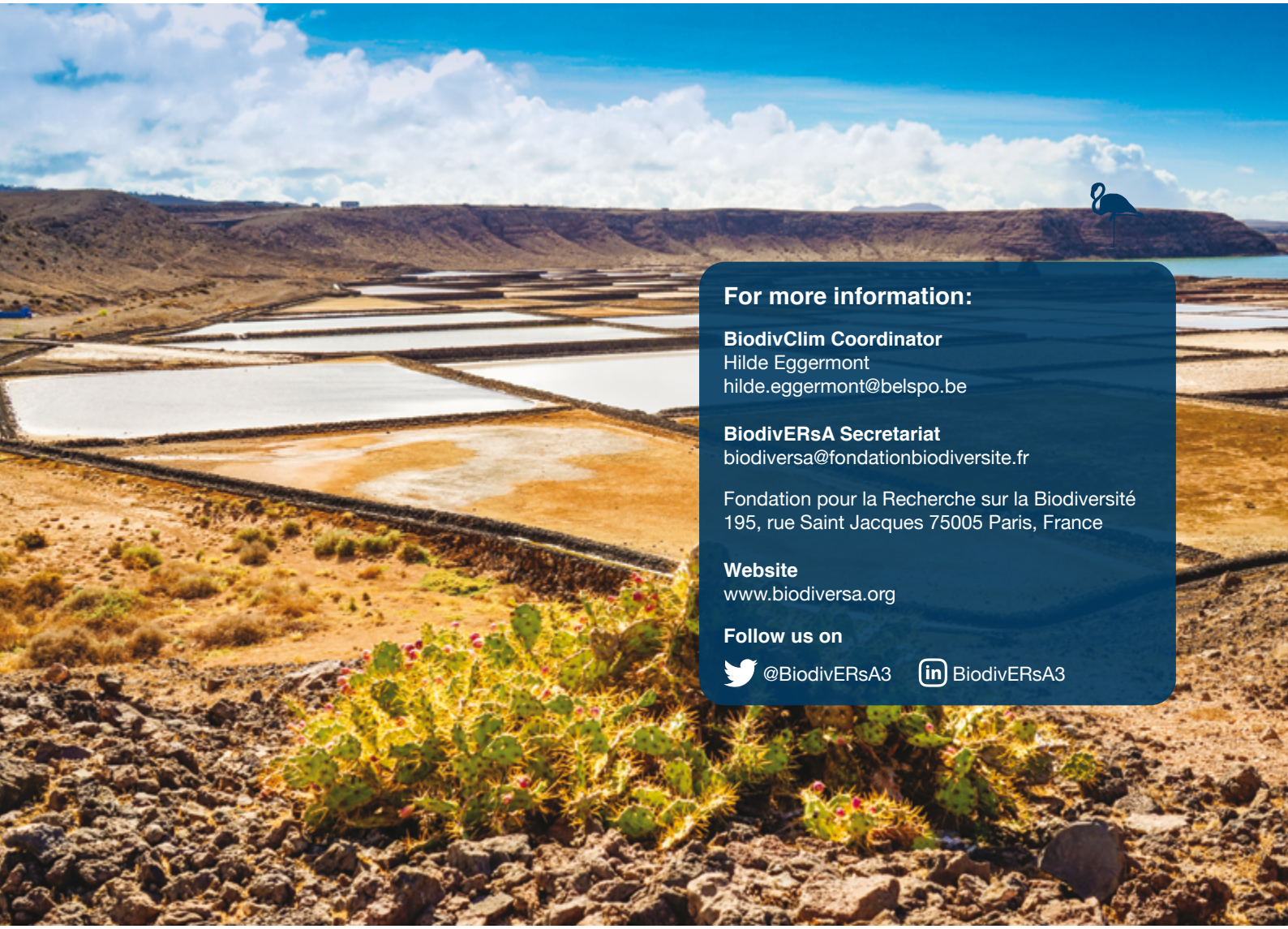
Layout

Thibaut Lochu - www.thibautlochu.com



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