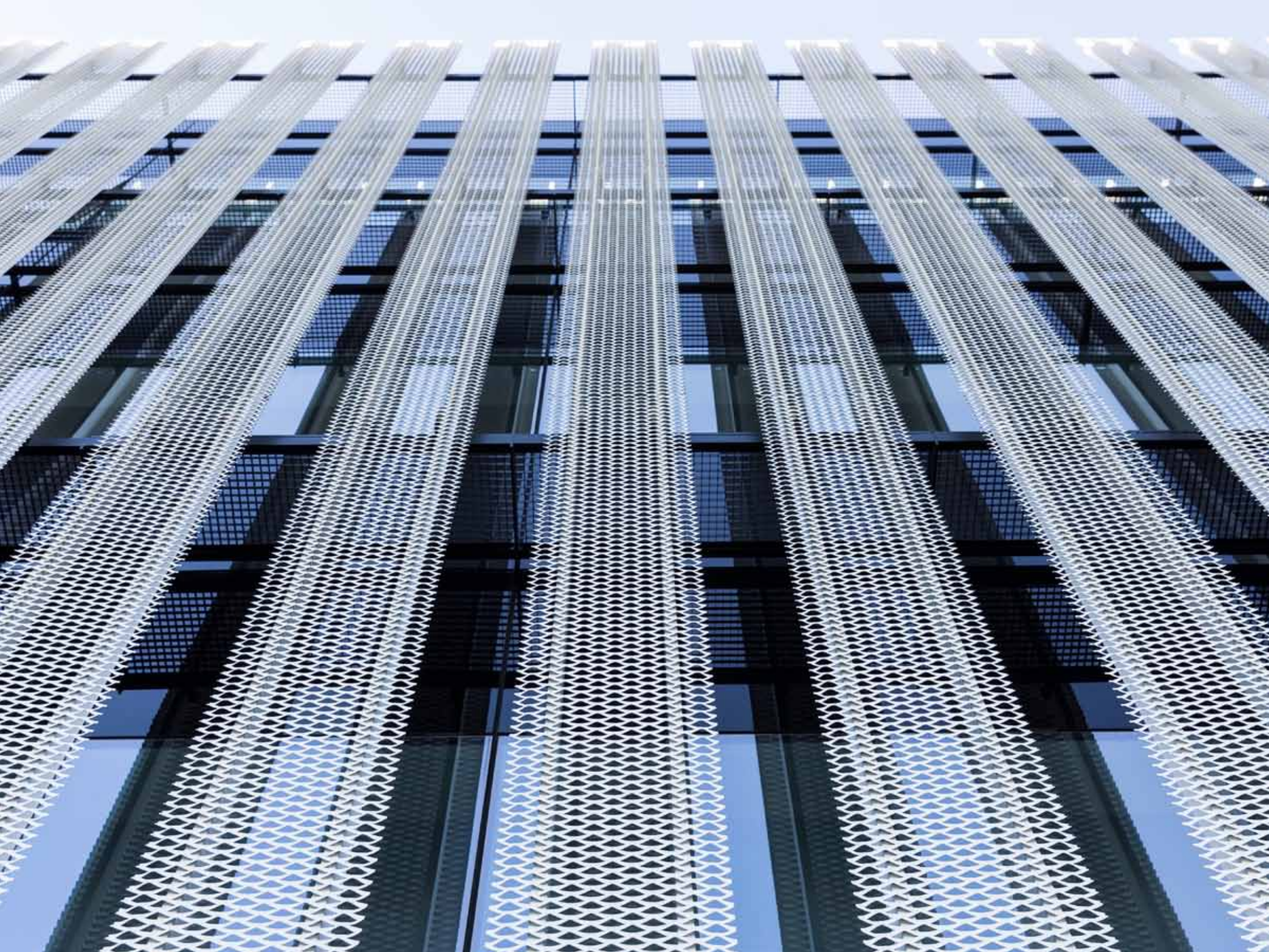




ACTIVITY REPORT 2020



BASQUE CENTRE
FOR CLIMATE CHANGE
Klima Aldaketa Ikergai
Sustainability, that's it!





BC3 aims to strategically foster co-production of knowledge relevant to decision making by integrating environmental, socioeconomic and ethical dimensions of climate change.

00

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01

DIRECTOR'S VIEW

DIRECTOR'S VIEW

María José Sanz
SCIENTIFIC DIRECTOR



BC3 - Integrating environmental, socioeconomic, and ethical dimensions of climate change to help decision makers.

The extraordinary situation caused by the COVID-19 pandemic in 2020, a health crisis of unpredictable dimensions, has evidenced that Climate Change and Biodiversity loss are threats to humanity that must be addressed together. The need to produce multi-disciplinary knowledge, to address systemically climate change, biodiversity, water, food, energy or health, to move towards sustainable international development, is more necessary than ever. We should make a reflection that solutions come about on the basis of the respect, varied abilities and viewpoints that a trans-disciplinary approach can provide, the courage to take on the complexity of physical and socio-ecological systems and the need to co-produce solutions together with the different stakeholders in society.

In BC3 we have achieved excellence in research on core aspects of climate change, from physical to ecological and socio-economic aspects, since its foundation in 2008. During 2020, in the context of this global pandemic, BC3 provided with relevant scientific information to key actors. This includes from contributions to IPCC and IPBES; co-production of knowledge together with international institutions, such as UN agencies and bodies, the European Commission, national, regional and local governments.

In 2020 we generated

143 Publications

123

PEER-REVIEWED
ARTICLES

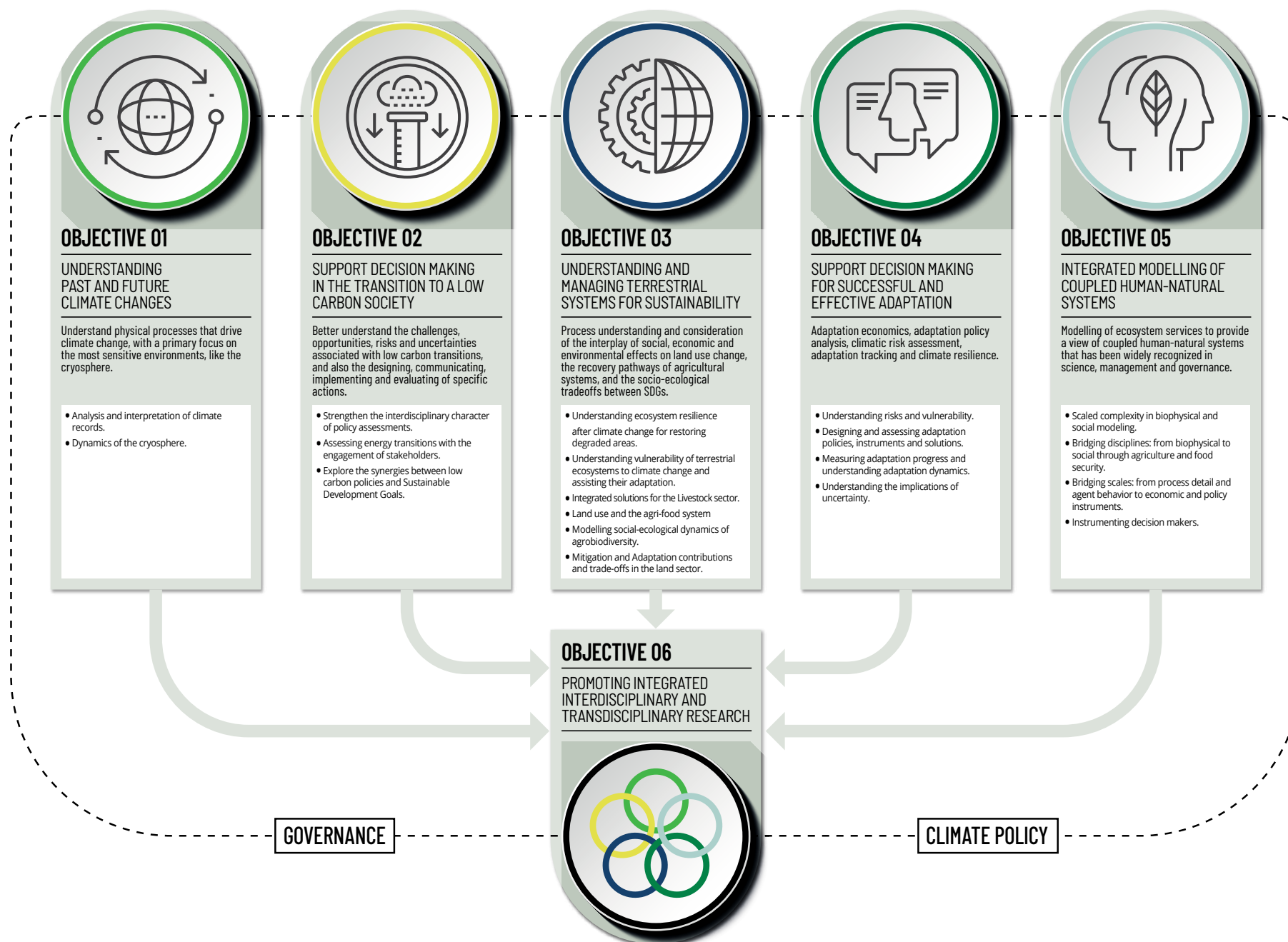
9

BOOKS AND
BOOK CHAPTERS

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TECHNICAL AND
POLICY REPORTS

THE CENTER'S ACTIVITY HAS BEEN ARTICULATED AROUND OUR SIX GENERAL OBJECTIVES:



02

THE CENTRE



BC3-BASQUE CENTRE
FOR CLIMATE CHANGE

Scientific Campus of the
University of the Basque Country.
LEIOA, BIZKAIA



PRESENTATION OF THE CENTRE

We are an excellence based research centre that contributes to the scientific knowledge about the causes and consequences of climate change. We produce multi-disciplinary knowledge to facilitate and drive decision-making towards sustainable international development. We are an interdisciplinary team led by the renowned climate change expert, Prof. María José Sanz, connected with key institutions, scientific networks and socioeconomic players.

For the past decade, our contribution to the international community in climate change research places us in a unique position to offer knowledge, tools, new methodologies and cross-cutting proposals orientated to the design and support of sustainable development policies.

PARTNERS, MISSION AND VISION

Our partners

We are a non-profit association formed by the following associate members:



Promoted by:



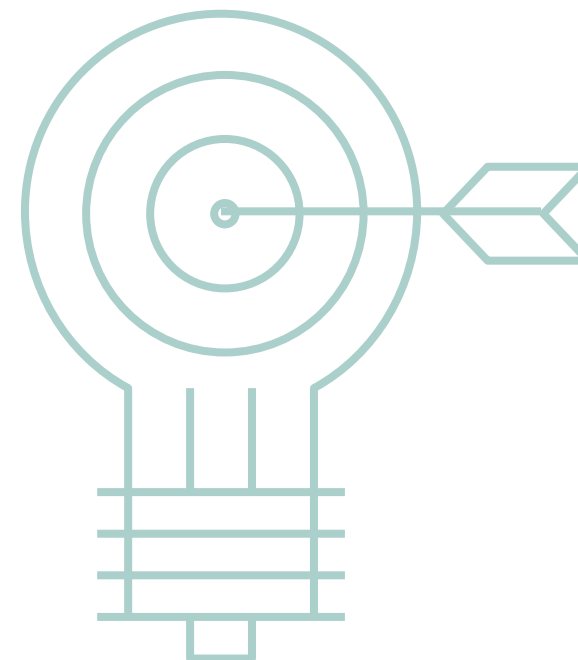
Mission

BC3 aims to strategically foster co-production of knowledge relevant to decision making by integrating environmental, socioeconomic, and ethical dimensions of climate change.

Vision

We want to contribute with our skills to sustainable development. Steering climate change science towards co-production of new knowledge and co-design of policies in collaboration with other interested stakeholders, with a solid transdisciplinary focus.

We embrace the challenge of going down a solid path, from research that deepens on the knowledge, and compares hypotheses and results from different models, to the development and implementation of integrated solutions, which are complex in their consideration of climate change's multiple facets.



INTERNATIONAL SCIENTIFIC ADVISORY COMMITTEE

The International Scientific Advisory Committee (ISAC) is a consultative body of independent experts created to provide advisory opinions and analysis on science to our centre. Its remit includes matters concerning research programs and general strategy. Members are appointed for four year as independent scientific experts on the basis of their specific skills, abilities, experience and knowledge.

The regular annual meeting was held on the 3rd of July 2020, where BC3 presented its scientific achievements during 2019 and its scientific objectives for 2020.

The composition of the Advisory members is as follows:

ANNELA ANGER-KRAAVI

Senior Research Associate at Cambridge Institute for Sustainability Leadership

NEIL ADGER

Professor of Human Geography at the University of Exeter

IÑIGO LOSADA

Scientific Director of the Institute of Environmental Hydraulics of University of Cantabria

REINHARD MECHLER

Deputy director of "Risk, Policy, Vulnerability" at the International Institute for Applied Systems Analysis (IIASA)

MARINA RUFINO

Professor of Agricultural Systems at Lancaster University

TIM TAYLOR

Senior Lecture at the University of Exeter

TERESA MORENO

Director of Institute of Environmental Assessment and Water Research (IDAEA)



ANNELA ANGER-KRAAVI



NEIL ADGER



IÑIGO LOSADA



REINHARD MECHLER



MARINA RUFINO















TIM TAYLOR



TERESA MORENO

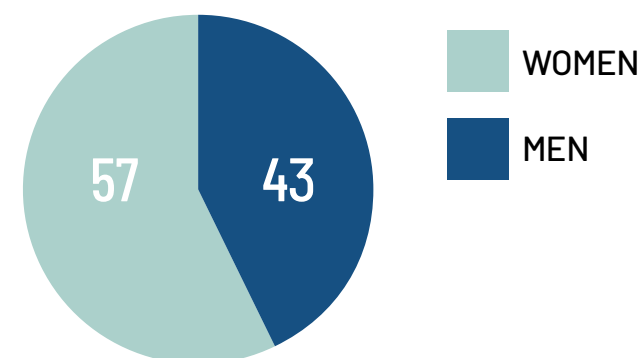
BC3 TEAM: Statistics

BC3 Team

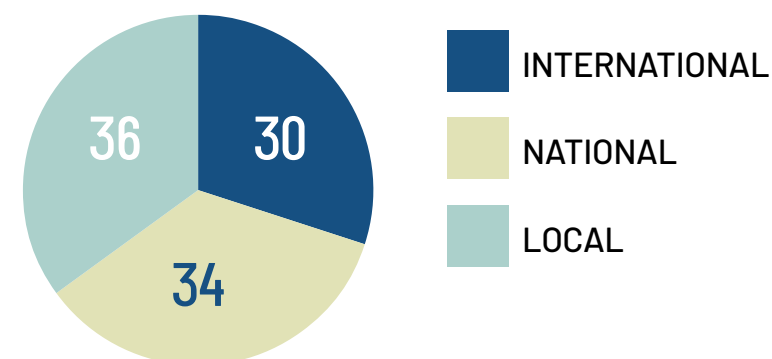
	2018	2019	2020
TOTAL BC3 TEAM 	58	66	77
SCIENTIFIC DIRECTOR 	1	1	1
RESEARCHERS 	51	58	69
Research Professors 	11	12	12
Research Fellows 	5	7	9
Post Doc Researchers 	17	15	13
PhD Students + Tech/Res Assistants 	18	24	35
ADMINISTRATION TEAM 	6	7	7
Operation Manager 	1	1	1
Project Manager Outreach 	1	1	1
Project Officer 	3	3	3
Management Assistant 	1	2	2

The BC3 staff (dated December 31, 2020)

Gender distribution



Nationality distribution



BC3 TEAM: HR Excellence in Research

The European Commission awarded BC3 in 2015 with the HR Excellence in Research in recognition of the commitment with the European Charter for Researchers and the Code of Conduct for the Recruitment of Researchers. The implementation of the Charter & Code made by the BC3 has been a key driver for talent attraction and retention, making BC3 an even more attractive destination for researchers. During 2020 we finalized the deployment of the **revised action plan** of the HR Excellence in Research process, and started the HR Excellence award renewal process. The **Improved Action Plan** was sent to the European Commission.

This action plan allows us to improve our recruiting process, ensuring that gender equality is present at all the stages of the research career, which is one of the axes that guides the Human Resources management.



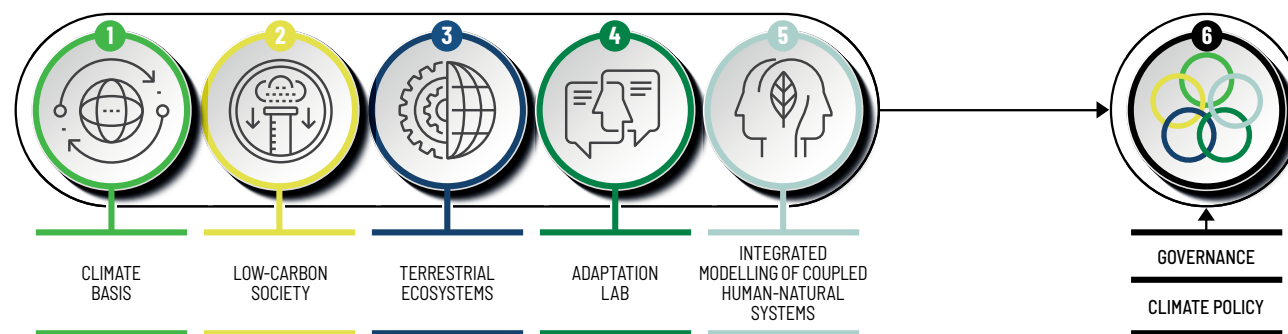
HR EXCELLENCE IN RESEARCH

BC3 TEAM: RESEARCHERS

BC3 RESEARCH LINES

Five Research Lines are contributing to our strategic objectives, providing structure to the centre's research activity.

As cross cutting themes, we also work with Governance and Climate Policy, that are addressing local, national and international issues.



OUR TEAM OF RESEARCHERS



MARÍA JOSÉ SANZ
SCIENTIFIC DIRECTOR
3 Terrestrial Ecosystems



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TECHNICAL ASSISTANT
2 Low Carbon



UNAI ÁLVAREZ
POSTDOCTORAL RESEARCHER
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JORGE CURIEL
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BC3 TEAM: RESEARCHERS

OUR TEAM OF RESEARCHERS



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MIKEL RUEDA
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RESEARCH ASSISTANT
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MARI MAR SOLÁ
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Human-natural Systems



YUWEI WU
TECHNICAL ASSISTANT
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Human-natural Systems



NOELIA ZAFRA
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3 Terrestrial Ecosystems

BC3 TEAM: ADMINISTRATION

ADMINISTRATION TEAM



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OPERATION MANAGER



SUSANA PÉREZ
MANAGEMENT ASSISTANT



AINHOA AZKARATE
PROJECT MANAGER



SILVIA DE LUIS
PROJECT OFFICER



IRUNE VEGAS
PROJECT OFFICER



RAQUEL VEGA
PROJECT OFFICER



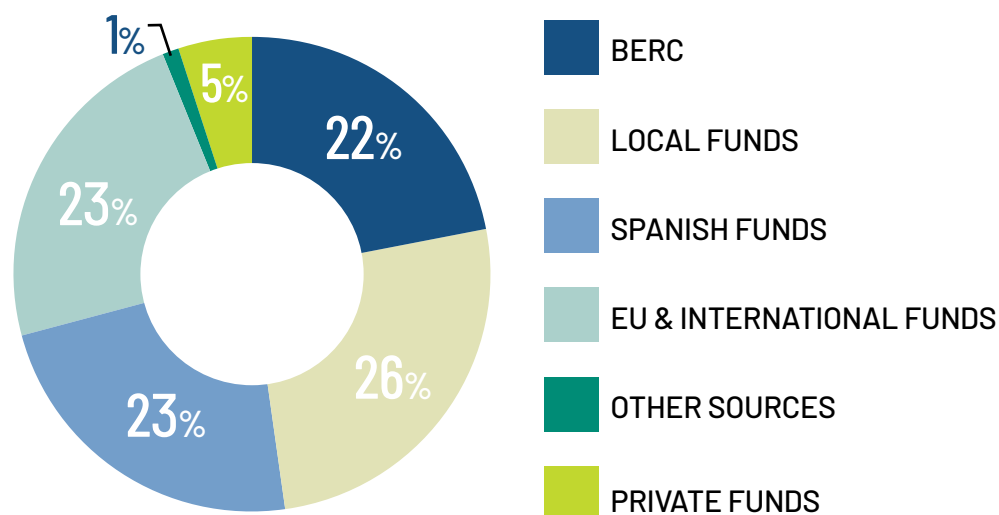
AINARA FERNÁNDEZ
COMMUNITY MANAGER

**FOR MORE
INFORMATION,
VISIT OUR WEBSITE:**
www.bc3research.org/people



FUNDING

Distribution of BC3 Funds



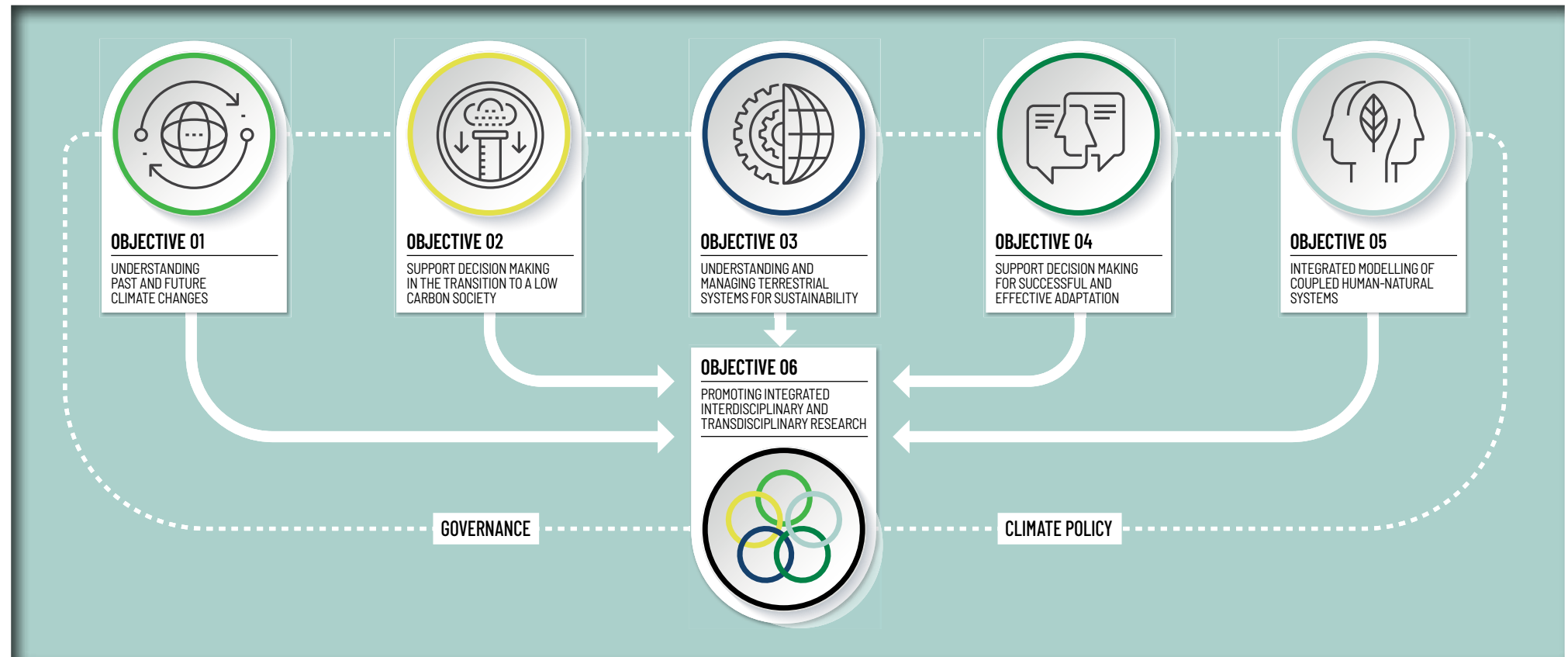
The attraction of external funding is one of the key indicators of excellence. Despite the global pandemic, 2020 has continued to be exceptional in terms of external resources attracted. The non-BERC* funding percentage has reached 77.8% in 2020.

* The acronym BERC corresponds to the term Basque Excellence Research Centre, a category of research centres financed by the Basque Government and framed in the Basque Network of Science, Technology and Innovation.



03

OUR OBJECTIVES



OBJECTIVES

Our Strategic objectives encompass a 360° view of climate change's challenges and opportunities, in harmony with the **Sustainable Development Goals**: understanding climate change causes and consequences, offering knowledge and tools to progress as a sustainable society, contribute to research, regulatory and policy related aspects, as well as to overall society through our contribution and integrated work.





OBJECTIVE 1

Understanding past and future climate changes

We conduct research to understand the past and future of climate change.

Based on the analysis and interpretation of existing data, we need to understand the physical processes that drive climate change, especially in more sensitive areas affected by phenomena with important repercussions, such as dramatic changes in the cryosphere.

OBJECTIVE 1

Understanding past and futures climate changes



On the basis that responsible scientific support for policymaking and co-generation of far-reaching scientific knowledge require a clear understanding of the physical basis of climate change, this is approached from BC3 by two main activities; **the development of methodological innovations in complex dynamical systems modelling and statistical analysis to contribute to the interpretation of climate records and a better understanding of the dynamics of the cryosphere** (polar and mountain regions). These activities are implemented in an integrated manner through four dimensions of integration: observation (field work), theory (modelling and analysis), experiment (laboratory work) and understanding (climate-change cognitive studies). While the first three dimensions build up the classical physical sciences triad (theoretical, field, and laboratory work), the fourth dimension relates the physical processes to their human perception and awareness, therefore providing a transdisciplinary and integrative “handshake” to the other objectives of BC3.

During 2020, BC3 continued to develop new models of climate proxy formation and evolution (proxy modelling) using thermodynamic and statistical physics approaches. Particular attention has been devoted to the Theory of Continuous Diversity, which is the main framework used by BC3 to model complex media, from glaciers to social systems. The combination of Continuous Diversity with a Small Sherpa Project (SSP) funded by BC3 (BALELUR) and S.H. Faria's contributions to the IPCC AR6 WGI in the field of regional climate gave rise to a new research activity within this objective, which is the regional climate modelling of high-mountain environments. The ultimate objective is to downscale selected CMIP6 models in order to develop BC3's own regional climate models for high mountains.

OBJECTIVE 1

Understanding past and futures climate changes



RESEARCH INFRASTRUCTURE

Izotza lab. The Centre's Low-Temperature Science laboratory for microscopy of frozen samples.

HIGHLIGHTED RESEARCH PROJECTS OR CONTRACTS

- **EastGRIP.** East Greenland Ice-core Project, Multi-national project.
- **Paleo-ICE.** "Is the current period the warmest of the last millennia? Evidence from the ice Pyrenees glacier".
- **CORaHE.** Design and construction of an X-Y-Z-motorized head to perform deep-UV Raman measurements at microscopic level in cold environments from -5 to -30 °C.
- **iMechPro.** Ice microstructure and mechanics, and their implications for the integrity of climate proxies in ice cores.
- **FATHOM.** Fully automated, low-temperature & high-performance optical microscope.

HIGHLIGHTED MODELS OR TOOLS

- **[Continuous Diversity Theory]** thermodynamic framework for the modelling of complex systems.
- **[Iceberg Dynamics]** A hybrid continuum-statistical model of the drift of an armada of icebergs on the North Atlantic or the Southern Ocean.
- **[Ice Slip Bands]** Physical Model of Slip-Band Formation and Distribution in Polar Ice (V 2.0).
- **Linescanner image processing tools (V 0.7, BC3 developed).** A set of Image procedures for processing images from ice-core line scanner, including specialized filters, noise and bias reduction, parallax corrections, stitching to extract a stratigraphic time series.
- **CORaHE Probe:** Prototype of a new Raman probe for low temperatures (V 0.4, under development).

HIGHLIGHTED PUBLICATIONS

- Iturbide M., Gutiérrez J.M., Alves L.M., Bedia J., Cerezo-Mota R., Cimadevilla E., Cofiño A.S., Luca A.D., Faria S.H., Gorodetskaya I.V., Hauser M., Herrera S., Hennessy K., Hewitt H.T., Jones R.G., Krakovska S., Manzanar R., Martínez-Castro D., Narisma G.T., Nurhati I.S., Pinto I., Seneviratne S.I., Hurk B.V.D., Vera C.S. 2020. **An update of IPCC climate reference regions for subcontinental analysis of climate model data: definition and aggregated datasets.** *Earth System Science Data*. 12. (4) 2959-2970. DOI (10.5194/essd-12-2959-2020).
- Mojtavani S., Wilhelms F., Cook E., Davies S.M., Sinnl G., Skov Jensen M., Dahl-Jensen D., Svensson A., Vinther B.M., Kipfstuhl S., Jones G., Karlsson N.B., Henrique Faria S., Gkinis V., Astrid Kjær H., Erhardt T., Berben S.M.P., Nisancioglu K.H., Koldtoft I., Olander Rasmussen S. 2020. **A first chronology for the East Greenland Ice-core Project (EGRIP) over the Holocene and last glacial termination.** *Climate of the Past*. 16. (6) 2359-2380. DOI (10.5194/cp-16-2359-2020).
- Morcillo G., Faria S.H., Kipfstuhl S. 2020. **Unravelling Antarctica's past through the stratigraphy of a deep ice core: an image-analysis study of the EPI-CA-DML line-scan images.** *Quaternary International*. 566-567. 6-15. DOI (10.1016/j.quaint.2020.07.011).
- Frugone-Alvarez M., Latorre C., Barreiro-Lostres F., Giral S., Moreno A., Polanco-Martinez J., Maldonado A., Carvedo M.L., Bernárdez P., Prego R., Delgado Huertas A., Fuentealba M., Valero-Garcés B. 2020. **Volcanism and climate change as drivers in Holocene depositional dynamic of Laguna del Maule (Andes of central Chile - 36°S).** *Climate of the Past*. 16. (4) 1097-1125. DOI (10.5194/cp-16-1097-2020).



OBJECTIVE 2

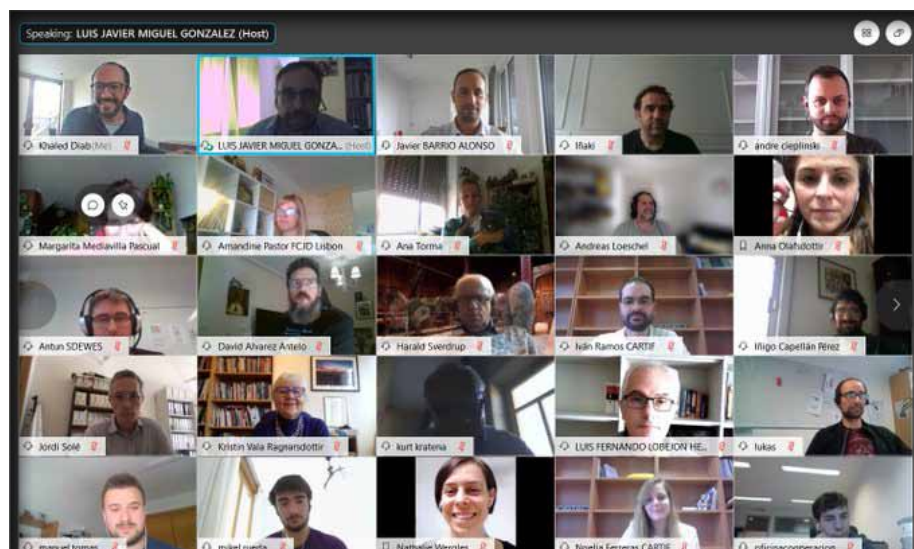
Support decision making in the transition to a low carbon society

We research to produce knowledge that can be useful for decision-making in the transition to a Low Carbon Society.

To be able to design, communicate, implement and assess actions towards a low carbon and energy secure society, we need to better understand challenges and opportunities, within a context of risks and uncertainties, with an interdisciplinary focus.

OBJECTIVE 2

Support decision making in the transition to a low carbon society



The global community faces the challenge of curbing greenhouse gas emissions in an equitable and effective manner, and without compromising the achievement of Sustainable Development Goals and the efforts to eradicate poverty and inequality. The research under this objective was articulated in three main activities:

Strengthen the interdisciplinary character of policy assessments

BC3 adopts a multidisciplinary approach to assess climate policies. We use integrated assessment tools (ranging from Economy-Energy-Environment models to microeconomic models and Global Integrated Assessment models) to analyse the implications of low carbon transitions, taking into account not only the technological, economic and financial dimensions, but also other relevant social and environmental aspects. In this context BC3 has contributed with the use of many different methods. In the CHANCE project, developed jointly with MIT, we are bridging the gap between economic and social goals, through a novel approach integrating Macroeconomic and Microsimulation that will allow us to assess two of the most pressing challenges after COVID-19: the design and implementation green recovery packages and the reduction of inequality. BC3 has also developed a novel methodology to account the attribution of responsibilities for greenhouse gas emissions published in Nature Communication. This methodology could contribute to making international negotiations on climate change for fair and efficient. During 2020 we have also just started two new different H2020 projects (PARIS REINFORCE and LOCOMOTION) where we are using and developing new integrated assessment tools that will help to reinforce the National Determined Contributions and accelerate the Paris Agreement.

Assessing energy transitions with the engagement of stakeholders

An innovative aspect of the research in this area is to engage multiple stakeholders in the research lifecycle so that multiple aspects of low carbon options are captured starting from the initial design. In the PARIS REINFORCE project, we aim to facilitate stakeholder dialogue coupled with a strong ensemble of complementary models in order to co-design, assess and support climate policies faced upon the challenges of a post Paris agenda. Another example is the work developed for the Ministry for the Ecological Transition and Demographic Challenge of the Spanish Government in 2020, where BC3 has been in charge of the economic impact assessment of the Spanish Long-term Strategy of De-carbonization 2050. We have also supported the Ministry of Transport, Mobility and Public Agenda (MITMA) on the economic analysis of the long-term strategy for energy efficient refurbishment in dwellings in Spain. Another example of is the development of the Trade-SCAN toolkit in collaboration with the Joint Research Centre of the European Commission; this tool has been used by the European Commission in its European Economic Forecast to analyse the economic impacts of the COVID-19 crisis. BC3 has also collaborated with private stakeholders, such as Iberdrola, for whom we have estimated the economic and social impact of different alternatives to finance renewables in Spain. During 2020 we have been working together with an extensive list of stakeholders and policy makers from different institutions.

OBJECTIVE 2

Support decision making in the transition to a low carbon society



Explore the synergies between low carbon policies and Sustainable Development Goals

The activity in 2020 has been to build mainly on work done in PARIS REINFORCE project where we are exploring how SDG indicators are considered in the IAM models used by IPCC report so we can help to fill this gap. In this line, BC3 has collaborated with the Green Growth Knowledge Platform and the United Nations Environmental Program. As a result of this collaboration BC3 has produced two different studies. The first values the increase in natural capital that would arise from meeting different SDG climate goals, whereas the second evaluates the costs of meeting SDG climate goals for a selected group of countries and globally.

HIGHLIGHTED RESEARCH PROJECTS OR CONTRACTS

- **PARIS REINFORCE.** Delivering on the Paris Agreement (H2020).
- **LOCOMOTION.** Low Carbon Society: an enhanced modelling tool for the transition to sustainability (H2020).
- **EU-TiVA.** European Union Trade in value added, jobs And GHG Emissions (EU JRC).
- **Technical assistance in the Spanish National Energy and Climate Plan 2021-2030.**
- **Technical assistance for the Spanish Long-term Strategy of De-carbonization 2050.**
- **European Climate Foundation.** A contract was signed in 2020, to assess the tax system.

HIGHLIGHTED MODELS OR TOOLS

- **DENIO Model:** Dynamic Econometric National Input-Output model for Spain (v.1.0-PNIEC) DENIO is a new-Keynesian dynamic econometric model that has been used to support the Spanish Ministry for the Ecological Transition on the development of the integrated National Energy and Climate Plan 2021-2030 of Spain. The model was used on the economic assessment of the Spanish Strategy of De-carbonization 2050.
- **DERIO Model:** Dynamic Econometric Regional Input-Output model for the Basque Country: Model to evaluate the implications of industrial, energy and environmental policies and scenarios in the Basque Country.
- **Trade-SCAN (v.1.0)** a software tool developed by the BC3 for the Joint Research Center of the European to support the analysis of the environmental and socio-economic consequences of international trade. The tool has three modules: 1) module for the decomposition of the factor content of trade; 2) module for the visualization of key indicators on the consequences of international trade; 3) module of dashboard of international trade. The tool is being actively used by officers of the European Commission (DGT JRC, DG TRADE, DG EUROSTAT). The tool is currently being upgraded to include more databases, GHG emissions and footprint indicators.
- **HOMES Model:** The HOMES model (Household Outcome Micro-simulator for Environmental Studies) is a model designed to analyze the socioeconomic and distributive impacts of public policies that directly affect households and consumers, both economic, energy, environmental or fiscal.

HIGHLIGHTED PUBLICATIONS

- Dietzenbacher E., Cazarro I., Arto I. 2020. **Towards a more effective climate policy on international trade.** Nature Communications. 11. (1) DOI (10.1038/s41467-020-14837-5).
- Lieu J., Hanger-Kopp S., van Vliet O., Sorman A.H. 2020. **Assessing risks of low-carbon transition pathways.** Environmental Innovation and Societal Transitions. 35. 261-270. DOI (10.1016/j.eist.2020.04.009).
- Pizarro-Irizar C., González-Eguino M., van der Gaast W., Arto I., Sampedro J., van de Ven D.-J. 2020. **Assessing stakeholder preferences on low-carbon energy transitions.** Energy Sources Part B-Economics Planning and Policy. 15. (10-12) 455-491. DOI (10.1080/15567249.2020.1812767).
- Román M.V., Arto I., Ansuategi A., Galarraga I. 2020. **The economic implications of tied aid and local content requirements for climate finance.** Climate Change Economics (cce). 11. (1) DOI (10.1142/S2010007820500025).
- Sampedro J., Smith S.J., Arto I., González-Eguino M., Markandya A., Mulvaney K.M., Pizarro-Irizar C., Van Dingenen R. 2020. **Health co-benefits and mitigation costs as per the Paris Agreement under different technological pathways for energy supply.** Environment International. 136. DOI (10.1016/j.envint.2020.105513).
- Sorman A.H., García-Muros X., Pizarro-Irizar C., González-Eguino M. 2020. **Lost (and found) in Transition: Expert stakeholder insights on low-carbon energy transitions in Spain.** Energy Research and Social Science. 64. DOI (10.1016/j.erss.2019.101414).
- Tomás M., López L.A., Monsalve F. 2020. **Carbon footprint, municipality size and rurality in Spain: Inequality and carbon taxation.** Journal of Cleaner Production. 266. DOI (10.1016/j.jclepro.2020.121798).



OBJECTIVE 3

Understanding and managing terrestrial systems for sustainability

We conduct research to understand and support the management of terrestrial systems for sustainability.

And to do so, we need a thorough understanding of the relationship between environmental effects and the social and economic factors associated with sustainable use of the land. It is necessary to analyse both vulnerability and the effects of climate change on fields such as agriculture, biodiversity, food safety, as well as on terrestrial systems in general.

OBJECTIVE 3

Understanding and managing terrestrial systems for sustainability



BC3 explores different aspects that are relevant for socially efficient allocation of land resources, in terms of their long-term conservation of ecosystems as well as for their ongoing utilization. Effective land use decisions require process understanding and consideration of the interplay of social, economic and environmental effects on land, while promoting integrative, climate-smart agriculture and ecosystem management. The activities undertaken by BC3 are focused on improving and further developing bottom-up methodologies and estimates of different ecosystem services and functions by reinforcing ecosystems monitoring and experimentation on terrestrial systems, including in relation to adaptation mechanisms and mitigation opportunities for climate change.

The research under this objective was articulated in the following six main activities:

Understanding ecosystem resilience after climate change for restoring degraded areas

BC3 is expanding the study of how ecosystems affected by ancient anthropogenic impacts (agriculture, mining) recover over long periods of time in different regions (Spain, Greenland, Brazil). The results of the REBECOM and Norse will allow us to understand how ecosystem key attributes (interaction structure, carbon and nutrient pathways) reassemble through time and how this recovery process may be affected by past and present climate changes.

Understanding vulnerability of terrestrial ecosystems to climate change and assisting their adaptation

During 2020, activities focused on:

- A)** Developing early markers of ecological and physiological vulnerability of forests to climate change and collecting evidence on how forestry practices, current and historical, may affect the stability of forests under the increasingly frequent number and intensity of natural perturbations.
- B)** Modelling and monitoring for European forest soils, integrating soil biodiversity in terrestrial responses to climate change and feedbacks to climate. Improvements and integration in predictions with the soil model, KEYLINK.
- C)** Disentangling the response mechanisms of the vegetation to increasing climatic stress and its impact on vegetation water-use efficiency. Studies were completed on the impact of different climate change drivers, elevated CO₂ and drought, on plant carbon-water trade-offs using different analytical tools and experimental approaches.
- D)** Exploring management and land-use legacies on current responses of forests to natural perturbations. BC3 is studying how, and at which extent, historical management of Mediterranean and

OBJECTIVE 3

Understanding and managing terrestrial systems for sustainability



Conifer temperate forests is affecting their current response to droughts and their capacity to recover after droughts and their stability.

E) Biophysical functioning of terrestrial ecosystems and their responses to management and climate variability, in collaboration with UPV/EHU, whose research focuses on the hydrogeological study of the Bidasoa river basin located between the provinces of Gipuzkoa and Navarra with an area of 681 km².

Integrated solutions for the Livestock sector

BC3 continues developing new (e.g. SIMSSR: farm model for studying sustainability trajectories for small ruminant systems in Europe) and adapting existing BC3 (e.g. SIMSDAIRY: farm model for dairy cattle) or external (e.g. RothC: field model for studying soils carbon dynamics) modelling tools, from the field and farm level to life cycle analysis (LCA) and regional scales. These models are useful to explore scenarios that can both adapt to climate change (e.g. reducing the effect of heat stress on ruminant production systems) and mitigate GHG emissions and promote soil C sinks in both the livestock sector and indirectly affected sectors, including aspects related to cost-effectiveness, trade-offs, and sustainability in terms of animal welfare and productivity, biodiversity and socio-economic resiliency. These models and other approaches (e.g. national inventories) are currently tested and used in combination with new metrics of GWP* in order to analyse the historical contribution of different European livestock sectors to additional atmosphere warming levels and their role on stabilising global temperatures. Modelling different emission target scenarios should allow us to envision the desired reduction of GHG emissions from particular livestock sectors to achieve a stable impact on global temperatures, i.e. to be climatically neutral.

Land use and the agri-food system

BC3 explores the effects of closed nutrient loops on environmental impact, resilience and sustainability at different levels of the agri-food system, by optimizing the relationship between agriculture, land use and waste management. A life cycle analysis (LCA) coupled with models developed by the group (e.g. SIMSWASTE) is used to model outputs at the farm and land use levels in order to understand if the environmental impacts of resource use competition can be used by different manure management systems in dairy cattle. Additionally, BC3 addresses the social implications of agricultural intensification. This is done with a social-ecological empirical lens. BC3 also contributes to filling the knowledge gap on farmers' preferences for climate risk related insurance in agricultural systems in Europe. A team of environmental economists analysed the attractiveness of a climate risk insurance scheme and the choices farmers face between adaptation via farm management practices and purchase of crop insurance in the market.

OBJECTIVE 3

Understanding and managing terrestrial systems for sustainability



Modelling social-ecological dynamics of agrobiodiversity

Focused on understanding how institutions, including markets and policies, can co-evolve to support sustainable agrobiodiversity under climate change, we analyse different governance options. For example, BC3 focused on the role of economic incentive schemes and programs, including so-called payments for ecosystem services, generally in contexts from the Global South where agricultural landscapes are undergoing rapid transformations while impacting agrobiodiversity at the landscape level. Such governance models are analysed by taking into account the diversity of values that co-exist among stakeholders shaping agricultural landscapes. BC3 has also analysed the role of different valuation mechanisms, including deliberative monetary valuation to assess the contributions from agrobiodiversity rich landscapes in order to support PES-like programs.

Mitigation and Adaptation contributions and trade-offs in the land sector

Research is focused in multilateral activities and efforts to improve the understanding of the mitigation potential of the Land Use Sector in the global, regional and national context. The land sector is now at the core of the discussions on how to raise climate change mitigation ambition by countries (through their National Determined Contributions) and by the private sector. It becomes therefore fundamental to improve the understanding of the mitigation potential of the Land Use Sector. M.J. Sanz contributed to goals for the Rise to Zero initiative, to be launched in 2021, as part of the Expert Group on Land from the Marrakesh Partnership.

OBJECTIVE 3

Understanding and managing terrestrial systems for sustainability



HIGHLIGHTED RESEARCH PROJECTS OR CONTRACTS

- **HOLISOILS** Holistic Management Practices, Modelling & Monitoring For European Forest Soils (H2020).
- **ISAGE**. Innovation for Sustainable Sheep and Goat Production in Europe (H2020).
- **MASBIO**. Sustainable land management practices for the preservation of biodiversity and other ecosystem services in the Mijares basin (Fundación Biodiversidad)
- **RESH20**. Restoration of environmental services and the water cycle in a context of adaptation to climate change in Mediterranean basins (Fundación Biodiversidad)
- **REBECOM**. Estimating recovery time of temperate forests after historic anthropogenic disturbances along a gradient of complexity (MCIN).
- **IBERYCA**. The role of plant-microbiota interactions in the resilience and collapse of Mediterranean forest of holm-oaks (MCIN).
- **PHLISCO** Reconciling water-use efficiency estimates across scales under future climate change scenarios using PHLoem carbon ISotopic COmposition (MCIN).
- **MANURE**. Management of dejections in productive systems of milk cattle from the Cantabrian coast. From exploitation to the territory: efficiency of the use of nutrients, mitigation of greenhouse gases and reduction of the carbon footprint (INIA).
- **RESH20**: Restoration of environmental services and the water cycle in a context of adaptation to climate change in Mediterranean basins (Fundación Biodiversidad)
- **REVALUE**. Relational values in urban environments: A transdisciplinary approach (EJ PIBA).
- **HAYEDOS**. Evaluating the role of soil diversity in maintaining the functionality of beech forests in a climate change scenario (EJ PIBA).

HIGHLIGHTED MODELS AND TOOLS

- **SIMSNIC**. Model to investigate the effects of closed nutrient loops on environmental impact, resilience and sustainability at different levels of the agri-food system.
- **SIMSWASTE**. Model to investigate the effects of closed nutrient loops on environmental impact, resilience and sustainability at different levels of the agri-food system, by optimizing the relationship between agriculture, land use and waste management.
- **SIMSSR(v.1.)** Whole farm model to study small ruminant's production systems sustainability in Europe.
- **REDD+ funds distribution**. Assess how the distribution of REDD+ funds impacts deforestation and biodiversity.
- **KEYLINK Model**. Model the role of soil biodiversity on soil biogeochemical and hydrological cycling.

HIGHLIGHTED PUBLICATIONS

- Moreno-Mateos D., Alberdi A., Morriën E., van der Putten W.H., Rodríguez-Uña A., Montoya D. 2020. **The long-term restoration of ecosystem complexity**. *Nature Ecology And Evolution*. 4 (5) 676-685. DOI (10.1038/s41559-020-1154-1).
- Bastias C.C., Truchado D.A., Valladares F., Benavides R., Bouriaud O., Bruehlheide H., Coppi A., Finér L., Gimeno T.E., Jaroszewicz B., Scherer-Lorenzen M., Selvi F., De la Cruz M. 2020. **Species richness influences the spatial distribution of trees in European forests**. *OIKOS*. 129. (3) 380-390. DOI (10.1111/oik.06776).
- García-Angulo D., Heres A.-M., Fernández-López M., Flores O., Sanz M.J., Rey A., Valladares F., Curiel Yuste J. 2020. **Holm oak decline and mortality exacerbates drought effects on soil biogeochemical cycling and soil microbial communities across a**

climatic gradient. *Soil Biology & Biochemistry*. 149. DOI (10.1016/j.soilbio.2020.107921).

- Gazol A., Camarero J.J., Sánchez-Salguero R., Vicente-Serrano S.M., Serra-Maluquer X., Gutiérrez E., de Luis M., Sangüesa-Barreda G., Novak K., Rozas V., Tiscar P.A., Linares J.C., Martínez del Castillo E., Ribas M., García-González I., Silla F., Camisón Á., Génova M., Olano J.M., Heres A.-M., Curiel Yuste J., Longares L.A., Hevia A., Tomas-Burguera M., Galván J.D. 2020. **Drought legacies are short, prevail in dry conifer forests and depend on growth variability**. *Journal of Ecology*. 108. (6) 2473-2484. DOI (10.1111/1365-2745.13435).
- Muradian R., Pascual U. 2020. **Ecological economics in the age of fear**. *Ecological Economics*. 169. DOI (10.1016/j.ecolecon.2019.106498).
- Ruiz I., Sanz M.J. 2020. **Effects of historical land-use change in the Mediterranean environment**. *Science of the Total Environment*. 732. DOI (10.1016/j.scitotenv.2020.139315).
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- Pardo G., del Prado A. 2020. **Guidelines for small ruminant production systems under climate emergency in Europe**. *Small Ruminant Research*. 193. DOI (10.1016/j.smallrumres.2020.106261).



OBJECTIVE 4

Support decision making for successful and effective adaptation

We conduct research to facilitate decisions for successful and effective adaptation to climate change and its impacts. Based on scientific evidence, we assess and constantly monitor the risks of climate change and the capacity of our systems to be resilient against extreme events, such as flooding, heatwaves, etc. We accompany policy makers and socioeconomic agents on their decision making process to facilitate regulatory and programmatic action.

OBJECTIVE 4

Support decision making for successful and effective adaptation



BC3 applies multiple perspectives from economics, engineering and humanities with the goal of assessing and improving climate policy, risk and resilience assessment and adaptation planning. The main sectors currently considered are health, water management, and land use in mainly coastal and urban areas. Heatwaves, flooding, droughts and sea level rise are among the central hazards being addressed. The research has been undertaken through four main activities:

Understanding risks and vulnerability

The aim of this activity is to develop a good understanding of climate impacts related to sea-level rise, changes in hydrological regimes and temperatures. The focus lies on improving resilience of social, environmental and economic systems.

BC3 is contributing to developing methods for European-wide climate risk assessment. BC3 is examining the role of behavioural factors in public flood risk attitudes and has undertaken a major survey of professional opinion on the use of expected utility as a tool for evaluating flood risks. BC3 has also proposed an approach for European wide spatio-temporal risk assessment of (humid) heatwaves.

Together with the Basque Agency for Cooperation, BC3 is assessing coastal risks in Dakar (Senegal) and based on that developing a portfolio of adaptation solutions.

BC3 has undertaken a detailed analysis of the impacts on health and agriculture in Ukraine with and without autonomous adaptation, especially examining the distributional consequences on households across all regions of the country.

Designing and assessing adaptation policies, instruments and solutions

This activity explores how to address effects of different adaptation options within policy appraisal, with a strong focus on mainstreaming adaptation into other planning activities.

BC3 has been concluding work related to behavioural changes towards healthier, sustainable and equitable lifestyles, and on the role of green areas in promoting physical activity. BC3 has modelled health impacts of house rehabilitation. In the health-related activities, BC3 is shifting the emphasis from focusing on disease towards health promotion.

Jointly with IHOBE, BC3 is analysing the potential role of air contaminants as an agent for transmission ("carry") and amplification of exposure ("boost") in the transmission of the new coronavirus COVID-19 in the Basque Country. This is conducted in collaboration with local health agencies that analyse individual characteristics of COVID19 patients.

OBJECTIVE 4

Support decision making for successful and effective adaptation



At the Basque level BC3 is strongly involved in co-producing regional climate strategies. Currently BC3 is analysing the potential for mainstreaming health and climate resilience into urban planning activities with local stakeholders. BC3 has developed databases on global best practices on integrating climate change policies into urban planning, health and emergency policies, mobility and governance. BC3 has also analysed the role of the current organizational structures and competences in order to evaluate the training needs of administrative entities in relation to climate change.

At national level BC3 is providing long-term policy recommendations on issues such as climate change, urbanisation and health through expert panels (Spain 2050) coordinated by the National Long-term Country Foresight and Strategy Office, attached to the Presidency of the Spanish Government.

Measuring adaptation progress and understanding adaptation dynamics

The focus of this activity is on developing robust metrics, comparable baselines, standardized approaches to data collection, and solid guidance for the evaluation of adaptation progress (adaptation tracking).

BC3 is one of the five founding members and part of the Steering Committee of IPAM (International Platform on Adaptation Metrics). To attract finance for improved adaptation action, IPAM aims to become an international reference platform for adaptation metrics across scales and sectors, and co-develop metrics and tools going beyond the state of the art to respond to emerging adaptation needs. IPAM also seeks to create synergies among its members to refine and advance concepts in science, governance, management, project monitoring & evaluation, communication, capacity building and climate finance.

OBJECTIVE 4

Support decision making for successful and effective adaptation

Understanding the implications of uncertainty

This activity develops quantitative and qualitative approaches to deal with uncertainty and variability in climate change adaptation.

To support resilience assessment and reduce uncertainties in the planning of complex urban infrastructures, BC3 has developed a multi-perspective approach that is co-produced with local operators, engineers and managers. This was tested for urban wastewater systems and applied in Belfast and in Murcia, two locations with distinct climatic and socio-economic vulnerabilities. This was developed within the completed project ALICE-RISE H2020.

In collaboration with partners in Switzerland and the USA, BC3 has suggested an approach on how to deal with model bias in environmental modelling. This is relevant in the context of estimating uncertainty in model calibration, as the presence of model structure discrepancy leads to an underestimation of parameter uncertainty.

HIGHLIGHTED RESEARCH PROJECTS OR CONTRACTS

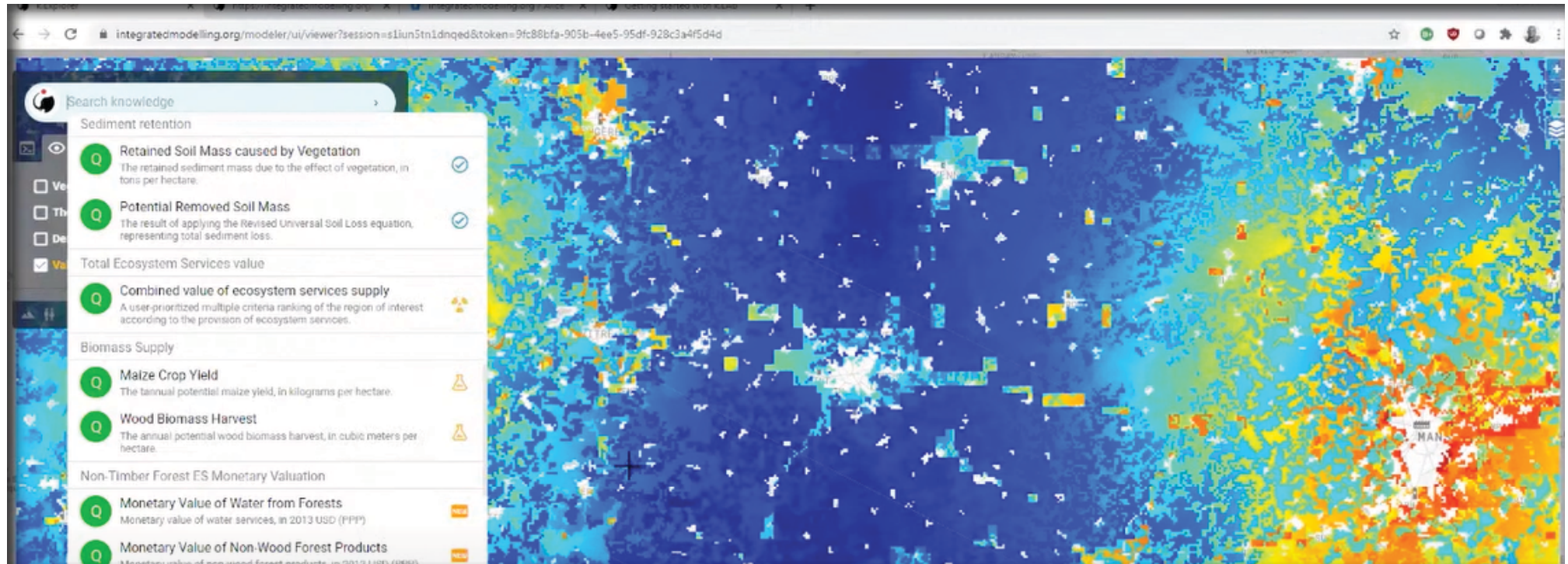
- **INHERIT.** INter-sectoral Health Environment Research for InnovaTions (H2020)
- **COACCH.** CO-designing the Assessment of Climate CHange costs. (H2020).
- **ALICE.** AcceLerate Innovation in urban wastewater management for climate change (H2020 MSCA RISE).
- **CLIC.** Can we measure the effectiveness of public investments in urban climate resilience? (AXA FOUNDATION).
- Joint Research Laboratory on **Environmental Antibiotic Resistance.** (Euskampus).
- **KONTRAE.** Emergence and dissemination of antibiotic resistance: Links between human health, livestock, food and the environment (ELKARTEK 2020)

OTHER HIGHLIGHTS

- BC3 is one of the five founding members and part of the Steering Committee of the recently created **IPAM (International Platform on Adaptation Metrics)**. IPAM is intended to help networking all the dedicated institutions and teams working on adaptation evaluation and metrics, to compare results and create synergies, and to advance science and technologies.
- BC3 co-leads the **International Network of Climate Change Centres of Excellence and Think-Tanks for Capacity Building (INCCETT 4CB)**. The Network aims to boost coherence and improve coordination between major global centres of excellence and think tanks, with a view of enhancing the impact of capacity building activities.

HIGHLIGHTED PUBLICATIONS

- United Nations Environment Programme (2020). **Covid-19, the Environment, and Food Systems: Contain, Cope, and Rebuild Better.** Geneva. (Anil Markandya, was the Lead Author).
- Martínez-Juárez P., Foudi S., Galarraga I., Osés-Eraso N., Cerdá E. 2020. **Cambio climático, riesgo de inundación y medidas de adaptación: Retos en la valoración de daños y evaluación de medidas.** *Economía: Revista Vasca De Economía*. 97. (1) 191-211.
- Nouri H., Stokvis B., Chavoshi Borujeni S., Galindo A., Brugnach M., Blatchford M.L., Alaghmand S., Hoekstra A.Y. 2020. **Reduce blue water scarcity and increase nutritional and economic water productivity through changing the cropping pattern in a catchment.** *Journal of Hydrology*. 588. DOI (10.1016/j.jhydrol.2020.125086).
- Olazabal M., de Gopegui M.R. 2020. **¿Para qué impactos climáticos se preparan las ciudades españolas?** *Economía: Revista Vasca De Economía*. 97. (1) 213-239
- Rubio I., Ganzedo U., Hobday A.J., Ojea E. 2020. **Southward re-distribution of tropical tuna fisheries activity can be explained by technological and management change.** *Fish and Fisheries*. 21. (3) 511-521. DOI (10.1111/faf.12443).
- Villegz K., Del Giudice D., Neumann M.B., Rieckermann J. 2020. **Accounting for erroneous model structures in biokinetic process models.** *Reliability Engineering & System Safety*. 203. DOI (10.1016/j.res.2020.107075).



OBJECTIVE 5

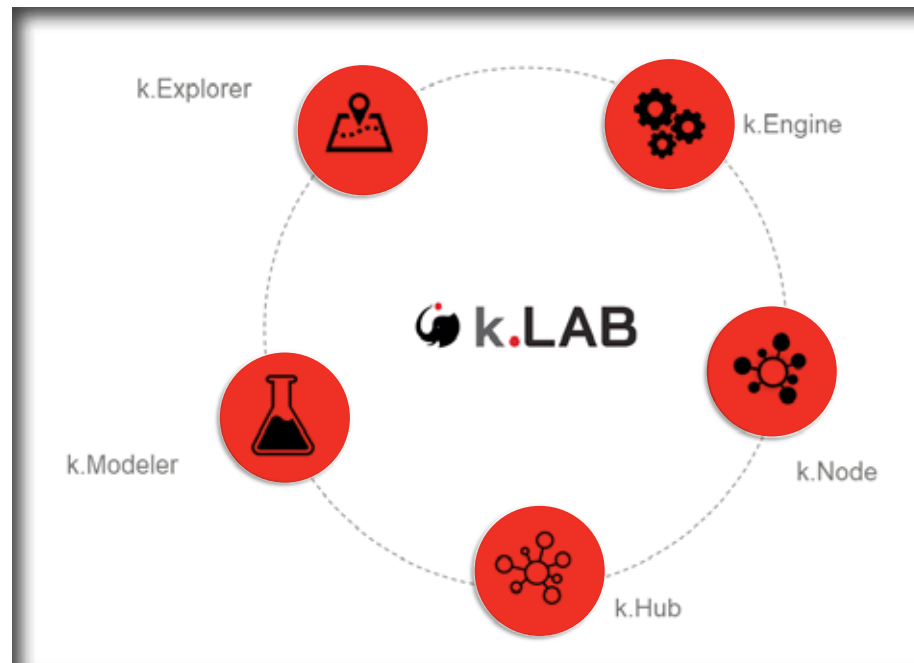
Integrated modelling of coupled human-natural systems

We conduct research to provide integrated modelling of coupled human-natural systems.

Using interdisciplinary scientific evidence and data in an integrated way to understand the evolution of interdependencies between human beings and nature, and designing solutions that bear the complexity of biophysical and social planes in mind.

OBJECTIVE 5

Integrated modelling of coupled human-natural systems



BC3 has a strong focus on methodological innovations in the field of informatics for sustainability and ARIES, Artificial Intelligence for Environment & Sustainability platform, is the flagship project of Objective 5. The philosophy behind ARIES is not to make one model, but a collaborative and open-source platform for interoperable data and models, based on the Knowledge Laboratory (k.LAB) technology: a software building, for the first time, new knowledge from the integration of the existing one. To connect the scientific knowledge generated in different scientific domains, we apply the Integrated Modelling approach, which implements the FAIR (findable, accessible, interoperable and reusable) principles. Although the internet and online data repositories have made it easier for both humans and computers (Findable) to retrieve digital resources (Accessible), Interoperability (two or more digital resources are related to the same topic or entity and can interact among themselves) and Reusability (when a digital resource can be used in other contexts) are still hardly sought-after aspirations. We employed Artificial Intelligence techniques, and in particular semantics and machine reasoning, to build optimal computational workflow, based on dependencies declared in each model component. This modular modelling technique allows to resolve complex analyses by connecting simple self-explanatory and self-contained models, which can be written independently. **k.LAB**, the software stack powering ARIES, has reached a level of stability that enables a larger programming team to build it out further.

User Interfaces:

The k.LAB software package includes two general purpose interfaces, the k.Explorer and the k.Modeler, and ad-hoc thematic applications.

- **The k.Modeler interface**, based on the well-known Eclipse development platform, is the modeler's user interface and it is approximating version 1. Deterministic and stochastic modelling techniques are fully available. Spatially explicit machine learning models are now seamlessly integrated in the modelling workflow, with distributed computations that can be published and served online, through URNs that uniformly identify any source of knowledge. Further work will fully enable agent-based modelling along with time-explicit process-based and distributed simulations running on multiple connected machines
- **The k.Explorer web-based interface** allows non-technical end users to access data and model content through drag/drop operation and near-natural-language queries through an Internet browser. It is expected to be released to the public in 2021.
In 2020, some major developments on the k.Actors language have been applied. We have enabled the definition of applications that implement custom user interfaces and support specialized workflows on top of the k.Explorer view component.

OBJECTIVE 5

Integrated modelling of coupled human-natural systems



Networked Infrastructure:

Since 2020, there has been huge development on the network components to enable full use of the technology on the cloud, bypassing software downloads. The software implementing the network infrastructure, which enables BC3 and other actors to become hosts and providers of interoperable knowledge, incorporates state-of-the-art security and is being tested and documented for wider release. In light of this, BC3 has made a substantial investment in a new network of servers and machines that can support a fully online service.

- **The k.LAB Engine** is a server connected to the k.LAB network. It implements the modelling API. Its main operation is the observation of concepts in contexts by assembling a dataflow and running it to obtain observations.
- **The k.LAB Node** is the server infrastructure that provides knowledge for the k.LAB network. Its main operation is the distribution of knowledge to the engines: providing data and computed models from URNs, and hosting worldviews, software components and semantic projects.

- **The k.LAB Hub** is a server that coordinates k.LAB nodes, authenticates users and engines, and connects engines to the k.LAB network. It offers an API for authentication, statistics, and web UI for user management and registration.

Through resource adapters the network components can give access to users to multiple sources of data and models made available for the Open Geographical Consortium WFS and WCS protocols, for WEKA (machine learning) computations, and several types of file-based resources. Other adapters include multidimensional tabular sources (e.g. NetCDF, CSV, SQL and no-SQL databases) and computations in other programming languages through an API bridge (targeting Python and R as first candidates due to their large diffusion).

The currently available contents of the ARIES network include:

- More than 200 spatial data layers (at scales from regional to global) from their authoritative sources.
- The entire feature data from OpenStreetMap (through a specialized mirror that is updated constantly) so that they can be used in our computations.
- A suite of model components to address ecosystem services related queries in 5 areas of study (recreation, pollination, flood regulation, sediment regulation, carbon storage), and their combination with spatial multi-criteria assessment for trade-off and spatial planning analysis.
- A suite of model components to address Natural Capital Accounting (NCA) and the production of outputs in standardized tabular format.
- A full set of GIS algorithms to use within modelling workflows to implement complex spatial models.

BC3 has promoted the production of multimedia contents, such as videos, and interactive online events, like Twitter chats, in order to increase social engagement while boosting BC3's online presence. BC3 has also collaborated with different international partners and media through news pieces and interviews – ISPRA website, SEEA newsletter, the Infinite Leaders podcast – to spread the word about the ARIES mission among different audiences.

As part of the training plan, BC3 has also started working on documenting the different steps to setup and use the k.LAB software through video tutorials. All these materials will be available to the public throughout 2021.

In addition, BC3 kept working to integrate well-known forest growth models and agricultural models. This year, BC3 has integrated modelling components for livestock and rangelands. BC3 has also continued developing online workflows to fetch NASA and ESA satellite data on demand, in a form directly compatible with k.LAB.

OBJECTIVE 5

Integrated modelling of coupled human-natural systems



HIGHLIGHTED RESEARCH PROJECTS OR CONTRACTS

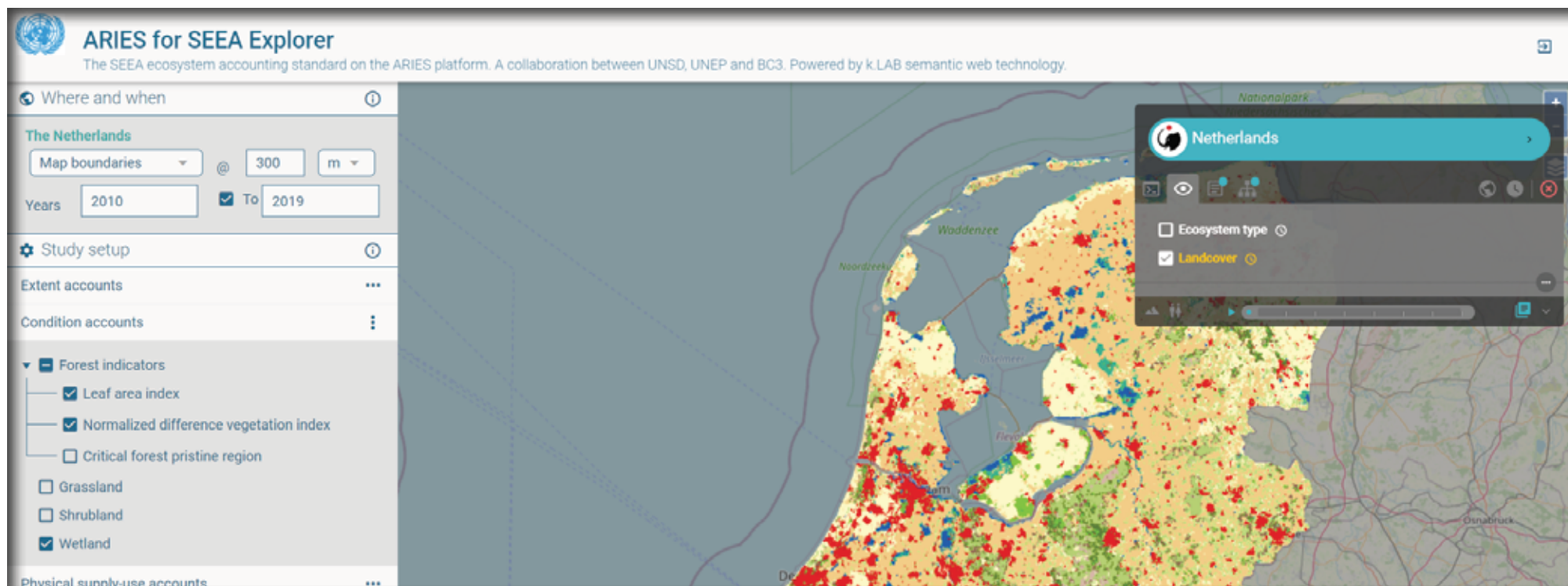
- **ALICE.** Towards a better management of Atlantic Landscapes: developing tools to better characterise biodiversity and ecosystem services (Interreg Atlantic Area).
- **SABER CULTURAL.** Safeguarding Biodiversity and Ecosystem services by integrating CULTURAL values in freshwater management: learning from Māori (H2020 MSCA IF).
- **CARDINAL.** Entendiendo el rol funcional de los colibríes migradores en redes de interacción planta-polinizador a lo largo de un gradiente latitudinal (FBBVA).
- **OBServ.** Open Library of Pollinator Biodiversity and Ecosystem Services Scenarios (MCIN - BIO-DIVSCEN).
- **SEEA EA Project.** Jointly with the United Nations Environment Programme (UNEP) and United Nations Statistics Division (UNSD).
- **Leticia Project.** Jointly with the innovation laboratory of the Inter-American Development Bank Group (IDB Lab)

HIGHLIGHTED MODELS AND TOOLS

- k.LAB
- k.EXPLORER.
- k.Modeller, k.LAB hub and k.LAB node.

HIGHLIGHTED PUBLICATIONS

- Capriolo A., Boschetto R.G., Mascolo R.A., Balbi S., Villa F. 2020. **Biophysical and economic assessment of four ecosystem services for natural capital accounting in Italy.** Ecosystem Services. 46. DOI (10.1016/j.ecoser.2020.101207).
- Kleemann J., Schröter M., Bagstad K.J., Kuhlicke C., Kastner T., Fridman D., Schulp C.J.E., Wolff S., Martínez-López J., Koellner T., Arnhold S., Martín-López B., Marques A., Lopez-Hoffman L., Liu J., Kissinger M., Guerra C.A., Bonn A. 2020. **Quantifying interregional flows of multiple ecosystem services – A case study for Germany.** Global Environmental Change-Human and Policy Dimensions. 61. DOI (10.1016/j.gloenvcha.2020.102051).
- Balbi S., Álvarez-Rodríguez U., Latora V., Antonioni A., Villa F. 2020. **A game theory model to explore the role of cooperation and diversity in community food security: the case of Southern Malawi.** Regional Environmental Change. 20. (2) DOI (10.1007/s10113-020-01642-5).
- Magrach A., Lara C., Luna U.M., Díaz-Infante S., Parker I. 2020. **Community-level reorganizations following migratory pollinator dynamics along a latitudinal gradient: Community responses to migratory species.** Proceedings of the Royal Society B-Biological Sciences. 287. (1930) 20200649. DOI (10.1098/rspb.2020.0649rspb20200649).
- Stelzenmüller V., Coll M., Cormier R., Mazaris A.D., Pascual M., Loiseau C., Claudet J., Katsanevakis S., Gissi E., Evagelopoulou A., Rumes B., Degraer S., Ojaveer H., Moller T., Giménez J., Piroddi C., Markantonatou V., Dimitriadis C. 2020. **Operationalizing risk-based cumulative effect assessments in the marine environment.** Science of the Total Environment. 724. DOI (10.1016/j.scitotenv.2020.138118).



OBJECTIVE 6

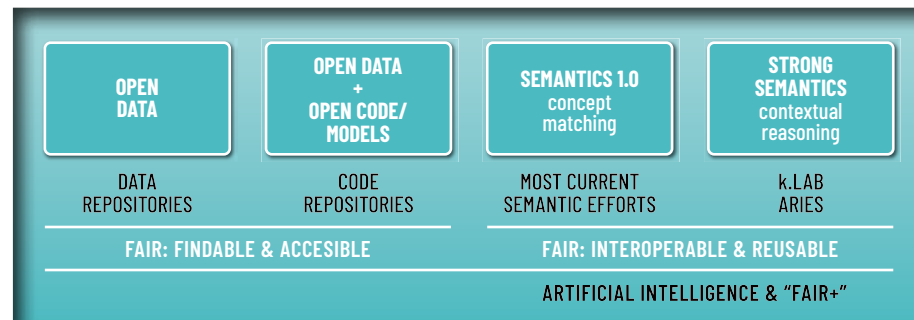
Promoting integrated interdisciplinary and transdisciplinary research

We promote integrated interdisciplinary and transdisciplinary research.

Because only with an interdisciplinary approach is it possible to generate knowledge that addresses the climate challenges that we are facing. Excellent, cross-cutting knowledge, based on and with the cooperation of all kinds of stakeholders, to support even further the shared vision defined in the Paris Agreement, as the foundation for a coordinated transdisciplinary action.

OBJECTIVE 6

Promoting integrated interdisciplinary and transdisciplinary research



OUR EFFORT IS FULLY ALIGNED WITH INNOVATION OBJECTIVES AT MULTIPLE LEVELS OF GOVERNANCE:

Basque Country

Informe Innobasque de Prospectiva 2019
(Innobasque Prospective Report 2019)

Spain

Estrategia Española De I+D+I en Inteligencia Artificial
(Spanish R + D + I Strategy in Artificial Intelligence)

European Union

European Open Science Cloud (EOSC)

In 2020, BC3 has kept its commitment to the deployment of a production-level, scientifically rigorous, cloud-based toolkit that included a new major component: a user-friendly, web-accessible interface for non-technical users.

BC3 seeks to contribute to an interdisciplinary understanding of the causes and impacts of climate change in broad social-ecological contexts across geographical, temporal and governance scales. This includes the promotion of progressive integration of research efforts from different BC3 research lines towards more integrated multidisciplinary and transdisciplinary projects.

Strategic Integrative Projects (SIPs)

THE INTEGRATED MODELLING (IM) PARTNERSHIP:

Decision making in both the private and public sector still rarely incorporates the environmental data and understanding that exist in today's world. This is not caused by a lack of information: rather, it is the difficulty of retrieving, evaluating and integrating the existing information that can lead to uninformed decisions. Such decisions can result in unintended consequences for people and nature, such as over-drafting of freshwater resources or undue fragmentation of ecological systems. The resulting loss of resilience and ecosystem function jeopardizes planning for a sustainable future in an era of great environmental change, damage and uncertainty. We believe that technology, and specifically artificial intelligence, holds the key to a future where wide and intuitive integration and use of knowledge, by both scientists and non-scientists, is possible, and decision-making can automatically benefit from all the products of the best science – data, models and understanding – with a great decrease in end-user complexity and with verifiable and transparent modalities. The approach we describe is our contribution to making this vision a reality for the first time. During the past decade, we have envisioned and built the ARIES (Artificial Intelligence for Environment & Sustainability) platform, a technology that integrates network-available data and model components through semantics and machine reasoning. Its underlying technology (k.LAB) can handle the full end-to-end process of integrating data with multiple model types to predict complex change. The open-source k.LAB software supports selection of the most appropriate data and models using cloud technology and following an open data paradigm: the resulting insight, in the same fashion, remains open and available to society at large, and becomes a base for further computations, contributing to an ever-increasing knowledge base. Most importantly, we have been first in developing a way to consistently characterize and publish data and models for their integration in predictive models, building and field-testing languages and technologies that have eluded researchers to date.

The fully integrated toolset we are building in support of knowledge-driven decision making includes four key advances:

1. A **common set of terms** (semantics) for interoperable and coherent description of informational artifacts of diverse nature;
2. Actionable **Open Data** methodologies that ensure Findable, Accessible, Interoperable and Reusable (FAIR) stewardship for data of diverse domains;
3. Actionable **Integrated Modelling** methodologies to ensure transparent application of the FAIR principles across automated and unsupervised computational workflows;
4. **Software Infrastructure** for the immediate and complete implementation of the paradigm, at different levels of usage, from the non-technical to the expert.

OBJECTIVE 6

Promoting integrated interdisciplinary and transdisciplinary research

U R B A N
K L I M A
2 0 5 0



Highlighted initiatives and projects:

■ SMALL SHERPA PROJECTS (SSP):

The Small Sherpa Projects (SSPs) are BC3 internal projects that aim to explore emerging innovative ideas promoting integrated interdisciplinary and transdisciplinary research across the Research Lines or Research Groups of the centre.

During 2020 two Small Sherpa Projects were launched:

■ Coupled hydro-climate model for high-mountain regions and its integration in ARIES (MENDIA).

This project aims at developing a novel coupled hydro-climate model and its integration into ARIES. The model developed in this project will find concrete applications in diverse case studies of various high-mountain regions and contribute to the water supply and demand analysis, and ontology and semantics development of climatology and glaciology in ARIES knowledge base.

■ Investing in nature: an experiment on diverse values (Innate).

The importance of this research lies in the fact that even environmental scientists and activists are increasingly adopting economic estimations of value in an attempt to convince policy makers of the importance of integrating nature's value in decision-making. (Marvier and Kareiva 2014). However, the impact that abandoning nonmonetary expressions of value may have on practical decisions (such as where to direct public funds) is still unclear. The team hypothesise that values of nature that are more amenable to being monetised (i.e. instrumental values) may receive disproportionate policy attention at the expense of other types of values (i.e. relational or intrinsic).

■ URBAN KLIMA 2050 LIFE project

BC3 is one of the consortium members of the Urban Klima 2050 LIFE project for the deployment of the Climate Change Strategy of the Basque Country - KLIMA 2050 in urban areas that has been approved by the European Union within the Integrated Projects Area for mitigation and / or adaptation to climate change. This project is the Basque Country's largest climate action project for the coming years. In this framework, BC3 is working on assessing and designing solutions for mitigation and adaptation in Basque municipalities, as project leaders of the C3.1, C8.1, C9.2 actions (mainstreaming climate change and health policies into urban planning, analysis the competences of the different public departments, benchmarking of mainstreaming climate resilience at urban level).

■ SPANISH TECHNICAL REPORT ON IMPACT AND RISKS OF CLIMATE CHANGE:

Under the Life SHARA BC3 carried an assessment of impacts and risks of climate change in Spain. This report has been promoted by the Ministry for the Ecological Transition and the Demographic Challenge (MITECO) and sets out the main impacts of climate change on the different productive sectors and natural systems in Spain. The report was coordinated by MJ Sanz and E. Galan for all sectors, and includes all areas (water resources, terrestrial ecosystems and agriculture, coastal areas, cities, health, energy, infrastructures and tourism). It was a collaboration between the teams of Terrestrial Ecosystems, Low Carbon, Adaptation Lab and outside collaborators.

04

HIGHLIGHTS



RECOGNITION OF EXCELLENCE IN RESEARCH

BC3 received the "Radio Bilbao Award for Excellence, 2020" (Research Category), which recognises the good work of institutions and personalities in the Basque territory. The award ceremony was held at the Euskalduna Palace on October 19, 2020, and the award was received by María José Sanz, Scientific Director of BC3. The evaluation committee of the awards highlighted the work carried out by the BC3 Basque Center for Climate Change in multidisciplinary research on the causes and consequences of climate change and in producing relevant knowledge to support politicians and governments make science-based decisions.



ONE BC3 RESEARCHER AMONG THE CLARIVATE ANALYTICS LIST OF “HIGHLY CITED RESEARCHERS” FOR 2020

The Ikerbasque Research Professor at BC3, Unai Pascual, has been named to the prestigious Clarivate Analytics list of “Highly Cited Researchers” for 2020. The 2020 list of Highly Cited Researchers, in a new Cross-Field category to identify researchers with substantial influence across several fields during 2009-2019 with production of multiple highly cited papers that rank in the top 1% in Web of Science, includes researchers ranking in the top 1 percent by citations for field and publication year.

THESIS AWARDED: “SOCIAL EQUITY AND PAYMENTS FOR ECOSYSTEM SERVICES: FROM MACRO TO MICRO”

The BC3 postdoctoral researcher Bosco Lliso won the 2nd Prize for Excellent Development Research for his PhD thesis “Social Equity and Payments for Ecosystem Services: From Macro to Micro” by Researcher Group on Development Economics of the German Economy Association and KfW Development Bank. The Research Prize honours academic work combining original research and practical relevance, thus giving fresh impetus for development cooperation.



BC3 PUBLICATIONS

During 2020, BC3 put its scientific production within the best scholarly and the most influential leading publishers.

143 publications were published.

123

PEER-REVIEWED
ARTICLES

9

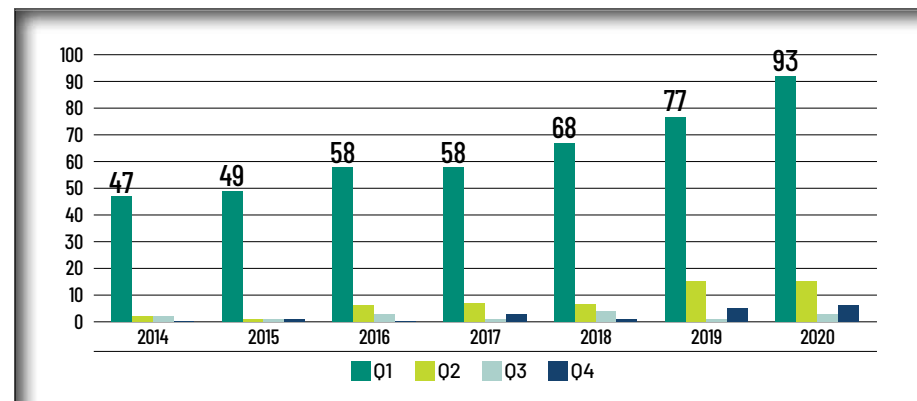
BOOKS AND
CHAPTERS

11

OTHER RELEVANT
PUBLICATIONS

BC3 PUBLICATIONS

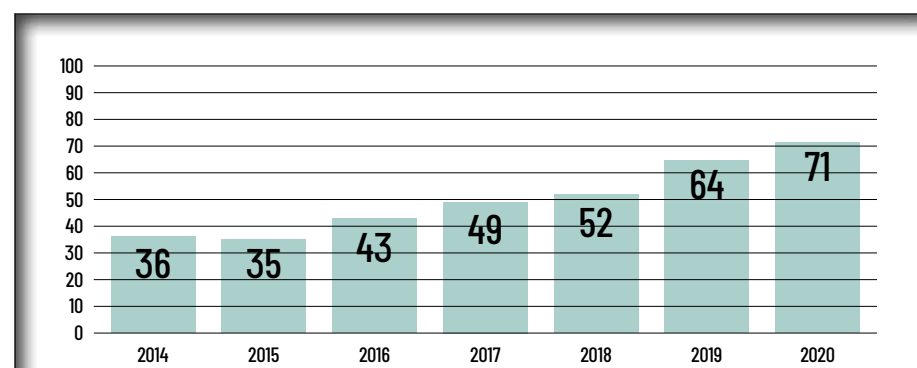
INDEXED JOURNAL ARTICLES 2014-2020
BY QUARTILE DISTRIBUTION (ABSOLUTES)



During 2020 BC3 has maintained the high number of articles produced and indexed in SCOPUS, along with their quality and impact. The **80%** of our publications were Q1 and the **61%** were D1.

Accordingly, the number of citations have increased during the year and over **4.500** citations were received by BC3 publications.

INDEXED JOURNAL ARTICLES IN D1. EVOLUTION 2014-2020 (ABSOLUTES)



BC3 PUBLICATIONS

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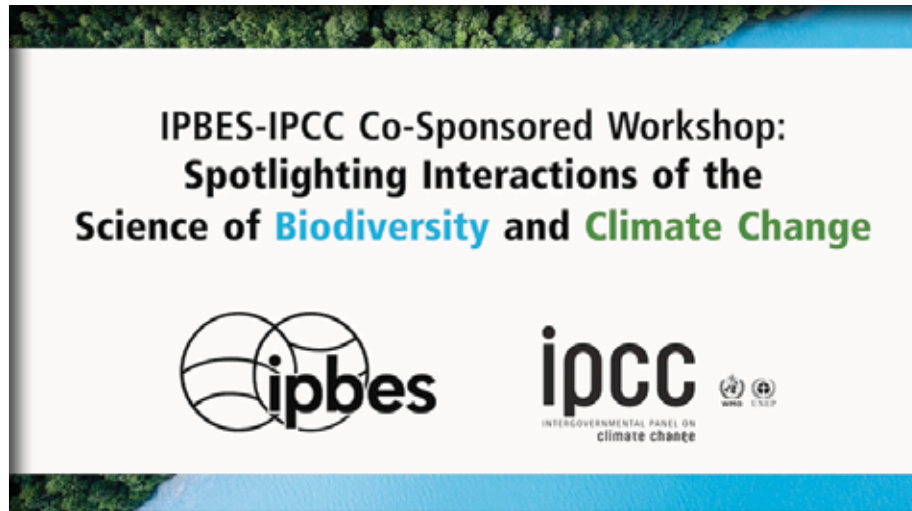


CONTRIBUTIONS TO KEY INTER-DISCIPLINARY INTERNATIONAL PANELS: IPCC AND IPBES

In this year in which the global public health crisis broke out, it has become clear that the need to contribute with scientifically sound knowledge to Panels and Key Institutions at the international level, in a collaborative way, is more critical than ever. Hence, BC3 has strengthened its engagement with the most authoritative and interdisciplinary scientific body dealing with climate change.

CONTRIBUTIONS TO KEY INTER-DISCIPLINARY INTERNATIONAL PANELS

IPCC and IPBES



In 2020, BC3 contributed to two major global scientific meetings:

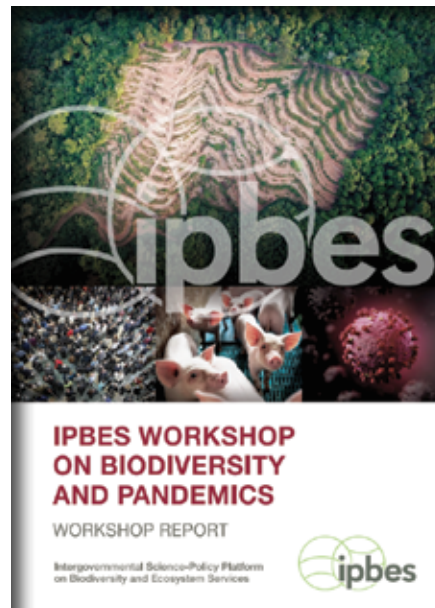
IPBES-IPCC Co-Sponsored Workshop: Spotlighting Interactions of the Science of Biodiversity and Climate Change.

Two global inseparable threats to humanity that need to be addressed together: Biodiversity loss and Climate Change. They are also deeply interconnected in ways that pose complex challenges to effective policy-making and action. In order to face this challenge, **fifty of the world's leading experts, including BC3 researcher, Unai Pascual**, drawn in a balanced way from the domains of climate change and biodiversity, participated in a ground-breaking four-day workshop that for the first time at this level brought together the two global expert communities, focused on opportunities to meet both climate change- and biodiversity-related goals.

<https://www.ipcc.ch/2020/12/13/ipbes-ipcc-co-sponsored-workshop/>

Workshop on biodiversity and pandemics:

On top of that, BC3 contributed to the workshop, authorized by the IPBES Bureau and Multidisciplinary Expert Panel (MEP), on biodiversity and pandemics. This was held virtually on 27-31 July 2020, in accordance with the provisions on "Platform workshops" in support of Plenary-approved activities. The workshop report is considered supporting material available to authors in the preparation of ongoing or future IPBES assessments. <https://ipbes.net/pandemics>



CONTRIBUTIONS TO KEY INTER-DISCIPLINARY INTERNATIONAL PANELS

IPCC and IPBES



IPCC

Intergovernmental Panel on Climate Change

BC3 is contributing to most of the Sixth Assessment cycle key reports that were mandated after the Paris Agreement.

This contribution has allowed to strengthen BC3 international collaboration with leading researchers from key climate change research institutions worldwide.

Authorships: **AR6 Assessment Report, Working Group I Report; Chapter 1** (Sergio H.Faria, Lead Author), **Chapter 10** (Contributing Author), S.H. Faria is also co-author of a special **cross-chapter box on the climate impacts of COVID-19**, which is going to appear in the same report (AR6-WGI). **Working Group II Report, Chapter 6 (Cities)** (Marta Olazabal, Contributing Author). M.J. Sanz acted as **expert reviewer of the IPCC AR6 Volume II on Adaptation and the Volume I on the Scientific Basis**.

Likewise, during 2020, María José Sanz has continued being a member of the **Emission Factor Database (EFDB) Advisory Board**.

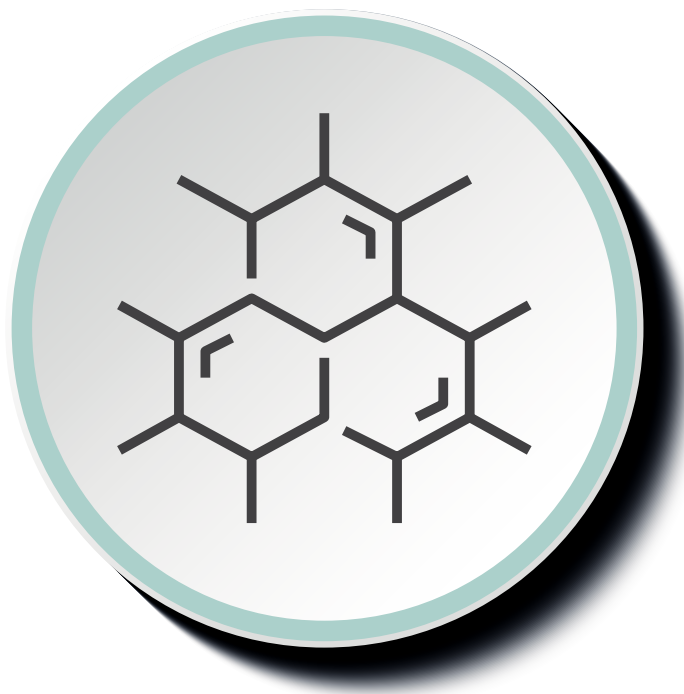


IPBES

Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

BC3 is the research centre with the largest representation at IPBES at the Spanish Level.

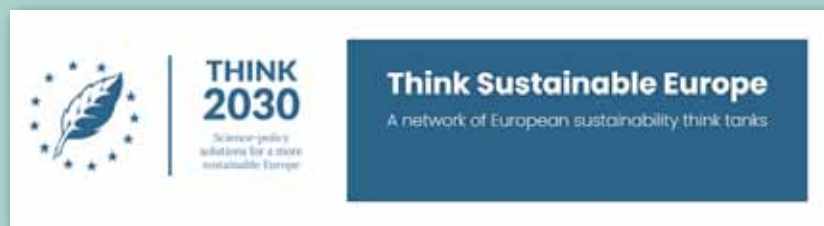
Authorships: IPBES Values Assessment (Unai Pascual (Co-chair), Ignacio Palomo (Lead Author Chapter 3), Bosco Lliso (Author-Fellow Chapter 1) and Noelia Zafra-Calvo, (Contributing Author Chapter 5). Unai Pascual, was one of the fifty leading experts workshop participant of the ongoing IPCC-IPBES report on Climate Change and Biodiversity (IPBES-IPCC Co-Sponsored Workshop): "Spotlighting Interactions of the Science of Biodiversity and Climate Change" and on the Workshop Report on Biodiversity and Pandemics of the Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES 2020).



BC3 NETWORKS

BC3 is aware of the importance of the networking to co-produce and share knowledge, and promotes and participates in the generation of new collaboration networks.

BC3 NETWORKS



Some networks in which BC3 has an active role:

THINK SUSTAINABLE EUROPE

- BC3 is, since 2020, a member of this network of European sustainability think tanks, which represents a coalition of leading institutes across Europe that can collectively offer a space for discovering transdisciplinary and more coherent solutions for the environmental and socio-economic challenges and for the promotion of transformative changes that the EU and its Member States are facing.

INTEGRATED MODELLING NETWORK (ARIES)

- The network brings together institutions contributing to designing and building a fully integrated information landscape for the science of the future.

OTHER HIGHLIGHTED NETWORKS

- RED ECOSOIL
- GIGAKU TechnoPark Network
- Manure management network
- SHAI0
- Hispanic-American Input-Output Society or Research Network on Energy Workforce Transitions (ReNEWT).

INTERNATIONAL PLATFORM ON ADAPTATION METRICS (IPAM)

- BC3 is one of the five founding members of this international network. IPAM is intended to help networking all the dedicated institutions and teams working on adaptation evaluation and metrics, to compare results and create synergies, and to advance science and technologies. BC3 is part of the Steering Committee of the new international platform for climate change adaptation metrics.

REMEDIA

- BC3 promoted the creation of the Scientific Network on Green House Gas mitigation from the agroforestry sector (agriculture, livestock and forestry) in Spain and has an active role in it.

05

MEANS OF RESEARCH



RESEARCH PROJECTS

The collaboration scheme and internationalization of BC3 is based on our continued active contribution to International Research Projects. This has happened mainly by an increased leadership in **Horizon H2020 Projects** and through the collaboration agreements with international bodies and research carried out “under demand” through strategic contracts that can be understood as a proxy of BC3’s international reputation and leadership.

In 2020, **23%** of the total funding came from international projects.

RESEARCH PROJECTS: HIGHLIGHTS

European Commission Funded Projects



H2020_PARIS REINFORCE

NAME OF THE PROJECT: Delivering on the Paris Agreement: A Demand-Driven Integrated Assessment Modelling Approach

FUNDING AGENCY: European Commission

FUNDING PROGRAM: Horizon 2020 research and innovations programme

CALL: H2020-LC-CLA-2018

TIME FRAME: 2019-06-01 - 2019-06-01

FUNDING: 766.578,75 €

PARTNERS:

National Technical University of Athens (NTUA) - Coordinator

Bruegel AISBL (Bruegel)

University of Cambridge (Cambridge)

Cicero Senter Klimaforskning Stiftelse (CICERO)

Fondazione Centro Euro-Mediterraneo sui

Cambiamenti Climatici (CMCC)

Energy, Engineering, Economic, Environment

Systems Modelling and Analysis (E4SMA)

École polytechnique fédérale de Lausanne (EPFL)

Fraunhofer Institute for Systems and Innovation

Research (Fraunhofer ISI)

Imperial College of Science Technology and

Medicine - Grantham Institute (Grantham)

Holistic P.C. (HOLISTIC)

Institute for European Energy and Climate Policy

Stichting (IEECP)

Société Européenne d'Economie SARL (SEURECO)

Centre for Sustainable Development of the

University of Brasília (CDS/UnB)

China University of Petroleum-Beijing (CUP)

Institute of Economic Forecasting - Russian

Academy of Sciences (IEF-RAS)

Institute for Global Environmental Strategies (IGES)

The Energy and Resources Institute (TERI)

BC3, Basque Centre for Climate Change

LINK WITH BC3's OBJECTIVES

OBJECTIVE 2. Support decision making in the transition to a low carbon society

KEY BC3 RESEARCHERS INVOLVED

Mikel Gonzalez Equino

Iñaki Arto

Maria Jose Sanz

Alevgul Sorman

Jorge Moreno

Ester Galende

Dirk-Jan Van De Ven

ACKNOWLEDGEMENT

This project has received funding from the European Union Horizon 2020 Research and Innovations programme under Grant Agreement N° 820846

URL ADDRESS

<https://paris-reinforce.eu/>



PROJECT DESCRIPTION

PARIS REINFORCE aims to underpin climate policymaking with authoritative scientific processes and results, and enhance the science-policy interface, in light of the Paris Agreement and associated challenges. In particular, our aim is to develop a novel, demand-driven, IAM-oriented assessment framework for effectively supporting the design and assessment of climate policies in the EU as well as in other major emitters and selected less emitting/developed countries, in respect to the Paris Agreement objectives. Building on an exhaustive facilitative dialogue and a strong ensemble of complementary—in terms of mathematical structure, geographical, sectoral and focus coverage—integrated assessment, energy system and sectoral models, we will create an open-access and transparent data exchange platform, I2AM PARIS, in order to support the effective implementation of Nationally Determined Contributions, the preparation of future action pledges, the development of 2050 decarbonisation strategies, and the reinforcement of the 2023 Global Stocktake. We also seek to enhance the legitimacy of the scientific processes in support of climate policymaking, by introducing an innovative stakeholder inclusion framework and improving the transparency of the employed models, methods and tools. Beyond effectively communicating respective outputs and fostering wider societal acceptance of climate policy, we actively involve policymakers and other stakeholder groups in all stages: from the formulation of policy questions and the definition of modelling assumptions in a demand-driven approach; to the design of I2AM PARIS interfaces and specifications, and the mobilisation of tacit knowledge embedded in them in the aim of bridging knowledge gaps. Finally, we will introduce innovative integrative processes, in which IAMs are further coupled with well-established methodological frameworks, in order to improve the robustness of modelling outcomes against different types of uncertainties.

RESEARCH PROJECTS: HIGHLIGHTS

European Commission Funded Projects



H2020_LOCOMOTION

NAME OF THE PROJECT: Low-Carbon Society: an enhanced modelling tool for the transition to sustainability

FUNDING AGENCY: European Commission

FUNDING PROGRAM: EU_HORIZON2020

CALL: H2020-LC-CLA-2018

TIME FRAME: 2019-06-01-2023-05-31

FUNDING: 450.875 €

PARTNERS:

Universidad de Valladolid (coordinator)

Università di Pisa

Medunarodni Centar za Odrzivi Razvoj Energetike

Voda i Okolisa

Osterreichische Energieagentur Austrian Energy Agency

BC3, Basque Centre For Climate Change

Centre of Economic Scenario Analysis and Research EU

Haskoli Islands

Centre for Renewable Energy Sources and Saving

Fondation EL

Fciencias.ID - Associacao para a Investigacao e

Desenvolvimento de Ciencias

United Nations University

Bureau Europeen de L'environnement Aisbl

Centro de Investigacion Ecologica y aplicaciones

Forestales Consorcio

LINK WITH BC3's OBJECTIVES

OBJECTIVE 2. Support decision making in the transition to a low carbon society

KEY BC3 RESEARCHERS INVOLVED

Iñaki Arto

Mikel Rueda

Manuel Tomas

Maria Jose Sanz

Mikel Gonzalez Eguino

Marc Neumann

ACKNOWLEDGEMENT

This project has received funding from the European Union Horizon 2020 Research and Innovations programme under Grant Agreement N° 821105

URL ADDRESS

<https://www.locomotion-h2020.eu>



PROJECT DESCRIPTION

The overall objective of LOCOMOTION is to enhance existing Integrated Assessment Models (IAMs) in order to provide policy makers and relevant stakeholders with a reliable and practical model system to assess the feasibility, effectiveness, costs and impacts of different sustainability policy options, and to identify the most effective transition pathways towards a low-carbon society.

Building on existing IAMs developed in the MEDEAS European project, and including knowledge from other relevant models (World6, TIMES, LEAP, GCAM, C-Roads, ...), a number of substantive improvements are foreseen with respect to the state-of-the-art in energy-economy-environment modelling:

- Expanding the geographical coverage and detail by creating a new worldwide multi-regional model with 7 global regions and integrating the 28 EU countries.
- Improving IAMs by increasing the detail and precision of existing modules and adding new ones.
- Integrating relevant functionalities from other models and comparing modelling results.
- Integrating demand management policies in scenario assessment.
- Representing and quantifying uncertainty.
- Improving the usability of the IAMs through the development of two interface levels (professional and educational).
- Exploiting and disseminating model result to three stakeholder groups: policy-makers and experts on strategic planning; experts on IAMs, modellers and programmers; and civil society.

The improved IAM will be the product of an interdisciplinary work in data management, policy and scenario assessment and system dynamic modelling of relevant environmental, economic, social, technological and biophysical variables.

This new IAM will be a robust, usable and reliable tool of diagnostic and scenario assessment for a sustainable transition towards a low-carbon society. LOCOMOTION will provide the different stakeholders with a more effective, user-friendly and open-source, model system for decision-support, education and social awareness.

RESEARCH PROJECTS: HIGHLIGHTS

European Commission Funded Projects



H2020_ISAGE

NAME OF THE PROJECT: ISAGE "Innovation for Sustainable Sheep and Goat Production in Europe"

FUNDING AGENCY: European Commission

FUNDING PROGRAM: Horizon 2020 research and innovations programme

CALL: H2020-SFS-2015-2

TIME FRAME: 2016-2020

STATUS: Active

FUNDING: 474.259 €

PARTNERS:

Aristotle University of Thessaloniki (Coordinator) • Kentro Genetikis Beltiosis Zoon Neas Mesimvrias • LEVER S.A. Development Consultants LEVER • Agricultural Cooperative of Pieria Sheep and Goat Farmers • Agricultural Livestock Cooperative of Western Greece • Luke - National Resource Institute Finland • ProAgria Association of Rural Advisory Centers • Institut National de la Recherche Agronomique • L'Institut de l'Élevage • Capgenes • Comité National Brebis Laitières • European Federation of Animal Science • Università Politecnica delle Marche • Istituto per la Certificazione Etica ed Ambientale • Mediterranean Agronomic Institute of Zaragoza / International Centre for Advanced Mediterranean Agronomic • Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria • Agencia Estatal Consejo Superior de Investigaciones Científicas • BC3 - Klima • Carnes Oviarogon SCL • CABRANDALUCIA Federación Andaluza de Asociaciones de Ganado Caprino de Raza Pura • ASSAFE (ES); ARDIE-KIN SL • Asociación Nacional de Criadores de Ganado Ovino Selecto de Raza Manchega • Asociación Española de Criadores de Ovino Selecto de Raza Lacaua • Nigde University • Ataturk University • Pan Hayvancılık Gıda Sanayi Tic LTD • Red Rock Agricultural Pastoral • Tarım Limited Sirketi • Gaziantep İli Damızlık Koyun Keçi Yetiştiricileri Birliği • Scotland's Rural College • Organic Research Centre • National Sheep Association • The Agriculture and Horticulture Development Board • Yorkshire Dairy Goats

LINK WITH BC3's OBJECTIVES

OBJECTIVE 3. Understanding and managing terrestrial systems for sustainability

KEY BC3 RESEARCHERS INVOLVED

Agustín del Prado
Guillermo Pardo

ACKNOWLEDGEMENT

This project has received funding from the European Union Horizon 2020 research and innovations programme under grant agreement N° 679302

URL ADDRESS

www.isage.eu



PROJECT DESCRIPTION

iSAGE will enhance the sustainability, competitiveness and resilience of the European Sheep and Goat sectors through collaboration between industry and research. iSAGE have a powerful consortium with 18 industry representatives from various EU production systems and socio-economic contexts. The sheep and goat sector will be investigated because it is sensitive to general socio-economic, demographic, and ecological and market challenges; nevertheless, the project's approach and results will be made available and disseminated to other EU livestock industries. Therefore, at the core of iSAGE is a participatory approach centered on a multi-actor internal and external communication (WP) to build the project from the farmer level. This approach will ensure relevant issues are addressed and the project outcomes are applicable in practice and create a farm-level observatory and knowledge exchange network on the sustainability of livestock. This WP will also assist three assessment work packages that will deal with the sustainability assessment of sheep and goat farm systems and related supply chains, with socio-economic demographic and consumer trend analyses, and with the impacts of climate change. Assessment WPs will inform action WPs that will: **(1)** redesign holistic farming systems to best reconcile the various demands concerning productivity, sustainability and societal values. **(2)** identify industry solutions that aim to improve sustainability and productivity of sheep and goat systems through breeding, including new phenotypes linked to sustainable animal productivity. iSAGE, together with stakeholders and end-users, will draft a roadmap for further research and policy making. The stakeholder groups will be the key players in disseminating project outputs through case studies and demonstrations to act as a blueprint to other producers across Europe and create networks to assist wider implementation of iSAGE outputs.

RESEARCH PROJECTS: HIGHLIGHTS

European Commission Funded Projects



INTERREG_ALICE

NAME OF THE PROJECT: INTERREG ALICE "Towards a better management of Atlantic Landscapes: developing tools to better characterise biodiversity and Ecosystem Services"

FUNDING AGENCY: Interreg Atlantic Area

FUNDING PROGRAM: Interreg Atlantic Area

CALL: Interreg Atlantic Area 2016

TIME FRAME: 2017-2020

STATUS: Active

FUNDING: 285.178 €

PARTNERS:

Universidad de Cantabria (leading partner)
 Consejería de Medio Rural, Pesca y Alimentación del Gobierno de Cantabria
 Universidade de Trás-os-Montes e Alto Douro
 Agri Food and Biosciences Institute
 BC3
 Université de Bretagne Occidentale
 Gistree
 Quercus
 Université de Rennes
 Le Centre National de la Recherche Scientifique
 National University of Ireland, SEMRU

LINK WITH BC3's OBJECTIVES

OBJECTIVE 5. Integrated modelling of coupled human-natural systems

KEY BC3 RESEARCHERS INVOLVED

Ferdinando Villa (PI)
 Stefano Balbi
 Javier Martinez
 Ainhoa Magrach

ACKNOWLEDGEMENT

ALICE project, whose leading partner is Universidad de Cantabria, has received funding from the European Union's Interreg Atlantic Area programme. Ref number: EAPA_261/2016

URL ADDRESS

<http://project-alice.com/>



PROJECT DESCRIPTION

Eleven European institutions from 5 countries (France, Ireland, United Kingdom, Portugal and Spain) joined to develop an innovative approach to assess how Blue and Green Infrastructures can contribute to meeting the EU 2020 targets for biodiversity in Atlantic coastal and terrestrial landscapes. The team includes scientists, universities, research institutes, local and national governments, NGOs and SMEs, who have the appropriate environmental, social and economic experience. Fishing, tourism, agriculture and forestry provide essential economic assets (Ecosystem Services) to the development of many coastal and rural areas of the Atlantic region. All these activities have been identified as important within the Research and Innovation Strategies for Smart Specialization for many EU regions of the Atlantic region (ie RIS3 objectives). However, the Ecosystem Service provision from Atlantic landscapes could be seriously compromised by losses on biodiversity because of changes on land uses and climate change. Aquatic ecosystems such as rivers and estuaries are especially vulnerable to the impacts of human activities in the watershed such as urbanization, pollution of rivers, application of fertilizers and bad land management. Based in four Case Studies, the aim of ALICE is to develop a common methodology that recognizes the socioeconomic differences between the "Case Studies" to help transform the way, regional and local actors manage natural resources in the Atlantic region. This will assist on a more sustainable management of these landscapes by ensuring the conservation of biodiversity and ecosystem services provisioning.

RESEARCH PROJECTS: HIGHLIGHTS

European Commission Funded Projects



LIFE-IP URBAN KLIMA 2050

NAME OF THE PROJECT: LIFE-IP URBAN KLIMA 2050: systemic implementation of the CC action in the Basque Country for increased urban resilience as full territory enabler

FUNDING AGENCY: European Commission

FUNDING PROGRAM: PROGRAM: EU-LIFE

CALL: LIFE Integrated projects 2018 -Climate Action

TIME FRAME: 2019/09/01- 2025/08/31

STATUS: Completed

FUNDING: 494.929 €

PARTNERS:

Sociedad Publica de Gestion Ambiental IHOBE S.A.

Gobierno Vasco / Basque Government

Diputación Foral de Alava (DFA)

Diputación Foral de Bizkaia (DFB)

Diputación Foral de Gipuzkoa (DFG)

Agencia Vasca de! Agua / Euskal Uraren Agentzia (URA)

Ente Vasco de la Energía (EVE)

Fundación de Cambio Climático de Gipuzkoa

(NATURKLIMA)

Fundación AZTI / AZTI Fundazioa

BC3, Basque Centre for Climate Change

Fundación Tecnalia Research & Innovation

NEIKER - Instituto Vasco de Investigación y Desarrollo Agrario S.A.

Universidad de Navarra -TECNUN

Centro de Estudios Ambientales (CEA)

Ayuntamiento de Donostia/San Sebastian (AytoDSS)

Ayuntamiento de Bilbao

Ayuntamiento de Bermeo

Ayuntamiento de Zarautz

Ayuntamiento de Bakio

Ayuntamiento de Gernika y Lumoko

LINK WITH BC3's OBJECTIVES

OBJECTIVE 4. Support decision making for successful and effective adaptation

KEY BC3 RESEARCHERS INVOLVED

Maria Jose Sanz

Aline Chiabai

Mikel Gonzalez Eguino

Ainhoe Azkarate

Marc Neumann

Silvia de Luis

Iñaki Arto

Estibaliz Sanz

Ester Galende

Maria Ruiz de Gopegui

Alejandro Rodríguez Zuñiga

ACKNOWLEDGEMENT

The URBAN KLIMA 2050 LIFE 18 IPC 000001 project has received funding from the European Union's LIFE Programme

URL ADDRESS

<http://urbanklima2050.eu/eu/>



PROJECT DESCRIPTION

All European regions are vulnerable to Climate Change (CC), although its consequences can manifest itself in several ways, depending on the region of the planet in which we find ourselves. According to the estimations, both the South and Southeast areas of Europe, where the Basque Country (north of Spain) is located, will be the critical areas affected by CC according to the number of adverse phenomena. In the Basque case it has been identified that main CC threats and impacts on the citizens, the territory and the economy. These will come as a result of the increasing frequency and intensity of extreme events (i.e. sea storms, heat waves, floods....) resulting in:

- Increase of mean sea level and wave frequency and intensity, impacts on urban settlements, harbours, and natural coastal environments.
- River floods with strong affections to the urban settlements.
- Heat waves and islands affecting health population.
- Landslides affecting infrastructures and neighbourhoods.
- Habitats displacement or disappearance and loss of its ecosystem services.

LIFE-IP URBAN KLIMA 2050 will demonstrate the effective and well-coordinated implementation (directly in the IP and through complementary funding), of a climate strategy (KLIMA 2050) on a large territorial scale (Basque Country, 7.200 Km², 2,2 Mill inhabitants), while ensuring involvement of key stakeholders (Regional Government, Provincia Authorities, Municipalities, Public and Private companies, Research and Education sector, Social agents and citizens) and promoting the coordination with and mobilisation of other relevant funding sources: European Union (FEADER, FEDER, FSE, H2020), national level (MITECO, Fundación Biodiversidad, Basque Government own funds...) and other private funds (BBVA, Iberdrola Foundation...).

URBAN KLIMA 2050 defines a particular approach to adapt, and sometimes mitigate the effects of CC in the Basque urban zones. It is considered that this approach could be considered as a replicable case study for similar regions of the EU.

RESEARCH PROJECTS: HIGHLIGHTS

Other International Funded Projects (Competitive Programmes)



AXA_CLIC

NAME OF THE PROJECT: CLIC "Can we measure the effectiveness of public investments in urban climate resilience?"

FUNDING AGENCY: Fundacion AXA

CALL: AXA_POSTDOCTORAL RESEARCH

FELLOWSHIP GRANTS 2017

TIME FRAME: 2018-2020

STATUS: Active

FUNDING: 130.000 €

LINK WITH BC3's OBJECTIVES

OBJECTIVE 4. Support decision making for successful and effective adaptation

KEY BC3 RESEARCHERS INVOLVED

Marta Olazabal
 María Ruiz de Gopegui Aramburu
 Elisa Sainz de Murieta
 Ibon Galarraga
 Anil Markandya

ACKNOWLEDGEMENT

-

URL ADDRESS

<https://clic.bc3research.org>



PROJECT DESCRIPTION

After the Paris agreement, the need to collect more information about current efforts and progress towards adaptation is patent. Because of this, understanding the strengths and weaknesses of current adaptation policies is critical for public and private decision-making so that efforts can be well targeted, public funds and private investments can be effectively allocated, best-practices can be transferred and ultimately, adaptation science and practice can advance. When it comes to cities, local climate adaptation planning is relatively new. Earliest local adaptation plans began emerging about ten years ago and are an increasingly important component of the international climate policy agenda. It turns therefore critical to evaluate if and how local authorities are acting to adapt and whether local climate adaptation plans are on track to effectively reduce future risks. In this project, a large-n (> 20 cities) experiment will be conducted to assess the quality and effectiveness of climate change adaptation public policies and investments in cities. The study will provide information on whether current urban adaptation initiatives across the world are being designed according to the risks they are exposed to. Results will be useful to assess whether investments in urban climate resilience are on track to be effective i.e. reducing vulnerability and building adaptive capacity. Linking with previous research undertaken by BC3 colleagues in the Adaptation Lab (see ECONADAPT and RESIN), the methodological approach will combine information characterising urban adaptation initiatives (looking at policy and economic aspects, scientific knowledge and legitimacy) and tailored risk functions that allow to account for the uncertainty of climate change. The sample set will cover developed and developing cities. Results are also expected to contribute building a global reference baseline on adaptation policy action in world-wide coastal cities, that will hopefully help to track progress towards (effective) adaptation.

RESEARCH PROJECTS: HIGHLIGHTS

Spanish Government and Other Spanish Institutions (Competitive Programmes)



PHLISCO

NAME OF THE PROJECT: Reconciling water-use efficiency estimates across scales under future climate change scenarios using PHLoem carbon ISotopic COmposition

FUNDING AGENCY: MCIU – Spanish Ministry for Science, Innovation and Universities

CALL: STATE PROGRAM FOR THE GENERATION OF KNOWLEDGE AND SCIENTIFIC AND TECHNOLOGICAL STRENGTHENING OF THE R & D & I AND R & D & I SYSTEM ORIENTED TO THE CHALLENGES OF SOCIETY, CALL 2019.

TIME FRAME: 2020-06-01 / 2023-05-2023

FUNDING: 71.390 €

LINK WITH BC3's OBJECTIVES

OBJECTIVE 3. Understanding and managing terrestrial systems for sustainability

KEY BC3 RESEARCHERS INVOLVED

Teresa Gimeno

ACKNOWLEDGEMENT

Project funded by the Ministry of Science, Innovation and Universities and the State Research Agency with exp nº.: PID2019-107817RB-I00

URL ADDRESS

https://www.bc3research.org/projects/phlisco_ES

PROJECT DESCRIPTION

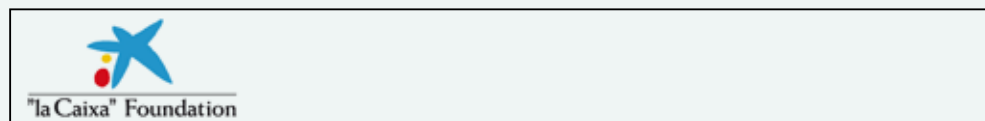
The exchange of water for carbon between the vegetation and the atmosphere constitutes the most important feedback mechanism underlying the regulation of water and carbon (C) cycles by the terrestrial biosphere. Water use efficiency (WUE) is the trait that serves to describe this intimate link between the C and water cycles and is a crucial parameter incorporated in many land-surface-models to predict vegetation-climatic feedbacks under future climate change scenario. WUE can be estimated using multiple approaches and methodologies concerning different temporal spatial and temporal scales. Empirical comparison of WUE estimates reveal that important disagreements exists among methodologies; however, these empirical comparisons cannot reveal the underlying mechanisms driving these discrepancies. Two of the most widely used methodologies to estimate WUE are measurements of the ratio of photosynthesis to stomatal conductance to water, using gas-exchange techniques, and analyses of the carbon isotopic composition (d13C) of plant material. This latter approach is based on the assumption that the d13C of plant material is mostly the result of isotopic discrimination occurring during diffusion through the stomatal pores and fractionation at the point of carboxylation.

The vast majority of these studies analyses d13C in either the leaves or the wood, but these reflect the signal of the plant physiological status all along the organ ontogeny. In addition, in tall trees, d13C varies greatly among leaves and thus individual measurements cannot capture whole-tree physiological status. Analyses of the phloem d13C constitute a promising avenue, as the phloem signal, when collected at the base of the trunk should reflect the whole tree physiological performance. Still, WUE estimates from d13C, even when they come from the phloem, are usually lower than WUE from measurements of gas-exchange. This is partly due the fact that estimates of WUE from d13C most often neglect the leaf internal resistance to CO2 diffusion, beyond the stomatal pores. Mesophyll conductance (gm) is the inverse of this resistance and it is a trait that varies greatly among plant functional types and in large individuals (adult trees) also among canopy layers. Furthermore, gm also varies greatly in response to climate change drivers including increasing vapour pressure deficit, water availability and atmospheric CO2 concentration. Previous studies, including ours, combining measurements of gm with WUE from different estimates suggest that neglecting gm limitations in the calculations of WUE from d13C could induce large biases and that these biases would be even larger under water limitations. Still, these studies showed that even after incorporating gm limitations, other post-photosynthetic fractionation processes exist that underlie disagreements between WUE estimates.

The aim of this proposal is to reconcile estimates of WUE describing vegetation functioning at different scales by incorporating internal leaf diffusional limitations, using *Fagus sylvatica* as a model species. This objective will materialise in the form of a novel protocol for estimating whole-tree WUE at large spatial scales from analyses of the phloem content. In this project, we will combine measurements under controlled conditions, intensive field measurements of physiological performance, sampling of physiological performance (including WUE from different methodologies and gm) across a broad geographical range.

RESEARCH PROJECTS: HIGHLIGHTS

Spanish Government and Other Spanish Institutions (Competitive Programmes)



ENERPOLIS

NAME OF THE PROJECT: ENERgy Efficiency POLIcies in Spain: analysing consumer choices

FUNDING AGENCY: Fundación La Caixa

CALL: Proyectos Investigación Social La Caixa_2019

TIME FRAME: 2020-02-01/2022-01-31

FUNDING: 100,000 €

PARTNERS: BC3

LINK WITH BC3's OBJECTIVES

OBJECTIVE 2: Support decision making in the transition to a low carbon society

KEY BC3 RESEARCHERS INVOLVED

Ibon Galarraga
Sebastien Foudi
Alessandro Silvestri
María del Mar Solà
Elena López

ACKNOWLEDGEMENT

The project has received funding from "la Caixa" Banking Foundation under the project code 0435 - ENERPOLIS - ENERgy Efficiency POLIcies in Spain

URL ADDRESS

<https://www.bc3research.org/projects/enerpolis>

PROJECT DESCRIPTION

In order to combat climate change, several policies have been used in Spain to reduce the carbon intensity of the economy. However, household behavioural change has not received enough priority by the international climate debate. For these, more research is needed to keep the 1.5°C target within reach. ENERPOLIS seeks to understand the effectiveness of market based (energy efficiency labels) and command and control instruments (Low emission zones) in Spain. This will be done through analysing the willingness to pay for energy efficiency of household appliances and study the effectiveness of the Madrid Low emission zone. The project will allow to provide useful recommendations to improve the design of policies influencing consumers' choices of energy efficient technologies. Specifically, it will allow us to provide insights on the effectiveness of regulatory and economic instruments in the transition towards an energy efficient economy.

The promotion of Energy Efficiency (EE) is an important step towards the decarbonisation of the energy sector. Several policy instruments target consumers' choices and behaviour towards the purchase and use of energy efficient technologies. As some of these are rather new, research and feedback are needed to fine tune the instruments and ensure their effectiveness. This project will focus on two specific instruments in Spain, EE labelling for appliances and the Low Emission Zone (LEZ) regulation for transport in Madrid. The first one provides information to guide consumers to purchase more efficient appliances and is often used together with rebate schemes so can be considered as a market instrument. The second is a good example of command and control instrument as controls the number/type of vehicles entering a certain zone. The objective of this project is to evaluate the performance of these policies and explore possible design improvements. The research procedure proposed is: first, we will enhance the understanding on how EE information can be provided more efficiently adding information on monetary terms; second, the impact of LEZ on air quality and on city fleet composition will be analysed; and third, we aim at contributing to the debate on the effectiveness of market based (EE labels) and command-and-control (LEZ) instruments. Three quantitative methodologies will be used: hedonic method, controlled lab experiment and causal inference

RESEARCH PROJECTS: HIGHLIGHTS

Spanish Government and Other Spanish Institutions (Competitive Programmes)



iMechPro

NAME OF THE PROJECT: Ice Microstructure and Mechanics, and their Implications for the Integrity of Climate Proxies in Ice Cores Microestructura y Mecánica del Hielo y sus implicaciones para la integridad de los Proxies Climáticos en Testigos de Hielo

FUNDING AGENCY: MCIU – Spanish Ministry for Science, Innovation and Universities

FUNDING PROGRAM: ERA-NET

CALL: R + D + i projects "Research challenges" corresponding to the State Program of R + D + i Oriented to the Challenges of Society, CALL 2018

TIME FRAME: 2019-01-01/2021-12-31

FUNDING: 181.500 €

PARTNERS: BC3

LINK WITH BC3's OBJECTIVES

OBJECTIVE 1: Understand past and future climate changes

KEY BC3 RESEARCHERS INVOLVED

Sérgio H. Faria

ACKNOWLEDGEMENT

Proyecto financiado por el Ministerio de Ciencia, Innovación y Universidades y la Agencia Estatal de Investigación con el nº exp: RTI2018-100696-B-I00

URL ADDRESS

<https://www.bc3research.org/projects/imechpro>

PROJECT DESCRIPTION

Glaciers and ice sheets are essential elements of Earth's climate system. Their interactions with the environment can have dramatic implications for life on the globe, as demonstrated by their roles in sea-level rise and global warming. Such environmental interactions remain recorded in the ice microstructure, in form of impurities like air bubbles, particles, and other climate proxies buried by subsequent snowfalls. It happens, however, that glaciers and ice sheets flow.

They creep downslope under their own burden, disrupting the stratigraphy of deepest ice, and consequently destroying the integrity of their oldest climate records. A precise estimate of this flow is essential not only for reliable prognoses of sea-level rise, but also for the reconstruction of disturbed ice-core climate records. For all these reasons, glaciologists have been struggling to produce ever more sophisticated models of glacier and ice-sheet flow. Nevertheless, too often these models rely on outdated, sometimes even dogmatic theories of ice mechanics, which ignore essential aspects of the microstructure and physical properties of natural ice. In particular, numerous ice-core and borehole studies have revealed a clear correlation between microstructure, mechanical properties, and impurities in natural ice, in form of a multiscale Structure-FlowEnvironment Interplay (SFEI). To date, there exists no holistic model capable of addressing all aspects of the SFEI in natural ice. The objective of iMechPro is to help correcting this flaw, through a systematic study of the evolving interactions among microstructure, impurities, and mechanics of natural ice. This project involves advanced optical microscopy and mechanical tests of natural ice at the IzotzaLab, the novel low-temperature laboratory at BC3, combined with interpretation of field data, digital image analysis of new and already existing micrographs, conceptual and mathematical modelling. Ice samples, field data, stratigraphy records, and micrographs will be available from diverse sites, including Antarctica, Greenland, the Pyrenees, and possibly also the Alps, Patagonia, Alaska, and Siberia, therefore covering a wide range of ice varieties and climatic conditions. The results from iMechPro shall pave the way to a new generation of glacier and ice-sheet flow models, by considering all deformation mechanisms and microstructural processes taking place in natural ice, combined with realistic descriptions of climate proxy formation and decay.

RESEARCH PROJECTS: HIGHLIGHTS

Basque Government and Other Basque Institutions (Competitive Programmes)



REVALUE

NAME OF THE PROJECT: RElational VALues in Urban Environments: A transdisciplinary approach
FUNDING AGENCY: BASQUE GOVERNMENT
FUNDING PROGRAM: EJ_INV_BASICA_APLICADA
CALL: EJ_INV_BASICA_APLICADA_2019
TIME FRAME: 2019-09-30-2022-06-30
FUNDING: 50.000 €

LINK WITH BC3's OBJECTIVES

OBJECTIVE 3. Understanding and managing terrestrial systems for sustainability

KEY BC3 RESEARCHERS INVOLVED

Unai Pascual
 Bosco Lliso
 Alevgul Sorman
 Ainhoa Magrach
 Julia Neidig

URL ADDRESS

<https://www.bc3research.org/projects/revalue>

PROJECT DESCRIPTION

REVALUE is a transdisciplinary project that aims to answer questions about the role of 'relational values' about nature in an urban context, including (1) What counts for people as relational value about urban biodiversity? (2) What indicators best measure relational values at both individual and social levels in an urban setting? And (3) How does it help to understand the relationships between urban biodiversity, human well-being and social equity, through a relational values lens? REVALUE also focuses on the role of recognizing and activating relational values in inclusive urban planning. To find answers to these questions, REVALUE will apply a case study in the city of Vitoria-Gasteiz (European Green Capital 2012).

REVALUE is a transdisciplinary project that aims to answer questions about the role of 'relational values' about nature in an urban context, including (1) What counts for people as relational value about urban biodiversity? (2) What indicators best measure relational values at both individual and social levels in an urban setting? And (3) How does it help to understand the relationships between urban biodiversity, human well-being and social equity, through a relational values lens? REVALUE also focuses on the role of recognizing and activating relational values in inclusive urban planning. To find answers to these questions, REVALUE will apply a case study in the city of Vitoria-Gasteiz (European Green Capital 2012). For this, it has the collaboration of the Barcelona Lab for Urban Environmental Justice and Sustainability at the Universitat Autònoma de Barcelona (UAB) and the Vitoria-Gasteiz City Council through the Green Lab of the Center for Environmental Studies (CEA). REVALUE also aims to co-create knowledge between the research team of BC3, UAB and social actors of Vitoria-Gasteiz. The project is also sponsored by the Vitoria-Gasteiz City Council.

RESEARCH PROJECTS: HIGHLIGHTS

Basque Government and Other Basque Institutions (Competitive Programmes)



HAYEDOS

NAME OF THE PROJECT: Evaluando el papel de la diversidad del suelo en el mantenimiento de la funcionalidad de los hayedos en un escenario de cambio climático (Assessing the role of soil diversity in maintaining beech functionality in a climate change scenario)

FUNDING AGENCY: Basque Government

FUNDING PROGRAM: EJ_INV_BASICA_APLICADA

CALL: EJ_INV_BASICA_APLICADA_2019

TIME FRAME: 2019-09-30 -2021-09-29

FUNDING: 49.481 €

LINK WITH BC3's OBJECTIVES

OBJECTIVE 3. Understanding and managing terrestrial systems for sustainability

KEY BC3 RESEARCHERS INVOLVED

Teresa Gimeno
David Moreno
Jorge Curiel
Javier Porras

URL ADDRESS

<https://www.bc3research.org/projects/hayedos>

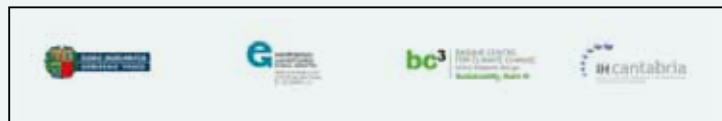
PROJECT DESCRIPTION

Warming of the Earth's surface, together with changes in precipitation regimes, increase the frequency and intensity of drought episodes, due to climate change. In recent decades, the risk of loss of ecosystem functionality due to recurrence of drought episodes has increased, even for regions where water availability was not assumed to be limiting. This is the case of forests in temperate regions, such as European beech forests (*Fagus sylvatica*), where clear signs of decline have been observed in recent years in the lower altitudinal and latitudinal limits of their distribution, that is, in areas exposed to higher temperatures and a greater water deficit. However, the assessment of loss of ecosystem functionality should not be linked exclusively to the survival, growth and reproduction of the dominant species, since it depends largely on its interactions with other species. In the case of beech forests, the establishment and maintenance of a network of symbiotic relationships between beech roots and mycorrhizal fungi plays a fundamental role in guaranteeing the supply of water and nutrients, especially during climatically unfavourable times.

In this project, we propose that maintaining this network of symbiotic relationships together with the plasticity of root growth are key to maintaining the supply of water and nutrients in beech forests, especially for those at the lower limit of their climatic distribution. and during periods of low water availability. To do this, we propose a combined approach, experiments and observational studies in the field and under controlled conditions to assess the vulnerability and risk of loss of functionality of beech forests in the Iberian Peninsula.

RESEARCH PROJECTS: HIGHLIGHTS

Other Funding Agencies



GOVERNADAPT

NAME OF THE PROJECT: Governance of climate change adaptation and risk management
FUNDING AGENCY: ELANKIDETZA - BASQUE AGENCY FOR DEVELOPMENT COOPERATION
TYPE: Collaboration Agreement
TIME FRAME: 2013-12-01/ 2021-01-31
FUNDING: 109.350 €
PARTNERS:
 BC3
 Fundación Instituto de Hidráulica Ambiental de Cantabria, IHCantabria

LINK WITH BC3's OBJECTIVES

OBJECTIVE 4. Support decision making for successful and effective adaptation

KEY BC3 RESEARCHERS INVOLVED

Elisa Sainz de Murieta
 Ibon Galarraga
 Marta Olazabal
 Anil Markandya
 Andrea Palomero
 Ambika Markanday

URL ADDRESS

<https://www.bc3research.org/projects/governadapt>



PROJECT DESCRIPTION

Governadapt is a pilot project funded by the Basque Cooperation Agency whose main goal is assessing climate-induced coastal risks in the city of Dakar and determining, in a co-creation process with stakeholders, acceptable levels of risk that will guide the identification of different adaptation pathways.

The project is led by the Basque Centre for Climate Change (BC3), in collaboration with IHCantabria, a research institute specialised in delivering science-based innovative solutions related to the water cycle.

The project has a strong cooperation and capacity building focus, build on three priorities:

- I. Participation and co-production
- II. Mainstreaming the gender perspective
- III. Including the needs and views of the vulnerable groups



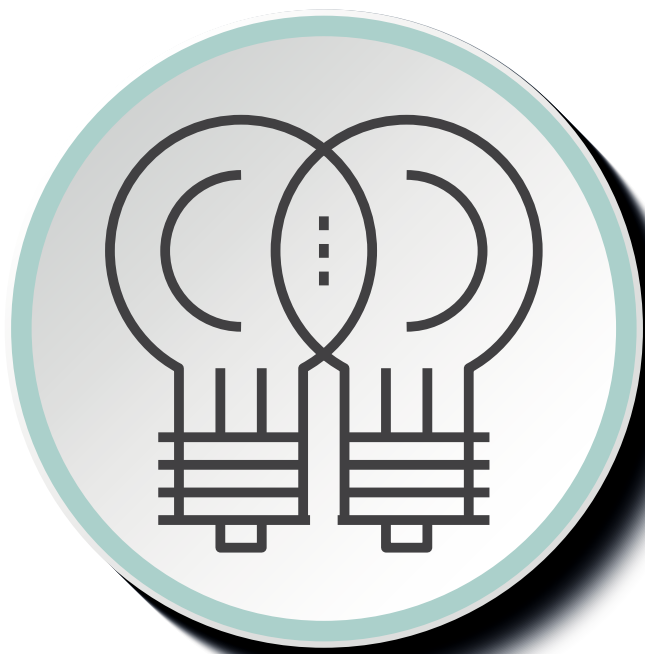
BC3 Scientific Infrastructure: **IZOTZALAB**

A UNIQUE APPROACH TO LOW-TEMPERATURE RESEARCH

BC3's research infrastructure, **Izotzalab**, is a unique laboratory in the Iberian Peninsula for testing and analyzing the physics and chemistry of cold samples (such as ice cores) and prototypes, including ice, snow, permafrost, microorganisms, porous polymers, liquid crystals and mechatronic components.

The facilities of the IzotzaLab are set up to operate at freezing temperatures down to -30°C . All tests and experiments can be carried out inside its state-of-the-art cold room, which features a wide variety of analytical instruments and data ports.

During 2020, efforts concentrated on the development of the design and construction of the prototype of a new deep-UV Raman head for microscopic low-temperature spectroscopy and the development of a fully automated optical microscopy system for low-temperature and high-resolution 3D scanning. Once they become operational, both instruments will provide cutting-edge research opportunities and contribute to the unique experience of working at the IzotzaLab.



BC3 COLLABORATORS

BC3 has continued strengthening and expanding its national and international relationships with many leading research institutions worldwide during 2020.

A wide network of international, national and local collaborators, is a key pillar of BC3.

OVER 300 ACTIVE COLLABORATORS DURING 2020

06

TRAINING, DISSEMINATION AND CAPACITY BUILDING



TRAINING ACTIVITIES CONDUCTED

During 2020 BC3 has continued developing its training activity through different initiatives and programs with the aim also of strengthening the Basque System of Education and Science, and counting on the University of the Basque Country UPV/EHU as a key collaborator.

TRAINING ACTIVITIES CONDUCTED

Supervised PhD Students

STUDENT NAME	SUPERVISOR/S AT BC3	UNIVERSITY	THESIS TITLE
Aitor Andonegi	Agustin del Prado	University of the Basque Country UPV/EHU	Análisis y evaluación integral de sistemas de pastoreo de ovejas lecheras: propuesta de escenarios y herramientas de gestión
Alba Márquez Torres	Ferdinando Villa and Stefano Balbi	University of Lleida	Spatial-temporal characterization of forest ecosystem services in a context of climate change through semantic integration.
Alberto González García	Ignacio Palomo	Universidad Autónoma de Madrid	Planificación socio-ecológica del territorio en Madrid
Alessandro Silvestri	Sebastien Foudi	University of the Basque Country UPV/EHU	The transition towards low carbon mobility: key factors and socio-economic impacts.
Alina Tepes	Ibon Galarraga	University of the Basque Country UPV/EHU	Implications of uncertainties for adaptation decision making in the agriculture sector
Ama Kissiwah Boateng	Marta Olazabal	National University of Public Service (Budapest)	Planning for Climate Change in 21st Century Cities: The Role of Local Governments
Ambika Markanday	Ibon Galarraga and Anil Markandya	University of the Basque Country UPV/EHU	The economics of climate change adaptation and decision-making in cities: Barriers and opportunities across scales
Asma Jebari	Agustin del Prado	Universitat de Lleida	Cuantificación Del Secuestro De Carbono En La Ganadería Ligada A Los Pastos Del País Vasco
Asun Rodríguez	David Moreno	University of the Basque Country UPV/EHU	Recuperación de la estabilidad de las redes de interacción en bosques templados tras impactos causados por la minería desde la edad media
Becca Wilgosh	Alevgul H.Sorman	University of the Basque Country UPV/EHU	A Just Transition beyond unions? Workers' assessment of socio-environmental justice in Alberta, Canada and Northern Spain
Daniel García Angulo	Jorge Curiel	Universidad Autónoma de Madrid	Effects of drought-induced decline in Mediterranean Holm oak and the modulating role of land-use on soil biogeochemical cycles and soil microbial communities
Elena Lopez	Ibon Galarraga	University of the Basque Country UPV/EHU	Pathways to a decarbonised building sector: understanding energy decision in heating and cooling
Elham Bakhshian	Marcela Brugnach		Participatory modelling of the interaction between evolving anthropogenic shore and human activities.
Enaut Izagirre Estibaritz	Sergio H. Faria	University of the Basque Country UPV/EHU	Evolution of glaciers and glacial lakes in response to climate change in the Cordillera Darwin Icefield, Tierra del Fuego, southernmost South America
Ester Galende Sánchez	Alevgul H. Sorman and Mikel González-Eguino	Universidad Autónoma de Madrid	Public participation and the climate crisis: Democratic innovations as a path to transformation

STUDENT NAME	SUPERVISOR/S AT BC3	UNIVERSITY	THESIS TITLE
Estibaliz Sanz	Aline Chiabai	Universidad internacional de Cataluña (UIC)	Mainstreaming of climate change adaptation in urban planning
Estibaliz Treviño Gil-García	Elisa Sainz	University of the Basque Country UPV/EHU	Valoración económica de los servicios de los ecosistemas para la gestión sostenible de espacios naturales protegidos: impactos y adaptación al cambio climático
Freddy Eliseo Michel Portugal	Sergio H. Faria	University of the Basque Country UPV/EHU	Territorialidad, resiliencia tradicional/ancestral y cambio climático: pueblos y nacionalidades indígenas de la Amazonía ecuatoriana del Cantón Mera de la Provincia de Pastaza 2016-2018
Gonzalo Morcillo	Sergio H. Faria	University of the Basque Country UPV/EHU	Statistical analysis of climate and paleoclimate records
Iratxe Rubio Benito del Valle	Elena Ojea	University of Vigo	New insights into industrial fisheries: adaptation to climate change from an interdisciplinary point of view
Itxaso Ruiz	Sergio H. Faria and María José Sanz	University of the Basque Country UPV/EHU	Integrated response options based on land management in rural areas of the Mediterranean Basin
Javier Moreno	Ignacio Palomo	University Pablo de Olavide	Incorporating complexity into ecosystem services governance
Jorge Moreno	Dirk Van de Ven and Mikel González-Eguino	Imperial College London	Modelling analysis of the Sustainable Development Goal interactions under the Climate-Land-Energy-Water framework
Julia Neidig	Unai Pascual	Universidad Autónoma de Barcelona	Relational Values in Urban Systems: An application to Vitoria-Gasteiz
Manuel Encinas	Jorge Curiel	University of the Basque Country UPV/EHU	El papel de las interacciones planta-microbiota en la resiliencia y colapso ante el cambio climático de encinares Mediterráneos
Manuel Tomás	Iñaki Arto	UPV/EHU	Modelling the consumption of European households: a heterogeneous approach
María del Mar Solà	Ibon Galarraga	University of the Basque Country UPV/EHU	Consumer decision making towards energy efficiency
Martin Friedrichs	Simone Langhans	Free University Berlin	Uncertainties in species distribution models: effects of spatial and temporal scales on future predictions
Michele Zen	Stefano Balbi	Ca Foscari	Understanding complexity in ecosystem service assessment perspectives and innovations in spatial analysis

TRAINING ACTIVITIES CONDUCTED

Supervised PhD Students

STUDENT NAME	SUPERVISOR/S AT BC3	UNIVERSITY	THESIS TITLE
Mikel Rueda	Iñaki Arto	University of the Basque Country UPV/EHU	An estimation of first-node and second-node Armington elasticities: A dynamic and gravitational approach
Nerea Bilbao Barrenetxea	S.H. Faria	University of the Basque Country (UPV/EHU)	Understanding the Karakoram anomaly and its implications for the future of glaciers and water supply in the Karakoram region (K-VORTEX)
Nicolás González Santacruz	Sergio H. Faria	University of the Basque Country UPV/EHU	Estudio comparativo de la formación del hielo de los Pirineos, Antártida y Groenlandia, así como de su evolución estructural
Omar Flores	Jorge Curiel	Universidad Autónoma de Madrid	Soil carbon cycle responses to global change and its prediction by modelling links between key biotic and abiotic processes in terrestrial ecosystems
Sébastien Huclin	Mikel González and Cristina Pizarro	IIT- Comillas, Madrid	Electric system modelling
Sofía Ávila Calero	Alevgul H. Sorman	Universidad Autónoma de Barcelona (UAB)	Social And Biophysical Dimensions Of Clean Electricity Production (TBC)
Xabier Díaz de Otálora Aguirre	Agustín del Prado	Universitat Politècnica de Valencia	Sustainability assessment of European dairy cattle systems
María Ruiz de Gopegui	Marta Olazabal	Autonomous University of Barcelona	The role of urban planning on citiesb climate justice performance
Sean Godwin	Marta Olazabal	University of Almeria	Nature's contributions to adaptation: urban resilience to climate change through nature-based solutions
Paloma Franco	María José Sanz Sergio H. Faria Marc Neumann	Universidad Autónoma de Madrid	Transiciones a la sostenibilidad como adaptación al cambio climático en cuencas hidrográficas
Celina Aznarez	Unai Pascual	Autonomous University of Barcelona	<i>Title to be determined</i>
Luz Vivas Doris	María José Sanz	Universidad Politécnica de Valencia	<i>Title to be determined</i>

Supervised Master Students

STUDENT NAME	SUPERVISOR/S AT BC3	UNIVERSITY	THESIS TITLE
Ana Morales	Elisa Sainz de Murieta	University of the Basque Country UPV/EHU	El living lab: un instrumento de innovación
Andrea Briones Palomero	Elisa Sainz de Murieta	Utrecht University	EU's external climate governance: decentralised cooperation as a reinforcing tool for EU's climate leadership
Borja Aramburu Muñoa	Jorge Curiel	University of the Basque Country UPV/EHU	The role of Soil Biodiversity on plant defense against Phytophthora Cinammoni
Javier De la Casa Sánchez	Asun Rogriguez and Teresa Gimeno	Universidad de Alcalá de Henares	Does isotopic fractionation occur during root water uptake? Reporting a global divergence in the isotopic composition of plant water and its sources.
Juan Francisco Castillo	Ainhoa Magrach	University of the Basque Country UPV/EHU	Dynamics of plant-pollinator interactions in time
Julen Montilla	Cristina Pizarro and Iñaki Arto	University of the Basque Country UPV/EHU	Green jobs in the Spanish renewable energy sectors: an input-output approach
Julia Cambronero	Marta Olazabal	University of Copenhagen	Analysis and comparison of the coastal adaptation policy process in urban agglomerations from two countries in the same geographical area and different socioeconomic characteristics. Indonesia (developing country) and australia (developed country)
Karl Kevin Leon	Iñaki Arto and Mikel González-Eguino	University of the Basque Country	Estimación adelantada de Gases de Efecto Invernadero: aplicación en España en el contexto del COVID-19
Pablo Olmedo	Ainhoa Magrach	University of the Basque Country UPV/EHU	Dynamics of plant-pollinator interactions in space
Simon Brenner	Stefano Balbi	Universität Duisburg-Essen	Assessing the Value of Green Infrastructure for Flood Regulation in the Ruhr Region Using the ARIES Flood Regulation Model
Victor Alfonso Rivera Meza	Ainhoa Magrach	Universidad Veracruzana	Influencia de la urbanización en interacciones mutualistas del bosque mesófilo de montaña Xalapa, Veracruz.

TRAINING ACTIVITIES CONDUCTED

Courses given at a postgraduate level

TYPE OF COURSE	NAME OF THE COURSE	MAIN ORGANIZER	BC3 RESEARCHERS
PhD Course	PhD in Analysis and Management of Climate Change	Ca Foscari	Stefano Balbi
Master Course	Environment and Fisheries/Aquaculture Interactions	University of the Basque Country UPV/EHU and Plentziako Itsas Estazioa	Sergio Henrique Faria and Iratxe Rubio
Master Course	Conservation Biology	University of Cape Town	Stefano Balbi
Master Course	Máster en jardines históricos y servicios ecosistémicos de la infraestructura verde	Universidad Politécnica de Madrid	Stefano Balbi
Master Course	Master en geoinformática para la gestión de recursos naturales	Universidad de Leon	Stefano Balbi
Master Course	Impacts of climate change on fisheries and aquaculture	University of the Basque Country and Plentziako Itsas Estazioa	Iratxe rubio
Master Course	Modelización de Servicios Ecosistémicos. Estrategia de modelización integrada de ARIES	Universidad Politécnica de Madrid	Marta Pascual
Master Course	Modélisation du fonctionnement des peuplements végétaux	Université de Bordeaux	Teresa Gimeno

TYPE OF COURSE	NAME OF THE COURSE	MAIN ORGANIZER	BC3 RESEARCHERS
Advanced Course	Research in Marine Environment and Resources (RIMER)	University of the Basque Country UPV/EHU	Elisa Sainz de Murieta
Advanced Course	Modelización en Ecosistemas Forestales: Una visión desde la simulación de procesos ecológicos	Universidad Pública de Navarra	Alba Marquez
Advanced Course	Livestock and climate change: Assessment of emissions, mitigation options and adaptation strategies	IAMZ-CIHEAM	Guillermo Pardo Nieva
Advanced Course	Socioeconomic Aspects of Climate Change	University of the Basque Country UPV/EHU	Elisa Sainz de Murieta
Advanced Course	ALICE Winter School	CNRS France	Stefano Balbi
Advanced Course	k.LAB training	ARIES Team - BC3	Alessio Bulckaen
Advanced Course	Global Environmental and Climate Change: Tools for Action and Transformation	-	Alevgul H. Sorman
Advanced Course	Applied Panel Data Econometrics	-	Manuel Tomás

Our researchers have also taught a range of postgraduate and advanced courses in different universities and institutions.

TRAINING ACTIVITIES CONDUCTED

Courses organized by BC3: Highlights



11th EDITION OF THE BC3-UPV/EHU SUMMER SCHOOL

(POSTPONED UNTIL 2021)

The annual Summer School on Climate Change was launched in 2010 with the collaboration of the University of the Basque Country UPV/EHU. The objective of this school is to offer an updated and recent view of the ongoing trends in climate change issues, gathering leading experts in the field and students from top universities and research centres worldwide.

Since the Summer School was launched, it has covered a wide range of topics from an interdisciplinary perspective. In 2020 BC3 organized two courses to be held within the framework of the summer courses, Uda Ikastaroak, that were finally postponed until 2021 due to COVID19:

"Green Deal: Turning point in the face of the Climate Crisis?" which will focus on the Green Deal, a powerful reform agenda of a green and social nature, and that as a result of the coronavirus crisis is intended to develop in many countries and regions around the world, including the European Union and the United States and "Artificial Intelligence for the Wellbeing and Sustainability of Societies" that aims to introduce students and non-experts to AI-powered technologies (beyond Machine Learning), to demonstrate concrete applications of AI, related to the wellbeing and sustainability of societies, getting a live experience with these innovative technologies and sharing reflections on how AI has developed until now and what we can expect in the future.



TRAINING ACTIVITIES CONDUCTED

Courses Co-organized by BC3

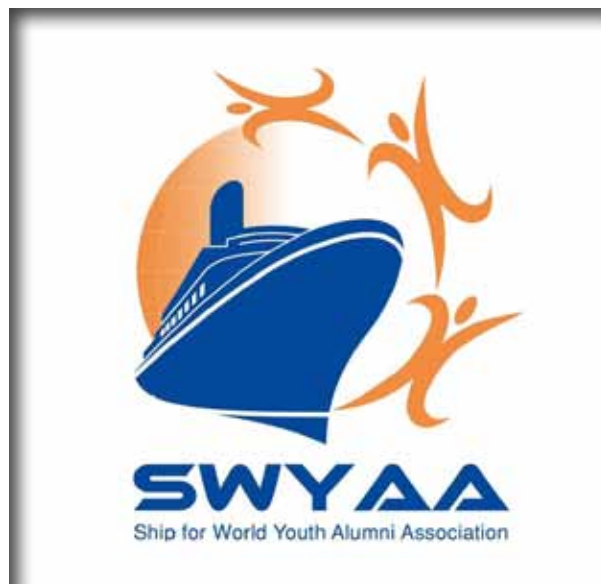


5th TATIANA PÉREZ DE GUZMÁN EL BUENO SCHOOL OF THE ENVIRONMENT

María José Sanz, Scientific Director of BC3, participated in the 5th Tatiana Pérez de Guzmán el Bueno School of the Environment, which was hosted by the Menéndez Pelayo International University (UIMP) of Santander in August 2020 and entitled "Environmental and social priorities -ecological for the day after the pandemic". She gave the presentation "Biodiversity, climate change and natural resources", inviting the audience to reflect on the errors of the past related to prohibitions or sanctions to face the environmental degradation of the planet, and stated that COVID-19 may be an "opportunity" to accelerate the implementation of the 2030 Agenda.

GLOBAL ENVIRONMENTAL AND CLIMATE CHANGE: Tools for Action and Transformation

BC3 researcher, Alevgul Sorman, participated in the Ship for World Youth (SWY) program, facilitating the discussion on "Global Environmental and Climate Change: Tools for Action and Transformation". The SWY programme is a unique cross-cultural exchange program, with over 50 years of history, led by the Cabinet Office of the Government of Japan, that aims to provide participating youth with the opportunity to enhance their leadership skills, along with deepening their mutual understanding and broadening their perspectives of socially relevant matters. The course that was designed and facilitated by Alevgul Sorman during the 5-week programme, covered five complementary modules introducing challenges like the climate emergency, biodiversity loss and the global plastics problem to identify areas for youth action.



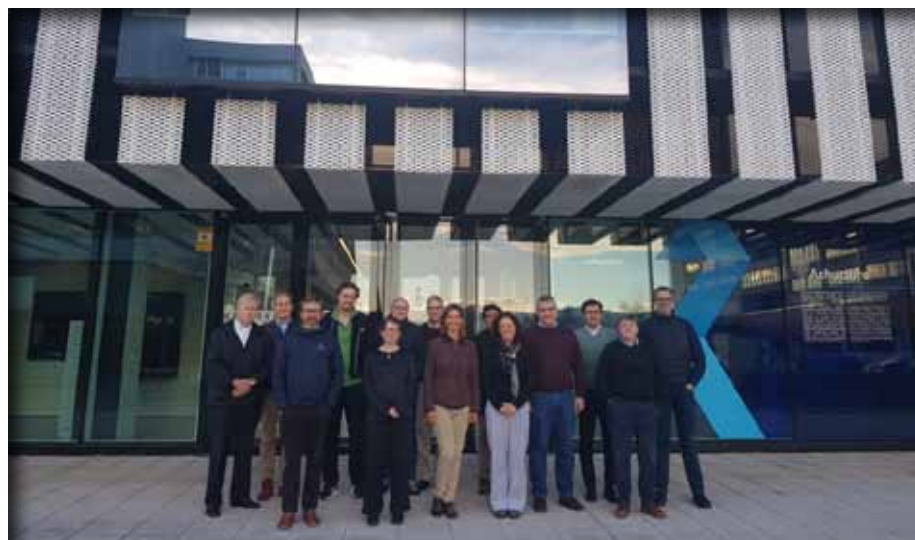


DISSEMINATION AND CAPACITY BUILDING

During 2020 BC3 organized a series of different dissemination activities with the aim of promoting ongoing research, supporting decision-making processes and enhancing the engagement of key players (stakeholders) by establishing a dialogue with them.

DISSEMINATION AND CAPACITY BUILDING CONDUCTED

Organization of Scientific Events



Meeting of the authors of GFOI's Methods and Guidance Documentation (MGD)



Conference "Impact of alternative financing mechanisms for Renewable Energies in Spain"

SOME HIGHLIGHTS

MEETING OF THE AUTHORS OF GFOI'S METHODS AND GUIDANCE DOCUMENTATION (MGD)

13-16 JANUARY, 2020, BILBAO

In January 2020, BC3 hosted a meeting of the authors of the Methods and Guidance from the Global Forest Observations Initiative (GFOI) to focus on the refinement of the GFOI Methods and Guidance Documentation (MGD).

Under the GFOI, the MGD Component is mandated to ensure that developing countries receive adequate guidance on operational methods to integrate remote sensing data with ground data on forests. The goal of this work is to facilitate estimation of greenhouse gas emissions and removals, in a manner consistent with international requirements for measurement, reporting and verification, which is especially important for REDD+ activities (Reducing emissions from deforestation and forest degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries).

The authors of the MGD were revising version 2 of the document to incorporate new guidance published in the IPCC 2019 refinement.

THE MGD HAS BEEN DOWNLOADED MORE THAN 9K TIMES SINCE BEING MADE AVAILABLE ONLINE ON THE REDDCOMPASS PLATFORM IN 2017 AND IS REFERENCED 14 TIMES IN THE IPCC 2019 REFINEMENT.

CONFERENCE: "IMPACT OF ALTERNATIVE FINANCING MECHANISMS FOR RENEWABLE ENERGIES IN SPAIN"

FEBRUARY 19, 2020, BILBAO

BC3 presented in Bilbao its scientific report *"Impact of alternative financing mechanisms for Renewable Energies in Spain"*. The development of renewables that has been necessary to meet the objective that by 2020 20% of the total energy consumed comes from renewable sources, is financed mainly through surcharges in electricity prices, placing the burden of meeting renewable energy targets on consumers of electricity. Various economic and social agents have been recommending exploring alternative ways of financing renewables in order to favour the competitiveness of industries, promote decarbonisation and 2030 efficiency goals through electrification, and reduce the price of electricity for households.

The analysis carried out in this study by BC3, presented at an event in Bilbao in February 2020, shows that it is possible to look for alternative means of financing that do not have negative effects on the economy, that may even favour economic growth and that send the adequate signals to customers about the environmental damage of the consumption of each energy. This research enables us to identify the advantages and disadvantages of the alternatives.

DISSEMINATION AND CAPACITY BUILDING CONDUCTED

Organization of Scientific Events



XVII ECOFLOR International Meeting



XVII ECOFLOR International Meeting

SOME HIGHLIGHTS

XVII ECOFLOR INTERNATIONAL MEETING

5-6 MARCH, 2020, BILBAO

International experts in Bilbao analyzed the relationship between the decline of bees and climate change.

On March 5 and 6, the XVII International Meeting of the Group of Floral Ecology (ECOFLOR) was held in Bilbao, which brought together a hundred international experts in ecology, floral evolution and pollination biology. Floral Ecology (ECOFLOR), a Spanish thematic network that functions since 2004 as a working group of the Spanish Association of Terrestrial Ecology (AEET), annually brings together scientists interested in floral ecology and evolution to address these issues and to share his latest discoveries with the aim of putting them into practice.

This meeting was organized jointly between the Basque Center for Climate Change (BC3) and the Spanish Association for Terrestrial Ecology (AEET) and addressed the conservation measures necessary to maintain wild bee populations, which are, according to Ainhoa Magrach, Ikerbasque researcher at BC3 and organizer of the event, "a life insurance for human beings".

"MORE THAN A HUNDRED EXPERTS IN ECOLOGY, FLORAL EVOLUTION AND POLLINATION BIOLOGY PARTICIPATED IN THIS INTERNATIONAL EVENT HOSTED BY BC3"

DISSEMINATION AND CAPACITY BUILDING CONDUCTED

Dissemination in Scientific Meetings



Donostia Sustainability Forum



SOME HIGHLIGHTS

OPEN ACTIVITY AT DONOSTIA SUSTAINABILITY FORUM "THE CLIMATE CRISIS: FACING ONE CRISIS TO GET OUT OF ANOTHER"

1 OCTOBER, 2020, DONOSTIA-SAN SEBASTIÁN

The global pandemic we are suffering has shown that it is extremely difficult to anticipate the magnitude of the risks facing us. Climate change is one of the biggest challenges humanity has to face in the coming years and the risks involved for our society are increasing. The necessary measures to implement require more ambitious, effective policies, among others, in sustainable consumption and production, efficient use and management of resources, integrated management of ecosystems and reduction of waste. Within this framework, multidisciplinary approaches are the key to propose effective solutions, as well as taking on the challenges represented by their inevitable impacts. María José Sanz, offered an open conference, in the recently created Donostia Sustainability Forum, to present that solutions come about on the basis of the respect, varied abilities and viewpoints that a multidisciplinary approach can provide, the courage to take on the complexity of physical and socio-ecological systems and the need to generate knowledge together with the different stakeholders in society.

AGORA K2050: CLIMATE CRISIS. AND NOW WHAT?

28 OCTOBER, 2020, DONOSTIA-SAN SEBASTIÁN

María José Sanz, Scientific Director of BC3 participated in the conference organized by Agora K2050 Center for Environmental Resources Observatory of Sustainability "*Climate crisis. And now what?*".

Warnings from the scientific community about the health risks that the global socioeconomic model implies have materialized in 2020 in a global pandemic that has devastated the planet. This represents a health crisis of unpredictable dimensions.

Scientific reports have been warning for decades about the serious risks to health and ecosystems that climate change will pose. María José Sanz participated in this debate led by women, to address the institutional commitments necessary to face Climate Change that point to cities as fundamental agents of climate action.

07

KNOWLEDGE CO-PRODUCTION AND TRANSFER



FOR POLICY-MAKING

A key aspect of BC3's research production is to engage multiple stakeholders in the research lifecycle so that the collected insights may be captured and incorporated into the research process from the very beginning.

KNOWLEDGE CO-PRODUCTION AND TRANSFER **FOR POLICY-MAKING**



Climate change is nowadays at the top of political agendas and it is a fundamental part of BC3's work to contribute to design related policies, as well as to facilitate, through science, their application in a regulatory framework, consistent with the Sustainable Development Goals.

During 2020, BC3 continued reinforcing its collaboration with internationally recognized teams and institutions at global and national levels, as well as with Basque Country research organizations and policy making processes.

Experience on the ground so far clearly indicates that local values and contexts matter, and that potential top-down solutions need to be matched with a diversity of bottom-up approaches across sectors to achieve cost-effective and science based fair solutions. This implies that all levels of governance (local, regional national and international) need to be closely involved in acting in the face of climate change while better integrating the efforts by public and private sectors as well as by civil society in general.

During 2020, BC3 played an active role contributing and engaging with actors, directly addressing policy-makers at the highest possible levels, as well as developing capacity building activities and supporting policy making process with a range of tools and activities conducted to this end.

KNOWLEDGE CO-PRODUCTION AND TRANSFER **FOR POLICY-MAKING**

Contributions to key actors in 2020: Highlights

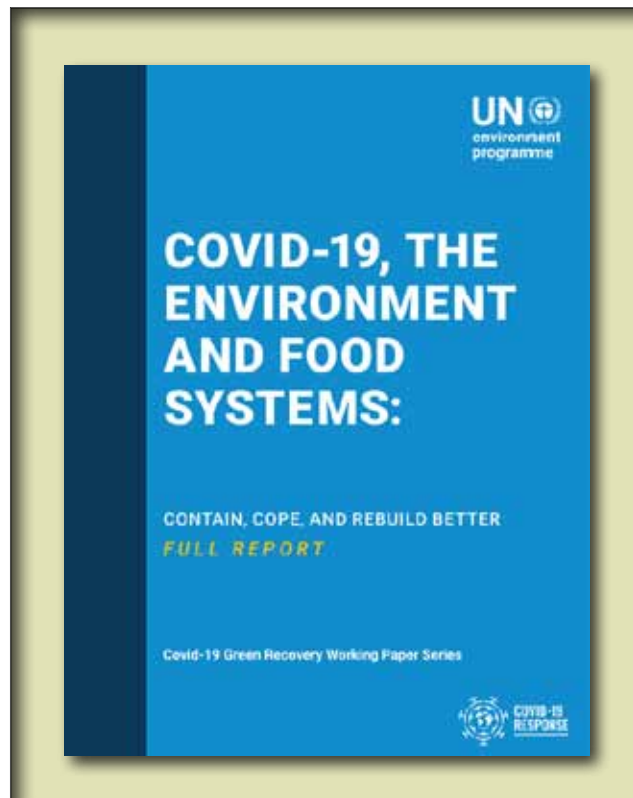


SUPRA-NATIONAL INSTITUTIONS

United Nations Environment Programme

During 2020, BC3 has reinforced its collaboration with UNEP with major contributions to “UN COVID-19 Response”.

This is a major UNEP report in which Anil Markandya, BC3 Distinguished Professor and former Scientific Director, has been the coordinating lead author. It analyzes impacts from COVID-19 at the nexus of food systems and the environment. Likewise the report proposes ways for governments and international agencies to mitigate these impacts and promote the resilience and sustainability of food systems through policies and investments.



KNOWLEDGE CO-PRODUCTION AND TRANSFER FOR POLICY-MAKING

Contributions to key actors in 2020: Highlights



SUPRA-NATIONAL INSTITUTIONS

European Commission

BC3 has continued its collaboration with the Directorate Growth and Innovation of the Joint Research Centre (JRC) of the European Commission (EC) as part of the research activity of the EC on the assessment of the "Economic, environmental and social effects of globalisation". This collaboration is articulated through the project EU-TiVA: "European Union trade in value added, jobs and greenhouse gas emissions", which is led by the BC3 and aims at providing scientific evidence-based policy support in topics related to the socio-economic and environmental impacts of trade.

- **TRADE-SCAN TOOLKIT** (produced by BC3 in collaboration with the Joint Research Centre of the European Commission), was used by the European Commission in its European Economic Forecast to analyse the economic impacts of the COVID-19 crisis.
- In the **H2020 CHANCE PROJECT**, developed jointly with MIT, BC3 is bridging the gap between economic and social goals, through a novel approach used to assess two of the most pressing challenges after COVID-19: the design and implementation of green recovery packages and the reduction of inequality.
- In the framework of the **H2020 LOCOMOTION PROJECT**, BC3 participated in the event about **policy modelling**, intended to exchange information, encourage debate and spur cooperation between H2020 projects as regards accounting for COVID-19 impacts. Among its objectives:
 1. Sharing perspectives and expectations from the Commission on the socio-economic and environmental analysis of COVID-19 impacts that could contribute to the shaping of EU follow up policies.
 2. Exchanging information on ongoing and upcoming work in projects on modelling and socio-economic analysis of COVID-19 impacts
 3. Exchanging experiences on topics that will be defined and prioritised together with the participants (i.e., focus groups) to get insights on current state of the art, and the need for future developments.

KNOWLEDGE CO-PRODUCTION AND TRANSFER **FOR POLICY-MAKING**

Contributions to key actors in 2020: Highlights



SUPRA-NATIONAL INSTITUTIONS

The United Nations Statistics Division (UNSD)

IMPLEMENTING NCA STANDARDS THROUGH ARIES.

This project establishes the framework for pilot testing of the System of Environmental Economic Accounting (SEEA) Ecosystem Accounting (EA) in some strategic partner countries to the European Union (EU), developing a toolbox that is aligned with SEEA classifications and concepts to be applied for modelling ecosystem services and automatized the production of accounting tables from model outputs. See the latest version of the ARIES for SEEA EA application: https://youtu.be/8zK4W_mxwZ0

InterAmerican Development Bank (IDB):

INTEGRATED MODELLING FOR PROTECTING THE AMAZON'S BASIN NATURAL CAPITAL.

A collaboration was signed with the innovation laboratory of the Inter-American Development Bank Group (IDB Lab), in order to contribute to the Leticia project, a digital platform that plans to fill the conservation financing gap in the Amazon Basin by optimizing project financing channels in this region. Leticia aims to provide in one place intelligent data and tools to connect governments, investors, donors, philanthropists with carefully identified investment opportunities in high priority locations for programs such as Herencia Colombia. ARIES will add the AI and semantic data analysis perspective.

KNOWLEDGE CO-PRODUCTION AND TRANSFER FOR POLICY-MAKING

Contributions to key actors in 2020: Highlights



NATIONAL, REGIONAL AND LOCAL GOVERNMENTS

During 2020, BC3 has also reinforced its participatory approach that is serving as a basis for strengthening the evidence base of interventions and practices for national, regional and local governments. The engagement with different stakeholders is conducted from the outset of the project, optimizing the alignment between the BC3 research process and its results with the values, needs and expectations of stakeholders.

BC3 has pursued to establish regular collaborations with the Spanish Government, Spanish Office of Climate Change, Basque Government and local Governance Bodies, as well as other national and regional governments worldwide.

National governments: Highlights

SPANISH GOVERNMENT

Since 2018, BC3 has collaborated with different bodies of the Spanish Government and Administration on the elaboration of the National Energy and Climate Plan 2021-2030, and the 2050 Long-term Low Emissions Strategy, that all Member States of the European Union have to submit to the European Commission.

These documents constitute the roadmap in the medium and long term for the low-carbon transition of the Spanish economy. BC3 used the in-house developed DENIO model and the FASST model to elaborate the economic impact assessment.

In 2020, BC3 has been in charge of the economic impact assessment of the Spanish Long-term Strategy of De-carbonization 2050, developed for the Ministry for the Ecological Transition and Demographic Challenge of the Spanish Government.

APPEARANCE AT THE SPANISH CONGRESS OF DEPUTIES OF BC3 RESEARCHER

Called by the Commission for Ecological Transition and Demographic Challenge, as an international expert to report on the Climate Change bill and energy transition (DS. Congress of Deputies No. 144 of 09/17/2020), Ikerbasque Research Professor at BC3, **Unai Pascual**, made an appearance at the Spanish Congress of Deputies.

KNOWLEDGE CO-PRODUCTION AND TRANSFER **FOR POLICY-MAKING**

Contributions to key actors in 2020: Highlights



Basque Government: Highlights

AGREEMENT BETWEEN THE DEPARTMENT OF THE ENVIRONMENT, TERRITORIAL PLANNING AND HOUSING AND THE BC3

In June 2020, an important agreement was signed between the Department of the Environment, Territorial Planning and Housing of the Basque Government, that will bring to the centre a contribution of 430,000 euros per year for the next four years. A total of 1.7 million euros aimed to carry out actions related to mitigation and adaptation of the territory to the impacts of climate change.

This agreement included six specific areas of action: 1. Climate basis, 2. Transition to a low-carbon society, 3. Terrestrial ecosystems, 4. Measures to adapt to climate change, 5. Integrated models human-natural systems and 6. Dissemination and training.

SUPPORT FOR THE KLIMA 2050 STRATEGY:

Within the framework of the KLIMA 2050 Strategy, in 2020 BC3 has worked on a report to evaluate the degree of implementation of the Strategy during the period 2015-2020.

This report includes an analysis of the new political context derived from the commitments acquired, at European, state and regional level, within the context of climate emergencies declarations. The document has also made it possible to identify the need to update the objectives of the Strategy in this new political landscape, in addition to carrying out an analysis of the evolution of mitigation and adaptation in recent decades at different levels.

On the other hand, the report includes an evaluation of the degree of progress in each and every one of the objectives, goals and lines of action of the Strategy. For this, BC3 has proceeded to develop, in collaboration with Ihobe, a system of indicators that allows the analysis of progress in both mitigation and adaptation.

Collaboration in the analysis of the simultaneous exposure of the population to various environmental factors that influence **Health** (temperatures and their synergistic effect with air pollutants). During 2020, work has started with the collection of data from pollution and meteorological variables measured in the Surveillance Network of the Air Quality in the Basque Country since January 2015.

LOCAL GOVERNMENTS

BC3 has continued work on transferring knowledge to local authorities through national journal publications: For example, in **Ekonomiaz**, a contribution to support decision makers in tackling flood risk prevention and help them to evaluate their adaptation policies.

KNOWLEDGE CO-PRODUCTION AND TRANSFER FOR POLICY-MAKING

Activities, Supporting Information and Tools Produced



Science-Policy Interface

BC3 supports policy making through activities, information and tools produced in 2020.

28

HIGH-LEVEL
POLICY ORIENTED
MEETINGS HELD

2

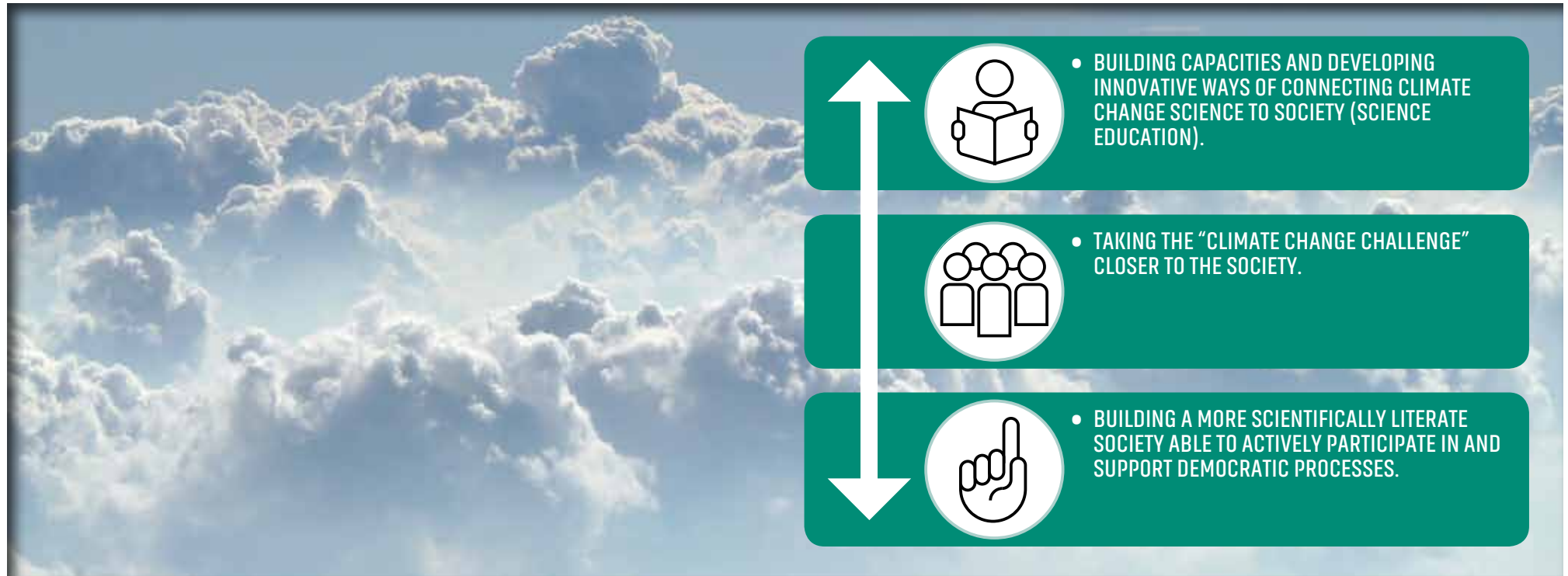
TRAINING AND
CAPACITY BUILDING
COURSES TARGETED
AT POLICY MAKING

10

CAPACITY BUILDING
EVENTS ORGANIZED

7

BC3 PROMOTED
NETWORKS TO SUPPORT
POLICY MAKING PROCESS



FOR SOCIETY

BC3, contributes to activate society to face climate change and sustainable development challenges. BC3 offers greater and better knowledge regarding climate change's causes and consequences, and connects scientific knowledge and participation, training and greater awareness for society.

Activities conducted through two action plans:

- BC3 SCIENCE EDUCATION PROGRAMME
- KNOWLEDGE TRANSFER TO THE GENERAL PUBLIC

KNOWLEDGE CO-PRODUCTION AND TRANSFER FOR SOCIETY

Activities, Supporting Information and Tools Produced



Training Caravan 2020

As could not be otherwise, the arrival of the pandemic has conditioned BC3's activity of co-production of knowledge and transfer to society in 2020, which has been limited by the circumstances. An activity that BC3 considers key as it increases social awareness of climate change, defined by the European Commission as one of the great social challenges facing Europe at the present time.

Training Caravan Programme

Despite the COVID-19, in 2020 BC3 has been able to reach three high schools within the frame of our Training Caravan Program.

The aim of this initiative led by the BC3 researchers jointly with the Basque Government, is to reach 17-18 years old Basque students in order to explain to them the path of the research career. Launched in 2010, the Training Caravan has brought us excellent results over the years and therefore, in addition to the three talks given, BC3 has been working on the development of new formulas to reach school audiences regardless of sanitary conditions.

New formulas to keep providing students with scientific evidence, through study cases and scientific results, to encourage reflection and shed scientific rigor on some "misinterpretations" and "equivocal messages" that have been translated about science.

Web: <https://trainingcaravan.bc3research.org> Twitter: [#trainingcaravan](https://twitter.com/trainingcaravan)



RUBIO BENITO DEL VALLE, IRATXE Y BENITO DEL VALLE ESKAURIAZA, AMELIA. 2020

Goiz bat Tuní-Ontzin / Una mañana en Tuní-Ontzi / Unha mañá no Tuní-Ontzi

In 2020, BC3 was also involved in the production of a children's book that explains in an easy way the challenges humankind needs to tackle climate change. Through the story of a skipper and his daughter, who spend a journey in a vessel called Tuní-Ontzi, kids get a first illustrated approach to concepts such as global warming and sustainability. A dissemination activity available in three languages, Basque, Galician and Spanish, that was offered as a gift to skippers and workers from the Spanish and Basque fishing industry who took part and facilitated a survey conducted by Iratxe Rubio for her PhD.

KNOWLEDGE TRANSFER TO THE GENERAL PUBLIC

Mass and Social Media



BC3 IN THE MEDIA



Interviews in Digital Media	73
Website Traffic	187.918 visits
Social media Activity	608 tweets

At BC3 we are aware that our media outreach activity boosts the increase of the social visibility of climate change.

Our experts are regularly consulted by national and international media, responding to our goal of being a bridge between science and policy-making on climate change and society together with other socio-economic actors. This ambition is aligned with our Strategic Objective to promote the transition towards a transdisciplinary science: Science with and for society.

With this objective, in 2020 we accounted for a total of 278 interviews and media appearances. Some of them within the framework of our ongoing collaborations, both aimed at expert audiences and society at large, and in both cases aimed at raising awareness of the key issues surrounding climate change.

In the same way, we are very conscious of the need to develop innovative ways of dissemination to connect climate change communication with society. New media, based on the co-production of content, that can respond to the current communication keys based on scientific knowledge. In this regard, it is worth highlighting the contribution made by our Scientific Director, Maria José Sanz, in the documentary series 'Porvenir', which analyzes the causes and consequences of climate change, as well as global warming in Spain. A series produced by Movistar+ and conducted by the renowned journalist, Iñaki Gabilondo, 'Porvenir' has addressed for the first time what climate change will be like in Spain from a new point of view: that of docufiction.

08

SET OF INDICATORS (BERC INDICATORS)

SET OF INDICATORS

BERC Indicators

PUBLICATIONS (Production)

● Total number of publications published in the given year	143
● Number of articles published in the given year	123
● Number of Books and Chapters published in the given year	9
● Other publications published in the given year	11

PUBLICATIONS (Impact Factor)

● % of Indexed articles in Quartile 1	80%
● % of Indexed articles in Decile 1	61%
● H index (self-cites excluded)	57

TRAINING

● PhD - Supervised students	41
● PhD - Defended thesis	4
● Master - Supervised students	11

KNOWLEDGE TRANSFER

● Dissemination in Scientific events	62
● Number of BC3 seminars	14
● Number of Dissemination events organized	12

OUTREACH AND SOCIAL MEDIA

● Interviews in TV	15
● Interviews in press/magazines	151
● Interviews in radio	39
● Interviews in digital media	73
● Website traffic	164.573 visits
● Social media Activity	608

FUNDING

● Total budget	4.986.555€
● % of Funding (non BERC)	77,8%

PEOPLE

● Total BC3 Team	77
● Number of researchers	70
● Number of administration staff	7
● Number of guest researchers	15

Sustainability, that's it!



bc³

BASQUE CENTRE
FOR CLIMATE CHANGE
Klima Aldaketa Ikergai

Sustainability, that's it!

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